

NARMADA CONTROL AUTHORITY

Environment Sub Group

Agenda and Minutes of Meetings

PART II

*14th to 20th Meeting of the Environment Sub-
Group (ESG)*

1992 to 1993

Table of Contents

		<i>Page</i>
1992	14 th meeting Agenda	1
1992	14 th meeting Minutes	28
1992	15 th meeting Agenda	62
1992	15 th meeting Minutes	141
1992	16 th meeting Agenda	223
1993	16 th meeting Minutes	292
1993	17 th meeting Agenda	340
1993	17 th meeting Minutes	442
1993	18 th meeting Agenda	460
1993	18 th meeting Minutes	600
1993	19 th meeting Agenda	672
1993	19 th meeting Minutes	741
1993	20 th meeting Agenda	767
1993	20 th meeting Minutes	849

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

पर्यावरण उपदल **Environment Sub-Group** चौदहवीं बैठक की कार्यसूची **Agenda for Fourteenth Meeting**

स्थान : पर्यावरण भवन, नई दिल्ली

दिनांक : 25 फरवरी 1992 10.00 बजे

Venue : Paryavaran Bhawan
New Delhi

Date : 25 February 1992 10.00 A. M.

इन्दौर
फरवरी 1992
INDORE
February 1992

AGENDA FOR 14TH MEETING OF THE ENVIRONMENT SUB-GROUP
NCA TO BE HELD ON 25.2.1992 AT PARYAVARAN BHAVAN,
C.G.O COMPLEX, NEW DELHI

I N D E X

Item Nos.	Contents	Page No.
XIV-1(75)	Confirmation of the Minutes of the Thirteenth meeting of the Environment Sub-Group	1
XIV-2(76)	Review of Action taken on the decisions of previous meetings.	2 - 3
XIV-3(77)	Present Status of Studies/Surveys and Environmental Action Plans.	4 - 9
	Any other Item	10
	Date & Venue of next meeting	10

ANNEXURES

XIV-1	Status report of Environmental Aspects for the period ending 31st December, 1991.	1 - 14
-------	---	--------

**Item No.XIV-1(75)CONFIRMATION OF THE MINUTES OF THE THIRTEENTH
MEETING**

Minutes of the Thirteenth meeting of Environment Sub-Group of Narmada Control Authority were circulated to all Members and invitees separately vide letter No.ENV/34(13)/91 dated the 6th January, 1992. No comments have been received.

The minutes may be confirmed.

**Item No.XIV-2(76)REVIEW OF ACTION TAKEN ON THE DECISIONS OF
THE PREVIOUS MEETING**

1. Consideration of Policy Issues [Item No.XIII-2(72)]

a) Catchment Area Treatment :

Chairman of Environment Sub Group during its 13th meeting held on 29th November, 1991 while reviewing the progress of execution of treatment works on very high and high priority areas of the catchment desired that the outcome of the discussions of the NCA meeting scheduled during the afternoon of 29th on the issue of treating the balance high and very high priority areas **Pari-Passu** with the project works is to be reported to the Sub-Group.

Chairman, NCA during its meeting held on 29.11.1991 had stated that no difference of opinion exists among the States for treating the very high and high priority categories of catchment directly draining into reservoir at the cost of the project **Pari-Passu** with the engineering works. However, as regards the remaining area a view has to be taken on the extent of area to be treated as also for finding the resources for the same and the time frame for completing the work. He further pointed out that no standard guidelines for such works exist anywhere in the world. Therefore the CWC has been requested to work on this issue in consultation with the Min. of Water Resources and expressed the hope that CWC will come out with some proposals in the coming two to three months. He further pointed out that some actual ground observations will be useful to assess the exact relationship between the Status of the catchment in its different portions and its impact on the reservoir and hoped that the proposed Environment Development Cell (EDC) in NCA will be able to take up such works in near future.

b) Extension of Time for Environmental and Forestry Approval:

During the 13th Environment Sub-Group meeting Chairman brought to the notice of the Sub-Group that Ministry of Environment and Forest has written a letter on 25.11.1991 in reply to a letter received from the Ministry of Water Resources on the issue of the extension of time for Environment and Forestry approval stressing the need to rework schedules for Environmental protection works and construction of the project. The action taken by MOWR on this is being awaited.

2. **Time frame for preparation of Action Plan and implementation of Environment Safeguard Measures (Item No.XII-2(64)B-3)**

During the 13th Environment Sub-Group meeting GOMP had submitted a statement of expenditure incurred on Environmental & R&R components as on September, 1991 which was circulated alongwith the minutes of the meeting. However, similar information from Govt. of Gujarat and Govt. of Maharashtra is still awaited.

Item No.XIV-3(77)PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS

The latest status report of studies and activities regarding Environmental Aspects of SSP and NSP for the quarter ending December, 1991 is attached (Annex.XIV-1). The progress/present position of the different measures are given below, briefly, for review by the Sub-Group.

1) Phased Catchment Treatment.

Narmada Sagar Project

The GOMP has submitted Action Plan for Catchment Area Treatment of NSP in June, 1991. Accordingly the treatment is proposed to be completed by 1996-97 covering a total non forest area of 47,000 ha and a forest area of 6,424 ha at a total cost of Rs.22.23 crores. It is proposed to treat a total area of 7,199 ha during the current year at an estimated cost of Rs.3.18 crores. The progress reported as on November, 1991 is 8700 ha (by khus plantation). Latest progress is to be reported by GOMP.

During the last Environment Sub-Group meeting Chairman questioned the inclusion of areas of catchment under Compensatory Afforestation works. GOMP had promised to verify and provide the clear picture soon. However, the information is still awaited from the GOMP. GOMP may clarify and report the progress on treatment works.

Sardar Sarovar Project

Government of Madhya Pradesh

The detailed Action Plan has been submitted by the GOMP to the MOE&F and according to this, it is proposed to treat 72,000 ha of degraded forest and 18,000 ha of non-forest areas. An area of 6,000 ha will be covered during the current year (1991-92) and 19,000 ha every year subsequently till 1995-96. Another 8,000 ha will be treated during 1996-97, thus completing the entire programme. At the price level of 1990, GOMP has projected a total expenditure of Rs.43.93 crores. The progress reported as on November, 1991 is 9800 ha. by khus plantations. The latest progress may be reported.

Government of Gujarat

The detailed action plan alongwith the drawings as desired by the Chairman was supplied to the MOE&F. Govt. of Gujarat vide letter No.SSNNL/ENV/271/91 dated 27.6.91 has revised the plan for completion by 1994-95. According to the plan 6000 ha is targeted for the current year. Catchment area treatment works are reported to be completed in 3970 ha till November, 1991. The latest progress may be indicated by GOG.

During the last Environment Sub-Group meeting Chairman had directed the GOG to reconcile its figures of catchment area with the figures available with NCA and AIS&LUSO, New Delhi. Progress on the reconciliation of figures is to be reported by GOG.

Govt. of Maharashtra.

The Catchment area treatment plan for cultivable area received from Govt. of Maharashtra was submitted to MOE&F earlier. Thereafter the detailed catchment area treatment plans for forest and non-forest areas separately prepared by GOM for presentation to the World Bank Appraisal Mission for Narmada Basin Development Project were also forwarded as desired by the MOE&F. A detailed catchment area treatment plan, including the map of the area, for the forest areas covering 21227 ha catchment, identified as per the guidelines issued by the MOWR is received. The progress on preparation of similar plan for non forest areas may be reported by GOM.

During the last Environment Sub-Group meeting Chairman observed that the progress on catchment area treatment in Maharashtra stands at Nil affecting Pari-Passu implementation of catchment area treatment works. GOM informed the Sub-Group that the works could not be started due to agitation in the area but serious effort are on for bringing the situation to normalcy by the end of December, 1991. GOM is to report on the steps taken for taking up the catchment area treatment works Pari-Passu with the works on project.

ii) Compensatory Afforestation

Narmada Sagar Project

Govt. of Madhya Pradesh.

Govt. of Madhya Pradesh has reported a total progress of 28287 ha of compensatory afforestation as against a target of 25676 ha till 1990-91 rains. As such GOMP is ahead of the scheduled target.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP has indicated the progress on 2421 ha as on November, 1991 against the scheduled target of 2828 ha. The latest progress is awaited from GOMP.

GOMP was expected to prepare the detailed plan for clear felling and cut in regular felling based on the report of State Forest Research Institute (SFRI), Jabalpur, Wild Life Committee constituted by GOMP and final reports of Friends of Nature Society, Bhopal. GOMP may indicate the progress.

Govt. of Gujarat

By 1991 rains, plantations were completed in 2408 ha of non forest land and 4520 ha of degraded forest in the catchment besides 2555 ha of degraded forest land outside catchment. Progress reported during the current season in non-forest areas in Kutch district is only 258 ha due to reduced rainfall in the area. The latest progress in all the areas may be reported by GOG.

Govt. of Maharashtra

Certain clarifications were sought by MOE&F from GOM on the proposals submitted for afforestation of 19205 ha of land including 13000 ha of degraded forest and 6205 ha of non forest land. During the last Sub-Group meeting significant progress on an area of 8425 ha was reported against the expenditure of Rs.4,38,78,000 by GOM. Details of the works accomplished are awaited. It was further assured that the balance areas as proposed will be afforested during the next year for which an estimate of Rs.9,29,18,000 is projected. The complete details needs to be furnished by the GOMP.

iii) Command Area Development

Narmada Sagar Project

Govt. of Madhya Pradesh

For drawing up a master plan on drainage, control of water logging and salinity, consultants have been shortlisted by GOMP. However, in order to make some data available to the consultants certain field observations for the purpose of data collection were to be taken up by the GOMP. Steps taken for the same may be reported.

Regarding studies on effect of run off from the fields due to application of pesticides, insecticides and chemical fertilizers in the command area, it was stated during the 11th, 12th and 13th Environment Sub-Group meetings that replies are not received from J.N.Agricultural University, Jabalpur and Pollution Control Board who have been addressed in the matter by NVDA. Further steps taken may be reported.

During the last Environment Sub-Group meeting Chairman desired that GOMP may also draw up terms of reference for carrying capacity studies of command area development as being drawn up by the Govt. of Gujarat. Progress may be reported.

Sardar Sarovar Project

Govt. of Gujarat

Reports on the engineering aspect of studies assigned to Consultants were expected by the end of 1991. GOG keeping in view the discussions of the last Environment Sub-Group meetings is to draw up an implementation plan based on the outcome of the studies. The progress of finalisation of the Terms of Reference of carrying capacity aspect alongwith tentative schedule of the implementation of the action plan resulting from the studies is to be reported by GOG.

Govt. of Rajasthan

Govt. of Rajasthan has submitted a report to Ministry of Environment and Forests during August, 1990. No comments have been received so far.

iv) Survey of Flora, Fauna and Carrying Capacity Studies.

Narmada Sagar Project

Govt. of Madhya Pradesh

Progress of the studies being done by Wildlife Institute of India may be reported. The final report of the studies conducted by Friends of Nature Society, Bhopal may also be furnished.

Sardar Sarovar Project

Govt. of Madhya Pradesh

The studies are entrusted to State Forest Research Institute, Jabalpur. They are continuing the work. The Institute has already submitted their report for the quarter ending September, 1991. The report for the quarter ending December, 1991 is now due. GOMP is to report the position.

Govt. of Gujarat

The studies are being carried out by M.S University, Vadodara. Their interim reports I and II were forwarded to MOE&F. The final report is expected by April, 1992. Up-to-date progress is to be reported by GOG. The position of Wildlife studies under progress may be reported.

v) Archaeological & Anthropological Survey

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP stated that the survey in 89 villages are completed and for remaining 165 villages, it is likely to be completed by March, 1992 and the action plan could be ready by June, 1992.

Action plan prepared for the monuments identified for protecting/shifting may be furnished.

Sardar Sarovar Project

Govt. of Madhya Pradesh

It is stated that the archaeological survey in 169 villages is completed by State Department of Archaeology and Museum and the survey in remaining 24 villages will be completed by March, 1992. The present position may be indicated.

vi) Seismicity and Rim Stability of Reservoir

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP indicated that studies for some patches of narrow water divide will be completed during the field season programme of 1991-92 by GSI. GOMP may report the progress on works.

Sardar Sarovar Project

GSI had earlier completed Rim Stability Survey in 130 Sq.Km. area in Madhya Pradesh and entire area in Gujarat. A meeting to review the action to be taken for completion of the remaining survey works entrusted to GSI was held by NCA on 18.9.91 and modalities were worked out. A lump sum amount of Rs.1 lakh was paid by NCA towards advance payment of the work to GSI. GSI is expected to complete the works within the current field season. GSI in its report on rim stability had suggested some additional studies to wipe out suspicion about the leakage from the reservoir to adjacent basins. GOMP during the meeting held on 18.9.91 to discuss rim stability was directed to initiate tracer studies as suggested by GSI in consultation with CW&PRS or Bhabha Atomic Research Centre (BARC). GOMP to indicate the progress of works.

As desired in the last Environment Sub-Group meeting, a copy of the draft report on Rim Stability analysis in 130 Sq.Km area in MP was made available to Prof. Ramaseshan.

vii) Health Aspects

Chairman during the last Environment Sub-Group meeting has desired that the action plan submitted by the State Governments should include the present health status of the people living in the submergence area. Besides, the plan should not include only whatever normal health infrastructure the State Government was anyway to provide but also extra amount for special provisions arising from implementation of the project like extra equipment, more funds for baseline data build up etc. GOMP, GOG and GOM are to report the steps taken to include the above in their action plans.

Govt. of Gujarat

During the last two meeting of the environment Sub-Group, Min. of Env. & Forests has called for a baseline data on health aspects which are awaited from GOG. The comments of the MOE&F on the health plan submitted are also awaited.

Govt. of Maharashtra

Copy of the draft health plan received from GOM was forwarded to MOE&F. The progress on preparation of final health plan by GOM is still awaited.

viii) Fisheries Development of SSP and NSP Reservoir

During the last Environment Sub-Group meeting Chairman has desired that NCA is to explore and find out if the studies on conservation aspect as carried out are sufficient. If not, Central Inland Capture Fisheries Research Institute (CICFRI) or other agencies may be contacted for this. A meeting to explore the same is proposed to be held in February, 1992. The outcome of the same will be reported to the Sub-Group.

Govt. of Madhya Pradesh

A consolidated report of the Limnological studies conducted by the 3 Universities for the 3 zones for the year 1989-90 was furnished during the last meeting of Environment Sub-Group. Latest report may be furnished. Besides progress on works done by fisheries cell of NVDA may also be reported.

Govt. of Gujarat

Govt. of Gujarat may like to submit the progress of studies by Central Inland Capture Fisheries Research Institute (Fisheries development in estuary). The progress achieved on breeding Hilsa fish in captivity may also be furnished.

Any Other Item

Date & Venue of next meeting

ANNEXURES

ANNEX - XIV (1)

STATUS REPORT OF STUDIES AND ACTIVITIES
REGARDING THE ENVIRONMENTAL ASPECTS OF
SARDAR SAROVAR PROJECT (SSP)
DECEMBER, 1991

The present status of studies/preparation of action plans and implementation, in respect of suggested Environmental Safeguard Measures is as indicated below:

Suggested Environmental Safeguard Measures

- 1) Phased Catchment Area Treatment.
- 2) Compensatory Afforestation.
- 3) Command Area Development.
- 4) Flora, Fauna & Carrying Capacity.
- 5) Seismicity.
- 6) Health Aspects.
- 7) Archaeological & Anthropological Studies.
- 8) Fisheries.
- 9) Rim Stability Analysis.

1) PHASED CATCHMENT AREA TREATMENT

- All India Soil & Land use survey organization, New Delhi submitted its report on prioritization of watersheds in April, 1991.

- The total catchment area of SSP below NSP is 2468973 ha.

	Madhya Pradesh	Gujarat	Maharashtra	Total for the Basin
Total Catchment	2248601	36761*	163611	24,68,973 ha
Very High & High	541825	35412	163354	6,93,591
Directly draining Very High & High	90000	29575	25395	1,44,973

*According to Govt. of Gujarat, the actual catchment area is only 30229 ha and entire area is planned for treatment.

- The extent of catchment area to be treated as part of reservoir projects is yet to be finalised at Government of India level. However, pending a final decision, following the guidelines of the Ministry of Water Resources, lands identified as of 'high' and 'very high' erodibility categories situated in the Sub-watersheds directly draining into the reservoirs are being taken up for treatment by the State Governments.

Government of Madhya Pradesh (90,000 ha)

In SSP catchment in M.P., 29 sub-watersheds have been identified for treatment. They cover an area of about 90,000 ha., 20% of which is estimated to be forest land. Treatment has been planned separately for forest and non forest areas.

The programme and progress is given below:

Progress during the current season includes only the measures of khus plantations. Other measures are in progress.

Programme and Progress of Catchment Area Treatment in M.P. (in ha.)

	91-92	92-93	93-94	94-95	95-96	96-97	Total esti- mated cost at price level of 1990 (Rs.crores)
Target/Progress as on Dec '91							
Non-forest area/ha	6000	15000	15000	15000	15000	6000	25.20
(72,000 ha)	9800						
Forest area/ha							
(18,000ha)	*	4000	4000	4000	4000	2000	18.33
Total	6000	19000	19000	19000	19000	8000	43.53
	9800						

*For Forest areas, advance preparation will be done.

Government of Maharashtra (25,400 ha)

The total catchment area of the SSP in Maharashtra is 163611 ha. Out of this, 25400 ha is proposed to be treated. The treatment plans for the non-forest and forest areas are prepared separately.

Programme and Progress of Catchment Area Treatment (in ha.)

	Yr. I	Yr. II	Yr. III	Yr. IV	Yr. V	Yr. VI	Yr. VII	Total	Cost
Forest Area	2027	3200	3200	3200	3200	3200	3200	21227	29.41
(21,227ha)									
Non Forest Area	740	929	1175	815	512	-	-	4171	2.20
(4,171)									

25398 ha

Say 25,400 ha

The catchment area treatment works are yet to commence.

Government of Gujarat (30,229 ha)

The total catchment area of the SSP in Gujarat is 36,761 ha. of this, a total of 29,575 ha is identified for treatment. However Govt. of Gujarat has planned to treat 30229 ha.

The catchment area treatment measures have been planned separately for forest and non-forest areas covering 27204 ha and 3025 ha respectively.

a) Forest Area (27,204 ha)**Programme and Progress for treatment (Area in ha.)**

<u>1990-91</u>	<u>1991-92</u>	<u>1992-93</u>	<u>1993-94</u>	<u>1994-95</u>	<u>Total</u>
Progress Target/Progress as on Sept.91					
4528	5000/3970	6000	6000	5676	27204

b) Non-Forest Area (3025 ha.)

The plan is phased for completion in five years. Till the rains of 1990, an area of 897 ha has been treated. The works to treat 830 ha. area are under progress during the current season.

2) Compensatory Afforestation**Government of Madhya Pradesh**

A total of 6547 ha of degraded forest and 2190 ha of non-forest land located in districts of Jabua, Dhar and Khargone is identified for afforestation works in lieu of submergence of 2732 ha forest area. The work of compensatory afforestation in the districts of Dhar and Jabua has been assigned to Madhya Pradesh Van Vikas Nigam (MPVVN). The compensatory afforestation work in non-forest and degraded forest land identified in Khargone district has been entrusted to the Divisional Forest Officer, Kaveri Forest Division.

Programme and Progress of Afforestation (Area in ha.)

	<u>DEGRADED FOREST</u>	<u>NON-FOREST</u>	<u>TOTAL</u>
Already planted during			
i) 1990 rains	132	716	848
ii) 1991 rains	1200	373	1573
Total area targatted to be planted			
1991-92	1580	400	1980
1992-93	1580	400	1980
1993-94	1580	400	1980
1994-95	1675	274	1949
	-----	-----	-----
	6547	2190	8737

Government of Maharashtra

The forest area diverted due to submergence is 6488 ha. The total area to be put under compensatory afforestation is 19205 ha being 6205 ha non-forest area and 13000 ha of degraded forest. A detailed compensatory afforestation scheme has already been submitted by the Government of Maharashtra to the Ministry of Environment & Forests on 14.05.90 for approval. Ministry of Environment & Forests has sought certain clarifications from Govt. of Maharashtra which are still awaited. A plan on compensatory afforestation prepared by Govt. of Maharashtra was submitted to World Bank during Sept. 1991. According to this plan the programme of compensatory afforestation is given below:-

Programme of Compensatory Afforestation

Year	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99 to 2001	Total
Plan- Adv. works	3600	3600	3600	3600	3600	1000	Subsequent tending operations	19000	
Cost (In crores)	3.075	5.224	5.72	5.98	6.10	4.43	9.43	4.76	37.72

The progress reported till the rains of 1991 is 6425 ha.

In addition, compensatory afforestation is also required to be undertaken in 2,700 ha. of non-forest land in lieu of the forest land in Taloda area released for resettlement works. For this, non-forest land to the extent of 2,900 ha has already been identified. The GOM has issued orders on 22.04.91 to transfer these lands to the forest dept. Ministry of Environment and forests, has asked for the details of land identified and other clarifications. It was reported that 800 ha of land is found suitable for compensatory afforestation by Forest Department and is accepted. The present position with reference to identification of the balance land of 1900 ha. is awaited from the Government of Maharashtra.

Government of Gujarat

A total of 4165.9 ha of forest area has been diverted for SSP in Gujarat. A work plan for 4650 ha of non-forest land in nine villages of Kutch district and of 9300 ha of degraded forest land outside the basin, in the districts of Surat, Bharuch, Vadodara, Panchmahals and Sabarkantha, is under implementation. Besides 25560 ha of the forest area below density 0.6 in the catchment is also planned for afforestation works.

The programme and progress is as follows:

	1991-92 Target/progress as on Aug '91	1992-93	1993-94	Work done till rains of 1990	Commulative progress as on December '91
Non Forest Area (4650 ha)	900/258	1225	375	2150	2408
Degraded forest (outside- the catch- ment) (9300 ha)	3300/2555	3000	3000	-	2555

13,950 ha.					

Additional Activities

(a) Dam Vicinity Plantation (235 ha)

Planted till rains of 1990 - 202.5 ha

(b) Forest Plantation (500 ha)

Ravine lands on the left bank of the Sabarmati in village Ratanpur (300 ha) and Pirojpur (200 ha). In Pirojpur an area of 6 ha is planted against the target of 35 ha till Sept. 91.

(c) Additional Plantation in Non-forest Areas (1088 ha)

Non-forest land in Kutch district. Lands have already been released. The plantations will be completed by 1994-95.

3) COMMAND AREA DEVELOPMENT (INCLUDING DRAINAGE STUDIES)

Government of Madhya Pradesh

No command area in Madhya Pradesh.

Government of Maharashtra

No command area in Maharashtra.

Government of Gujarat

Master Plan for surface and sub-surface drainage has been prepared upto Mahi River Crossing. Services of six Consultants have been engaged for carrying out studies beyond Mahi Crossing. These include studies related to ground water, drainage, conjunctive use of surface and ground water, silting aspects of main canal, planning and design of micro-level canal net work etc. Reports were expected by the end of the year 1991.

Government of Rajasthan

The Government of Rajasthan, has submitted a report on Environmental & Ecological aspects and remedial measures for Narmada Canal Project. Copy of the report is submitted to Ministry of Environment and Forests.

4) FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

Government of Madhya Pradesh

Study has been entrusted to the State Forest Research Institute, Jabalpur, in collaboration with H.S.G University, Sagar and Rani Durgavati University, Jabalpur. The study commenced in April, 1990 and is expected to be completed in three years by March, 1993. Action plan will be ready by March, 1994 and implementation will be done by March, 1996. The Institute has submitted interim reports for the quarters ending March, June and September, 1991.

Government of Gujarat

1) Basic Studies

Studies were conducted by M.S. University, Vadodara in 1983. Fresh study for the SSP submergence area in Gujarat has been entrusted again to M.S. University, Vadodara. An inception report and interim reports I & II have been furnished. Final report is expected by April 1992.

2) Wildlife Conservation Measures

The area of the Shoolpaneshwar Sanctuary has been enlarged from 151 sq.kms. to 448 sq.kms. Habitat improvement measures in the enlarged Shoolpaneshwar Wildlife Sanctuary to foster the flora and fauna of the area are scheduled for completion in five years. Notification, declaring Shoolpaneshwar sanctuary is issued.

3) Wildlife Management Study for Sardar Sarovar Submergence Area

The above study has been assigned to a group with a Principal Investigator (of the rank of Conservator of Forest). The report was to be available by end of 1991. A workshop on approaches to integrated wild-life management in Gujarat was organised in October, 1990. Report is made available.

4) Additional Environment Improvement Programme.

Sardar Sarovar Narmada Nigam Ltd, has decided to undertake the following additional environmental improvement programme in the catchment area and its vicinity.

	Estimated Cost (Rs in lacs)
i) Creation of a habitat for the great Indian Bustard (highly endangered bird of the country):	26.75
ii) Improvement of support watering facility at six locations.	14.75
iii) Providing inspection and transport facilities.	3.40

TOTAL:	44.90
	=====

Government of Maharashtra

School of Environmental Science, Pune University are assigned the work. Terms of Reference are finalised. Work is planned for completion in two years i.e. by 1993.

5) SEISMICITY

Government of Gujarat

The design of the dam allows for a horizontal seismic coefficient of 0.125 g., and it covers additional risk due to reservoir induced seismicity. An eminent Indian Consultant Dr. Jai Krishna, who was the Vice Chancellor of the Roorkee University had been engaged as the Consultant to the Project. The design of the dam had also been referred to the Central Water & Power Research Station, Pune, and Earthquake Engineering School at Roorkee, for dynamic analysis. Advice was also obtained from the World Bank Consultants viz - Dr. Glough and Dr. Bolt, of Burkley University. The design of the dam has also been approved by the Dam Safety Panel comprising eminent engineers.

Establishing Seismological Observatories:

Installation and Commissioning of seismological instruments have been completed in four observatories at Kevadia, Naswadi, Karjan and Kawant. The remaining five observatories viz. Alirajpur, Barwani, Sagbara, Kukshi and Shahada are being commissioned.

No separate study regarding Seismicity Aspect is required in Madhya Pradesh and Maharashtra.

6) HEALTH ASPECTS

Government of Madhya Pradesh

The State Director of Health Services, has conducted detailed survey during 1982-83. Health plan regarding immediate service to be provided and continued health services to the

population has been prepared. Provision for hospitals, dispensaries, mobile units and evaluation cell & monitoring cell has been made. The total anticipated expenditure including the cost of strengthening of health institutions has been worked out as Rs.748.73 lacs.

Government of Maharashtra

Report has been prepared on the following aspects:

- a) Strengthening anti malaria programme in the border area.
- b) Provision of mobile dispensaries.
- c) Providing sub centres.
- d) Construction of primary health services.

The total expenditure anticipated is Rs.2,577.00 lacs.

Government of Gujarat

Two studies relating to schistosomiasis had been carried out in 1985 by the National Institute of Communicable diseases and concluded that there is no threat to the people in the project area. Subsequently, a team led by the Chief of Schistosomiasis Division WHO, Scientist from British Council, London, and Environment Advisor, World Bank carried out investigations and confirmed the above.

The work plan on health aspects has been furnished to the Ministry of Environment & Forests, and World Bank. Total implementation will take about 17 years time. The programme covers the villages on the periphery of reservoir and the command area.

The work plan submitted would be implemented in a phased manner keeping in view the progressive development of irrigation in the vast command area of the project. A twenty five bed hospital is already set up and operating in the main colony of the project.

7) ARCHAEOLOGICAL AND ANTHROPOLOGICAL STUDIES

ARCHAEOLOGICAL STUDIES

Government of Madhya Pradesh

Survey for identification of monuments is being carried out by the State Department of Archaeology and Museum. Out of 193 villages, survey is completed for 169 villages and for the remaining 24 villages it is expected to be completed by March, 1992. Detailed action plans are still awaited from the Government of Madhya Pradesh.

Government of Gujarat

Inventory survey of 19 villages, coming under submergence carried out by the Director of Archaeology, has identified the following two temples for shifting.

- 1) Shoolpaneshwar Mahadev Temple at Surpan, District Bharuch.
- 2) Hamfeshwar Mahadev Temple in Chhota Udaipur Taluk.

Shifting of these monuments is proposed in three phases. Identified monuments are not listed as protected monuments. Sites have been finalised to relocate Shoolpaneshwar and Hamfeshwar temples in consultation with trustees of the temples. Shoolpaneshwar temple will be shifted & reconstructed near Gora, about 15 kms., down-stream on the same bank. The construction work was expected to commence after the monsoon. Whereas, Hamfeshwar temple will be shifted and reconstructed at a higher elevation near the present location.

Government of Maharashtra

No work is proposed.

ANTHROPOLOGICAL STUDIES

Government of Madhya Pradesh

Government of Madhya Pradesh has informed that in view of the studies being carried out in connection with Narmada Sagar Project, no separate anthropological studies are required and that the Director General, Anthropological Survey of India has also expressed the same view.

Government of Maharashtra

No study is proposed.

Government of Gujarat

No study is proposed.

8) **FISHERIES**

Government of Madhya Pradesh

Studies of important fish/fauna specially the Mahaaseer has been included in the studies being conducted by the three Universities of the State, for the upper Narmada, Rani Durgavati University, Jabalpur, Middle Narmada, Barkatullah University, Bhopal and lower Narmada, Vikram University, Ujjain. All the three Universities have initiated the studies in their respective areas as per MOU in 1989. Progress report for the period ending Sept. 1990 has been received. The study period is three years.

Government of Maharashtra

Department of Fisheries, Government of Maharashtra, has submitted a draft outline for the fresh water, fisheries development in Maharashtra area.

Government of Gujarat

Central Inland Capture Fisheries Research Institute, Barrackpore, Calcutta, (Local office at Vadodara) has undertaken the studies in respect of aquatic life upstream and downstream of Sardar Sarovar in Narmada River in Gujarat State. Report of the first phase of pre-impoundment survey has been received.

The design plans and estimates for a 10 ha., fish farm and fish hatchery complex have been finalised. The plan is to be implemented in 9 years and will include Hydrobiological studies, establishment of fish hatchery and fish farm training of Fishermen, establishing and assisting primary fishermen's cooperatives, establishing and assisting an Inter-state Fisheries Development Board and a Cell at Directorate for monitoring.

NARMADA CONTROL AUTHORITY

The Narmada Control Authority, had commissioned a socioeconomic study by Central Inland Capture Fisheries Research Institute, Barrackpore, for possible fisheries development in the entire Narmada Basin excluding Bargi reservoir to the confluence of the Narmada with the Arabian sea including estuarine areas. The proposals to establish an Inter-state Apex Body with participation by the States and NCA is under consideration.

9) RIM STABILITY ANALYSIS

Government of Madhya Pradesh & Govt. of Maharashtra

Geological Survey of India, Nagpur Division, was assigned the work by SSNNL Gujarat. Now the work has been transferred from Nagpur Division to Bhopal Division and is in progress. GSI has completed works in 130 sq.km area in Madhya Pradesh and entire area in Gujarat. The work on remaining areas measuring 170 sq.km in Madhya Pradesh and entire area in Maharashtra is likely to be completed by the end of current working season of G.S.I. i.e. April '92.

Government of Gujarat

Rim Stability analysis has been completed by the Geological Survey of India, Jaipur Branch, in the Gujarat portion of the reservoir. No more work in this respect is required.

STATUS REPORT OF STUDIES & ACTIVITIES
REGARDING THE ENVIRONMENTAL ASPECTS OF
NARMADA SAGAR PROJECT
DECEMBER, 1991

1) **PHASED CATCHMENT AREA TREATMENT:**

The free draining area of Narmada Sagar Project down-stream of Bargi Dam is about 38,952 sq.kms. As per the guidelines of MOWR, directly draining watersheds of 'very high' and 'high' priority categories only are to be treated. This is, however, subject to a final decision on the subject yet to be arrived at. Works on prioritisation of the watershed was entrusted earlier to GSIT&S, Indore. However, the work is now entrusted to "All India Soil & Land Use Survey Organisation, New Delhi, and they are carrying out the prioritisation for the entire catchment of NSP.

AIS&LUS has divided the catchment area down-stream of the Bargi Dam into nine sub-catchments. These sub-catchments are further divided into watersheds and sub-watersheds. Preparation of maps and reports relating to five sub-catchments has been completed and these cover the entire area around the periphery of the Narmada Sagar Reservoir. Out of 638 Sub-watersheds, only 25 sub watersheds of 'high' and 'very high' priority directly draining into the reservoir. An area of 58,510 ha is proposed to be treated. About 20% of this area i.e. 11,510 ha is estimated to be forest land and the rest 47000 ha non forest land.

Total Forest area to be treated:

a) Forest land	11510
b) Pilot project	2415
(Area is an additionality)	-----
	13925

The above area will be treated under following categories:-

a) Under compensatory afforestation	7460
b) Under CAT plan.	6465

Programme and Progress of Works

Programme of Catchment Area Treatment(58510)

	Area treated till Dec'91 Total	91-92	92-93	93-94	94-95	95-96	96-97
Non-forest area (47000ha)	7500	6000	9000	9000	9000	9000	5000
Forest area (6465ha)	1200	1199	2175	1050	1000	1000	-
	8700						

Progress indicated during the current season pertains to measures of khus plantations only; the other measures wherever necessary are in progress.

2) COMPENSATORY AFFORESTATION:

A total of 40332 ha forest land would come under submergence and an additional 779.9 ha of forest land has been diverted for the residential colony, power house complex, dam, saddle dam and approach roads. Subsequently, another 308.4 ha of forest land was permitted to be diverted for power house. Thus a total of 41420 ha of forest land has been permitted to be utilised for the construction of ISP.

The Government of Madhya Pradesh, has identified 10143 ha of non-forest and 70802 ha of degraded forest land.

Programme of Compensatory Afforestation

	Targets/ progress till Dec' 1991.	91-92	92-93	93-94	94-95	95-96
Degraded forest area 23048 (70,802ha)		12400	12528	12400	12400	12370
Non Forest Area 5239 (10,143ha)		1500	1534	1500	1500	1037
	25676					
(80,945) 28287		13900	14062	13900	13900	13407
(Say 81,000)						

3) COMMAND AREA DEVELOPMENT

The Government of Madhya Pradesh has submitted command area development plan. The project on completion will provide annual irrigation to 1.69 lakh ha of cropped area over a net C.C.A. of 1.23 lakh ha.

The implementation of the plan would be taken up in three phases for completion in 6/2007.

4) FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

Studies on these aspects were entrusted to Wildlife Institute of India, Dehradun in December, 1989 and are expected to be completed by March 1993. Action plan will be ready by March, 1994. Implementation of the action plan will be completed by March, 1996. Progress report upto December, 1990 has been submitted by Wildlife Institute of India.

Friends of Nature's Society, Bhopal, is entrusted with preparation of Wildlife Retrieval and Conservation Plan on consultancy basis. A position report was submitted in July, 1989 and a preliminary draft report was expected by October, 1991. The final draft was to take another three months. The progress report as on August 1991 is submitted.

5) SEISMICITY AND RIM STABILITY

The reservoir competency survey has been done by GSI and report is submitted. In the report, GSI has suggested further studies for some patches of narrow water divide. These studies are to be taken up in consultation with GSI. The Director, GSI has been approached for the same.

Establishment of Seismic observatories in the Narmada Sagar Complex area is under correspondence with IMD, DGTD and CWC. Meeting of IMD, CWC, DGTD and NVDA Officers for finalising the issue was held on 18.3.91. A list of instruments and broad specifications were agreed. DEA's clearance to the proposal for the procurement is awaited.

6) HEALTH ASPECTS

A note on health aspects of NSP prepared by NVDA was examined in the Ministry of E&F and comments were sent for modifying the report. NVDA has submitted the revised plan costing Rs.748.73 lacs for the preventive and curative aspects of health. Regarding preventive aspects, a MOU is signed with the Department of Preventive and Social Medicine, Gandhi Medical College, Bhopal, whereas, for studies on health aspect in project impact areas of SSP and NSP work is proposed through a cell of monitoring and evaluation under Directorate of Health Services, Bhopal.

Pre-impoundment and post-impoundment Limnological studies being carried out by three Universities will take care of water quality aspect.

7) FISHERIES DEVELOPMENT

The aspect relating to study of the availability of important aquatic fauna/fish, especially the migratory species has been included in the Limnological studies being conducted by the 3 Universities of the State; the Upper Narmada, (Bargi Reservoir) Rani Durgavati University, Jabalpur, Middle Narmada (Tawa, Barna and Kolar Reservoirs) Barkatullah University, Bhopal, Lower Narmada, Vikram University, Ujjain. All the three Universities have initiated the studies in their respective areas as per MOU. Their report for the period 1990 is submitted.

8) ARCHAEOLOGICAL AND ANTHROPOLOGICAL SURVEY

A survey of the 254 villages is required for identification of the archaeological monuments falling within the submergence area. State Department of Archaeology and Museum was entrusted with the survey of 87 villages which has been completed. The survey has identified 150 artifacts and 30 monuments besides Siddeshwar temple, Nimawar, Dewas and Joga Fort, Hoshangabad, which are likely to be affected.

As only lower bastion in north of the Joga Fort is likely to be affected by scour action of water and the Siddeshwar temple is well above the FRL of 860 ft., these two structures are not considered as affected by the project. However, other structures/monuments will be considered for shifting or protection after their archaeological significance is established through joint inspection of the competent authorities.

Archaeological Survey of India, was entrusted with the survey of 167 villages. So far they completed the survey of only 20 villages and identified 40 artifacts. State Department of Archaeology and Museum, M.P. is given this survey work also which will be completed by March 1992 and action plan would be ready by June, 1994. Action will be taken to preserve material of archaeological importance in consultation with experts.

ANTHROPOLOGICAL STUDIES

Efforts are being made for retrieval of bio-cultural material from the Narmada Basin. A lot of information is gathered from the field which generates immense data of Socio-Anthropological significance.

Rashtriya Manav Sangrahalaya has constituted a working group for the retrieval of bio-cultural material in Narmada Basin. Survey of tribal art and handicraft is entrusted to M.P. Adivasi Kala Parishad. These works are in progress.

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण
NARMADA CONTROL AUTHORITY

पर्यावरण उपदल
Environment Sub-Group

चौदहवीं बैठक का कार्यवृत्त
Minutes of the Fourteenth Meeting

25 फरवरी, 1992
पर्यावरण भवन, नई दिल्ली में हुई
Held at Paryaveran Bhawan, New Delhi
25th February, 1992

इन्दौर
अप्रैल, 1992

INDORE
April, 1992

MINUTES OF THE 14TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 25TH FEBRUARY, 1992
AT PARYAVARAN BHAWAN, NEW DELHI.

I N D E X

Item No.	C o n t e n t s	Page No.
	Introduction	1
XIV-1(75)	Confirmation of the Minutes of the 13th Meeting.	2
XIV-2(76)	Review of action taken on the decisions of previous meeting.	3 - 6
XIV-4(77)	Present Status of Studies/Surveys and Environmental Action Plans.	7 - 18
XIV-5(78)	Any other item Date and Venue of next meeting.	19

--***--

**MINUTES OF THE 14TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 25TH FEBRUARY, 1992
AT PARYAVARAN BHAWAN, NEW DELHI**

Shri R. Rajamani, Secretary, Ministry of Environment & Forests and Chairman of the Environment Sub-group of NCA welcomed the Members and Invitees to the 14th Meeting of the Environment Sub-group. The list of participants is enclosed at Annex.XIV. Min.1.

Discussion on the agenda items was taken up thereafter.

**Item No. XIV-1(75): CONFIRMATION OF THE MINUTES OF THE
13TH MEETING.**

Minutes of the 13th meeting of Environment Sub-group held on 29th November, 1991 at Sardar Sarovar Project Guest House, Kevadia Colony, Gujarat were circulated vide letter No.Env.34(13)/91/48 dated 6th January, 1992. Attention of the Chairman of the Sub-group was drawn to the note circulated by Vice Chairman, NVDA seeking correction of the minutes regarding the direction issued by the Chairman during the meeting. Chairman confirmed that statement as recorded was what was stated by him and hence no correction was required. Objections if any on those directions can be discussed under an agenda item separately.

The recorded minutes were therefore confirmed.

**Item No.XIV-2(76): REVIEW OF ACTION TAKEN ON THE DECISIONS
OF PREVIOUS MEETING**

1. Consideration of Policy Issues (Item No.XIII-2(72))

a) Catchment Area Treatment and Cost Sharing:

Chairman invited the attention of Central Water Commission (CWC) on the issue of Catchment Area Treatment and pointed out that unless CWC comes out with a solution soon it would not be possible to proceed with the works as desired by Ministry of Environment & Forests pari-passu with the construction of the dam. Shri R.V. Rao, Director, Environment Management, CWC informed that CWC has already issued a circular on the issue and only minor clarifications are required by the Ministry of Water Resources on the same. Further, he expressed the opinion that even these clarifications will not fulfill the objectives of the Ministry of Environment & Forests with respect to the extent of catchment to be treated by project authorities. Chairman desired that a letter from Min. of Env. & Forests should be again addressed to the Secretary, Ministry of Water Resources on this issue. Chairman further dwelt on the issue and informed that the need for stressing the catchment area treatment on since 1960 was not only with a view to reduce the silt affecting the reservoir but also for moderation of water flow & floods and ensuring even availability of water. Dr.S. Maudgal, Advisor, Ministry of Env. & Forests narrated the history of the need for catchment area treatment and stated that National Resources Management cannot be looked

in isolation of water resource project and that Dewan Committee in 1985 has looked into this aspect of Narmada Basin and estimated that 30% of the Narmada catchment needs treatment and cost estimates for the same were also projected. He further stated that Govt. of Gujarat started treating the area as envisaged in Dewan Committee report without making the distinction between the directly or indirectly draining areas. Thereafter ALLUSO developed a methodology for prioritisation of the catchment into high and very high and other categories to be taken up in phased manner for treatment. Now, Sardar Sarovar Project authorities of Maharashtra and Madhya Pradesh are treating a part of the catchment which according to the Ministry of Water Resources is covering sub-watersheds of high and very high priority categories directly draining into the reservoir. However plans are not prepared for treating the balance sub-watersheds. A definite plan is to be made and funds are required to be earmarked for the same by the project authorities. Shri D.C. Debnath, Executive Member, NCA stated that State Governments are finding it difficult to treat the balance areas as desired by Min. of Env. & Forests because huge area and huge cost are involved which may not be possible at project cost within short time as desired. Moreover the efficacy of catchment area treatment and afforestation is still under debate amongst specialists in the field on the economic estimated life of the reservoir and flood moderation in times of need. Shri P.R.

Chari, Vice Chairman, NVDA stated that sub-watersheds of very high and high categories directly draining into the reservoir can be done pari-passu, but the balance sub watersheds of the twin categories cannot be addressed in short time and also due to fund constraints. Chairman reiterated and made it clear that the Min. of Env. & Forests holds a firm view that catchment area treatment of the twin categories freely draining into the reservoir is to be done pari-passu and the action plans and execution are required for the same. Enough time has already passed and now it is not possible to wait further for the CWC to come out with a formulation. Shri R.V. Rao of CWC pointed out that Govt. of India had formed a sub-committee of the concerned ministries which had given its views as to what is to be done at project cost and by project authorities based on what is relevant and there appears to be a discernible difference in the views of Min. of Water Resources and Min. of Env. & Forests. So, it will be appropriate if the two ministries discuss and decide the issue once for all. He further stated that so far as CWC is concerned it has already issued guidelines on the major issue of extent of catchment to be treated at project cost. Chairman reiterated that the concept of treating catchment area has been already accepted and since Min. of Water Resources is the nodal agency to seek a final decision on the issue, initiatives are to be taken by Min. of Water Resources. He further clarified that the clearance to the project was granted subject to certain conditions directing the State

Governments to prepare an action plan for treating the catchment area irrespective of this debate. He further stated that constraint if any may be brought out and may be discussed. He directed the State Governments to prepare a plan for the balance sub watersheds of the twin categories freely draining into the reservoir and requested submission of these plans before the next meeting of the Environment Sub-Group.

b) Extension of Time for Environmental and Forestry Approval:

Chairman stated that as no representative of the Ministry of Water Resources was present, they are to be reminded on the issue.

2. Time frame for preparation of Action Plan and implementation of Environment Safeguard Measures (Item No. XII - 2(64)B-3)

While Govt. of Gujarat and Govt. of Madhya Pradesh have submitted the detailed expenditure incurred on Environmental and R&R component, similar details from Govt. of Maharashtra are still awaited.

Item No. XIV-4(77): **PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENTAL ACTION PLANS.**

1) **Phased Catchment Treatment**

Narmada Sagar Project

Chairman while reviewing the progress of Catchment Area Treatment desired to know the type of measures adopted, besides Khus plantation, where works on 8700 ha area of catchment are reported to be under progress. Executive Engineer, (Watershed Project), Narmada Valley Development Authority (NVDA) reported that out of 6000 ha of the target for treating non forest areas, treatment measures like Engineering structure bunds, check dams, contouring and terracing are in progress on 4000 ha area and the balance 2000 ha area may spill over to next year. He further explained that because works are to be done on private fields for which clearances required from District Land Improvement Committees (DLIC) are not forthcoming it would be difficult to take up these works in approximately 2000 ha areas as targeted. In reply to another question from Chairman whether anticipating such delays adequate proposals covering the short falls of current year and planned target for the next year have been sent to DLIC for approval, he replied in affirmative. However, as members were concerned over the reporting format where progress by khus plantation over shadows other soil conservation works, Govt. of Madhya Pradesh agreed to change the reporting format. Mr. Chengappa, Conservator of Forests, Regional Office of MOE&F, Bhopal raised doubts based on his visit to

4 sub watersheds about the actual work being done even on 4000 ha area as reported . Chairman desired that the monitoring should be speeded up to check such discrepancies if any.

Regarding the inclusion of areas of catchment under compensatory afforestation, GOMP clarified that because MOE&F had earlier directed that compensatory afforestation is to be taken up within the impact area, GOMP has selected the degraded forest areas within the catchment for the purpose of compensatory afforestation and sent a list of such areas to MOE&F for acceptance and were going ahead with the compensatory afforestation works as planned. However recently ALLUSO has identified some of the areas selected for compensatory afforestation as falling under high and very high priority categories, soil conservation measures were also planned for these areas and these areas were included in catchment area treatment plans also.

Besides, the areas of pilot project which do not form a part of very high and high priority categories and sub watersheds as identified by ALLUSO, treatment works were already in progress. These areas were included in the plans as additionalities.

Chairman, however, reviewed the situation and directed that such areas even though identified under compensatory afforestation plan earlier needs to be treated under catchment area. He further directed that GOMP may revise the figures of catchment area treatment and compensatory afforestation accordingly.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP reported the progress on 9800 ha area by khus plantation till December, 1991. The progress of this area covers khus plantation on runs along the contours within the field. In reply to a query whether other soil conservation measures are also in progress, Executive Engineer, (Watershed), NVDA replied in affirmative. However he stated that as Madhya Pradesh land Improvement Act 1967 makes it obligatory to have consent of the land owners hence involvement of the local population, for enlisting their willingness and support is essential which is not readily forthcoming due to agitation in the area, yet hectic efforts are being made for completing the treatment in the area targeted. In reply to a question he emphasised that there is no constraints of funds.

GOMP also agreed to prepare plans for the balance sub watersheds of the twin categories draining into the reservoir as part of the Phase-II programme as suggested by the Chairman. Chairman desired to know the extent of area where soil conservation measures besides the khus plantations are in progress and stated that no slippage could be allowed in treatment works in view of the enormous task ahead. GOMP agreed to send the details.

Govt. of Gujarat

GOG reported that soil conservation works on 3970 ha of catchment are in progress and targets may be achieved by March, 1992.

Progress on the reconciliation of the figures of catchment area was to be reported by GOG, however it is still awaited.

Govt. of Maharashtra

Secretary (Forests), Govt. of Maharashtra informed that there is no progress on catchment treatment works in Maharashtra because of law and order problems. Additional Collector, (Dhule) informed the sub-group that law and order situation has not improved and the matter is pending with the Government. In reply to a question of Chairman whether adequate steps, to convince the people of the area about the beneficiary impacts of the catchment treatment, have been taken, he informed that people are not co-operating when approached and do not divulge any information required by the project authorities. Dr. S. Maudgal, Advisor, MOE&F pointed out that the Govt. of Maharashtra was advised earlier for furnishing a compressed action plan for the areas to be treated and even this is still awaited. Chairman stated that as there is no work in a portion of the catchment area of Sardar Sarovar Project falling in Maharashtra, pari-passu clause appears to be failing and this needs to be brought to the notice of Ministry of Water Resources. GOM assured that every effort is being made to pursue the works within the stipulated time.

ii) Compensatory Afforestation

Narmada Sagar Project

Chairman directed that GOMP should revise the figures of catchment area and compensatory afforestation as

suggested earlier. When Mr.Chengappa, Conservator of Forests, (MOE&F), Bhopal pointed out that many of the areas identified by GOMP are encroached, Mr. Thapliyal, Member (Env.), NVDA stated that such areas will be substituted by other suitable areas.

Sardar Sarovar Project

Govt. of Madhya Pradesh

When it was pointed out that out of the scheduled targets of 1980 ha , GOMP has completed afforestation works only in 1573 ha, Chairman directed that GOMP should take up this slippage as additional works during the next working season and target should accordingly be revised GOMP should complete the works on 2387 ha during the coming monsoon.

Govt. of Maharashtra

GOM reported the progress on 8383 ha of compensatory afforestation out of 13000 ha of degraded forest areas required to be afforested and it was further stated that the balance areas will be afforested during the coming monsoon, completing all works in the entire degraded areas. However with regards to the afforestation on non forest areas spread over to 6205 ha Mr. Chengappa reported that only 121 ha is found to be suitable for afforestation as other areas are encroached upon. GOM indicated that the exact area which is available for afforestation free of encroachment is to be verified and additional adjacent areas free from encroachment will be identified to replace encroached areas. With regards to the identification and afforestation of 2700 ha of non-forest land in lieu of Taloda land it was

reported that GOM has identified entire 2700 ha land for compensatory afforestation in the district of Dhule and 1500 ha area is already planted up.

Govt. of Gujarat

GOG reported that it was due to the failure of rains in Kutchh district that plantations could not be taken up as targeted yet it was indicated that there is enough time on hand to complete the works during the coming years.

iii) Command Area Development

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP indicated that consultants for preparing the master plan for drainage measures, control of water logging and salinity have been shortlisted but it was felt that some data/ studies would be required to be made available to the consultants before the works of master plan is commenced. Therefore several field observations for the purpose of data compilations have been taken up.

Regarding studies on run off from the fields due to application of pesticides insecticides and chemical fertilizers in the command area it was informed that a proposal in this regard is received by NVDA from Jawaharlal Agriculture University, Jabalpur which is under scrutiny. Regarding carrying capacity of the command area NVDA has got in touch with GOG. GOMP required the terms of reference for the above studies. These were circulated during the meeting and annexed as Annexure XIV. Min-II.

Sardar Sarovar Project**Govt. of Gujarat**

Report on the engineering aspect of the studies assigned to the consultants expected by end of 1991 are still awaited and GOG is yet to submit the implementation plan based on the outcome of the above studies. Besides, the progress of finalisation of terms of reference of carrying capacity aspects alongwith tentative schedule of the implementation of the action plan is also awaited.

Chairman, Env. Sub-group expressed concern of the negative impact that the proposed canal system bisecting Great Rann of Kutchh and Little Rann of Kutchh may bring in on wild Ass population and desired that detailed impact study is to be done within two to three months time involving Wildlife Institute of India and MOE&F and further desired that the physical progress on the canal works in those areas be stopped till the impact assessment studies are over. GOG informed that bridges/Syphons are under construction over the canal to allow migration of wild Ass. However chairman expressed doubt over the effectiveness of these bridges quoting examples from Rajaji National Park where despite construction of bridges migration of elephants is affected considerably. It was resolved that "physical works on canal on the areas under reference will not start till the impact assessment studies involving Wildlife Institute of India, MOE&F and GOG are conducted". The

experts may be required to sit together to develop alternative plans if so required.

Govt. of Rajasthan

MOE&F informed that Govt. of Rajasthan was informed in March, 1991 that no separate environmental clearance is required for the canal portion falling in Rajasthan areas as it is already covered under the environmental clearance granted to Narmada Sagar and Sardar Sarovar Projects in 1987. Accordingly Govt. of Rajasthan was advised to get in touch with Narmada Control Authority. However Chairman desired to know whether MOE&F has looked into the elements contained in the report submitted by Govt. of Rajasthan. During the discussions that followed it was suggested that Govt. of Rajasthan may conduct impact assessment studies for the canal portion as are being done by GOG. Copy of the terms of reference finalised by GOG were circulated during the meeting and Govt. of Rajasthan was advised to adopt the same for developing action plans.

iv) Survey of Flora, Fauna and Carrying Capacity Studies.

Narmada Sagar Project

Govt. of Madhya Pradesh

Wildlife Institute of India has submitted half yearly progress report for the period ending December, 1991. A copy of this report alongwith status report of Narmada Sagar and Sardar Sarovar Projects prepared by NVDA was submitted to the MOE&F.

Friends of Nature Society, Bhopal who was entrusted with the preparation of plan for wildlife retrieval and conservation has also submitted their draft report which is under scrutiny of NVDA, a copy of which is also supplied alongwith the above report to MOE&F.

Sardar Sarovar Project

Govt. of Madhya Pradesh

The State Forest Research Institute, Jabalpur engaged for the studies has submitted their quarterly report for the period ending December, 1991. This report is also submitted by NVDA to MOE&F alongwith the status report referred above.

Govt. of Gujarat

GOG informed that the draft final report from M.S. University, Vadodara has been received by GOG and is under scrutiny. However report on progress of wildlife studies in Gujarat is still awaited.

v) Archaeological & Anthropological Survey

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP indicated that the survey in the remaining villages will be completed within next 3 months and action plan will be ready by June, 1992.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP informed that Archaeological survey works in 182 villages is completed by State Archaeological Department. Survey in the remaining 11 villages will be completed soon and the action plans will be ready by June, 1992.

Govt. of Maharashtra *m v d*

Chairman desired to know whether any survey has been conducted in Maharashtra state. GOM while agreeing to inform the details in this regard stated that only one temple Shoolpaneshwar which is on the border of Gujarat and Maharashtra is going under submergence and is to be relocated by GOG.

Govt. of Gujarat

GOG informed that a new temple is under construction downstream of SSP and it is proposed to shift the idol from Shoolpaneshwar with religious ceremony to the new temple. However, stay order has been issued by the Dhule Court on works of shifting the same. Chairman pointed out that Narmada had an ancient civilization therefore if any report on sample excavation in the areas exist, it should be looked into. Director, Archaeological Survey of India informed that reports exist for certain areas upto Ujjain. But for Gujarat and Maharashtra areas reports are not available readily. Chairman desired that a separate meeting to sort out the archaeological aspect may be convened by NCA and progress reported to the Sub-group.

vi) Health Aspects**Govt. of Gujarat**

GOG has informed that M.S. University has carried out a survey in 1983 which provided baseline data on health aspect. Shri Sekhar Singh, IIPA pointed out that baseline data as stated is not addressed in the health plan submitted by the State Govts. Chairman stated that the baseline data

on health together with the health plan is required to be kept at primary health centers and with Director Health Services so that whenever some changes occurs in the health pattern these are quickly addressed.

Govt. of Maharashtra

GOM was directed to include the baseline data in their health plan. Progress on preparation of final health plan by GOM is awaited for the last one year.

vii) Fisheries Development

It was reported to the sub-group that a meeting was called by NCA on 24th February, 1992 to ascertain the status on conservation aspect of fish and it was decided during the meeting that a desk review study may be assigned to CICFRI on "status of the studies on fish conservation in Narmada Sagar and Sardar Sarovar Projects and its downstream". Terms of reference are being drawn up for the same and it was agreed by Mr. Rao, Director, CICFRI to complete the above studies within 3 months time.

Govt. of Madhya Pradesh

GOMP informed that the consolidated report of 1990-91 from the Principal Investigator Dr. G.P. Bhatnagar from Bhopal University is awaited and will be furnished as soon as available.

Govt. of Gujarat

Progress of the studies by CICFRI (Fisheries development in estuary) and progress achieved in breeding hilsa fish in captivity are still awaited.

Dr. Sekhar Singh of IIPA pointed out that three aspects which deserves attention are (i) Eco system (ii) Fish ladder (iii) Salinity ingress. However Dr.S.N. Singh, Sr.Scientist, CICFRI explained that fish ladders are of no use so far as migration of hilsa fish is concerned as the fish is reported to migrate only upto 60 to 80 Km whereas the dam is constructed 148 Km away from the mouth of the river and that the conservation aspect of the fish fauna in NSP, SSP and its downstream is already addressed. Besides, remedial actions to preserve fresh water prawn, mahaseer and hilsa fish are already developed. However the desk review study as suggested above may make the status of studies more clear which may be helpful to point out lacuna if any and to suggest further remedial measures.

Item No.XIV-5(78): ANY OTHER ITEM

DATE AND VENUE OF NEXT MEETING WILL BE
INFORMED IN DUE COURSE.

ANNEXURES

A N N E X U R E S

Annex No.	Item in which referred to	Page No.
XIV Min.1	Introduction	1 - 2
XIV Min.2	XIV-4(77)	3 - 11

ANNEX-XIV. MIN.1

**LIST OF PARTICIPANTS ATTENDED THE 14TH MEETING OF
ENVIRONMENT SUB-GROUP HELD ON 25.2.1992
IN PARYAVARAN BHAWAN, NEW DELHI.**

1. Shri R. Rajamani, Secretary, Ministry of Environment & Forests, New Delhi. **Chairman**
2. Shri D.C. Debnath, Executive Member, NCA, Indore
3. Shri P.R. Chari, Vice Chairman, NVDA, Bhopal.
4. Dr. S. Maudgal, Advisor, Ministry of E&F, New Delhi.
5. Shri K.M. Joseph, Member (Civil), NCA, Indore.
6. Shri N.V.V.Char. Secretary, SSCAC., Vadodara.
7. Shri T. Balaraman, Secretary (Forests), Maharashtra.
8. Shri A.B. Mathur, Chief Conservator of Forests and Addl.Secretary to Government of Rajasthan.
9. Shri D.R. Thapliyal, Member (Env.), NVDA, Bhopal.
10. Prof. R.K. Katti, Director & Consultant, UNEECs, Bombay.
11. Prof. S. Ramaseshan, Professor, DCE., IIT, Kanpur.
12. Dr. Shekhar Singh, IIPA, New Delhi.
13. Shri D.S. Chinnamani, Asst. Director General, ICAR, New Delhi.
14. Dr. C. Margabandhu, Director (Expt), Archaeological Survey of India, Janpath, New Delhi.
15. Shri M.K. Jiwrajke, DIG (FC) MOE&F, New Delhi.
16. Shri M.B. Mehta, CCF WL, Baroda G.S.
17. Shri R.Vidyasagar Rao, Director (EM), UWC, New Delhi.
18. Shri H.S. Pahla, J.D. W.I.I., Dehradun.
19. Shri A.V. Gururaja Rao, Specialist Environment, SSNNL, Gandhinagar.
20. Shri B.K. Changappa, Conservator of Forest (Central), Regional Office, Bhopal.
21. Shri Suresh Chandra, Conservator of Forests, NVDA, Bhopal.

22. Dr. S.N. Singh, Senior Scientist, CICFRI, Vadodara.
23. Smt. Nalini Bhat, MOE&F, New Delhi.
24. Dr. Pawan Kumar, Specialist Environment, NCA, Indore.
25. Dr. S.B. Katolay, Env.Dept. Govt. of Maharashtra.
26. Shri C.I. Joy, Dy. Secretary (Fisheries), GOG.
27. Shri S.N. Chatterjee, Director (Fisheries), NVDA, Bhopal.
28. Shri M.S. Gill, Addl. Collector, SSP, Dhule, Maharashtra.
29. Shri P.M. Acharya, Dy. Secretary (R), Narmada W.R. Dept. Government of Gujarat, Gandhinagar.
30. Shri R.G. Bhat, Officer-on-Spl. Duty (EGS) NPG, SSNNL, Gandhinagar.
31. Shri R.K. Behre, Executive Engineer, (WM), NVDA, Bhopal.
32. Shri A.K. Barua, US (PP), MOWR, New Delhi.

ANNEX- XIV MIN.IIPROPOSED TOR FOR EIA STUDIES
IN COMMAND AND ESTUARY AREA
OF SSP IN GUJARAT.

GENERAL

A. SCOPE

The EIA shall be an in-depth investigation of factors described in this terms of reference (TOR)4 adequate to satisfy inquiries from international donors and to withstand close scientific scrutiny. The detailed items of the scope are described under the remaining sections of this TOR.

B. FORMAT OF EIA

The EIA shall contain three main sections, and within each section, a number of environmental topics shall be addressed. The main sections are; project setting, impact evaluation, and environmental management plan. The environmental topics addressed in these sections may vary; however in general they encompass physical resources, ecological resources social and cultural resources and quality-of-life values. The emphasis within each main section is as follows;

(i) Project Setting : describes the existing conditions into which the project is being introduced (i.e. physical, ecological, social, cultural and quality-of-life setting). In practice it assists in review of the EIA to shift some of these data to the next major section dealing with impact analysis, in order to avoid repetition. Thus, in this section, often the descriptions are more general and non-quantitative. For instance, a description of the elements making up the project would be provided here; however details may be withheld until they are necessary for analysis of impacts.

(ii) Impact Evaluation : This section provides the analysis of impacts(both positive and negative) and also presents the alternatives for mitigation of impacts, drawing initial conclusions concerning the preferred manner for mitigation, and setting for their further development in the environmental management plan.

(iii) Environmental Management Plan (EMP) : The

EMP elaborates on the mitigation measures and presents logical schemes for implementing those measures, monitoring results and redirecting the EMP, as a further measure of assurance that in fact the correct procedures will be followed. The active roles for all participating groups shall be spelled out in the EMP, and budget provisions identified.

C. SCHEDULE

The Contractor shall prepare the EIA in a period of 17 months, and during this period provide the following reports;

(i) Inception Report : within month two, which indicates staffing, TORs for subcontracts provision of support services, and elaborations of methodologies and logistics for conducting the work.

(ii) Interim Reports : (3): prior to World Bank missions, generally set for month 4, 8, and 12, which will report on progress in specific tasks, and provide conclusions where such can be made at the time of the reporting.

(iii) Draft Final Report : the draft EIA, at month 14, and

(iv) Final Report : the final EIA in the 17th month.

II PROJECT SETTING

The EIA shall describe the project setting by quantitative means, using primary data which skillfully reflect actual conditions in order to provide a sound basis for impact evaluation. The project setting involves (i) maps of the command area and contiguous area, prepared to adequate scales to depict land use, vegetation, drainage areas and infrastructure. The maps may also be used to superimpose information concerning soil types, groundwater conditions and other background data. Please

see descriptions of impact analyses for additional information on the types of background data to be provided.

The project setting, shall include a detailed description of the project. Maps should be used to locate and depict the association between project infrastructure and background conditions.

In many cases, quantitative data concerning the setting and the project (in tables and figures) may best be withheld for inclusion in the impact analysis. Decisions in this regard should be made during formulation of the EIA.

III IMPACT EVALUATION

The EIA shall address the impact of the WDDS on the following categories of resources:

A. PHYSICAL RESOURCES, INCLUDING SOIL AND WATER AND AIR

1. SOIL RESOURCES

The EIA shall identify the range and extent of soil types throughout the Command Area and in contiguous areas, specifically in relation to their classification, elevation with respect to sea level and groundwater level, texture and porosity, and provide representative values for percent organic matter, cation exchange capacity and sodium adsorption ratio. The EIA will identify potentially critical soil types or zones, where water-logged soils and soil salinity may become problematical. The EIA will consider operations criteria to predict conditions under which soil water content becomes excessive either due to high groundwater levels, excessive surface application rates and/or inadequate local drainage, and relate soil parameters to critical operating parameters for use in preparing the Environmental Management Plan (EMP). Likewise increases in magnitude and extent of soil salinity must be evaluated in relation to operational scenarios and soil parameters in order to predict conditions under which salinity in soils may be maintained within limits and minimized, followed by inclusion in the EMP.

2. WATER RESOURCES

The EIA shall provide quantitative data to describe significant features of surface and groundwater resources within the Command Area and in contiguous areas.

2.1 Surface Water Resources

Surface water resources (excluding those provided by the project) include inland waters, rivers and estuaries, lakes, the coastal zone (gulfs and open coastlines).

(a) Inland Waters

Inland waters are limited to seasonal drainages and some perennial rivers as they approach the coastlines.

(i) Configuration: Drainage basins should be mapped and demarcated. Sufficient elements of the hydrological cycle shall be quantified to provide an understanding of seasonal flow rates in each drainage basin. Current discharges from urban centers and industries shall be identified and their quantities roughly estimated. Seasonal hydrographs for major drainages shall be constructed. Natural depressions which collect water such as Nalsarovar shall be identified, mapped and demarcated. Topographic information at the reconnaissance level shall be provided, and the variation in the seasonal extent of water surface shall be identified.

(ii) Quality: Existing data on water quality shall be compiled and additional monitoring provided as necessary to define conditions during representative seasons of the year, and at illustrative locations. Seasonal streams may be dry during most of the year or may transport effluent discharges only. In the latter case some representative monitoring data shall be obtained. Perennial rivers shall be monitored at locations which depict effects of human activity, primarily at points up stream and downstream of major urban centers and industrial outfalls. Some representative water quality data on depressions, such as Nalsarovar, shall be provided as well. Parameters shall include DO, BOD, COD, TSS, pH, alkalinity, TDS, conductivity, and other selected parameters which relate to effluent discharges (phenols, metals, ammonia), in appropriate combinations to fit the circumstances.

(iii) Impact Evaluation: The EIA shall provide adequate analysis to quantify potential impacts of the WDDS (including M&I supply) on inland surface water quality. The analysis should be based on a realistic assessment of irrigation tailwater (including groundwater seepage) quantity and quality, and M&I discharges; and should address possible effects from elevated salinity (high TDS), pesticides, nutrients from fertilizers and M&I discharges, industrial pollutants, and high TDS/BOD discharges from urban centers on rivers (both seasonal and perennial), depressions (such as Nalsarovar, where local drainage patterns from contiguous irrigation activities will be critical), and estuaries.

(b) Coastal Waters

The coastal zones include two Gulfs (Cambay and Kutch), inundation areas under tidal influence (the Rann) and coastlines.

(i) Configuration: The EIA shall provide information on the general configuration of the two Gulfs including depths, profiles and sections for general conditions, and notations on anomalies. The areas adjacent to shorelines (+2 m elev) should be similarly described, in particular the inundation areas and river outlets. The general coastal configuration should be

described. Current movements within the Gulfs under seasonal conditions, and along coastlines, shall be defined.

(ii) Quality: Water quality conditions shall be documented using existing data supplemented by field monitoring. The monitoring plan shall be designed to provide insight into the general area as well as areas directly affected by human activity and riverine discharges. Water quality shall focus on critical areas (multiple parameters for urban areas and river mouths) and on salinity gradients in the gulfs.

(iii) Impact Assessment: The EIA will evaluate the potential for irrigation return flows and/or drainage discharge which contain M&I effluents to adversely affect water quality in the gulf regions in particular. It is also important to attempt to distinguish between background (ambient) water quality and existing effects from human activity, upon which potential effects from the WDDS would be superimposed. Various operational scenarios shall be considered in which the outcomes may reflect: 1. existing effects are reduced (due to better overall management at State level) and potential effects are minor enough to result in zero net degradation, or 2. existing effects continue and potential effects are nevertheless negligible by comparison, or 3. existing effects continue and potential effects are serious. The first scenario relies on an active state-wide water quality management plan as the outcome of the impact evaluation. This same approach is also applicable to the analysis of inland waters (specifically the Sabarmathi River and others as well).

2.2 Groundwater Resources

The EIA shall assess the potential for negative impacts on groundwater in relation to fertilizer and pesticide, salinity in irrigation water and in soil pore-water, soil parameters, percolation and migration rates, lithology, and proximity to saline surface water.

(i) Configuration: Aquifers within the command area and contiguous areas shall be mapped and classified, and relevant parameters (including stratigraphic information) provided. This effort should utilize existing boring logs and surveys, and should provide usable summaries of information using accepted presentation methods (charts, graphs and figures). Relevant information concerning overlying soils, aquicludes, gradients and transmissibility should be provided in order to predict in general the propensity to transmit pollutants to and within the aquifer.

(ii) Quality: Groundwater quality parameters including pH, conductivity and TDS; and pollutant parameters such as TOC, nitrate, and specific pesticides, may be identified as necessary to establish background water quality levels. Groundwater salinity (TDS) contours should be constructed for areas with highly saline groundwater.

(iii) Impact Evaluation: Using various management strategies, and in conjunction with relevant data, the EIA will assess potential impacts on groundwater quality parameters: salinity, nitrate, organic carbon, trace chemicals, heavy metals and others as necessary. The assessment and background information will also be used to identify and ultimately to choose preferred management strategies for agricultural chemical use and industrial waste management, which can then be used as a component in the environmental management plan.

3. AIR RESOURCES

The WDDS does not have a direct negative impact on air quality except during the construction stage. There are however indirect (second-order) negative impacts and both direct and indirect positive impacts. Indirect impacts on air quality stem from increased urbanization, industrialization, population growth and consumption. These cannot be accurately quantified and it is not necessary to do so. The EIA may describe potential scenarios and may also propose conditions within the EMP to manage air quality. A potential direct positive impact is the replacement of combustion fuels with electricity from the SSD in industries and in the home. This can be counted as a direct benefit if there are policies which prescribe fuel substitutions which provide a means for estimating quantities. The EIA should explore this aspect, document policies and make forecasts where possible on long-term effects on future air quality within the region (specifically urban centers).

B. BIOLOGICAL RESOURCES

This category includes flora and fauna, forests, wildlife, fisheries and critical ecological systems.

1. COMMAND AREA ECOLOGY

The major ecological systems represented in the command area shall be identified, mapped and their principal features noted. Any critical ecological systems should also be described (i.e. those limited in areal extents dependent on limited external resource inputs, or necessary for support of endangered, threatened or regionally important animal or bird species). The EIA shall indicate the nature and extent of changes in the make-up of the ecology of the region brought about by the WDDS. The extent to which extensive irrigation might threaten the existence of critical ecological systems should be evaluated in conjunction with alternative control measures.

2. FLORA AND FAUNA

A detailed description of flora and fauna involving inventories is needed. The typical flora and fauna associated with specific ecological systems should be itemized, emphasizing species of plants that are economically important on the household level, have medicinal or religious value, or provide

forage for wild or domesticated animals; and animals not otherwise covered under wildlife (see item 3, below), including insects, reptiles, birds, and domesticated or semi-domesticated animals. The EIA shall attempt to identify plant and animal species which are threatened with extinction, or those upon which animal species and humans depend. The EIA will evaluate and forecast the probability of these impacts and quantify or otherwise describe their extent.

3. WILDLIFE

The EIA shall provide quantitative data based on recent field information on the types, numbers and extent of significant species of wildlife within the command area and in contiguous areas and shall evaluate the effects of the WDDS on those species.

(i) Inventory: A wildlife inventory shall be prepared using existing information from the Department of Forests and Environment (and other sources) and providing additional field survey teams to obtain direct information to update and make up any deficiencies in the current data base. The inventory should identify, classify and inventory all significant wildlife and bird species, (those not covered in the general fauna inventory). The range of their habitats should be noted, and endangered, rare and regionally important species so indicated.

(ii) Sanctuaries: The wildlife and bird sanctuaries shall be described, their ecological characteristics, flora and fauna identified, and the relation between protected wildlife species in each sanctuary and the ecological setting analyzed in order to identify important linkages. The EIA will evaluate alternative operating scenarios to determine their relative impacts (beneficial or damaging) on the wildlife species. The preferred scenarios will be incorporated into the wildlife component of the EMP.

4. FORESTS

The existing forests within the command area or in contiguous areas will be identified, mapped and classified. These areas may include actual or degraded forest land and land under alternate ownership supporting forest, scrub, thorn bush, or other desert ecosystems which in a broad sense may be classified as forest. The extent to which canal rights-of-way conflict with each of the forest types shall be determined. Afforestation within the command area, in contiguous areas, and along rights-of-way shall be described in terms of extent, tree types, required human interventions, and schedule.

C. SOCIO-ECONOMIC, CULTURAL AND QUALITY-OF-LIFE VALUES

This category of impacts includes changes in economic livelihood; alterations in social values as demonstrated by various indicators (public health, employment, education), public

health issues per-se (medical and engineering aspects); cultural values, in particular, physical aspects such as religious and historical monuments, and changes in cultural values as well (marriage, mobility, religious preference, rural/urban shifts); and quality-of-life (an aggregate of income, public health, mobility, education and other factors).

1. ECONOMICS

The EIA shall document current economic conditions for persons living within the command area, including distributions of wage and income, personal wealth and ownership, sectors of employment, age/earnings relationships and other factors. The economic profile should be geared to illustrating essential changes among population/age/employment groups brought about by the project. The numbers of person within each cohort distribution group directly receiving irrigation as well as those benefiting via new employment and/or economic growth opportunities, and their increased levels of income should be identified.

2. SOCIAL TRENDS

This category focuses on dislocations and reorientation of social values as evidenced by social statistics in public health, education, marriage, childbirth, mortality migration and other factors. Data from relevant State agencies may often be useful in depicting existing conditions. In addition field work will be necessary to augment existing data. In some areas it will be possible to forecast changes in social indicators as a result of the project. For instance: public health response to improved water supply may be estimated based on numbers of people served and the expected reduced frequencies of disease that accompany such improvements; educational opportunities may be related to family income. Second order and negative impacts are more difficult to predict, and many are uncontrollable. The project objectives nevertheless should focus on these social indicators as being of primary importance for the real worth of the project: it should stem or reverse urban migration, improve family support structure, augment public health and reduce mortality rates, and result in similar improvements in social statistical indicators. The EIA should assess baseline values and to the extent possible forecast such changes.

3. PUBLIC HEALTH

A number of project-related factors may adversely affect health and will require engineering solutions for remedy. The EIA should identify baseline indicators for vector transmitted diseases including malaria, filariasis and schistosomiasis, determine any aspects of the project which could exacerbate the incidence of these diseases, and recommend alternative solutions for implementation during construction or operations phases, depending on the conditions responsible for the disease. Alternative solutions which appear to be justified shall be

incorporated into the EMP, and in addition public health monitoring methods shall be devised to give early warning of the spread of specific diseases within the project area.

4. RELIGIOUS, CULTURAL AND HISTORIC VALUES

On the one hand the project should avoid disruption of monuments which preserve religious, cultural and historical values. The EIA should indicate if and where conflicts exist between physical monuments and the rights-of-way acquired under the WDDS component. On the other hand, religious, cultural and historical values having to do with social organization, social groups living together, extended family groupings, religious beliefs that are sustained by life style and mutual support, transmission of attitudes and beliefs to successive generations, and the like, should also be preserved; however these intangible artifacts are difficult to observe, measure and forecast changes. The project should nevertheless preserve existing religious, cultural and historical values by providing direct benefits to the people already living in the area who are in need of the irrigation water in order to sustain their livelihoods. While this may seem the case on the surface, the EIA should evaluate whether the distribution of benefits in fact support these values.

IV ENVIRONMENTAL MANAGEMENT PLAN (EMP)

1. BASIS OF PLAN

The EMP is a binding proposal to monitor and control environmental operational and socio-economic aspects of the project to accomplish basic desirable objectives; and to monitor and regulate this control function to assure it is being carried out. The plan therefore involves numerous potential participants involved in implementation, monitoring, control/regulation and administration of the plan. the basis of the plan is to provide adequate checks to assure implementation, and thus to demonstrate a willingness to actually carry through or environmental improvements.

2. COMPONENTS

The environmental assessment identifies numerous preferred alternatives for reducing environmental impact. These are to be developed into components of the EMP by (i) developing action items to bring about implementation (ii) identifying monitoring needs for the component, (iii) identifying responsibilities and assigning them to specific groups, (iv) determining necessary resources to implement activities and (v) identifying strengthening needs. The EIA shall consider feasibility of plan implementation, required resources, schedules and checks. The plan shall provide all these elements for every component, and outline budget requirements, training needs, and implementation schedules for the work.

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

पर्यावरण उपदल
Environment Sub-Group
पन्द्रहवीं बैठक की कार्यसूची
Agenda for Fifteenth Meeting

स्थान : पर्यावरण भवन, नई दिल्ली

Venue : Paryavaran Bhawan
New Delhi

दिनांक : 19 अगस्त 1992 2-30 बजे

Date : 19 August 1992 2-30 P.M.

इन्दौर
अगस्त 1992
INDORE
August 1992

AGENDA FOR 15TH MEETING OF THE ENVIRONMENT SUB-GROUP
NCA TO BE HELD ON 19.8.92 AT PARYAVARAN BHAWAN,
C.G.O. COMPLEX, NEW DELHI AT 2.30 AM.

I N D E X

Item Nos.	Contents	Page No.
XV-1(78)	Confirmation of the Minutes of fourteenth meeting of the Environment Sub-Group	1
XV-2(79)	Review of Action taken on the decisions of previous meetings	2 - 7
XV-3(80)	Present Status of Studies/ Surveys and Environmental Action Plans	8 - 16
XV-4(81)	Action taken by NCA on Environmental clearance and completion of studies.	17
	Any other Item	18
	Date & Venue of next meeting	18

ANNEXURES

XV-1	Status report of Environmental Aspects for the period ending 30th June, 1992.	1 - 16
XV-2	Executive Summary of the Action Plan and Status of Environmental Safeguard Measures for Sardar Sarovar Project.	17 - 33
XV-3	A report on special monitoring of compensatory afforestation in Kachch District, Gujarat.	34 - 47
XV-4	Minutes of the meeting on Archaeological/Anthropological aspect convened by NCA on 20.5.92	48 - 54

**Item No.XV-1(78): CONFIRMATION OF THE MINUTES OF THE
FOURTEENTH MEETING**

Minutes of the fourteenth meeting of Environment Sub-Group of Narmada Control Authority were circulated to all Members and invitees separately vide letter No.ENV/34(14)/91/958 dated 5th May, 1992. No comments have been received.

The minutes may be confirmed.

Item No.XV-2(79): REVIEW OF ACTION TAKEN ON THE DECISIONS OF THE PREVIOUS MEETING

1. Consideration of Policy Issues [Item No.XIV-2(76)]

a) Extent of Catchment Area Treatment:

The issue of the extent of catchment area to be treated at project cost has been decided by the Govt. of India during June, 1992. Accordingly critically degraded sub-watersheds of very high and high category directly draining into the reservoir are to be treated at project cost in addition to the catchment area which is directly damaged by the project activities.

Simultaneously, the States may also prepare a master plan for treatment of the balance of the critically degraded "Very High" and "High" categories of the watersheds to be executed early but separately by funds from Centrally sponsored schemes of MOA&AS or any other source.

b) Extension of Time for Environmental and Forestry Approval:

During the discussions in the past meetings of the Environment Sub-Group Chairman has been stressing the need to rework the schedules for environmental protection works and construction of the project. This issue was discussed during the meeting of NCA held on 25.7.92 and it was agreed that NCA would approach Ministry of Environment & Forests for seeking approval for the present schedule of the various studies and their pari-passu implementation as are under progress. Accordingly action is already initiated by the NCA.

2. Time frame for preparation of Action Plan and implementation of Environment Safeguard Measures [Item No.XIV-2(77)]

During the last meetings of the Environment Sub-Group Government of Madhya Pradesh, Maharashtra and Gujarat were directed to present to the sub-group a clear picture on the estimated cost and expenditure on various environmental studies and implementation works. Despite a series of letters addressed to them on the issue concrete reply is yet not received. Fragmented information compiled from the various documents on the subject is presented below:

ii) ESTIMATED COST AND EXPENDITURE (AS ON DATE INDICATED IN EACH CASE) OF ENVIRONMENTAL SURVEY/STUDIES AND IMPLEMENTATION OF WORKS.

1. CATCHMENT AREA TREATMENT.

Studies

- i) Prioritization of catchment by AIS & LUSO, New Delhi**
- ii) Prioritization & thematic mapping by ISRO for area in Gujarat.*

Implementation (Phy. ha, Fin. Rs. Crores)

Treatment	<u>Targets</u>		<u>Achievements</u>		<u>Date</u>
	Phy.	Fin.	Phy.	Fin.	

<u>A. Govt. of Gujarat</u>					
a) Non-forest Area	3025	2.41	1171	1.1	June'92
b) Forest Area	27204	32.68	9309	6.08	June'92
<u>B. Govt. of Madhya Pradesh</u>					
a) Non-Forest Area	72000	24.69	7650*	1.26*	June'92
b) Forest Area	18000	15.99	-	-	
<u>C. Govt. of Maharashtra</u>					
a) Non-Forest Area	21200	29.41	-	-	
b) Forest Area	4200	2.2	-	-	

Say	145630	107.38	16470	8.43	

* Incomplete works

** Works were carried out under the budget of AIS&LUSO.

II. COMPENSATORY AFFORESTATION (Physical target in ha & Fin. in Rs. Crores)

	<u>Targets</u>		<u>Achievements</u>		<u>Date</u>
	Phy.	Fin.	Phy.	Fin.	
<hr/>					
<u>A. Govt. of Gujarat</u>					
a) Non Forest	4650	8.15	2500	2.98	June, 92
b) Degraded Forest	9300	9.42	2834	2.45	June, 92
 <u>B. Govt. of Madhya Pradesh</u>					
a) Non Forest	2190		1089		
b) Degraded Forest		18.00		11.59	June, 92
	6547		1332		
 <u>C. Govt. of Maharashtra.</u>					
a) Non Forest	9000	37.00	-	-	June, 92
b) Degraded Forests	13000		8383	9.42	
	44687	72.57	16138	16.43	

III. Flora fauna (including wildlife & fisheries) & Carrying Capacity (FFC) of the areas adjoining submergence.

	(In Rs. crores)	
	<u>Estimated Cost</u>	<u>Cost incurred</u>
A. <u>Govt. of Gujarat.</u>		
a) Studies in 1982 by M.S. University.	-	-
i) Sanctuary improvement works	0.75	0.59
ii) Downstream fisheries by CICFRI**	-	-
b) Studies on FFC by M.S. University in 1992	0.34	0.20
c) Studies on wildlife management 1992	0.16	0.05

** Project under Ministry of Agriculture

	<u>Estimated Cost</u>	<u>Cost incurred</u>
d) People's participation in sanctuary management by VIKSAT***	-	-
e) Fisheries plan for Estuary & Command *	4.00	-
B) <u>Govt. of Madhya Pradesh</u>		
a) Studies by State Forest Research Institute on flora, fauna (wildlife)	0.203	0.103
b) Liminological studies by three universities (Aquatic fauna & Water quality)	0.19	0.19
c) Fisheries plan (SSP)*	0.82	-
C) <u>Govt. of Maharashtra.</u>		
a) Flora, Fauna, Carrying Capacity by School of Environmental Science, Pune University, Pune.	0.38	0.16
b) Fisheries plan (Tank * pond & reservoir fisheries)	1.66	-
D) <u>Narmada Control Authority</u>		
a) Sociological Survey of fishing families.	0.14	0.14
IV. <u>COMMAND AREA DEVELOPMENT.</u>		
<u>Govt. of Gujarat.</u>		
a) Studies	1.58	-
b) Implementation	685.00	-
<u>Govt. of Rajasthan</u>		
a) Studies	-	-
b) Implementation	-	-
* From State Budget		
*** Studies by World Bank's assistance.		

	<u>Estimated Cost</u>	<u>Cost incurred</u>
V. <u>HEALTH ASPECT.</u>		
a) <u>Govt. of Gujarat.</u>		
i) Hospital	0.47	0.5
ii) Laboratories	2.36	
iii) Infrastructure	1.77	
iv) Anti Malaria	3.44	
v) Insecticidal spray	30.06	

	38.00	
b) <u>Govt. of Madhya Pradesh.</u>		
a) Surveillance of malaria	0.11	0.11
b) Implementation for NSP, Omkareshwar, Maheshwar & SSP projects.	7.49	

	7.60	

c) <u>Govt. of Maharashtra.</u> <u>R&R site.</u>		
a) Establishment of PHC & 3 sub-centres at R&R site.	0.2315	
<u>10 km belt around SSP.</u>		
a) 12 new sub-centres	0.3124	
b) Mobile health unit	0.0323	
c) Education health material	0.0200	

	0.5962	

Say Rs. 0.60 Crores		

VI. RIM STABILITY & SEISMICITY.

- a) Cost of studies
- b) Implementation

VII. ARCHEOLOGICAL/ANTHROPOLOGICAL.

a). Govt. of Gujarat.

- i) Cost of survey
- ii) Cost of Implementation

	<u>Estimated Cost</u>	<u>Cost incurred</u>
b). <u>Govt. of Madhya Pradesh.</u>		
i) Cost of Survey		
ii) Cost of Implementation		
c). <u>Govt. of Maharashtra.</u>		
i) Cost of Survey	-	-
ii) Cost of Implementation	-	-
e) <u>Rashtriya Manav Sanghralaya*</u>		
i) Paleontological studies	0.019	0.01
ii) Ethnological studies	0.007	0.007
iii) Tribal Art & culture	0.026	0.026
f) <u>Anthropological Survey of India*</u>		
i) People of India	-	-
ii) Narmada salvage plan	-	-

* These studies on anthropological aspects are carried out of the budgets of respective organisations.

The State Governments are requested to furnish the details in the missing information in the above format, confirm the figures indicated. Wrong information, if any, should also be corrected.

Item No.XV-3(80): PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS

The latest status report of studies and activities regarding Environmental Aspects of SSP and NSP for the quarter ending June, 1992 is attached (Annex.XV-1). An Executive Summary of the Action Plan and status of Environmental Safeguard Measures for Sardar Sarovar Project is also enclosed as Annex. XV-2. The progress/present position of the different measures are given below, briefly, for review by the Sub-Group.

i) Phased Catchment Treatment

Action being taken to take up planning and treatment of areas which are not directly draining may also be indicated even if this is not being done at project cost. The quality of catchment treatment and type of works taken, species planted etc. will also come up for discussion and in addition to the following points.

Narmada Sagar Project

The GOMP has submitted Action Plan for Catchment Area Treatment of NSP in June, 1991 to be completed by 1996-97 covering a total non forest area of 47,000 ha and a forest area of 6,424 ha at a total cost of Rs.22.23 crores.

According to the action plans submitted, GOMP was required to treat 6,000 ha of non-forest areas in addition to 1200 ha of the forest areas during 1991-92. In non-forest areas progress reported with khus plantation was spread to 6410 ha area. Works are completed in all respects only over an area of 1075 ha, thus there is a shortfall of 4925 ha.

During 1992-93 treatment works are proposed in 9000 ha in non-forest areas and 2175 ha over forest areas. Shortfall during 1991-92 is to be added to the targets of 1992-93. Therefore GOMP is to report a progress against 13,925 ha non-forest area and 2175 ha of forest areas.

During the last Environment Sub-Group meeting GOMP has agreed to change the reporting format to show clearly the areas which are completed in all respects. GOMP may also indicate the total non forest area planned for treatment this year and forwarded to District Land Improvement Committee. GOMP was also to revise the figures of Catchment Area Treatment and Compensatory

Afforestation so that the areas identified by AIS&LUSO for treatment are not counted against compensatory afforestation even though the MOE&F has earlier approved the same prior to the AIS&LUSO report.

Sardar Sarovar Project

Government of Madhya Pradesh

The detailed Action Plan has been submitted by the GOMP to the MOE&F and according to this it is proposed to treat 72,000 ha of degraded forest and 18,000 ha of non forest areas.

According to the plan submitted GOMP was required to treat 6000 ha of non forest areas during 1991-92, however GOMP has reported khus plantation over an area of 7632 ha but no other works could be completed in the area targeted. Therefore GOMP has agreed to include this 6000 ha to the targets of 1992-93 and according to the revised targets GOMP is to treat 23100 ha of non forest areas in addition to treating the forest area spread to 4000 ha. GOMP is requested to give the details on the mobilisation of man power, submission of cases to DLIC and the progress achieved as on date.

GOMP is also required to furnish the plan for treatment of the balance watersheds of the twin categories for the area other than directly draining as directed by the Chairman during the 14th Environment Sub-Group meeting.

Government of Gujarat

The detailed action plan along with the drawing were supplied to the MOE&F. Govt. of Gujarat vide letter No.SSNNL/ENV/271/91 dated 27.6.91 has revised the plan for completion by 1994-95. According to the plan submitted, Govt. of Gujarat was to carry out the treatment works over 4750 ha areas. However, GOG has reported progress of 4770 ha areas. That is, upto March, 1992, against a cumulative target of 9310, the achievement was 9298 ha.

During 92-93, Govt. of Gujarat has a target of 6000 ha.

In respect of non-forest area, 1171 ha has been treated against a target of 1727 ha upto March, 1992. The progress for 1992-93 is 662 ha.

The upto date progress may be reported.

During the last meetings of Environment Sub-Group, Chairman had directed the GOG to reconcile its figures of catchment area with the figures available with NCA and AIS&LUSO, New Delhi. Progress on the reconciliation of figures is yet to be reported by GOG.

Govt. of Maharashtra

The Catchment area treatment plan for cultivable area received from Govt. of Maharashtra was submitted to MOE&F earlier. Thereafter the detailed catchment area treatment plans for forest and non-forest areas separately prepared by GOM for presentation to the World Bank Appraisal Mission for Narmada Basin Development Project were also forwarded as desired by the MOE&F. A detailed catchment area treatment plan, including the map of the area, for the forest areas covering 21227 ha catchment, to be treated at project cost is received.

The progress on preparation of similar plan for non forest areas may be reported by GOM.

Serious concern has been expressed by the Chairman for non commencement of catchment area treatment works in Maharashtra, and in pointing out that this is infringing the pari-passu condition, and progress on components like this will have to be addressed to the project as a whole and not by looking only at state segments. Efforts are undertaken by the GOM for starting the works from the areas away from the submergence and to explain to the public at large, who are not to be affected by the submergence that they are expected to gain from the catchment area treatment works. In addition GOM was also directed to prepare a contingent plan so that treatment works would be completed in a short time immediately after normalcy is restored. GOM is requested to provide the detailed information on the steps taken on all the suggestions referred above.

ii) Compensatory Afforestation

Narmada Sagar Project

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh has reported a total progress of 28287 ha of compensatory afforestation as against the target of 25676 ha till 1991-92 rains. GOMP is requested to report the upto date progress against the afforestation works planned for 1992-93. In addition, the readjusted figures deleting the areas of catchment treatment from the targets and achievements for afforestation may be reported.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP had indicated completion of compensatory afforestation works on 2421 ha as on March, 1992 against the scheduled target of 2828 ha. GOMP has agreed to include the deficiencies of the last year to the targets of 1992-93, accordingly a target of 2387 ha is set for the current monsoon. The progress may be reported by GOMP.

Govt. of Gujarat

Govt. of Gujarat has reported a progress of 350 ha non-forest land and 2834 ha on degraded forest land during 1991-92, against the target of 900 ha and 3300 ha respectively for non-forest and degraded forest areas. Now 800 ha of non-forest and 2250 ha of forest area have been planned for afforestation works during the current monsoon of 1992-93 and it is expected that all works will be completed by 1994-95 as planned.

A special monitoring report of the compensatory afforestation for district Kutch, Gujarat by Chief Conservator of Forests (Central), Regional Office at Bhopal submitted to Secretary, MOE&F is appended (Annex. XV-3) for discussion of the sub-group as desired by the Chairman. The report has recommended among other things that plantation activities in Kutch district should have adequate research back up. Support and experience of CAZRI and arid Zone Forest Research Institute, Jodhpur should be sought to solve various problems in afforestation programmes. Monitoring report has also recommended that as per the available ecological index for the area under reference 100 to 150 trees per ha should be planted instead of 2500 plantations per ha planned at present. Besides recommending that better areas in Kutch district should be selected to plant the balance targets where suitable government lands are still available with the Revenue Department.

Govt. of Maharashtra

The revised plan for compensatory afforestation is under implementation in Maharashtra which envisages completion of all works within 3 years. According to this plan 8383 ha of degraded forest was planted up during 1991-92 and another area of 6888 ha including 2292 ha of non forest area is proposed to be completed during 1992-93 and the balance area will be planted during 1993-94. The upto date progress may be reported by GOM.

iii) COMMAND AREA DEVELOPMENT

Narmada Sagar Project

Govt. of Madhya Pradesh

For drawing up a master plan on drainage, control of water logging and salinity, consultants have been shortlisted by GOMP. However, in order to make some data available to the consultants certain field observations for the purpose of data collection were to be taken up by the GOMP. Upto date progress may be reported.

Regarding studies on effect of run off from the fields due to application of pesticides, insecticides and chemical fertilizers in the command area, proposal received from Agriculture University, Jabalpur is under negotiation; the latest progress may be reported. Progress may also be reported for drawing up of terms of references for carrying capacity studies of command area development works.

Sardar Sarovar Project

Govt. of Gujarat

GOG is to report the progress on finalisation of terms of references of carrying capacity aspects alongwith the schedule of implementation of the action plan.

During the last Environment Sub-Group meeting it was resolved that physical work at canal which divides Rann of Kutch and Little Rann of Kutch will not start till the impact assessment studies involving Wildlife Institute of India MOE&F and GOG are conducted. GOG is to report the progress on finalisation of the terms of references drawn up in consultation with the agencies indicated above.

According to the revised time frame the final Reports on the engineering aspects of studies assigned to Consultants are expected by the end of 1992. GOG is requested to indicate the upto date progress and provide the final reports submitted by the consultants as on date.

Govt. of Rajasthan

Govt. of Rajasthan is to report the steps taken for conducting the impact assessment studies, the terms of references for which were made available earlier.

iv) **SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES.**

Narmada Sagar Project

Govt. of Madhya Pradesh

Progress of the studies being done by Wildlife Institute of India may be reported. Regarding the report submitted by Friends of Nature Society, Bhopal, GOMP may like to report the progress on implementation of the recommendations accepted, the action plan on the recommendations accepted may also be furnished.

Sardar Sarovar Project

Govt. of Madhya Pradesh

The studies are entrusted to State Forest Research Institute, Jabalpur. They are continuing the work. The Institute has already submitted their report for the quarter ending March, 1992. The report for the quarter ending June, 1992 is now due. GOMP is to report the position.

Govt. of Gujarat

The detailed draft report on indepth studies on flora, fauna and carrying capacity aspects was submitted by M.S. University, Vadodara and on the Wildlife management aspect of Shoolpaneshwar sanctuary reports were submitted by Principal Investigator in June, 1992. These reports were under the scrutiny of SSNNL. GOG is requested to indicate the important recommendation accepted by the SSNNL specially with reference to rehabilitation of plant or animal life, developing migratory corridors for the wildlife likely to move from the submergence areas and measures recommended for improving the carrying capacity of the receiving areas and the mitigative actions proposed.

v) **ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY**

During the last Environment Sub-Group meeting, Chairman has directed that a meeting is to be convened by NCA to present a clear picture on the monuments coming under submergence as well as the excavation sites. Accordingly a meeting was convened on 20th May, 1992 which indicated that no excavation is proposed within the submergence area in Gujarat and Maharashtra whereas in Madhya Pradesh State Department of Archaeology and Museum has identified a few sites for excavation also, in addition to a few monuments requiring shifting before the submergence commences. The minutes of the meeting are placed at Annex-XV-4.

Govt. of Madhya Pradesh

Narmada Sagar Project

Govt. of Madhya Pradesh has reported that the survey works in 254 villages was completed and action plans were under formulation. GOMP is requested to submit the progress.

Sardar Sarovar Project

There is no Central or State protected monuments within the submergence of Sardar Sarovar Project. However, the State Departments of Archaeology, Govts. of Gujarat and Maharashtra have recommended preservation of the temples of Shoolpaneshwar and Hamfeshwar. Shifting of Shoolpaneshwar temple was to be completed by the current monsoon, GOG may report the progress. A programme of implementation/shifting of Hamfeshwar may be indicated.

The action plan for the areas in Madhya Pradesh is under formulation and GOMP is to report the progress.

The Anthropological Survey of India has also launched a Narmada Salvage Operation plan for carrying out the studies through a group of multi disciplinary experts. Representative of the Anthropological Survey of India may indicate further progress in this regard. In addition Rashtriya Manav Sanghralaya has also completed the studies on tribal art and culture, pre historic and paleo anthropological aspects. Anthropological Survey of India has also completed a project called "People of India" in which tribals of Narmada valley are extensively covered; hence no further studies in this aspect is proposed either in Narmada Sagar or in Sardar Sarovar Project.

vi) SEISMICITY AND RIM STABILITY OF RESERVOIR

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP indicated that studies for some patches of narrow water divide will be completed during the field season programme of 1991-92 by GSI. GOMP may report the progress on works.

Sardar Sarovar Project

GSI had earlier completed Rim Stability Survey in 130 sq.km.area in Madhya Pradesh and entire area in Gujarat. A meeting to review the action to be taken for completion of the remaining survey works entrusted to

GSI was held by NCA on 18.9.91 and modalities were worked out. A lump sum amount of Rs. 1 lakh was paid by NCA towards advance payment of works to GSI. GSI was expected to complete the works within the field season of 1991-92. GSI in its report on rim stability had suggested some additional studies to wipe out suspicion about the leakage from the reservoir to adjacent basins. GOMP during the meeting held on 18.9.91 to discuss rim stability was directed to initiate tracer studies as suggested by GSI in consultation with CW&PRS or Bhabha Atomic Research Centre (BARC). GOMP officers had discussed the issues with the Officers of above institute, however the final decision is to be taken in consultation with the Director, GSI who is yet to get in touch with the above institutes. GOMP is to report further development.

vii) HEALTH ASPECTS

Govt. of Gujarat

GOG has already submitted the health plan, implementation of which will be completed in 17 years with the development of command area. However as a part of the plan, hospital is already constructed and functioning at project site and existing dispensaries have been strengthened up for covering the needs of the workers and the villagers on the periphery of the reservoir. GOG is also requested to furnish a detailed report on the Malaria Eradication Programme and its success in the project impact areas. Upto date progress may be reported.

Govt. of Maharashtra

The revised draft health plan was submitted to the Ministry of Environment & Forests about an year back. Govt. of Maharashtra may indicate if the draft plan have been finalised by the State Government.

Govt. of Madhya Pradesh

GOMP is to report the progress on construction of hospital at Nisarpur and the steps taken for monitoring the water quality.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

During the last meeting of the Environment Sub-Group, Chairman has desired that a correct picture on the conservation aspect of fisheries is to be brought before the sub-group for which a desk review study is being entrusted to the CICFRI, Barrackpore and it is likely to be completed by December, 1992. However the studies on downstream fisheries are being conducted

by CICFRI through its regional centre at Vadodara and are expected to be completed by March, 1993. In addition Limnological aspects for entire Narmada stretch in Madhya Pradesh are being addressed by three universities and are likely to be completed by March, 1993. Another study on the conservation of fisheries of the Narmada Sagar Project is already completed by Friends of Nature Society, Bhopal. GOMP may enlighten the Sub-group about the findings of the study.

GOMP is requested to bring out a clear picture on the conservation aspect of fisheries based on the above studies. Similarly GOG is also requested to highlight the findings on the studies being conducted by CICFRI regional centre as delineated in its report of 1991-92 and also requested to furnish a copy of the report.

**Item No.XV-4(81): ACTION TAKEN BY NCA ON ENVIRONMENTAL
CLEARANCE AND COMPLETION OF STUDIES**

The clearance order from environmental angle was granted to Narmada Sagar and Sardar Sarovar projects in 1987 with the proviso that NCA will ensure that environmental safeguard measures are planned and implemented pari passu with progress of works on the projects and the detailed survey/studies assured will be carried out as per the schedule proposed and details made available to the Department for assessment and that catchment area treatment programme and the rehabilitation plans are to be so drawn as to be completed ahead of reservoir filling. In addition it was also required that Department of Environment should be kept informed of progress on various works periodically.

The reconstituted NCA delegated monitoring works to its sub-group headed by the Secretary, Ministry of Environment & Forests. The sub-group referred to as environment sub-group has held 14 meetings so far. The sub-group has issued directives for indepth studies on various items from time to time. NCA is also bringing out status report quarterly to keep the Department of Environment informed of the progress on various works. Decision has also been taken by the NCA to treat all sub-watersheds of high and very high priority categories directly draining into the reservoir and state governments have prepared the plans to treat all such areas ahead of reservoir filling. GOM has also agreed during the 43rd meeting of the NCA to prepare a contingency plan for treating the catchment area within 3 years.

Status of studies with respect to Sardar Sarovar Project is presented on page 33 Annex- XV-2. However a few indepth studies were ordered by the sub-group and these studies are also nearing completion. A time frame for completion of all studies and their implementation schedule pari passu with the progress on works is presented in Annex-XV-2.

Members may discuss and suggest further corrective actions if any.

Any Other Item

Date & Venue of next meeting

ANNEXURES

ANNEX - XV (1)

STATUS REPORT OF STUDIES AND ACTIVITIES
REGARDING THE ENVIRONMENTAL ASPECTS OF
SARDAR SAROVAR PROJECT (SSP)
JUNE, 1992

The present status of studies/preparation of action plans and implementation, in respect of suggested Environmental Safeguard Measures is as indicated below:

Suggested Environmental Safeguard Studies/Measures

- 1) Phased Catchment Area Treatment.
- 2) Compensatory Afforestation.
- 3) Command Area Development.
- 4) Flora, Fauna & Carrying Capacity.
- 5) Seismicity.
- 6) Health Aspects.
- 7) Archaeological & Anthropological Studies.
- 8) Fisheries.
- 9) Rim Stability Analysis.

1) **PHASED CATCHMENT AREA TREATMENT**

- All India Soil & Land Use Survey Organization, New Delhi submitted its report on prioritization of watersheds in April, 1991.

- The total catchment area of SSP below NSF is 2468973 ha.

	Madhya Pradesh	Gujarat	Maharashtra	Total for the Basin
Total Catchment	2248601	36761*	163611	24,68,973 ha
Very High & High	541825	35412	163354	6,93,591
Directly draining Very High & High	90000	29575	25395	1,44,973

*According to Govt. of Gujarat, the actual catchment area is only 30229 ha and entire area is planned for treatment.

- In accordance with the decision of the Govt. of India on the extent of catchment area to be treated at the project cost, the lands identified as of 'high' and 'very high' erodibility categories situated in the Sub-watersheds directly draining into the reservoirs in addition to the areas damaged directly by the project activities are being taken up for treatment by the State Governments.

Government of Madhya Pradesh (90,000 ha)

In SSP catchment in M.P., 29 sub-watersheds have been identified for treatment. They cover an area of about 90,000 ha., 20% of which is estimated to be forest land. Treatment has been planned separately for forest and non forest areas.

The programme and progress is given below:

Programme and Progress of Catchment Area Treatment in M.P.
(in ha.)

	91-92	92-93	93-94	94-95	95-96	96-97	Total estimated cost at price level of 1990 (Rs.crores)
Target/Progress							
Non-forest area/ha (72,000 ha)	6000	17100	15000	15000	15000	6000	25.20
Forest area/ha (18,000ha)	0000*	4000	4000	4000	4000	2000	18.33
Total	6000	21100	19000	19000	19000	8000	43.53
	0000						

*7632 ha. is planted up with Khus plantations during 1991-92

Government of Maharashtra (25,400 ha)

The total catchment area of the SSP in Maharashtra is 163611 ha. Out of this, 25400 ha is proposed to be treated. The treatment plans for the non-forest and forest areas are prepared separately.

Programme and Progress of Catchment Area Treatment (in ha.)
in Maharashtra

	92-93	93-94	94-95	95-96	96-97	Total Cost
Forest Area (21,227ha)	8427	3200	3200	3200	3200	21227 29.41
Non Forest Area (4,171)	2848	815	512	-	-	4171 2.20
25398 ha						

Say 25,400 ha

The catchment area treatment works are yet to commence.

Government of Gujarat (30,229 ha)

The total catchment area of the SSP in Gujarat is 36,761 ha. of this, a total of 29,575 ha is identified for treatment. However Govt. of Gujarat has planed to treat 30229 ha.

The catchment area treatment measures have been planned separately for forest and non-forest areas covering 27204 ha and 3025 ha respectively. Plan of the work is submitted to MOE&F. The programme and progress is given below:-

a) Forest Area (27,204 ha)

Programme and Progress for treatment (Area in ha.)

1990-91	1991-92	1992-93	1993-94	1994-95
4560/4528	4750/4770	6000	6200	5700

b) Non-Forest Area (3025 ha.)

Upto 90-91	91-92	92-93	93-94
897	830/274	662	636

Survey & Planning works is completed over an area of 3025 ha. Programme of Treatment of non forest areas includes contour bunding on 1276 ha, terracing in 980 ha pasture development over 307 ha, afforestation works over 534 ha, in addition, Nala plugging of 100 Nos. Works are completed in 1171 ha upto 1991-92.

2) Compensatory Afforestation

Government of Madhya Pradesh

A total of 6547 ha of degraded forest and 2190 ha of non-forest land located in districts of Jhabua, Dhar and Khargone is identified for afforestation works in lieu of submergence of 2732 ha forest area. The work of compensatory afforestation in the districts of Dhar and Jhabua has been assigned to Madhya Pradesh Van Vikas Nigam (MPVVN). The compensatory afforestation work in non-forest and degraded forest land identified in Khargone district has been entrusted to the Divisional Forest Officer, Kaveri Forest Division.

Programme and Progress of Afforestation (Area in ha.) in Madhya Pradesh

	DEGRADED FOREST	NON-FOREST	TOTAL
Already planted during			
i) 1990 rains	132	716	848
ii) 1991 rains	1200	373	1573
1992-93	1960	427	2387*
1993-94	1580	400	1980
1994-95	1678	274	1952
	-----	-----	-----
	6550	2190	8740
	-----	-----	-----

*(Target for the year 1992-93 is increased to the extent slippage occurred in plantation works during 1991-92. Advance soil preparation work is in progress on an area of 2387 ha).

Government of Maharashtra

The forest area diverted due to submergence is 6488 ha. The total area to be put under compensatory afforestation is 19205 ha being 6205 ha non-forest area and 13000 ha of degraded forest. A detailed compensatory afforestation scheme has already been submitted by the Government of Maharashtra to the Ministry of Environment & Forests on 14.05.90 for approval. Ministry of Environment & Forests has sought certain clarifications from Govt. of Maharashtra which are still awaited. A plan on compensatory afforestation prepared by Govt. of Maharashtra was submitted to World Bank during Sept. 1991. According to this plan the programme of compensatory afforestation is given below:-

In addition, compensatory afforestation is also required to be undertaken in 2,700 ha of non-forest land in lieu of the forest land in taloda area released for resettlement works. For this, non-forest land to the extent of 2,700 ha has already been identified. The GOM has issued order to transfer these lands to the forest department. Scheme for raising compensatory afforestation in 2,700 ha area is under preparation.

Programme of Compensatory Afforestation

Revised Plan: Govt. of Maharashtra has revised it's earlier plan as follows.

- Programme of Compensatory afforestation under implementation: in Maharashtra

Targets/Achievements (in ha)

		<u>Plantations</u>		
		91-92	92-93	93-94
Degraded Forests Area				
		<u>8383</u>	4596	-
	(13000 ha)	8383		
Non forest Area				
(i) In lieu of submergence (6490 ha)	9190	-	2290	6900
(ii) In lieu of R&R works at Taloda. (2700 ha.)				

Government of Gujarat

A total of 4165.9 ha of forest area has been diverted for SSP in Gujarat. A work plan for 4650 ha of non-forest land in nine villages of Kutch district and of 9300 ha of degraded forest land outside the basin, in the districts of Surat, Bharuch, Vadodara, Panchmahals and Sabarkantha, is under implementation. Besides 24560 ha of the forest area below density 0.6 in the catchment is also planned for afforestation works.

The programme and progress is as follows:

Target/Progress (Area in ha)				
	Work done till rains of 1991	1992-93	1993-94	1994-95
Non Forest Area (4650 ha)	2500	800	800	550
Degraded forest (outside the catch- ment) (9300 ha)	2834	2250	2250	1966
13,950 ha. (Total)				
Degraded forests (within the catchment) 24560 ha				
(i) 2000 plants/ha (12638 ha)	4078	3000	3000	2560
(ii) 400 plants/ha (11922 ha)	3330	2976	3000	2616

Plantations along Canal banks:

The total potential of canal bank plantations is estimated as 18000 ha. A project report prepared by forest Deptt. is under scrutiny of SSNNL. A programme of plantation is likely to be launched effectively from the year 1992. However to give start to the work of canal bank plantations, early plantations on 140 ha are already established till the rains of 1991.

Additional Activities

(a) Dam Vicinity Plantation (235 ha)

Planted till rains of 1990 - 202.5 ha

(b) Forest Plantation (500 ha)

Ravine lands on the left bank of the Sabarmati in village Ratanpur (300 ha) and Pirojpur (200 ha). In Pirojpur an area of 60 ha is planted against the target of 35 ha till Sept. 91.

(c) Additional Plantation in Non-forest Areas (1088 ha)

Non-forest land in Kutch district. Lands have already been released. The plantations will be completed by 1994-95.

3) COMMAND AREA DEVELOPMENT (INCLUDING DRAINAGE STUDIES)

Government of Madhya Pradesh

No command area in Madhya Pradesh.

Government of Maharashtra

No command area in Maharashtra.

Government of Gujarat

Master Plan for surface and sub-surface drainage has been prepared upto Mahi River Crossing. Services of six Consultants have been engaged for carrying out studies beyond Mahi Crossing. These include studies related to ground water, drainage, conjunctive use of surface and ground water, silting aspects of main canal, planning and design of micro-level canal net work etc. Reports were expected by March, 1992. Progress is not reported.

Government of Rajasthan

The Government of Rajasthan, has submitted a report on Environmental & Ecological aspects and remedial measures for Narmada Canal Project. Copy of the report is submitted to Ministry of Environment and Forests. Govt. of Rajasthan is directed to carry out Impact Assessment Studies on the lines

followed by Govt. of Gujarat. Terms of Reference are made available to Govt. of Rajasthan.

4) FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

In depth studies on flora, fauna, wildlife and carrying capacity are progressing in the forest areas coming under submergence of Sardar Sarovar Project spread to 13400 ha area. Studies are already completed in 4500 ha area in Gujarat and are likely to be completed in another 2800 ha area in Madhya Pradesh by 1993 and for the areas in Maharashtra the studies will be completed by 1994. According to the studies completed earlier in the areas falling in Gujarat and Maharashtra and part area of the basin in Madhya Pradesh no rare endangered or threatened species is to be wiped out from the country. In depth studies completed so far have confirmed the above findings. Regarding the carrying capacity of the adjoining areas massive afforestation and greening of the impact area are in progress in Gujarat and Maharashtra to cater the needs of the wildlife moving from the submergence areas. Felling plan have been prepared to provide corridors for the wildlife likely to migrate from the submergence areas.

Government of Madhya Pradesh

Study has been entrusted to the State Forest Research Institute, Jabalpur, in collaboration with H.S.G University, Sagar and Rani Durgavati University, Jabalpur. The study commenced in April, 1990 and is expected to be completed in three years by March, 1993. Action plan will be ready by March, 1994 and implementation will be done by March, 1996. The Institute has submitted quarterly reports. The last report for quarters ending March, 1992 is furnished by the Institute. A felling plan prepared by State Forests Research Institute is also submitted, this will be placed before the Wildlife Committee for consideration.

Government of Gujarat

1) Basic Studies

Studies were conducted by M.S. University, Vadodara in 1983. Fresh study for the SSP submergence area in Gujarat were been entrusted again to M.S. University, Vadodara. An inception report & interim reports I to III have been furnished. Draft final report is also submitted in May, 1992 and is under scrutiny of SSNNL.

2) Wildlife Conservation Measures

The area of the Shoolpaneshwar Sanctuary has been enlarged from 151 sq.kms. to 448 sq.kms. Habitat improvement measures in the enlarged Shoolpaneshwar Wildlife Sanctuary to foster the flora and fauna of the area are scheduled for completion in five years. Notification, declaring

Shoolpaneshwar sanctuary is issued. A study on people's participation in wildlife management Shool-paneshwar Sanctuary by VIKSAT commissioned by World Bank is also submitted in December, 1991.

3) Wildlife Management Study for Sardar Sarovar Submergence Area

The above study has been assigned to a group with a Principal Investigator (of the rank of Conservator of Forest) on approaches to integrated wild-life management in Gujarat was organised in October, 1990. Report of the workshop is made available. A report is submitted by Principal Investigator on Wildlife Management which is under consideration of SSNNL.

4) Additional Environment Improvement Programme.

Sardar Sarovar Narmada Nigam Ltd, has decided to undertake the following additional environmental improvement programme in the catchment area and its vicinity.

- i) Creation of a habitat for the great Indian Bustard (highly endangered bird of the country). Improvement of support watering facility at six locations. Providing inspection and transport facilities.

Government of Maharashtra

School of Environmental Science, Pune University were assigned the work. Terms of Reference are finalised. Work is planned for completion in two years i.e. by March, 1994. Vide Govt. of Maharashtra decision No.RPA/3190/93/89/-C-R-61/C-3 dated 20th March, 1992. 40% of the total expenditure (37,98000) Rs. 1519000 is granted to Pune University as first instalment. Studies have commenced.

5) SEISMICITY

Government of Gujarat

The design of the dam allows for a horizontal seismic coefficient of 0.125 g., and it covers additional risk due to reservoir induced seismicity. An eminent Indian Consultant Dr. Jai Krishna, who was the Vice Chancellor of the Roorkee University had been engaged as the Consultant to the Project. The design of the dam had also been referred to the Central Water & Power Research Station, Pune, and Earthquake Engineering School at Roorkee, for dynamic analysis. Advice was also obtained from the World Bank Consultants viz - Dr. Glough and Dr. Bolt, of Burkley University. The design of the dam has also been approved by the Dam Safety Panel comprising eminent engineers.

Establishing Seismological Observatories:

Installation and Commissioning of seismological instruments have been completed in four observatories at Kevadia, Naswadi, Kanjan and Kawant. The remaining five observatories viz. Aliraj- pur, Barwani, Sagbara, Kukshi and Shahada are being commissioned. No separate study regarding Seismicity Aspect is required in Madhya Pradesh and Maharashtra.

6) HEALTH ASPECTS

Government of Madhya Pradesh

The State Director of Health Services, has conducted detailed survey during 1982-83. Health plan regarding immediate service to be provided and continued health services to the population has been prepared. Provision for hospitals, dispensaries, mobile units and evaluation cell & monitoring cell has been made. The total anticipated expenditure including the cost of strengthening of health institutions has been worked out as Rs.748.73 lacs. The agreement for surveillance & control of Malaria is signed between Gandhi Medical College, Bhopal and NVDA.

Government of Maharashtra

Report has been prepared on the following aspects:

- a) Strengthening anti malaria programme in the border area.
- b) Provision of mobile dispensaries.
- c) Providing sub centres.
- d) Construction of primary health services.

The total expenditure anticipated is Rs.2,577.00 lacs.

Government of Gujarat

Two studies relating to schistosomiasis had been carried out in 1985 by the National Institute of Communicable diseases and concluded that there is no threat to the people in the project area. Subsequently, a team led by the Chief of Schistosomiasis Division WHO, Scientist from British Council, London, and Environment Advisor, World Bank carried out investigations and confirmed the above.

The work plan on health aspects has been furnished to the Ministry of Environment & Forests, and World Bank. Total implementation will take about 17 years time. The programme covers the villages on the periphery of reservoir and the command area.

The work plan submitted would be implemented in a phased manner keeping in view the progressive development of irrigation in the vast command area of the project. A twenty five bed hospital is already set up and operating in the main colony of the project.

7) ARCHAEOLOGICAL SURVEY AND ANTHROPOLOGICAL STUDIES

ARCHAEOLOGICAL SURVEY

Government of Madhya Pradesh

Survey for identification of monuments being carried out by the State Department of Archaeology and Museum is completed. Inspection for selection of monuments of archaeological significance is going on. Detailed action plans are under formulation & are expected to be ready by the end of June, 1992. Excavation at Navadatoli are already completed by Prof. Shankhilya of Pune as per the direction from ASI.

Government of Gujarat

Inventory survey of 19 villages, coming under submergence carried out by the Director of Archaeology, has identified the following two temples for shifting.

- 1) Shoolpaneshwar Mahadev Temple at Surpan, District Bharuch.
- 2) Hamfeshwar Mahadev Temple in Chhota Udaipur Taluk.

Shifting of these monuments is proposed in three phases. Identified monuments are not listed as protected monuments. Sites have been finalised to relocate Shoolpaneshwar and Hamfeshwar temples in consultation with trustees of the temples. Shoolpaneshwar temple will be shifted & reconstructed near Gora, about 15 kms., down-stream on the same bank. Whereas, Hamfeshwar temple will be shifted and reconstructed at a higher elevation near the present location.

Government of Maharashtra

No work is proposed.

ANTHROPOLOGICAL STUDIES

Government of Madhya Pradesh

Government of Madhya Pradesh has informed that in view of the studies being carried out in connection with Narmada Sagar Project, no separate anthropological studies are required and that the Director General, Anthropological Survey of India has also expressed the same view. M.P. State Adivasi Kala

Parishad has submitted its report on Tribal arts & culture. Besides Anthropological Survey of India has informed that Narmada Basin is already covered extensively under the project "people's of India".

Government of Maharashtra

No study is proposed.

Government of Gujarat

No study is proposed.

8) FISHERIES

Government of Madhya Pradesh

Studies of important fish/fauna specially the Mahaaseer has been included in the studies being conducted by the three Universities of the State viz. for the upper Narmada, Rani Durgavati University, Jabalpur, Middle Narmada, Barkatullah University, Bhopal and lower Narmada, Vikram University, Ujjain. All the three Universities have initiated the studies in their respective areas as per MOU in 1989. Progress report for the period ending Sept. 1991 has been received. The study period is three years, and will be completed by Sept. 1992

Government of Maharashtra

Department of Fisheries, Government of Maharashtra, has submitted a draft outline for the fresh water fisheries development in Maharashtra area.

Government of Gujarat

Central Inland Capture Fisheries Research Institute, Barrackpore, Calcutta, (Local office at Vadodara) has undertaken the studies in respect of aquatic life upstream and downstream of Sardar Sarovar in Narmada River in Gujarat State. Report of the first phase of pre-impoundment survey has been received.

The design plans and estimates for a 10 ha., fish farm and fish hatchery complex have been finalised. The plan is to be implemented in 9 years and will include Hydrobiological studies, establishment of fish hatchery and fish farm training of Fishermen, establishing and assisting primary fishermen's cooperatives, establishing and assisting an Inter-state Fisheries Development Board and a Cell at Directorate for monitoring.

NARMADA CONTROL AUTHORITY

The Narmada Control Authority, had commissioned a socioeconomic study by Central Inland Capture Fisheries Research Institute, Barrackpore, for possible fisheries development in the entire Narmada Basin excluding Bargi reservoir to the confluence of the Narmada with the Arabian sea including estuarine areas. The proposals to establish an Inter-state Apex Body with participation by the States and NCA is under consideration.

Regarding status of studies on fisheries in the reservoir & its downstream a desk review study is proposed. Terms of reference for the same are under negotiation with CICFRI, Barrackpore. Study period will be 3 months from the date of commencement.

9) RIM STABILITY ANALYSIS

Government of Madhya Pradesh & Govt. of Maharashtra

Geological Survey of India, Nagpur Division, was assigned the work by SSNNL Gujarat. Now the work has been transferred from Nagpur Division to Bhopal Division and is in progress. GSI has completed works in 130 sq.km area in Madhya Pradesh and entire area in Gujarat. The work on remaining areas measuring 170 sq.km in Madhya Pradesh and entire area in Maharashtra was expected to be completed by the end of April '92. However work may not be completed as scheduled due to law & order problems, Revised schedule is awaited from Director, GSI.

Government of Gujarat

Rim Stability analysis has been completed by the Geological Survey of India, Jaipur Branch, in the Gujarat portion of the reservoir. No more work in this respect is required.

STATUS REPORT OF STUDIES & ACTIVITIES
REGARDING THE ENVIRONMENTAL ASPECTS OF
NARMADA SAGAR PROJECT
JUNE, 1992

1) **PHASED CATCHMENT AREA TREATMENT:**

The free draining area of Narmada Sagar Project downstream of Bargi Dam is about 38,952 sq.kms. As per the guidelines of MOWR, directly draining watersheds of 'very high' and 'high' priority categories only are to be treated. This is, however, subject to a final decision on the subject yet to be arrived at. Works on prioritisation of the watershed was entrusted earlier to GSIT&S, Indore. However, the work is now entrusted to "All India Soil & Land Use Survey Organisation, New Delhi, and they are carrying out the prioritisation for the entire catchment of NSP.

AIS&LUS has divided the catchment area downstream of the Bargi Dam into nine sub-catchments. These sub-catchments are further divided into watersheds and sub-watersheds. Preparation of maps and reports relating to five sub-catchments has been completed and these cover the entire area around the periphery of the Narmada Sagar Reservoir. Out of 638 Sub-watersheds, only 25 sub watersheds of 'high' and 'very high' priority are directly draining into the reservoir. An area of 58,510 ha is proposed to be treated. About 20% of this area i.e. 11,510 ha is estimated to be forest land and the rest 47000 ha non forest land.

Programme and Progress of Works

Programme of Catchment Area Treatment(58510)

	91-92 Target/ Progress	92-93	93-94	94-95	95-96	96-97
Non-forest area (47000ha)	<u>6000</u> 1075*	9000	9000	9000	9000	5000
Forest area (6424ha)**	<u>1199</u> 1200	2175	1050	1000	1000	-

*Area planted up with khus plantation is spread to 6410 ha.

**Against 11510 ha area plan is furnished for treating 6424 ha area only. Balance areas are already identified for compensatory afforestation. However GOMP is directed to substitute the areas & to furnish the plan for the balance areas.

2) COMPENSATORY AFFORESTATION:

A total of 40332 ha forest land would come under submergence and an additional 779.9 ha of forest land has been diverted for the residential colony, power house complex, dam, saddle dam and approach roads. Subsequently, another 308.4 ha of forest land was permitted to be diverted for power house. Thus a total of 41420 ha of forest land has been permitted to be utilised for the construction of ISP.

The Government of Madhya Pradesh, has identified 10143 ha of non-forest and 70802 ha of degraded forest land. Till the end of March, 1992 NVDA has taken over an area of 6512 ha of non-forest land from revenue authorities.

Programme of Compensatory Afforestation

	Commulative progress till 1991-92	91-92 Target/ progress	92-93	93-94	94-95	95-96
Degraded forest area (70,802ha)	23048	<u>12400</u> 14344	12528	12400	12400	12370
Non Forest Area (10,143ha)	5239	<u>1500</u> 2167	1534	1500	1500	1037
		<u>13900</u>				
(80,945)	28287	16511	14062*	13900	13900	13407

(Say 81,000)

*An area of 10,600 ha is already made ready for plantation during rains of 1992.

3) COMMAND AREA DEVELOPMENT

The Government of Madhya Pradesh has submitted command area development plan. The project on completion will provide annual irrigation to 1.69 lakh ha of cropped area over a net C.C.A. of 1.23 lakh ha.

The implementation of the plan would be taken up in three phases for completion in 6/2007. Monthly observation of water levels started in November, 1991 for subsequent supply of this data to the consultants, already shortlisted, are likely to be continued for 2 seasons to draw inference for preparation of master plan for drainage. NVDA has addressed J.L. Agricultural University for studies on effect of pesticides, insecticides in the command and a project report is under scrutiny of NVDA.

4) FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

Studies on these aspects were entrusted to Wildlife Institute of India, Dehradun in December, 1989 and are expected to be completed by March 1993. Action plan will be ready by March, 1994. Implementation of the action plan will be completed by March, 1996. Progress report upto December, 1990 has been submitted by Wildlife Institute of India.

Friends of Nature's Society, Bhopal, is entrusted with preparation of Wildlife Retrieval and Conservation Plan. They have submitted the final draft which is under scrutiny of NVDA.

5) SEISMICITY AND RIM STABILITY

The reservoir competency survey has been done by GSI and report is submitted. In the report, GSI has suggested further studies for some patches of narrow water divide. These studies are to be taken up in consultation with GSI. The Director, GSI has been approached for the same.

Establishment of Seismic observatories in the Narmada Sagar Complex area is under correspondence with IMD, DGTD and CWC. Meeting of IMD, CWC, DGTD and NVDA Officers for finalising the issue was held on 18.3.91. A list of instruments and broad specifications were agreed. Procurement of the instruments is to be done in consultation with IMD. Consultants carried out noise survey during March, 1992 to finalise the sites proposed for observatories. Report is awaited.

6) HEALTH ASPECTS

A note on health aspects of NSP prepared by NVDA was examined in the Ministry of E&F and comments were sent for modifying the report. NVDA has submitted the revised plan costing Rs.748.73 lacs for the preventive and curative aspects of health. Regarding preventive aspects, a MOU is signed with the Department of Preventive and Social Medicine, Gandhi Medical College, Bhopal, whereas, for studies on health aspect in project impact areas of SSP and NSP work is proposed through a cell of monitoring and evaluation under Directorate of Health Services, Bhopal. The approved health plan is being implemented.

Pre-impoundment and post-impoundment Limnological studies being carried out by three Universities will take care of water quality aspect.

7) FISHERIES DEVELOPMENT

The aspect relating to study of the availability of important aquatic fauna/fish, especially the migratory species has been included in the Limnological studies being conducted by the 3 Universities of the State; the Upper Narmada, (Bargi Reservoir) Rani Durgavati University, Jabalpur, Middle Narmada (Tawa, Barna and Kolar Reservoirs) Barkatullah University, Bhopal, Lower Narmada, Vikram University, Ujjain. All the three Universities have initiated the studies in their respective areas as per MOU. Their report for the period 1991 is submitted. Aquatic fauna is also covered under the studies completed by Friends of Nature Society, Bhopal. Studies are Scheduled completion by Sept '92.

8) ARCHAEOLOGICAL AND ANTHROPOLOGICAL SURVEY

A survey of the 254 villages is required for identification of the archaeological monuments falling within the submergence area. State Department of Archaeology and Museum was entrusted with the survey of 87 villages which has been completed. Archaeological Survey of India has also completed the survey for 167 villages assigned for identification of the monuments of significance. Report is submitted to head office and is under scrutiny.

Action plan would be ready by June, 1994. Action will be taken to preserve material of archaeological importance in consultation with experts.

As only lower bastion in north of the Joga Fort is likely to be affected by scour action of water and the Siddeshwar temple is well above the FRL of 860 ft., these two structures are not considered as affected by the project. However, other structures/ monuments will be considered for shifting or protection after their archaeological significance is established through joint inspection of the competent authorities.

ANTHROPOLOGICAL STUDIES

Efforts are being made for retrieval of bio-cultural material from the Narmada Basin. A lot of information is gathered from the field which generates immense data of Socio-Anthropological significance.

Rashtriya Manav Sangrahalaya has constituted a working group for the retrieval of bio-cultural material in Narmada Basin. Survey of tribal art and handicraft entrusted to M.P. Adivasi Kala Parishad is completed and report is available. Besides Anthropological Survey of India has covered these studies under its own project called "peoples of India". The report is in 61 volume out of which 7 volume are under final editing. A Narmada Salvage plan is also launched by Anthropological Survey of India recently and the entire area is scanned and some ancient tools have been found.

ANNEX - XV (2)

EXECUTIVE SUMMARY
SSP: Comprehensive Environmental Action Plan
and Status : June '92

The action plans and status of implementation of suggested Environmental Safeguard Measures is as indicated below:

Suggested Environmental Safeguard Studies/Measures

- 1) Phased Catchment Area Treatment.
- 2) Compensatory Afforestation.
- 3) Command Area Development.
- 4) Flora, Fauna & Carrying Capacity.
- 5) Seismicity.
- 6) Health Aspects.
- 7) Archaeological & Anthropological Studies.
- 8) Fisheries.
- 9) Rim Stability Analysis.

SCHEDULE

I. PHASED CATCHMENT AREA TREATMENT (Area in ha round figures)

- The total catchment area of SSP below NSP is 2468973 ha.

	Madhya Pradesh	Gujarat	Maharashtra	Total for the Basin
Total Catchment	2248601	36761	163611	24,68,973 ha
Directly draining Very High & High	90000	29575	25395	1,44,973 ha*

*Planned to treat 1,45,600 ha.

Programme for Implementation and Achievement

A) Government of Madhya Pradesh (90,000 ha)

Item with targets	92-93	93-94	94-95	95-96	96-97	Total estimated cost at price level of 1990 (Rs.crores)
Non-forest area/ha (72,000 ha)	21000	15000	15000	15000	6000	25.20
Forest area/ha (18,000ha)	4000	4000	4000	4000	2000	18.33
Total 90000	25000*	19000	19000	19000	8000	43.53

The progress is lagging behind.

*During 1991-92 khus plantation was carried out over 7650 ha area. This incomplete area is now added to this year's (92-93) programme for completion.

B. Government of Maharashtra (25,400 ha)

	92-93	93-94	94-95	95-96	96-97	Total	Cost
Forest Area (21,200ha)	8400	3200	3200	3200	3200	21200	29.41
Non Forest Area (4,200) 25400 ha	2900	800	500	-	-	4200	2.20

The work in the real sense should yet to start.

(C) Government of Gujarat (30,200 ha) (rounded)

Works completed upto 3/92 1992-93 1993-94 1994-95

Forest Area (27200)*	9070	6230	6200	5700
Non Forest Area** (3000)	940	660	640	760

* Works are completed in 9070 ha and are in progress over 6000 ha during 1992-93.

** Survey & Planning works is completed over an area of 3025 ha. Programme of Treatment of non forest areas includes contour bunding on 1276 ha, terracing in 980 ha pasture development over 307 ha, afforestation works over 534 ha, in addition, Nala plugging of 100 Nos. Works are completed over 940 ha upto 91-92.

Against the total catchment area treatment target of say 1,45,600 ha, 10200 ha has been completed upto 3/92 and treatment of 43200 ha is planned for 1992-93 i.e. 7% is completed. The entire catchment area treatment for Sardar Sarovar will be completed by 1996-97 well before the full impoundment of the reservoir.

II) Compensatory Afforestation. (ha. rounded)

(A) Government of Madhya Pradesh (8740 ha)

	DEGRADED FOREST (6550)	NON-FOREST (2190)	TOTAL (8740)
Works completed up to 1991-92	1332	1089	2421
i) 1992-93	1960	427	2387
ii) 1993-94	1580	400	1980
iii) 1994-95	1678	274	1952

E. Government of Maharashtra (22190 ha)

	91-92	92-93	93-94
Degraded Forests Area (13000 ha)	8383 (completed)	4596	-
Non forest Area			
(i) In lieu of submergence (6490.00 ha) (rounded)	9190	-	6900.00
(ii) In lieu of R&R works at Taloda. (2700 ha.)		2290	
22,190			

C) Government of Gujarat (13,950 ha)

	Work done till 1991-92	1992-93	1993-94	1994-95
Degraded forest (outside the catch- ment) 300 ha)	2834	2250	2250	1966
Non Forest Area (4650 ha)	2500	800	800	550
13,950 ha	5334			

Against the target of 44700 ha of afforestation /reforestation, an area of 16140 ha is already planted up and 12200 ha of plantation is scheduled for 1992-93 i.e. 36% of the works is completed. The entire compensatory afforestation work will be completed by 1994-95, well before impoundment.

III. COMMAND AREA DEVELOPMENT (INCLUDING DRAINAGE STUDIES)**(A) Government of Gujarat**

Master Plan for surface and sub-surface drainage has been prepared upto Mahi River Crossing. For the areas beyond Mahi Crossing. Studies related to ground water, drainage, conjunctive use of surface and ground water, silting aspects of main canal, planning and design of micro-level canal net work etc. are completed. Reports are under scrutiny of SSNNL, Gujarat.

The entire studies for command area development including drainage studies are completed. The implementation will proceed side by side with the canal distributory construction.

(B) Government of Rajasthan

The Government of Rajasthan, has submitted a report on Environmental & Ecological aspects and remedial measures for Narmada Canal Project. Copy of the report is submitted to Ministry of Environment and Forests. Govt. of Rajasthan has been directed to carry out Impact Assessment Studies on the lines followed by Govt. of Gujarat. Terms of Reference are made available to Govt. of Rajasthan.

IV. FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

In depth studies on flora, fauna, wildlife and carrying capacity are progressing in the forest areas coming under submergence of Sardar Sarovar Project spread to 13400 ha area. Studies are already completed in 4500 ha area in Gujarat and are likely to be completed in another 2800 ha area in Madhya Pradesh by 1993 and for the areas in Maharashtra the studies will be completed by 1994. According to the studies completed earlier in the areas falling in Gujarat and Maharashtra and part area of the basin in Madhya Pradesh no rare endangered or threatened species is to be wiped out from the country. In depth studies completed so far have confirmed the above findings. Regarding the carrying capacity of the adjoining areas massive afforestation and greening of the impact area are in progress in Gujarat and Maharashtra to cater the needs of the wildlife moving from the submergence areas. Felling plan have been prepared to provide corridors for the wildlife likely to migrate from the submergence areas. Works to rehabilitate wildlife in Gujarat is nearing completion.

(A) Government of Madhya Pradesh

Study has been entrusted to the State Forest Research Institute, Jabalpur, in collaboration with H.S.G. University, Sagar and Rani Durgavati University, Jabalpur. The study commenced in April, 1990 and is expected to be completed in three years by March, 1993 action plan will be ready by March, 1994 and implementation will be done by March, 1996.

(B) Government of Gujarat

1) Basic Studies

Studies were conducted by M.S. University, Vadodara in 1983. Fresh study for the SSP submergence area in Gujarat have been entrusted again to M.S. University, Vadodara. An inception report & interim reports I to III have been furnished. Draft final report is also submitted in May, 1992 and is under scrutiny of SSNNL. Implementation of the actions arising out of recommendation will be done by 1996-97.

2) Wildlife Conservation Measures

The area of the Shoolpaneshwar Sanctuary has been enlarged from 151 sq.kms. to 448 sq.kms. Habitat improvement measures in the enlarged Shoolpaneshwar Wildlife Sanctuary to foster the flora and fauna of the area are scheduled for completion in five years with effect from 90-91.

3) Wildlife Management Study for Sardar Sarovar Submergence Area

The above study has been assigned to a group with a Principal Investigator (of the rank of Conservator of Forest) . A workshop on approaches to integrated wild-life management in Gujarat was organised in October, 1990. Report of the workshop is made available. A report is submitted by Principal Investigator on Wildlife Management which is under consideration of SSNNL. Implementation of the actions arising out of recommendations will be implemented by 1996-97.

(C) Government of Maharashtra

School of Environmental Science, Pune University were assigned the work. Terms of Reference are finalised. Work is planned for completion in two years i.e. by March, 1994. Implementation of the actions arising out of recommendations will be over by 1996-97.

V. SEISMICITY

Government of Gujarat

The design of the dam allows for a horizontal seismic coefficient of 0.125 g., and it covers additional risk due to reservoir induced seismicity. The design of the dam has also been approved by the Dam Safety Panel comprising eminent engineers.

Establishing Seismological Observatories:

Installation and Commissioning of seismological instruments have been completed in four observatories at Kevadia, Naswadi, Karjan and Kawant. The remaining five observatories viz. Alirajpur, Barwani, Sagbara, Kukshi and Shahada are being commissioned and will be completed by 1995-96.

VI. HEALTH ASPECTS

(A) Government of Madhya Pradesh

Health plan regarding immediate service to be provided and continued health services to the population has been prepared. The total anticipated expenditure including the cost of strengthening of health institutions has been worked out as Rs.748.73 lacs. An agreement is signed between Gandhi Medical College, Bhopal and NVDA entrusting the work of surveillance and control of malaria to the former.

The infrastructure building works will be completed pari-passu with the construction of the dam.

(B) Government of Maharashtra

Report has been prepared on the following aspects:

- a) Strengthening anti malaria programme in the border area.
- b) Provision of mobile dispensaries.
- c) Providing sub centres.
- d) Construction of primary health centres. The GOM is going ahead in this direction for implementation.

The total expenditure anticipated is Rs. 60.00 lacs.

Works will be completed Pari-Passu with the construction of the dam.

(C) Government of Gujarat

Two studies relating to schistosomiasis had been carried out in 1985 by the National Institute of Communicable diseases and concluded that there is no threat to the people in the project area. Subsequently, a team led by the Chief of Schistosomiasis Division WHO, Scientist from British Council, London, and Environment Advisor, World Bank carried out investigations and confirmed the above.

The work plan on health aspects has been furnished to the Ministry of Environment & Forests, and World Bank. Total implementation will take about 17 years time. The programme covers the villages on the periphery of reservoir and the command area.

The work plan submitted would be implemented in a phased manner keeping in view the progressive development of irrigation in the vast command area of the project. A twenty five bed hospital is already set up and operating in the main colony of the project.

As works in the command area are also envisaged in the health plan, the entire work will be completed side by side with the Irrigation system.

VII. ARCHAEOLOGICAL SURVEY

(A) Government of Madhya Pradesh

Survey for identification of monuments is completed. Detailed action plans will be available by the end of July, 1992. The survey has identified 24 monuments in Dist. Dhar & Khargone. However the monuments requiring relocation/protection will be

known by July, 1992 after scrutiny by experts. Besides 191 sculpture have been identified for transfer in these two districts.

All the implementation works will be completed well before the impoundment of the reservoir.

(B) Government of Gujarat

Inventory survey of 19 villages, coming under submergence carried out by the Director of Archaeology, has identified the following temples for shifting.

- 1) Shoolpaneshwar Mahadev Temple at Surpan, District Bharuch.
- 2) Hamfeshwar Mahadev Temple in Chhota Udaipur Taluk.

Shoolpaneshwar temple will be shifted and reconstructed near Gora, about 15 kms., downstream on the same bank. The work is already in progress and is expected to be completed by December, 1992. Whereas, Hamfeshwar temple will be shifted and reconstructed at a higher elevation near the present location. Since submergence will only be in 1994-95, there is enough of time for shifting/rebuilding the temple. Site is already finalised.

(C) Government of Maharashtra

The State Department of Archaeology has confirmed that there are no monuments to be protected/transferred in Maharashtra.

All the works will be completed by 1993-94.

VIII. FISHERIES

(A) Government of Madhya Pradesh

Studies of important fish/fauna specially the Mahaaseer has been included in the studies being conducted by the three Universities of the State viz. for the upper Narmada, Rani Durgavati University, Jabalpur, Middle Narmada, Barkatulla University, Bhopal and lower Narmada, Vikram University, Ujjain. All the three Universities have initiated the studies in their respective areas as per MOU in 1989. Progress Report for the period ending Sept., 1991 has been received. The study period is three years, and will be completed by March, 1993.

(B) Government of Maharashtra

Department of Fisheries, Government of Maharashtra, has submitted a plan for the fresh water fisheries development in Maharashtra area.

(C) Government of Gujarat

Central Inland Capture Fisheries Research Institute, Barrackpore, Calcutta, (Local office at Vadodara) has undertaken the studies in respect of aquatic life upstream and downstream of Sardar Sarovar in Narmada River in Gujarat State. The studies are expected to be completed by 1993.

The design plans and estimates for fish farm and fish hatchery is to be implemented in 9 years.

(D) NARMADA CONTROL AUTHORITY

Socio-economic study by Central Inland Capture Fisheries Research Institute, Barrackpore, for possible fisheries development in the entire Narmada Basin excluding Bargi reservoir to the confluence of the Narmada with the Arabian sea including estuarine areas completed. The proposals to establish an Inter-State Apex Body with participation by the States and NCA is under consideration.

IX. RIM STABILITY ANALYSIS**(A) Governments of Madhya Pradesh & Maharashtra**

GSI has completed works in 130 sq.km. area in Madhya Pradesh and entire area in Gujarat. The work on remaining areas measuring 170 sq.km. in Madhya Pradesh and entire area in Maharashtra was expected to be completed by the end of April, 1993.

If any remedial measures are to be taken, these will be completed pari-passu with the construction of the dam.

(B) Government of Gujarat

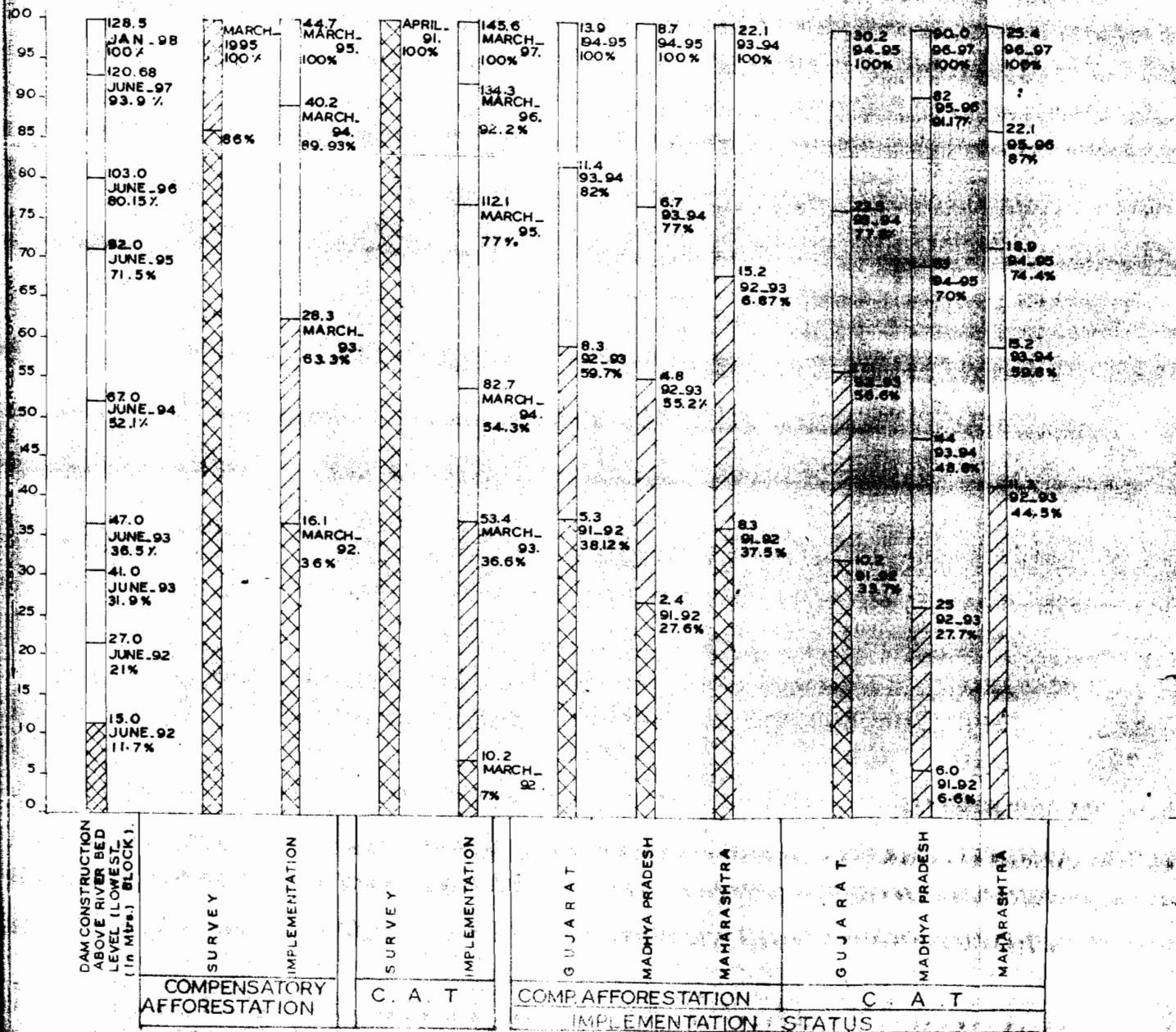
Rim stability analysis has been completed by the Geological Survey of India, Jaipur Branch, in the Gujarat portion of the reservoir. No more work in this respect is required.



JUNE-1992

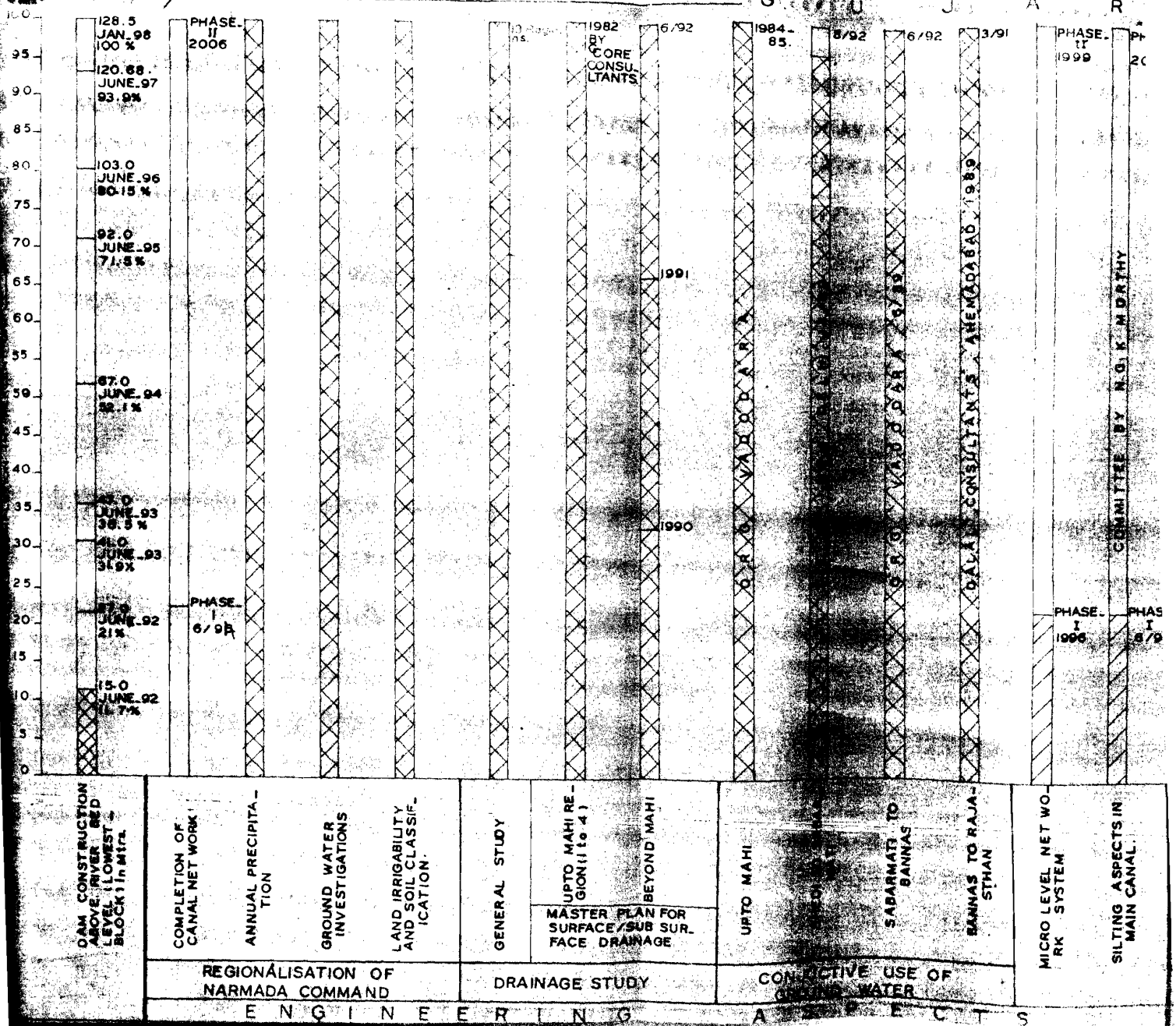
SARDAR SAROVAR PROJECT CATCHMENT AREA TREATMENT AND COMPENSATORY AFFORESTATION

WORKS IN PROGRESS
ACHIEVEMENTS



JUNE-1992

1A



SARDAR SAROVAR PROJECT

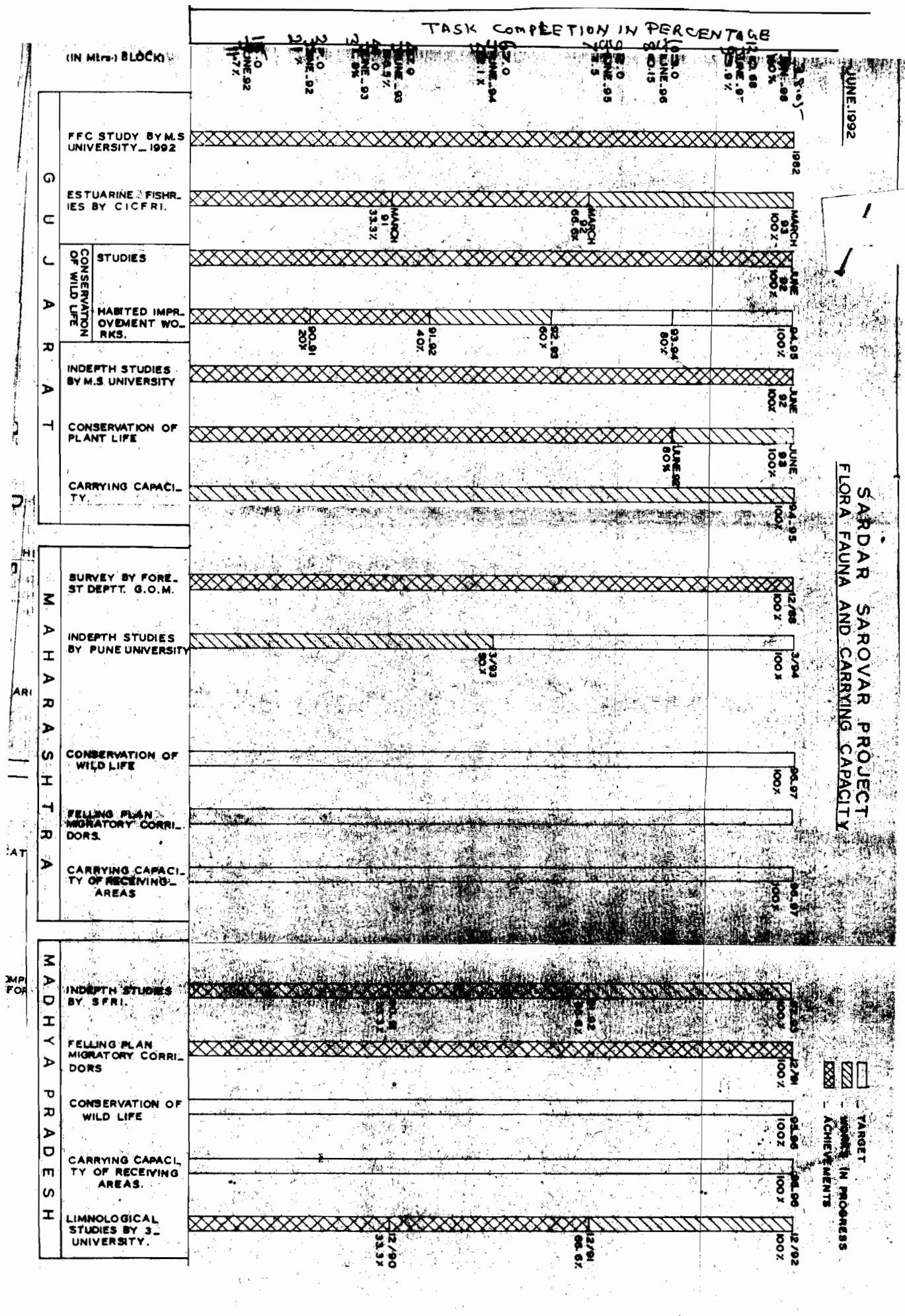
COMMAND AREA DEVELOPMENT

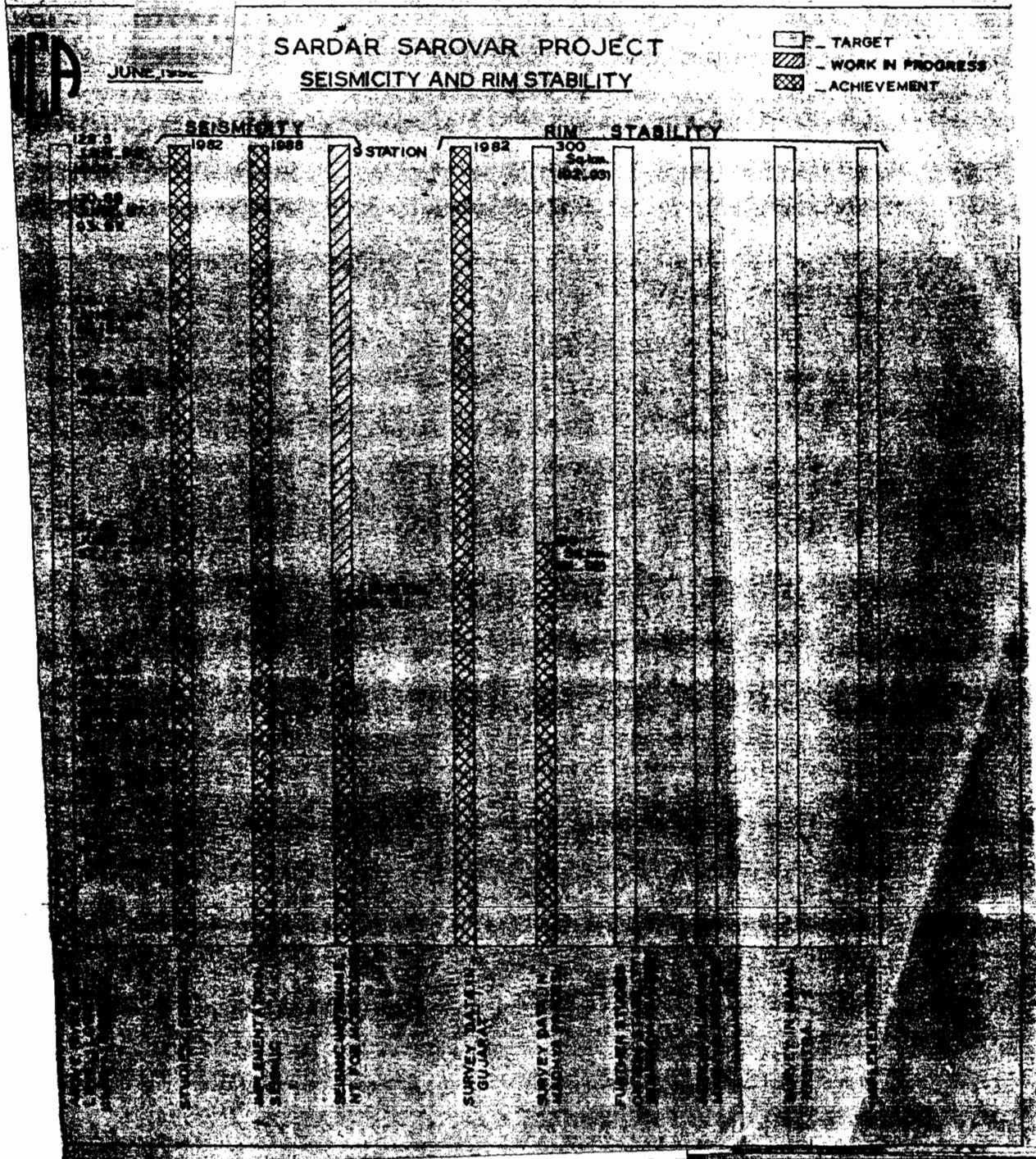
1-B

*

A T		1995	2000	2000	1995	1995	1995	2000	1995 3 Nos.	1995 3 Nos.	1994 5 Nos.	1994 5 Nos.
T.O.R	STUDY											
	IMPLEMENTATION											
	HEALTH PLAN											
	FISHRIES PLAN											
	CANAL BANK PLANTATION											
	FIELD CHANNEL											
	FIELD DRAIN											
	LAND LEVELLING.											
	DEVELOPMENT OF ROADS											
	AGRICULTURE RESEARCH STATION											
	IRRIGATION DEMONSTRATION FARM											
	FARMERS TRAINING CENTRE											
	SOIL TESTING LAB.											
IMPACT	433033											

D E D WORKS

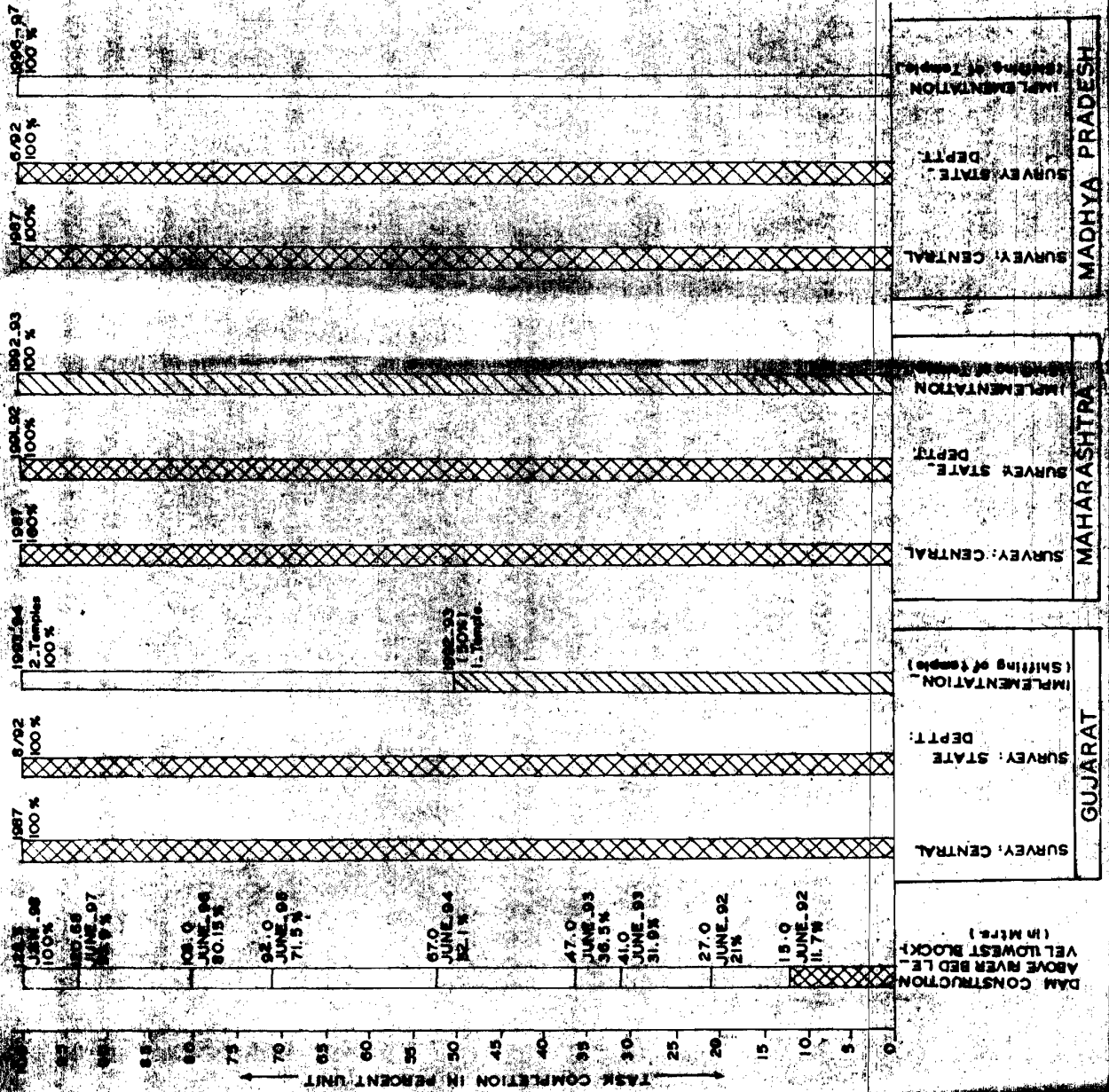




SARDAR SAROVAR PROJECT ARCHAEOLOGY

JUNE - 199

TARGET
WORK IN PROGRESS
ACHIEVEMENTS



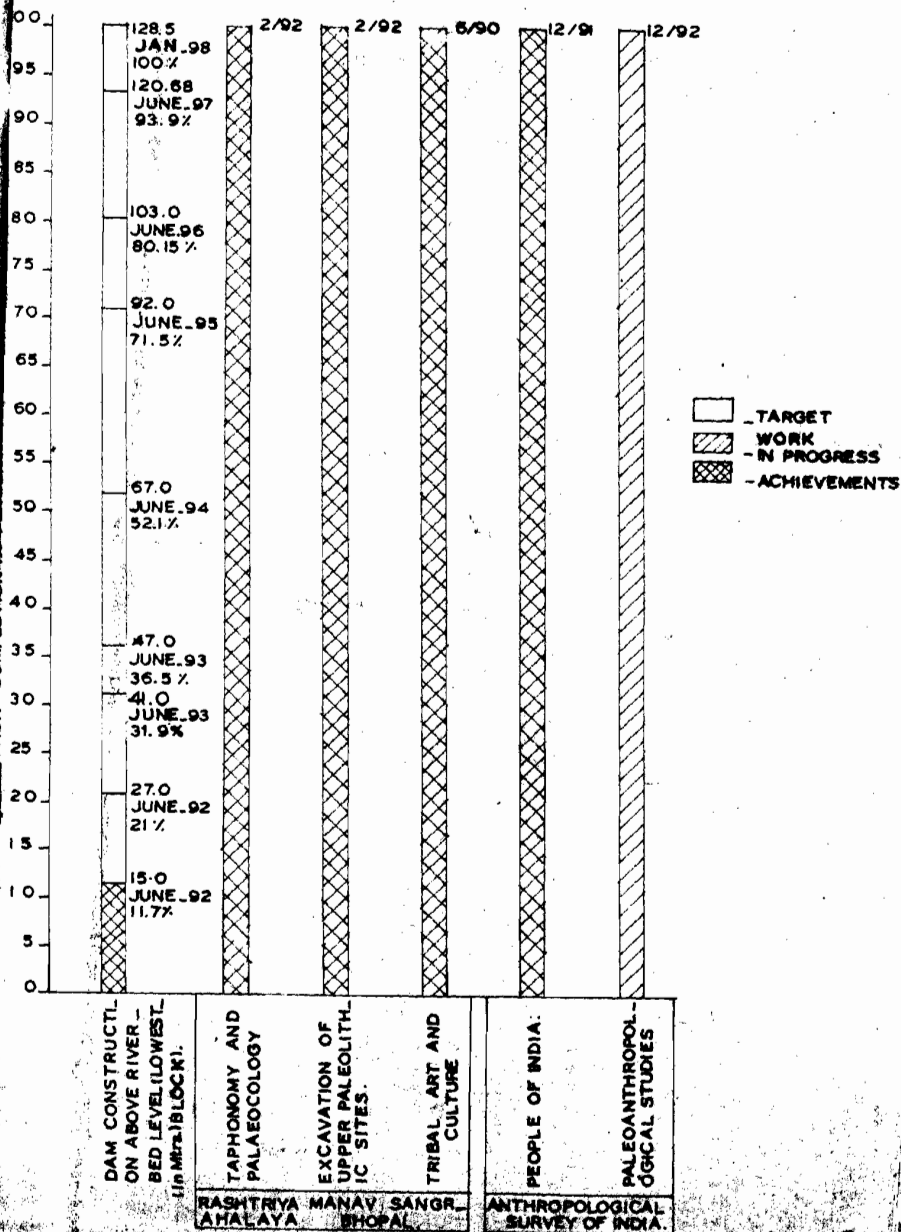
MADHYA PRADESH

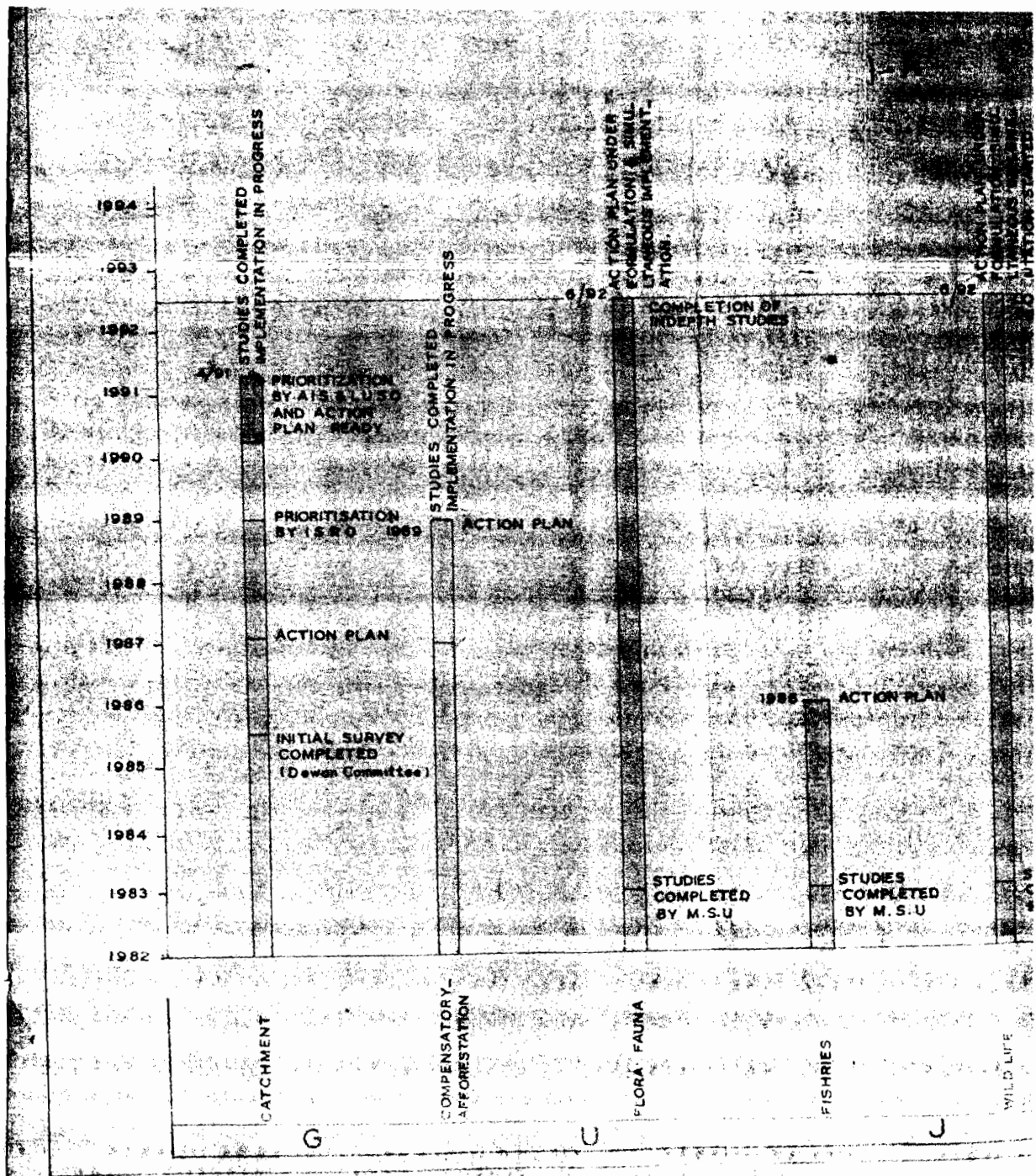
MAHARASHTRA

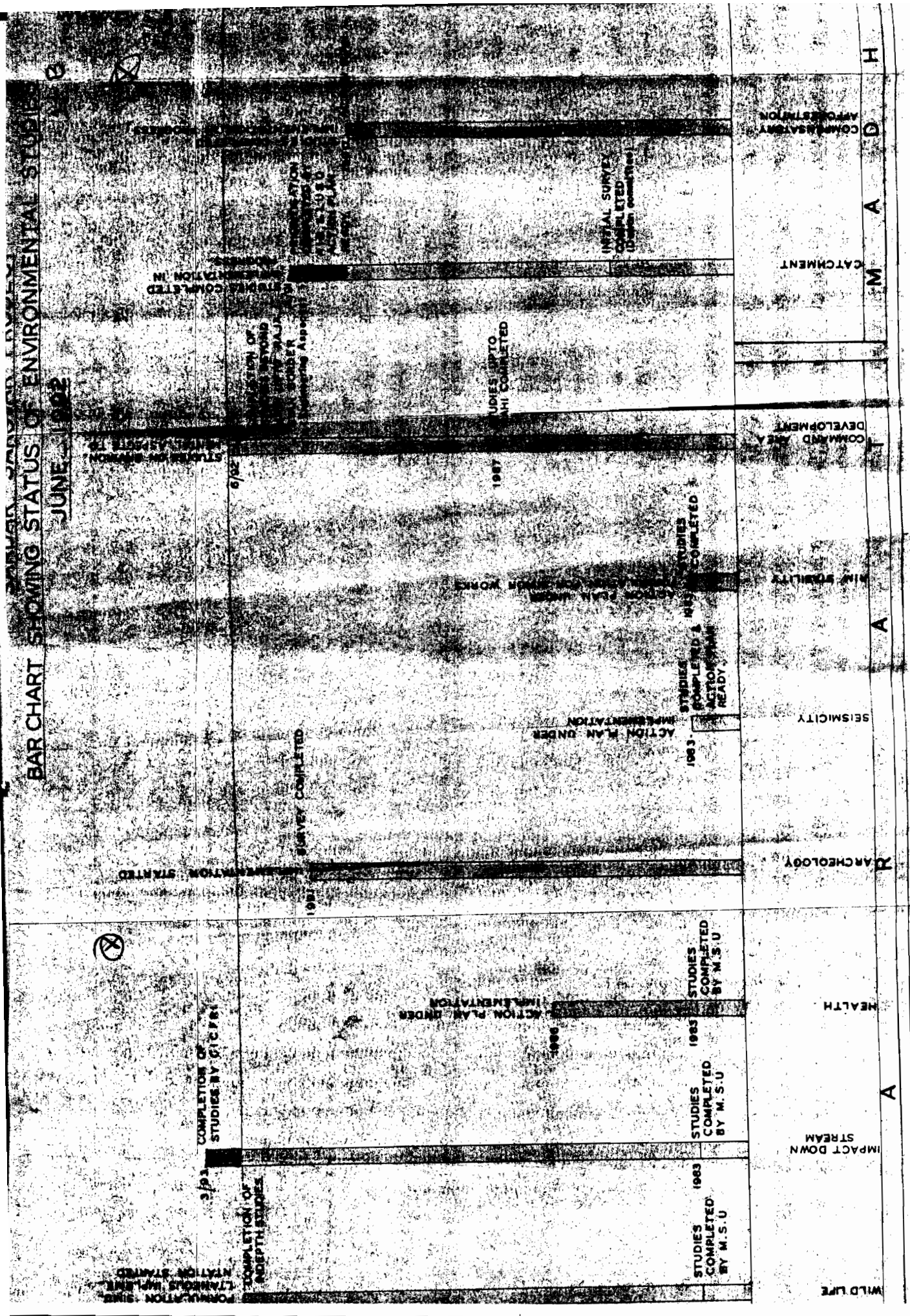
GUJARAT



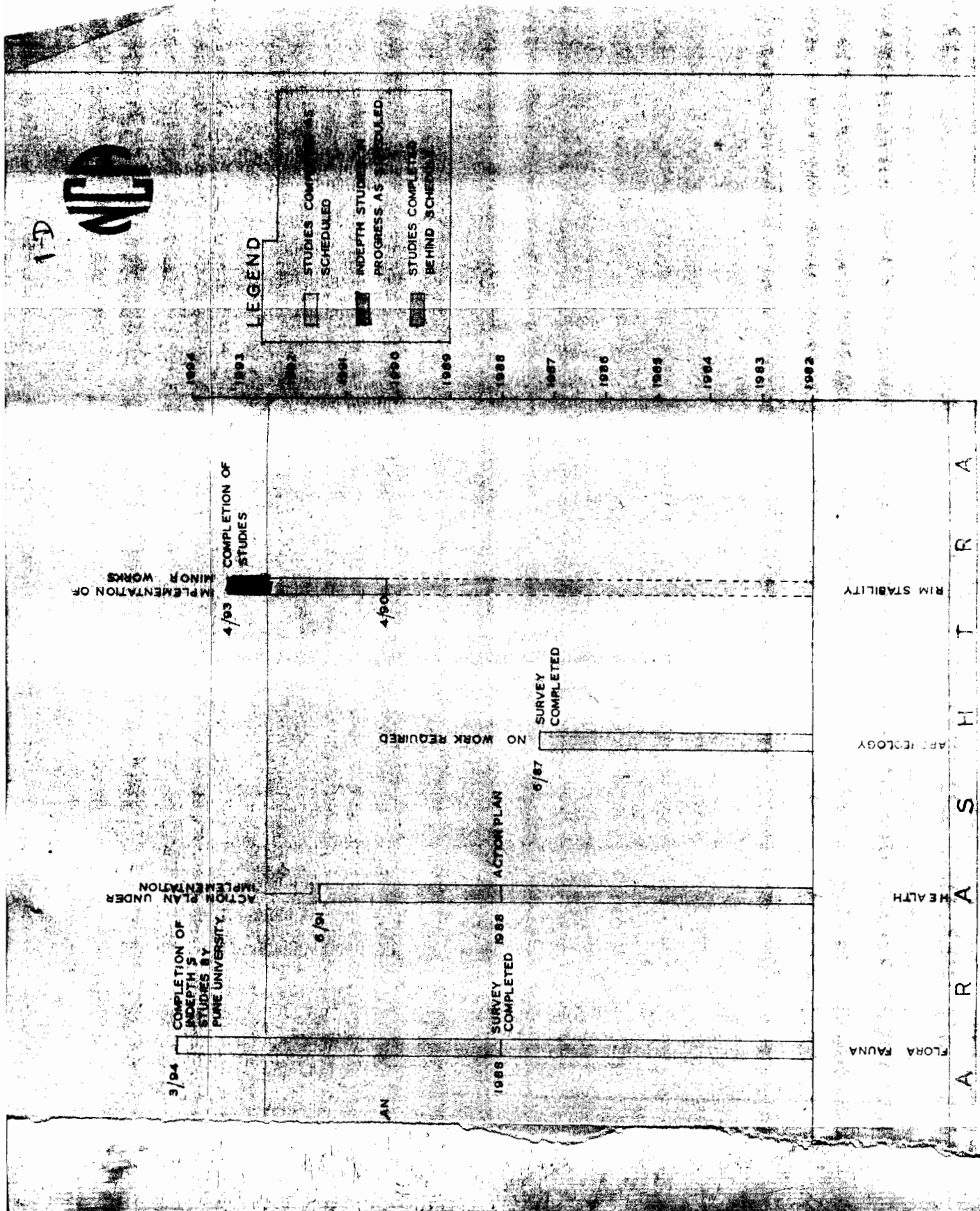
ARDAR SAROVAR PROJECT ANTHROPOLOGICAL ASPECTS







H	A	M	H	S	D	A	P	P	A	H
COMPENSATORY AFFORRESTATION		ATTACHMENT	ARCHAEOLOGY		HEALTH	STABILITY		FISHRIES		FLORA FAUNA
INITIAL SURVEY COMPLETED.										
STUDIES COMPLETED IMPLEMENTATION IN PROGRESS	STUDIES COMPLETED IMPLEMENTATION IN PROGRESS	COMPLETION OF SURVEY & ACTION PLAN	COMPLETION OF STUDIES	COMPLETION OF STUDIES	COMPLETION OF STUDIES	COMPLETION OF STUDIES	COMPLETION OF STUDIES	COMPLETION OF STUDIES	COMPLETION OF STUDIES	COMPLETION OF STUDIES
ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO	ACTION PLAN PROPOSED BY AJS & LUSO
4/90 ACTION PLAN	4/90 ACTION PLAN	4/90 ACTION PLAN	4/90 ACTION PLAN	4/90 ACTION PLAN	4/90 ACTION PLAN	4/90 ACTION PLAN	4/90 ACTION PLAN	4/90 ACTION PLAN	4/90 ACTION PLAN	4/90 ACTION PLAN
1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2
S	S	S	S	S	S	S	S	S	S	S



ANNEX - XV (3)

SPECIAL MONITORING OF
COMPENSATORY AFFORESTATION
IN KACHCH DISTRICT - GUJARAT

- A REPORT -

By

K. A. KUSHALAPA

Chief Conservator of Forests (C)

Bhopal 462 016

MARCH 1992

Contents

Sl. No.	Particulars	Page Nos.
1.	Special Monitoring Report	
1.0	Introduction	1
2.0	Kachch District	1
3.0	Compensatory afforestation	2 - 4
4.0	Technique	4
5.0	Choice of Species	4
6.0	Monitoring of Plantations	4 - 8
7.0	Observations and Suggestions	8 - 10
2.	Proforma details	11 - 12
3.	Map of the district	13
4.	Photographs	14 - 16

SPECIAL MONITORING REPORT OF
COMPENSATORY AFFORESTATION IN KACHCH DISTRICT

1.0 INTRODUCTION

The forest land diverted for Sardar Sarovar Project in Gujarat was 4165.91 ha. The condition No. V was to raise compensatory afforestation in double the degraded forest lands and in project impact areas (9290 ha.) in addition to the equivalent non-forest land (4650 ha.). Accordingly a scheme was drawn up by the Government of Gujarat to afforest 4650 ha. of non-forest land in Kachchh district covering 1500, 1550 and 1600 ha. annually for three years.

2.0. KACHCH DISTRICT

This portion according to Champion and Seth's (1968) classification of forest type comes under Northern Tropical Thorn Forests and Sub-type-Desert Thorn Forest. The area is flat with clayey loam black cotton soils in the interior areas. The coastal areas are sandy loam. Alluvial deposits are also seen. The rain fall is very erratic with every third year is a drought year. The average annual rainfall was about 369 mm. in 1972 which is considerably reduced, with only 10 to 16 rainy days per year. During 1991, the entire district had only about 10 mm. of rainfall. The temperature goes beyond 40° C. There is no surface water, except monsoon torrents. The subsoil moisture is also limited with underground brackish water level going down every year due to increased discharge and absence of recharge. The natural vegetation consists of several species of grass (many palatable to Cattle) with tree sps. like Acacia nilotica, A. senegal, Salvadora persica, S. oleoides, Prosopis cineraria etc. Prosopis juliflora which is an aggressive and pioneer species has now invaded all vacant lands. The year of introduction is not known.

There are two forest divisions viz Kachch East Division and Kachch West Division. The locality factors of West Division is comparatively better than East Division.

The first working plan was written in 1971 by Dr. S.R. Siris who reports that even in 1819, there was no forests in the district except scattered trees mentioned above. The entire area however is covered with scrub.

grass species. This indicates that grass land is a different type of land. Soil moisture is the limiting factor and hence natural dense trees are ruled out. The working plan is yet to be renewed. In the North Western portion of the district about 50,000 ha. of good mangrove forests are existing where annually 150 ha. is taken up for gap filling with success. Large portion of the district is a flat swamp which inundates during rains only and becomes a dry flat land during other season and are called Great Rann of Kutch and little Rann of Kutch which are famous for "Flemingo City" and wild Ass respectively. Rakhals are forest land with less than 0.4 in density and forming Savannah type of grass lands. Ranne are revenue lands, large in extent in the centre and North of the district where grazing is permitted being a pure grass land. Even in Rakhals grazing and also cutting of grass by villagers after its seeding are permitted.

3.0 COMPENSATORY AFFORESTATION

The Government of Gujarat should raise 4650 ha. of compensatory afforestation in Non-forest area. Accordingly in Kachch district the first compensatory plantation was raised in 1988. The targets and achievements are given below.

Planting	Target	Achievement in		Total
		East Dn.	West Dn.	
1988	500	300	200	500
1989	500	300	300	600
1990	1050	250	800	1050
1991	69.8	52	98	160
Total	2119.8	902	1398	2030
1992	800			
1993	300			
1994	330.2			
Total	4650	--	--	--

The places where plantation are raised in Kachch district are given below.

Planting year	Location	East Division		West Division		
		Taluk	Area(ha.)	Location	Taluk	Area (ha.)
1988	Chandrani	Anjar	50 x	Godhra	Mandvi	100 x
	Bhachau	Bhachau	50	Jakhav	Abdasa	100 x
	Vandhia	-do-	50 x			
	Sikarpur	-do-	50 x			
	Manaba	-do-	100			
1989	Chandrani	Anjar	80	Godhra	Mandvi	150
	Vandhia	Bhachau	60	Jakhav	Abdasa	110
	Sikarpur	-do-	80			
	Manaba	Anjar	80			
1990	Chandrani	Anjar	15	Godhra	Mandvi	30
	Bhachau	Bhachau	205	Undoth	-do-	160
	Sivlakha	-do-	30	Rotadia	-do-	100
				Dhekda	-do-	50
				Bada	-do-	180
				Jakhav	Abdasa	60
				Vanku	-do-	170
				Vizan	-do-	50
1991	Lakadia	Bhachau	52	Undoth	Mandvi	20.5
				Rotadia	-do-	4.5
				Sambharai	-do-	10
				Changodia	-do-	9.5

Note: The plantations shown with 'x' marks above are already monitored once in 1989 by DCF (C) Bhopal vide report dated 25.7.1989.

To achieve their balance target, they have already identified 65 ha. for 1992 plantation. Another 150 ha. is to be identified. They have already sent proposals to the Government to release 999 ha. of land already identified. If released, 150 ha. will be taken up for 1992 and balance about 800 will be earmarked for 1993. They have also an area in Somadka (Anjar Taluk) covered with Prosopis juliflora of about 270 ha. transferred

from Revenue department which can also be set apart for 1994. Government could not release 999 ha. on time. Large areas of barren lands are available with Revenue department which require permission to transfer to forest department to achieve the targets. The targets should be complete by 1994. The location map of all plantations raised is enclosed.

4.0 TECHNIQUE

Trench cum live hedge fencing has been given to all plantations. The area is cleared off grass and bushes in flat areas and tractor ploughing is adopted. Pitting is adopted in difficult areas where ploughing is not possible. Planting of polybagged seedlings at the rate of 2500/ha. is done. The PH of the soil ranges from 7.3 to 8.7 hence each plant is provided with 1 Kg. of farm yard manure and 500 gm of gypsum. Borewell was dug where ever possible for support irrigation in the first and second year. Soil working is given at the rate of 3 in the first year, 2 in the second year and one in the third year. In the recent plantations the width between rows has been about 3.0 m to run the tractor after 2 or 3 years and thus the spacing between plants in a row has been 1.0 to 1.5 m to make up 2500 plants per ha.

5.0 CHOICE OF SPECIES

In the beginning of the compensatory plantations in 1988, more emphasis was given for Prosopis juliflora only (50 to 60%). Along with this, species such as Acacia nilotica, A. tortalis, Azadirachta indica were tried. Later on in 1989 other spp. like Pithecolobium dulce, Albizia lebbek, Acacia senegal, Salvadora persica were tried. In 1990 plantations Jatropha curcas, Gordia myxa, Ficus religiosa, Commiphora mukul, Leucaena leucocephala, Emblina officinalis etc. were tried. In 1991 in addition, Acacia auriculiformis, Acacia senegal, Zizyphus jujuba were also introduced.

6.0 MONITORING OF PLANTATIONS

The following plantations were visited whose details and observations are given below:-

6.1 Codhra-1988 (100 ha.) plantations :- The species planted were

mostly Prosopis juliflora (54.8%) along with Acacia nilotica, A. tortalis and Azadirachta indica. The survival is about 80% and average height is about 1.75 metre vide photo 1.0. The growth of P. juliflora only is conspicuous. The soil is black, saline with pH of 8.3. The planting was done at 2m x 2m during July-Aug. 1988. They are stagnated and branchy showing signs of moisture stress. The quality of seeds also play an important role in quality of plantation. It is reported that bulk collections are being done and no seed production stand or plus trees are identified for any of the species introduced in Kachch district. So far 15,778 mandays was generated and about 90 t of grass are removed by villagers. Total no. of plants 2.5 lakhs.

- 6.2 Godhra 1989 (150 ha.) Plantations:- About 9 species are tried of which A. tortalis (32%), A. nilotica (26.6%) and Prosopis juliflora (29.7%) are the main species. Other spp. tried are Azadirachta indica (4.5%) Pithecolobium dulce and Albizia lebbek (2.66%) Acacia senegal (1.4%) etc. Survival about 80% and average height is about 2.5 m. Here the spacing is 3m x 1.5m to run the tractor. Originally area was ploughed and hence the growth is better. Support irrigation is continuing this year also. It was planted in June-July 89. (photo 2.0) They have dug a bore well of 50 cm dia upto 100 m. and yield of water is good. Hence they were able to irrigate the plots of 1989, 1990 and 1991. During 1991 the rainfall was only 63 mm. The plants along rows are already congested and requires to be thinned, otherwise due to moisture stress several plants will wilt once irrigation is discontinued. Villagers have removed 70 t of grass after seeding in Oct-Nov. 1990. The area was ploughed in May - June 1990 to conserve moisture. Total no. of plants 3.75 lakhs.

- 6.3 Undoth 1990 (160 ha.) plantations :- This is also adjoining Godhra plantations of 1988 and 1989. In all, it forms a compact block of 540 ha. About 14 species were planted in June-July 1990 at 3.0x1.5 m spacing after ploughing by tractor. pH of soil is 8.4. Survival is 85% and average height is 1.25 m. Soil is soft and good. The main species planted are A. nilotica (37.5%), A.

is 6 :
tortalis (37%), Albizia lebbek (10%), Azadirachta indica (1.3%),
P. juliflora (5%), Jatropha curcas (2%). Other species introduced
 are Cordia, Ficus, Sitabul, Amla, Ber, Commiphora spp., etc.
 (photo 3.0) and are of research interest only. Watering and soil
 working have given good result in height growth and survival.

During 1991, 50 seedlings of Prosopis juliflora were planted in Nov.
 1991. Balance area will be planted in 1992. A handwell was dug
 and plants are watered every month. They

different species were
 watered for 10 days. Different forms
 of seedlings were available
 and planted in Nov.

1991. Balance area will be planted in 1992. A handwell was dug
 and plants are watered every month. They

different species were
 watered for 10 days. Different forms
 of seedlings were available
 and planted in Nov.
 1991. Balance area will be planted in 1992. A handwell was dug
 and plants are watered every month. They

- 6.5 Chandram 1988 (50 ha.), 1989 (80 ha.) and 1990 (15 ha.)
plantations :- This is situated in East Kachch division where
 rain fall is less and erratic. All these plantations are in a
 continuous block of flat to slightly undulating area where only pits
 at 2m x 2m were dug and planted mostly of Prosopis juliflora,
Acacia nilotica and A. tortalis. In 1990 plantation only P. juliflora
 was planted. Neem in 1989; Catechu and Albizia lebbek in 1990
 are struggling and has no future. The percentage of survival is
 about 65-75 without any appreciable growth. The PH of the soil
 is about 8.3. The rainfall was 500 mm in 1989, 495 mm in 1990
 and 110 mm in 1991. The rainy days were about 11 only. They
 tried to irrigate but not successful. Most of the plants are
 spreading along the ground (photo 5.0). White salt encrustations
 were found through out the area.

Some experiments like introduction trials, different soil working
 techniques etc. were tried but later abandoned. (photo 6 & 7).

: : 7 : :

The original growth of Prosopis juliflora and A. nilotica in bush form are seen in depressions, dry stream courses etc. Therefore, they should not have selected this area at all for compensatory afforestation. No trees would come up here at 2m x 2m. The expenditure per plant in 1990 plantation works out to Rs. 3.15 which is very high and waste, considering the growth and area.

- 6.6 Bhachau 1990 (22 ha.) plantations :- This is situated very near to Bhachau town towards Kandla Port adjacent to NH. 71660 plants were raised mostly at 3m x 1m spacing such as A. nilotica (51%), Azadirachta indica (31%), A. tortalis (14%). 2 ha. only of 2m x 2m. They had a good source of water from open well and borewell and hence flood irrigation is being adopted once in 20 days (photo 8.) Plants are almost 2.0 m in height with 90% survival. The Neem etc. already look congested (photo 9) and may stagnate unless thin them early. They had only 120 mm of rain fall in 1990 and 110 mm in 1991. Expenditure on each plant so far is about Rs.4.00. It is a flat area where irrigation is possible and available. Once it is discontinued, the plants may tend to wilt. Adjoining waste land is completely invaded by Prosopis juliflora and is impenetrable. 15 ha. are still available for 1992 planting. In poorer areas where salt encrustations are visible on the surface, neem has failed.

- 6.7 Lakadia 1991 (52 ha.) plantation: It is a big block of 109 ha. of which 52 ha. was taken up for 1991 plantation. The balance 57 ha. will be planted in 1992. The terrain is gently undulating. A small plot was ploughed and planted with neem (1%) at 2 x 2.5m after pitting and fencing. The rest was dug with pits and planted with A. tortalis (30%), Prosopis juliflora (12%) and Salvadora persica (11%). The other spp. tried are A. nilotica (9%) Commiphora mukul (8%), A. senegal (4%), P. spicihora (4%) and misc spp. (4%). The total seedlings used was 1.24 lakhs. The survival is about 75% and average height in neem plot which is irrigated by tankers (photo 10) is about 1.0 m. The other area with pits and not irrigated is not promising (photo 11). An open well is being dug and expected to yield water at 20 m.

:: 3 ::

in which case plantation could survive. In 1991 the area received only 31 mm of rain fall. Expenditure incurred on each plant so far is about Rs. 3.00. Even the naturally occurring old A. nilotica trees in bush form also are wilting. Therefore it is not a suitable area for rainfed plantations. Even if irrigation is discontinued the plants will stagnate and wilt.

- 6.8 Dhamdaka (270 ha.) area : Visited Dhamdaka 270 ha. plot near Bhachau which was handed over to forest department for compensatory afforestation. A small perennial stream runs through the area and hence Prosopis juliflora has completely occupied the area due to more moisture and alluvial type of soil. Few Phoenix sylvestris trees are also seen. There is pressure from villagers for release of this land. This area will be protected as no planting is required and will be shown against the target of 1992 (photo 12).

7.0 OBSERVATIONS AND SUGGESTIONS

- 7.1 Earlier plantation (1988) raised were mostly of Prosopis juliflora which were not given support irrigation as in Chandrani area with the result the plants have not risen above ground. They are surviving without any appreciable growth and these plantations have no future.
- 7.2 In many areas borewell was dug like in Godhra and Sambarai and water yield is good. Support irrigation is now possible. Their plan is to give support irrigation for 2 to 3 years only till they establish. - Thereafter there is a likely occurrence of moisture stress (when irrigation is discontinued) and plants will either wilt or just survive without any growth. Therefore, artificial irrigation may do good in the beginning only but when they are discontinued, the plants will either stagnate or wilt.
- 7.3 There is acute competition for moisture as these areas are arid zones receiving rainfall of about 150 to 200 mm per annum. The natural vegetation consists of grasses with few scattered trees. The project is planting about 2500 plants per ha. They do not survive in the initial stages but when they grow up and spread

:: 9 ::

deep subsoil water, keen competition will set in and many plants may die in the process. Therefore, 2500 plants/ha. in such areas should be avoided. As per available 'Ecological Index' calculations such areas cannot accommodate more than 100 to 150 trees per ha. Hence drastic reduction in plant population per ha. is essential based on further research data. Neem, Salvadora, Acacia nilotica etc. species of long rotation should not be planted at 2m x 2m spacing as they get congested in the second or third year itself when irrigated. Wider spacing should be given and may be 10m x 10m.

- 7.4 Short cuttings (15-20 cm) of Ficus spp. are tried along inspection paths only. Ficus spp. have good potential even in arid zones and few trees are seen along road sides and farm lands. Therefore, 2m tall rooted cuttings could be planted at 10m x 10m spacing inside the plantations. Agave veracruz, A. sisalana could form a very good hedge around the plantation boundary. This is a good species for cottage industry in rope making.

- 7.5 Mulching helps in moisture conservation. Therefore there is a need for cover crop in all plantations. Stylosanthes hamata seeds could be broadcasted as soon as the area is ploughed. This is a good fodder also. When wider spacing is given for tree species, the interspace could be used to raise fodder grass or legume. Cenchrus setigerus, C. ciliaris and other improved palatable grass could be introduced so that nearby villagers are benefited by higher yield of fodder.

- 7.6 With their experience of past four years, they should be able to identify and short list the suitable trees species for the area. The likely choice could be Azadirachta indica, Acacia nilotica, A. tortalis, A. senegal, Prosopis cineraria, and P. juliflora. P. Juliflora should be reduced as it is a very aggressive weed and occupy all waste and Agriculture lands when left fallow. It may even invade good pasture lands like Banne lands thus making them impenetrable and useless. As it is already now seen in farm lands and other Waste lands, deliberate introduction in

2

1

11

Monitoring of the action on stipulated conditions in case of proposal approved by the Government of India under Section 2 of the Forest (Conservation) Act, 1980.

Part-I (General Particulars)

1. Name/Purpose of the project : Sardar Sarovar Project.
2. No. & date of the Govt. of India's letter according permission. : S/372/83-FC dated 8.9.1987
3. Area permitted to be diverted. : 4165.91 ha. of forest area in Gujarat.
4. District & Forest division. : Bhachub and Rajpipla
5. Area actually diverted. (in ha) : Work is in progress Date 10 & 11 March 1992

Part-II

(Details of Compensatory Afforestation)

1. Location of the area:
Extent 4650 ha. District Kachch Division Kachch East & West Division
Khasara No./Survey No. Indicated in separate note.
2. Whether the afforestation is made on forest or non forest area. : Non Forest area
3. If on non forest land, the land has been declared as protected/ reserve forest. (Enclst. copy of the Notification) : Declared under section 4 of IF Act 1927
4. If no, the steps taken to declare it protected forest. : -
5. Whether the afforestation cost was paid by the user agency. : Yes
6. If yes, the amount paid (Rs) : Details not available
7. Whether the amount paid was deposited in separate fund and was utilized in addition to the funds for forestry operation. (Give details) : Yes
8. Details of plantation raised species planted Area in ha. : Indicated in separate note.
- (a) Expenditure
- (i) If compensatory plantation not made the reason for the lapse. : Compensatory afforestation is in progress
- (c) Condition of plantation Survival av. ht av. girth. (See note)
9. Remarks: It should be mentioned that the plantation are identified as specifically related to the project. Identified by the boards, maps etc.

12

Part-III

(Planting of

trees in case of transmission line)

Number of trees planted

species

Year of Plantation

Expenditure (Rs)

paid by

Condition of

Survival

Av. ht.

Av. girth

Part-IV

Area worked under silviculture/management

Completed

Expenditure

Area worked under the
trees worked/reclaimed.

(other than mentioned above.)

Action taken by
the State Govt.In addition to the Govt. of India's
conditions, the Govt. of India is to preserve forest, Wildlife and present
soil erosion etc.Condition/monitoringAction takenPart-VII

(Monitoring)

- Whether any committee has been formed for monitoring of the action on condition stipulated. Narmada Control Authority is monitoring.
- If No, Give reason if yes give details of the committee.
- Reports of the monitoring committee, Report being prepared every quarter if any.

Part-V

- Abstract reports of inspection of forest officers if any. : Report DCF (C) is available of 23.7.1999 in the file.
- Remarks of the C.C.F. in regard to progress of the action on stipulated conditions.
- Effect of the Project on forest and Wildlife. Plantation improve wild life habitat, as seen in N. Mahaboy Wildlife sanctuary of Kachch.

ANNEX - XV (4)

SUMMARY NOTES OF THE DISCUSSIONS OF THE FIRST MEETING ON
ARCHAEOLOGICAL AND ANTHROPOLOGICAL ASPECTS ON NARMADA BASIN
HELD ON 20TH MAY 1992 AT 3.00 P.M AT NCA OFFICE, INDORE

The first meeting to review the status of works on Archaeological and Anthropological aspects of Narmada Basin was held under the Chairmanship of Shri K.M. Joseph, Member (Civil), Narmada Control Authority on 20.5.92 at 3.00 PM in the Committee room of the NCA office at Indore. List of participants is enclosed as Annex-I.

Chairman welcomed the participants and discussions on the subject under reference was taken up there after.

Following points emerged during the discussions.

ARCHAEOLOGICAL ASPECT

Government of Gujarat

Shri Guru Raja Rao, Specialist (Environment), SSNNL, Gujarat informed that the survey to list out important monuments, is completed recently by State Department of Archaeology, Govt. of Gujarat, for the entire 19 villages coming under submergence in Gujarat. Shoolpaneshwar temple situated in the village Manibeli in Akalkuwa Taluk, Dist. Dhule is recommended for preservation by Department of Archaeology and Museum, Govt. of Maharashtra as well as by the Department of Archaeology, Govt. of Gujarat. Another temple known as Hamfeshwar temple situated in the village Hamfeshwar in Chotta Udaipur in Gujarat is recommended for preservation by Department of Archaeology, Govt. of Gujarat. He further informed that Shoolpaneshwar temple may be coming under submergence of 1 in 100 year flood during this monsoon itself and steps have already been taken in consultation with the trustees

of the temple to establish a new complex in Village Gora, 3 Km downstream of the Sardar Sarovar Project and an area of 27 acres is allotted for the complex so as to facilitate the annual fair which is being celebrated by the natives from a very long time. Steps to shift the Idol are stayed by the order of Hon'ble Dhule court issued in response to a writ petition filed by those opposed to the project. Hearing of this case is scheduled for 8th June and only after obtaining favorable orders from the court further work in this regard is possible. Regarding the Hamfeshwar temple he informed that the site has been selected at 1/2 Km away from the Hamfeshwar temple within the same village. The temple will be affected by the submergence only by the year 1994. A firm action plan has not been developed yet.

Government of Madhya Pradesh

Shri Suresh Chander, Conservator of Forests, NVDA, Bhopal informed that survey for all the villages of the Sardar Sarovar as well as Narmada Sagar Projects is now completed by State Department of Archaeology and Museum, Govt. of Madhya Pradesh. He further informed that a committee has been formed to identify the monuments of significance which are required to be listed as State protected monuments for the purpose of protection or preservation. This report is likely to be available by middle of June and the action plan to protect these monuments will be ready by the end of June, 1992. Regarding the excavation site on Chikalda, Dhar Dist., Bhrahmin Gaon in Kharegone Dist and Navadatoli near Punasa and also the Dharampuri rock sculptures, the exact status of works is required to be ascertained from the State Department of Aracheology and Museum, Govt. of Madhya

Pradesh and he promised to furnish the information shortly. As representative from State Department of Archeology and Museum was not present in the meeting the issue could not be discussed further.

Regarding the survey work being carried out separately by Archaeological Survey of India, Capt. N.K. Mukherjee of ASI, Pre Historic Branch, Bhopal Circle informed that ASI has also completed the survey of 167 villages entrusted to it earlier and the report for all the villages was sent to Shri N.C.Joshi, Director, Archeological Survey of India, New Delhi, and the report is under scrutiny there for the purpose of identifying the monuments required to be listed as centrally protected monuments. He further informed that the report is expected within a week. Regarding the 4 monuments identified earlier as centrally protected monuments viz. Chhatri of Shri Bajirao Peshwa, Chaubis Awtar temple, Joga fort, Hoshangabad, Sidheshwar temple in Nemawar falling within the submergence of Maheshwar, Omkareshwar and Indira Sagar Projects, lot of discussions and inspection has already taken place and Rs.15 lakhs given to ASI by NVDA is being utilised for shifting Chaubis Awtar temple, Mandhata (Omkareshwar Project). The work on documentation, drawing and photography is already over, however for the acquisition of the land required for shifting of this temple, ASI has entered into correspondence with the Collector who is yet to allot the land. Regarding the Chhatri of Shri Baji Rao Peshwa at Roverkhadi (Maheshwar Hydro Electric Project) he informed that initially Rs.5 lakhs were required to be paid by

NVDA to the ASI for the purpose of undertaking the salvage works inside the protected area and the work of constructing RCC retaining wall abutting the protected area outside was to be attended by NVDA as part of their project as per the joint inspection note. Capt. Mukherjee informed that according to the latest development NVDA has asked the ASI to plaster the outer walls with water proof cement and allow it to submerged during monsoon period. However this proposal is not acceptable to the ASI and a letter in this regard is already addressed to the NVDA. He proposed that a joint inspection may be carried out by ASI, NVDA, NCA and others to find a solution to the problem. Regarding the other two temples one at Nemawar and other at Hoshngabad, according to the communication received from the NVDA it is mentioned that these two are not affected by the Narmada Sagar Project, hence they do not require any protection. Capt. Mukherjee however informed that the North Bastion of Jogafort is affected by the scour action of the water and hence the strengthening is required and that ASI has already taken up the works. Rs. 6 lakhs was requested for the same which is yet to be released by NVDA. He further informed that similarly ASI had also requested for Rs.3 lakhs from NVDA for strengthening the structures of temple at Nemawar also and the money is yet to be released by NVDA.

ANTHROPOLOGICAL ASPECT

Shri B.R. Bhatnagar, Assistant Anthropologist, Anthropological Survey of India, Central Region, Govt. of India informed that the Narmada salvage plan launched recently by the ASI will cover Palaeo Anthropological, Human ecological, Anthropological,

Tribal art, tradition etc. In this respect he informed that the report of surface scanning of 17 villages coming under submergence carried out by the ASI as part of the above project is submitted to its headquarters and 424 specimens have been collected, a few ancient tools have also been found. He further informed that Anthropological Survey of India has recently completed a project called "Peoples of India" in which 33 tribes of entire India including Narmada are already covered and the report in 7 volumes is under editing and is likely to be released soon, whereas the balance 54 volumes will be released a little later. As this study covered all socio cultural aspect of the tribals residing in the Narmada basin further studies may not be necessary. However for Gujarat portion the studies are being conducted by Udaipur Branch of ASI and the information can be had from that office. In response to this, Specialist (Env.), SSNNL requested that in case something is required to be done in the portion of Gujarat, Govt. of Gujarat should be informed in time and should not be taken by surprise in this regard.

Referring to the works undertaken by Rashtriya Manav Sanghralaya, participants were informed that collection and documentation of cultural object from tribal artisans and populations of Narmada valley in Madhya Pradesh has been completed by Madhya Pradesh Adivasi Kala Parishad, Bhopal and the report is available. Shri Suresh Chander, Conservator of Forests, NVDA, Govt. of Madhya Pradesh informed that he do not have any information available with him about the other two projects on Taptononmy-paleco, ecology of Central Narmada valley entrusted to Prof. G.L. Badam of Pune and excavation of Upper

Paleolithic sites of Mehta Khetta and further excavation in Nimawar region entrusted to Dr. (Mrs) Sheela Mishra of Pune and assured for supplying the information after procuring the same from Rashtriya Manav Shanghralaya.

It was decided that the next meeting if necessary to review the archaeological and anthropological studies be fixed up after receiving the required information from the respective institutions.

**LIST OF PARTICIPANTS ATTENDED THE MEETING OF ARCHAEOLOGICAL
AND ANTHROPOLOGICAL ASPECT AT NCA OFFICE AT INDORE ON 20TH MAY
1992 AT 3.00 P.M.**

S.No.	Name & Designation	Organisation
-------	--------------------	--------------

S/Shri

Narmada Control Authority

- | | | |
|----|-----------------------------|--------------|
| 1. | K.M. Joseph, Member (Civil) | NCA, Indore. |
| 2. | S.M. Pai, Secretary | NCA, Indore. |
| 3. | Dr. Pawan Kumar, Spl.(Env.) | NCA, Indore. |
| 4. | B.M. Gujarathi, DD(E) | NCA, Indore. |

Sardar Sarovar Narmada Nigam Ltd, GOG

- | | | |
|----|----------------------------------|-----------------|
| 1. | Shri R. Guru Raja Rao, Spl (Env) | SSNNL, Gujarat. |
|----|----------------------------------|-----------------|

Narmada Valley Development Authority, GOMP

- | | | |
|----|--|--------------|
| 1. | Suresh Chandra, Conservator
of Forests. | NVDA, Bhopal |
| 2. | T.C. Lohani, DFO | NVDA, Dewas |

Anthropological Survey of India

- | | | |
|----|---|---------------------------------|
| 1. | B.R. Bhatnager, Asstt.
Anthropologist. | ASI, Central Region,
Nagpur. |
|----|---|---------------------------------|

State Deptt. of Archaeology, GOG

- | | | |
|----|---|--|
| 1. | H.S. Shah, Technical
Assistant, Archaeology Deptt. | |
|----|---|--|

Arachaeological Survey of India

- | | | |
|----|--|--|
| 1. | Capt. N.K. Mukerjee,
Chief Security Officer for
Antiquities. | Aracheological Survey of
India, Bhopal. |
|----|--|--|

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

**पर्यावरण उपदल
Environment Sub-Group**

**पन्द्रहवीं बैठक का कार्यवृत्त
Minutes of the Fifteenth Meeting**

19 अगस्त, 1992
पर्यावरण भवन, नई दिल्ली में हुई
Held at Paryavaran Bhawan, New Delhi
19 August, 1992

इन्दौर
सितम्बर, 1992

INDORE
September, 1992

**MINUTES OF THE 15TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 19TH AUGUST, 1992
AT PARYAVARAN BHAWAN, NEW DELHI**

I N D E X

Item No.	Contents	Page No.
	Introduction	1
XV-1(78)	Confirmation of the Minutes of the 14th meeting.	2
XV-2(79)	Review of action taken on the decisions of previous meeting.	3 - 9
XV-3(80)	Present Status of studies/Surveys and Environmental Action Plans.	10 - 18
XV-4(81)	Any Other item Date and Venue of next meeting	19

A N N E X U R E S

XV.Min.I	List of participants of XVth meeting.	1 - 2
XV.Min.II	A copy of the decision of Govt. of India for extent of catchment area to be treated at project cost.	3 - 4
XV.Min.III	Proposal on effect of insecticide, pesticide on run off from the fields.	5 - 19
XV.Min.IV	Half Yearly report of Wildlife Institute, Dehradun for the period ending June, 1992	20 - 43
XV.Min.V	Quarterly Report of State Research Institute, Jabalpur for the period ending June, 1992.	44 - 60

MINUTES OF THE 15TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 19TH AUGUST, 1992 AT 2.30 PM
IN PARYAVARAN BHAWAN, NEW DELHI

Shri R. Rajamani, Secretary, Ministry of Environment & Forests and Chairman of the Environment Sub-group of NCA welcomed the Members and invitees to the 15th meeting of the Environment Sub-Group. The list of participants is enclosed at Annex.XV. Min.I.

Discussion on the agenda items was taken up thereafter.

**Item No. XV-1(78) : CONFIRMATION OF THE MINUTES OF THE
14TH MEETING.**

Minutes of 14th meeting of the Environment Sub-
Group of Narmada Control Authority circulated to all
members and invitees seperately vide letter No. ENV-
34(14)/91/958 dated 5.5.92 were confirmed.

**Item No.XV-2(79): REVIEW OF ACTION TAKEN ON THE DECISIONS
OF PREVIOUS MEETING**

1. Consideration of Policy Issues (Item No.XIV-2(76))

a) Extent of Catchment Area Treatment:

Dr. Sekhar Singh opened the discussions and referring to the decision of Govt. of India on extent of catchment area to be treated at project cost, expressed the opinion that perhaps Govt. of India has decided to consider the extent of catchment area to be treated on case by case basis. He desired to know the exact decision of Govt. of India in this regard. Chairman pointed out that it has been agreed during the meeting convened for the purpose that all critically degraded high and very high priority sub-watersheds directly draining into the reservoir will be treated at the project cost and further stated that while it has definitely set at rest the question of what is to be treated at project cost it was clear that other sub-watersheds of the catchment even if not directly draining were to be treated and this was a matter to be decided on a case to case basis as to how it will be funded and in what time phasing it will be done. He added that submission of plans for critically degraded sub-watersheds in the entire free draining catchments are also required to be submitted by the State Governments as already agreed upon and indicated in environmental clearance. A copy of the decision of the Govt. of India is enclosed as Annex-XV- Min-II.

Shri Lawlaker, Member (E &F), NVDA referring to the submission of plans for the balance critically degraded sub-watersheds informed that in case of Narmada Sagar Project All India Land Use Survey Organisation has provided prioritisation reports only for 5 sub-catchments out of 9 and is being persuaded to submit the report of balance sub catchments early. He agreed to provide the detailed plan by December if the reports from AIS&LUSO are made available at least by October. With regards to Sardar Sarovar project areas he pointed out that there are significant discrepancies in the catchment area figure supplied by AIS&LUSO for Maheshwar and Omkareshwar projects and that AIS&LUSO is being persuaded to reconcile the figures. Therefore the plans for the balance critically degraded sub-watersheds can be prepared only on receipt of details from AIS&LUSO. Chairman desired that Member (E&R) of NCA to look into these details and report during the next sub-group meeting.

Shri M.B. Mehta, Chief Conservator of Forests, SSNNL, Govt. of Gujarat (GOG) indicated that GOG has already submitted all details to Min. of Env. & Forests for the entire catchment in Gujarat.

Shri T. Balaraman, Principal Secretary (Forests), Govt. of Maharashtra agreed to prepare a contingency plan as desired by the Chairman.

b) Extension of Time for Environmental and Forestry Approval:

In pursuance of the decision taken by NCA in its meeting held on 25.7.92 a letter was forwarded by NCA to the MOE&F. Chairman informed the sub-group that a copy of the letter has just been received by him wherein it is indicated that schedule for construction originally was 1994-95 which has now slipped to 1998, therefore the studies which were to be completed earlier are now planned to be completed by March, 1994 only. Chairman further pointed out that the request is under consideration of MOE&F for taking a view on the same.

Dr. Sekhar Singh desired to know whether MOE&F would like to redefine the pari passu clause to avoid confusion with the expression of co-terminus. Chairman pointed out that the pari passu clause is not only for completion of studies but also for the implementation of the resultant recommendations and further stated that the pari passu clause should be read in terms of completion of works in the areas where impoundment is to commence. In response to a question on implementation of the recommendations of M.S. University with regards to conservation of plant and animal life Shri M.B. Mehta, Chief Conservator of Forests, SSP, Gujarat pointed out that the draft final report submitted by M.S. University, Vadodara has clearly indicated that no rare or endangered species is to become extinct from the country due to submergence to be caused by SSP.

Chairman desired to know the findings in this regard in the areas in Maharashtra. It was observed that the studies in Maharashtra have just commenced and are likely to take 2 years. The chairman therefore desired that the studies in Maharashtra where permanent impoundment is likely to commence from 1994 should be completed before 1993 and further desired that NCA as well as Govt. of Maharashtra should get in touch with the project Director, School of Environmental Science, Pune University, Pune to emphasize the need for quick completion of the studies. It was agreed that NCA officers alongwith Govt. of Maharashtra officials will pursue concerned consultants to scrutinise all

available reports and data currently available with other organisations and to submit interim report urgently to have a crash programme of further studies. In regard to catchment treatment in Maharashtra where there was no progress at all Chairman pointed out that there was an immediate likely infringement of pari passu clause if catchment treatment is not completed in 1992-93 as impoundment in this area will take place as per current schedule. The NCA and Govt. of Maharashtra were asked to take urgent note of this.

2. Time frame for preparation of Action Plan and implementation of Environmental Safeguard Measures (Item No. XIV-2(77))

Executive Member, NCA requested the members of the State Governments to kindly check up the figures given in agenda papers on estimates and expenditure and to point out discrepancies if any. He also requested for supply of the information to fill in the gaps. Chairman reiterated that he has been seeking this information for quite some time and the same is not yet fully available. He directed the state governments to submit the detailed estimates and expenditure as called for, without delay.

Details of the Estimate and Expenditure on Environmental works as available in the meeting are furnished below :-

CATCHMENT AREA TREATMENT

Studies

- i) Prioritization of catchment by AIS&LUSO, New Delhi**
- ii) Prioritization & thematic mapping by ISRO for area in Gujarat.*

Implementation (Phy. ha, Fin. Rs. Crores)

Treatment	Targets		Achievements		Date
	Phy.	Fin.	Phy.	Fin.	
<u>A. Govt. of Gujarat</u>					
a) Non-forest Area	3025	2.41	1171	1.1	June '92
b) Forest Area	27204	32.68	9309	6.08	June '92

Treatment	Targets		Achievements		Date
	Phy.	Fin.	Phy.	Fin.	
B. <u>Govt. of Madhya Pradesh</u>					
a) Non-Forest Area	72000	25.20	7650*	2.09*	June '92
b) Forest Area	18000	18.73	-	-	
C. <u>Govt. of Maharashtra</u>					
a) Non-Forest Area	21200	29.41	-	-	
b) Forest Area	4200	2.2	-	-	
Say	145630	107.38	16470	8.43	

II. COMPENSATORY AFFORESTATION (Physical target in ha & Fin. in Rs. Crores)

	<u>Targets</u>		<u>Achievements</u>		<u>Date</u>
	Phy.	Fin.	Phy.	Fin.	
<hr/>					
<u>A. Govt. of Gujarat</u>					
a) Non Forest	4650	8.15	2500	2.98	June, 92
b) Degraded Forest	9300	9.42	2834	2.45	June, 92
 <u>B. Govt. of Madhya Pradesh</u>					
a) Non Forest	2190!		1089!		
b) Degraded Forest	6547!	18.00	1332!	3.76	June, 92
 <u>C. Govt. of Maharashtra.</u>					
a) Non Forest	9000!	37.00	-	-	June, 92
b) Degraded Forests	13000!		8383	9.42	
<hr/>					
	44687	72.57	16138	16.43	

* Incomplete works

** Works were carried out under the budget of AIS&LUSO.

III. Flora fauna (including wildlife & fisheries) & Carrying Capacity (FFC) of the areas adjoining submergence.

(In Rs. crores)

Estimated Cost Cost incurred

A. Govt. of Gujarat.

a) Studies in 1982 by M.S. University.	-	-
i) Sanctuary improvement works	0.75	0.59
ii) Downstream fisheries by CICFRI**	-	-
b) Studies on FFC by M.S. University in 1992	0.34	0.20
c) Studies on wildlife management 1992	0.16	0.05
d) People's participation in sanctuary management by VIKSAT***	-	-
e) Fisheries plan for Estuary & Command *	4.00	-

B) Govt. of Madhya Pradesh

a) Studies by State Forest Research Institute on flora, fauna (wildlife)	0.203	0.103
b) Liminological studies by three universities (Aquatic fauna & Water quality)	0.19	0.14
c) Fisheries plan (SSP)*	0.82	-

C) Govt. of Maharashtra.

a) Flora, Fauna, Carrying Capacity by School of Environmental Science, Pune University, Pune.	0.38	0.16
b) Fisheries plan (Tank * pond & reservoir fisheries)	1.66	-

* From State Budget

** Project under Ministry of Agriculture

*** Studies by World Bank's assistance.

	<u>Estimated Cost</u>	<u>Cost incurred</u>
D) <u>Narmada Control Authority</u>		
a) Sociological Survey of fishing families.	0.14	0.14
IV. <u>COMMAND AREA DEVELOPMENT.</u>		
<u>Govt. of Gujarat.</u>		
a) Studies	1.58	-
b) Implementation	685.00	-
<u>Govt. of Rajasthan</u>		
a) Studies	-	-
b) Implementation	-	-
V. <u>HEALTH ASPECT.</u>		
a) <u>Govt. of Gujarat.</u>		
i) Hospital	0.47	0.5
ii) Laboratories	2.36	
iii) Infrastructure	1.77	
iv) Anti Malaria	3.44	
v) Insecticidal spray	30.06	

	38.00	
b) <u>Govt. of Madhya Pradesh.</u>		
a) Surviellance of malaria	0.11	0.018
b) Implementation for NSP, Omkareshwar, Maheshwar & SSP projects.	7.49	

	7.60	

c) <u>Govt. of Maharashtra.</u>		
<u>R&R site.</u>		
a) Establishment of PHC & 3 sub-centres at R&R site.	0.2315	
<u>10 km belt around SSP.</u>		
a) 12 new sub-centres	0.3124	
b) Mobile health unit	0.0323	
c) Education health material	0.0200	

	0.5962	

Say Rs. 0.60 Crores		

	<u>Estimated Cost</u>	<u>Cost incurred</u>
--	-----------------------	----------------------

VI. RIM STABILITY & SEISMICITY. (to be reported by All the States)

- a) Cost of studies
- b) Implementation

VII. ARCHAEOLOGICAL/ANTHROPOLOGICAL.

a). Govt. of Gujarat.

- i) Cost of survey
- ii) Cost of Implementation

b). Govt. of Madhya Pradesh.

- i) Cost of Survey
- ii) Cost of Implementation

c). Govt. of Maharashtra.

- | | | |
|----------------------------|---|---|
| i) Cost of Survey | - | - |
| ii) Cost of Implementation | - | - |

e) Rashtriya Manav Sanghralya*

- | | | |
|----------------------------|-------|-------|
| i) Paleontological studies | 0.019 | 0.01 |
| ii) Ethnelogical studies | 0.007 | 0.007 |
| iii) Tribal Art & culture | 0.026 | 0.026 |

f) Anthropological Survey of India*

- | | | |
|--------------------------|---|---|
| i) People of India | - | - |
| ii) Narmada salvage plan | - | - |

N.B : The missing information may please be furnished by all concerned immediately.

Item No.XV-3(81): PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS

i) Phased Catchment Treatment

Government of Madhya Pradesh

Narmada Sagar Project

In response to a query from Chairman, Mr.Chengappa, Chief Conservator of Forests, Regional Office, MOE&F stated that he had visited some of the areas where works are being carried out and reported that in addition to the vegetative measures, engineering works like intersection drain, gabion structures, gully plugs/checks etc are being taken up by the NVDA. The 'khus' grasses planted last year in an extensive area of 8700 ha were largely a failure. Representative of Govt. of Madhya Pradesh however explained that last year the 'khus' plantations were taken up very late and thereafter monsoon also failed and hence these became a heavy casualty. During this year, precautions are being taken up to stop recurrence of such lapses and plantations are taken up early, and also, replanting has been done where ever failure occurred last year.

It was pointed out that backlog of 4925 ha of 1991-92 are added up to the schedule of works for 1992-93. In all, 13925 ha of non forest areas, in addition to 2175 ha of the forest areas, are proposed to be treated. The progress reported till end of June, 1992 is 2425 ha of non forest areas. Govt. of Madhya Pradesh submitted the information on revised format and reported that the schemes covering 17516 ha of non forest areas were submitted to DLIC out of which DLIC has so far approved the scheme for 11900 ha area only. It was further reported that 6600 ha of forest compartments (degraded forests) identified for compensatory afforestation earlier are also identified by AIS&LUSO falling under high and very high degraded categories of watersheds directly draining into the reservoir. According to the directives of the environment sub-group these forest compartments are to be covered up under catchment area treatment. Of 6600 ha, 2695 ha area is already afforested and will be added up to the figure of catchment area treatment works and the areas equal to 6600 ha will be identified for compensatory afforestation separately. Programme and targets are therefore under revision.

Sardar Sarovar Project

According to the action plan submitted, Govt. of Madhya Pradesh was to treat 6000 ha during 1991-92 and 15000 ha during 1992-93. Because of shortfalls during 1991-92 the entire area of 6000 ha is added up to the targets of this year i.e. 92-93 as directed by the sub-group. GOMP indicated that the backlog of 6000 ha would spread upto 1994-95. GOMP has as such indicated a target of 17100 ha of non forest areas for 1992-93 taking 2100 ha out of backlog 6000 ha. NVDA representative further informed that the proposals for 11273 ha area were submitted to DLIC out of which 8900 ha are already approved for carrying out the work. 2 Divisions of Soil Conservation including 10 sub-divisions for treating non forest lands have been established. 2 Forest Divisions are now in position to take up the catchment area treatment works in forest areas.

Govt. of Madhya Pradesh representative indicated that in July 500 to 600 ha only could be treated in the non-forest areas and there after there is no progress. There are problems on arriving at agreements with cultivators whose lands are required to be treated. In response to a query from the Chairman with regards to the difficulty if any faced by the GOMP in treating the forest areas, no satisfactory answer could be given by GOMP. In view of the fact that GOMP could not do any work during last year also, Chairman directed that the NCA was to quickly look into those shortfalls to avoid any complications further. In response to another question on efficacy of khus plantation alone as a measure of catchment area treatment, it was explained that the khus plantation is recommended extensively as one of the measures of catchment area treatment because of its soil moisture conservation capacities.

Govt. of Maharashtra

Shri T. Balaraman, Principal Secretary (Forests), GOM pointed out that in all the 13 sub watersheds identified for treatment, there are problems and officers are still finding it difficult to work in the area. Problems are particularly serious around Manibeli village where 35 huts are yet to be shifted. Chairman directed that GOM should submit a revised contingency plan to treat all the areas within 3 years covering areas near impounded area of reservoir within 1992-93 season as already indicated. Failing this the pari passu clause will come into play for the whole project. Secretary (Forests) assured the Chairman that after the rains are over it would be possible for the officials of GOM to start treatment works in some of the areas. Chairman however desired that Dr. K.A.

Kushalapa, Chief Conservator of Forests, MOE&F, Bhopal may visit the areas to verify the commencement of works there, after the rains.

Prof. R.K. Katti and Dr. Sekhar Singh pointed out that works on catchment area treatment should be completed before the submergence commences in 93-94 as otherwise it would have ill effects on dead storage of the reservoir. However Shri K.M. Joseph, Member (Civil), NCA explained that unless the sluices provided at the bed level of the dam are plugged no serious ill effect will occur. Chairman desired that a small monitoring stations to measure the flow of silt from the catchment of the reservoir before and after treatment works may be considered for taking up.

Govt. of Gujarat

Shri M.B. Mehta explained that in Gujarat the bamboo plantation is taken up on extensive scale because of its capacity to hold the soil together. Progress on the reconciliation of the extent of area proposed for catchment area treatment is yet to be reported by the Govt. of Gujarat.

ii) Compensatory Afforestation

Govt. of Madhya Pradesh

Narmada Sagar Project

GOMP reported a progress on 12921 ha area against the target of 14062 ha during 1992-93. According to the readjusted figures the cumulative progress till date is 38913 ha say 38900 ha (rounded) area against cumulative target of 39738 ha and the works on 1141 ha area are under progress.

Sardar Sarovar Project

GOMP has reported a progress on 2400 ha area against the target of 2387 ha during 1992-93.

Govt. of Gujarat

Govt. of Gujarat reported that the works are going on as scheduled and only one season is left for completion of all works on compensatory afforestation. Mr. M.B. Mehta, CCF, SSP, Gujarat stated that he has reservations on the recommendations made in the special monitoring report of the compensatory afforestation prepared by Shri K.A. Kushalapa, CCF(C) Bhopal for Kutch and stated that for the conditions prevailing there, the technique adopted and success are unique. He further stated that Govt. of Gujarat is in rapport with

Central Arid Zone Research Institute. He also made presentations aided by projection of slides on the works done by GOG on compensatory afforestation in Kutch district.

Chairman stated that he was partially satisfied with the above afforestation work and desired that Govt. of Gujarat should explore the possibilities of finding non forest areas for plantation in the command area to develop forests of the same type which are going under submergence. Shri Sekhar Singh also pointed out that this issue was raised earlier also. Shri Mehta pointed out that large chunk of government non forest areas in contiguous patches are not available and that was why a scheme was proposed for taking up afforestation in Kutch and that this afforestation is in addition to double the area of degraded forests being reforested in the impact districts within the same ecological zone to the type of forest going under submergence. He also pointed out, Govt. of Gujarat has a scheme of extensive plantation along the main canal and distributories and also in the command area. He further stated that in Kutch, some of the plantations are also given support watering facilities and the plantations raised have registered good growth.

Chairman thanked CCF (Central Regional Office) Bhopal for taking up the pains and monitoring compensatory afforestation works and desired that the technical points raised by him may be discussed further with the experts.

Govt. of Maharashtra

Shri T. Balaraman, Principal Secretary (Forests), GOM informed that against 2700 ha of the forest land released in Taloda for R&R works 2192 ha will be afforested during the current year and the balance will be taken up during the next year and further informed that 4500 ha of non forest land is available in the district of Aurangabad adjacent to the district Dhule. The Environment Sub-Group felt that since the forest in Aurangabad may fall under ecological zone similar to one going under submergence, therefore the non forest areas identified in Dist. Aurangabad may also be accepted by MOE&F.

iii) COMMAND AREA DEVELOPMENT

Govt. of Madhya Pradesh

Narmada Sagar Project

Certain field observations, for the proposed data collection for making them available to the consultants, were made till June, 1992 and results are under compilation. The report is likely to be available by the end of August, 1992.

GOMP submitted a project proposal received from J.L. University on "effect of insecticide/pesticide on run off from the fields " forming annex-XV-III-Min. These are still under scrutiny of NVDA. Regarding drawing up of terms of reference of carrying capacity studies, GOMP indicated that efforts are being made to collect the information on relevant aspect of the studies.

Sardar Sarovar Project

Govt. of Gujarat

Govt. of Gujarat reported that terms of reference have been finalised for undertaking Impact Assessment studies for the areas in Kutch and all the agencies suggested by the sub-group are included as experts. Chairman desired that a copy of the TOR should be submitted urgently to the MOE&F.

Shri D.T.Buch informed that the studies on engineering aspects of the command area are nearing completion and their draft report are already received. Chairman desired that a copy of these reports should be made available to the MOE&F. Dr.Sekhar Singh desired to know as to what GOG proposed to do for integrated development of the command area. Chairman desired that GOG should submit a report on the aspects like Urban Area Development, Infrastructural Development, Social impacts, Development of growth Centres, Development of Roads etc alongwith a copy of the latest command area development plan to the MOE&F and NCA and desired that the Bar chart should also include the implementation aspects. He also desired that the NCA Secretariat may seek information for incorporating other details of command area development also in the bar charts. Govt. of Gujarat agreed to furnish all the relevant details of the command area development works under progress or contemplated by the Govt. of Gujarat.

Govt. of Rajasthan

Shri S.P. Mathur, Additional Secretary (Environment), Govt. of Rajasthan informed that the studies as desired by the sub-group have already commenced and are likely to be completed by December, 1992. As no further details could be supplied, Chairman desired that Secretary (Irrigation), Govt. of Rajasthan or Secretary (Command Area), Govt. of Rajasthan may be asked by NCA to furnish all details on the plans of Govt. of Rajasthan for development of command area on the line that are being taken up by Govt. of Gujarat.

iv) SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES**Govt. of Madhya Pradesh****Narmada Sagar Project**

Govt. of Madhya Pradesh submitted a half yearly report received from Wildlife Institute, Dehradun for the period ending June, 1992 and is placed as annex-XV-Min.IV and further informed that the report submitted by Friends of Nature Society, Bhopal was to be examined in the meeting to be convened for the purpose by NVDA on 26.8.92 and the action plans for implementation of the recommendations would be made available by March, 1993. Chairman desired that a copy of the report of Friends of Nature Society should be submitted to MOE&F for its views.

Sardar Sarovar Project

Govt. of Madhya Pradesh submitted a quarterly report received from State Research Institute, Jabalpur for the quarter ending June, 1992 and placed at Annex-XV.Min-V.

Govt. of Gujarat

Govt. of Gujarat indicated that a draft final report of these aspects submitted by M.S. University is scheduled for discussions on 25.8.92. Chairman desired that a copy of this report might be submitted to the MOE&F. Shri D.T. Buch, however, stated that the invitation had already been extended to MOE&F for the seminar proposed to discuss the report under reference. Advice of MOE&F, if any, may be discussed with the experts during the seminar for incorporation in the final report.

v) **ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY****ANTHROPOLOGICAL**

Dr. K.S. Singh, Director, Anthropological Survey of India stated that in 1982 a skull which was probably 0.4 million years old was found which was stated to be the second oldest after Shivalik man and further stated that although anthropological survey of India had extensively covered all the tribes including those of Narmada basin but intensive studies of some of the aspects were yet to be carried out. In reply to observations of Shri S.B. Lowalekar, Member (Env.), NVDA that Anthropological Survey of India, 2 years back indicated very clearly that no further studies in view of the studies, which were already going on, were required for the Narmada Basin, Dr.K.S. Singh stated that Anthropological Survey of India now felt that some studies for the village as a unit might be required for which the Anthropological Survey of India would like to carry out intensive works in 4 to 5 villages within a short period of 1 to 2 months time with the help of NVDA and other project agencies, Chairman desired that NCA might like to coordinate the work.

Govt. of Madhya Pradesh, Gujarat & Maharashtra

In response to a question on studies on ethnobotanical aspect from Chairman, It was informed that the agencies engaged for conducting flora and fauna would include ethnobotanical aspect in their studies.

ARCHAEOLOGY**Govt. of Maharashtra**

Member (Env.), NVDA further informed that the action plan on Archaeological aspects was scheduled to be submitted by State Department of Archaeology and Museum by the end of September, 1992.

Chairman desired that excavation works if required should be attended quickly before the submergence.

Govt. of Gujarat

Shri M.B. Mehta informed that a temple downstream of Sardar Sarovar Project was already under construction to house the deity of Shoolpaneshwar Mahadev.

vi) SEISMICITY AND RIM STABILITY OF RESERVOIR

Narmada Sagar Project**Govt. of Madhya Pradesh**

GOMP reported that for rim stability studies, the response of Director, GSI for undertaking field work was awaited.

Sardar Sarovar Project

GOMP informed that a meeting was arranged at Pune in the first week of June, 1992 in which the Director, CW&PRS, was informed about further studies by the project authorities. There appears some loss of water in the reach between Mandleshwar and Rajghat. There may be numerous reasons. Tracer study was once considered necessary. From other reasons on record, it appears this study may not be necessary now. But a final decision is required to be taken in consultation with G.S.I and CW & PRS.

vii) HEALTH ASPECTS

Govt. of Gujarat

GOG informed that one malaria control wing was stationed at Kevadia and more preventive measures would be included in the plan to keep the malaria under control.

Govt. of Maharashtra

Dr. S.B. Katoley, Scientist, GOM explained that the health plan included anti malaria activities, house to house, treatment, strengthening of the institutions for spray etc. He indicated that the plan included the incremental expenditure and that the baseline data as desired by the Chairman, Environment Sub-group were incorporated. However, Chairman expressed unhappiness over non finalisation of health plan by the State Government till date.

Govt. of Madhya Pradesh

The progress on construction of hospital at Nisarpur and steps taken for monitoring the water quality are yet to be reported by GOMP.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

Executive Member, NCA informed that a desk review study on status of fisheries was already assigned to CICFRI and the work would be started by them soon. Chairman desired that the Director, CICFRI might be requested to present the works being done by its regional institute at Vadodara during the next meeting of the sub-group. Sub-group was informed by Shri N.V.V. Char, Secretary, SSCAC that a study had been commissioned on fisheries by Govt. of Gujarat. Chairman desired that the terms of references for the same should be sent to NCA and MOE&F urgently.

Item No.XV-4(82) : ANY OTHER ITEM

DATE AND VENUE OF NEXT MEETING : 13TH NOVEMBER, 1992
AT 11.00 AM AT
INDORE (M.P)

ANNEXURES

ANNEX. XV. MIN. 1

**LIST OF PARTICIPANTS ATTENDED THE 15TH MEETING OF
ENVIRONMENT SUB-GROUP HELD ON 19.8.1992
IN PARYAVARAN BHAWAN, NEW DELHI.**

1. Shri R. Rajamani, Secretary, Ministry of Environment & Forests, New Delhi. - Chairman
2. Shri D.C. Debnath, Executive Member, NCA, Indore.
3. Shri K.M. Joseph, Member (Civil), NCA, Indore.
4. Shri N.V.V. Char, Secretary, SSCAC, Vadodara.
5. Shri N. Suryanarayanan, Commissioner (PP), Ministry of Water Resources, New Delhi.
6. Shri T. Balaraman, Principal Secretary (Forests), Govt. of Maharashtra.
7. Shri S.P. Mathur, Additional Secretary (Env.), Govt. of Rajasthan, Jaipur.
8. Dr. K.A. Kushalapa, Chief Conservator of Forests, Min. of Env. & Forests, Bhopal.
9. Shri S.B. Lowalekar, Member (Env. & Forests), NVDA, Bhopal.
10. Prof. R.K. Katti, Director & Consultant, UNEECS, Bombay
11. Prof. S. Ramasesharn, Professor, DCE, IIT, Kanpur.
12. Dr. Sekhar Singh, IIPA, New Delhi.
13. Shri D.T. Buch, Consultant, Narmada Planning Group, SSNNL, Gujarat.
14. Shri K.S. Singh, Director, Anthropological Survey of India, New Delhi.
15. Dr. C. Margabandhu, Director (Expl), Archaeological Survey of India, Janpath, New Delhi.
16. Dr.A.C.Grover, Director (Conservation), Archaeological Survey of India, New Delhi.
17. Shri M.B. Mehta, CCF WL, Baroda, Gujarat.
18. Shri R. Vidyasagar Rao, Director (EM), CWC, New Delhi.
19. Shri M.M. Husain, Director of Agriculture, NVDA, Bhopal

20. Shri B.K. Chengappa, Conservator of Forest (Central),
MOE&F Regional Office, Bhopal.
21. Dr. Pawan Kumar, Specialist (Env.), NCA, Indore.
22. Dr. S.B. Katolay, Env. Dept. Govt. of Maharashtra.
23. Shri Bhag Singh, Dy.Secretary, MOE&F, New Delhi.

ANNEX. XV. MIN. II

No.15/94/90-PP
Ministry of Water Resources
Govt. of India

Shram Shakti Bhawan,
Rafi Marg, New Delhi,
the 8th July, 1992.

To,

The Chief Secretary
Government of Rajasthan/MP/Maharashtra/Gujarat,
Jaipur, Bhopal, Bombay, Gandhinagar.

Sub: Catchment Area Treatment of Reservoirs.

Sir,

Committee of Secretaries in their meeting held on 3.7.92 at 4.45 P.M. in the Committee Room of Cabinet Secretariat have discussed catchment area treatment of reservoirs and decided as under:

- a) In view of the differences in the geographical situations around the different reservoirs, it would be difficult to provide for any standardised package for treatment of the watershed around the reservoir rim for improving their carrying capacity. The proposals will have to be looked into on a case to case basis and settled in consultation with the Ministry of Environment & Forests at the time of clearance of the project. But, the objective would be to keep this treatment to a reasonable extent and not to unduly burden the project with general land improvement activities as such.
- b) The Planning Commission in consultation with the Ministry of Agriculture and the Ministry of Environment & Forests should separately review the provisions required for improving the degraded lands in the different basins. These provisions and the programmes thereof need not be tagged with any specific project in reservoir basin as such.
- c) The works necessitated on account of the immediate and direct adverse impact of the project during the construction phase alongwith the work on the direct draining sub watershed for improving the carrying capacity of the degraded/highly degraded lands along the reservoir should be carried out pari passu with the construction programme of the project and provided for in the cost estimates of the project.

You may accordingly take further necessary action in the light of the above decision in respect of Environmental Action Plan with regard to catchment area treatment of Sardar Sarovar and other projects in your State.

Yours faithfully,

Sd/
(B.S. AHUJA)
Joint Commissioner (PP)

Copy to:

1. Member (WP)
CWC.
2. Vice Chairman/Secretary
SSCAC.
3. Vice Chairman
SSNNL.
4. Executive Member.
NCA.
- 5.
- 6.

ANNEX.XV.MIN.III

**MODIFIED RESEARCH PROJECT PROPOSAL
ON**

**"Impact of Agrochemicals Runoff from Fields on
Surface & Ground Water Quality in Command Areas".**

**FOR CONSIDERATION OF NVDA
NARMADA BHAVAN : BHOPAL (M.P.)**

**Principal Investigator : Dr. D.L.Kauraw
Senior Scientist
(Soil Science)**

**JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA
COLLEGE OF AGRICULTURE
KHANDWA (M.P.)**

RESEARCH PROJECT FOR CONSIDERATION OF NARMADA CONTROL AUTHORITY

1. Title of the project :

"Impact of Agrochemicals run-off from fields on Surface & Ground Water quality in command areas".

2. Location:

- | | |
|--|--|
| a) Name and address of Instt./University. | Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur. |
| b) Name and address of Head of the Deptt./ | Dr. M.M.Rai,
Department of Soil Science & Agricultural Chemistry. |
| c) Actual location where the research work will be carried out : | College of Agriculture, Khandwa Campus, Khandwa (M.P.) -450 001. |
| d) Head of the Campus | Dr. C.B.Singh, DEAN College. |
| e) Associate Director Research | Dr. P.L.Bhalla. |

3. Duration : : Three years or more.

4. About Principal Investigator:

- | | |
|---|---|
| a) Name & Designation: | Dr. D.L.Kaurew,
Senior Scientist (Soil Science). |
| b) Brief biodata indicating his specialised interest particularly in relation to the proposed research work : | <p>1) Academic qualification :
M.Sc.(Ag) Soil Sci.& Agri Chem.
Ph.D.-Soil Science (Soil Physics)</p> <p>2) Experience - 23 years.
experience in research & teaching in the related fields. Conducted the research work on soil and water management, water and nutrients movements within the soil profiles of the cropped fields. About 12 years work in the AICRP on 'Improvement of Soil Physical Conditions for better crop production'.</p> <p>Guided postgraduate Research and Ph.D. Research work for about 15 years.</p> <p>Working as Scientist Incharge/
Nodal Scientist, NARP-Subproject Khandwa, since July 1988.</p> |

5. Objectives :

- a) To determine the nature and levels of the residues of toxic agricultural chemicals run-off from fields in the ground water and surface water in command areas of the "Narmada valley".
- b) To study the ecological effects of the residues in irrigation water, and their physiological effects on aquatic and terrestrial vegetation, crops, animal lives and thus the agro-ecosystem as a whole.
- c) To determine the rate of dissipation of the agrochemicals and significant degradation products under fallow and cropped field conditions.
- d) To find out the suitable measures for reducing the ill effects of the residues of toxic agricultural chemicals, if any.
- e) To evaluate/determine suitable mathematical functional relationships amongst the various dominating parameters so as to predict the future possibilities of toxic residues under the diversified farming and ecological situations and,
- f) To evaluate the suitable preventive and remedial measures, so that it may not become a serious problem in future.

6. Practical and Scientific Utility :

In modern agriculture, a number of pesticides viz., insecticides, fungicides, rodenticides, herbicides etc. are being used to control insect-pests, diseases, rats and weeds for successful crop production. The high yielding crop varieties also need higher amount of NPK fertilizers and trace elements too, for their optimum production. These fertilizers and pesticides when used in the fields, are subjected to leaching losses and there by mix with ground water current, which reach to the wells and thus the drinking water is polluted. These chemicals also transferred from field to the water bodies by surface run-off. Hence, in the form of solution these chemicals reach to the near by Nallas, Rivers, Tanks and Dams, and pollute their water intended for crop, animals and human consumption.

The quantity of the chemicals leached through the soil profile to the ground water or get discharged along with run-off water depends on the method of application, soil type, soil organic matter (humus), water retentive capacity of the soil, on farm management, soil slope, methods of irrigation, rainfall (distribution and magnitudes), catchment design, cropping systems and floristic composition of the command area.

Hence, the knowledge on the effects of these parameters on residue built up of toxic chemicals in the under ground and surface water of the command area is essential to prevent and/or reduce the pollution hazards in future.

The investigations on impact of agrochemicals on run-off water will provide data on the nature and level of the residues in ground water, residue in still water and its disposal in flowing water, the residue absorbed on bottom sediments and its rate of dissipation, the nature and amount of residues in fishes, the

amount in water used for irrigation, the amount of residue transferred to representative irrigated crops and the possible transfer of residues from water or irrigated crops to meat, milk and egg.

The study will also provide the suitable remedial/control measures to modify or reduce the residual effects of agricultural chemicals in the command areas of Narmada Valley. This information will not only help to prevent pollution of water-consequently the whole environment of command area of "Narmada Sagar and Omkareshwar Command" but other command areas also viz; Tawa Command, or Bargi Command areas and other areas in the country.

7. Review of Research Work Conducted/ being conducted on the subject in India and Abroad.

(a) At sponsoring institution:

Preliminary studies on herbicidal residues in fields through bioassay method is being conducted. But the studies on herbicidal and pesticidal residues in water have not been under taken so far. Some studies in insecticide residues in food crops are in progress. However, no emphasis has been given to soil water and/or surface water residues.

(b) Research work done and in progress in India:

The studies on residues in food stuff, and soils have been conducted at different Agricultural Universities viz PAU, HAU, TNAU and IARI and Bhabha Atomic Research Centre-Trombay, Bombay. However, the research work on residues built-up in underground water or surface water in command areas, are totally lacking in India.

(c) Research work done and in progress in abroad.

The studies relating to the residues of toxic organic chemicals found in ground water are extensively conducted in USA (Rao et al. 1985). Some of the toxic chemicals viz. Alachlor, Atrazine, BHC, Benzene, Bromacil, Carbofuron, Chloroform, Cyclohexane, Dibromochloropropane, Dinoseb, Ethyle-benzene, Parathion and Simazine have been reported in under ground water. Many organic chlorinated compounds are reported in the ground and surface waters. The heavy metal residues have also been found in water creating the residue problems.

The use of activated charcoal to remove mercury from drinking water has been reported by various investigators (Logsdon and Symon, 1973, Sony, 1979).

Nitrate predominates in surface and ground water and the levels of nitrate can be increased through contamination by nitrogen containing fertilizers or human and animal wastes. The levels normally do not exceed 1 to 2 mg/l for nitrate and 0.1 mg/l for nitrite. Currently 40 surface water supplies and 568 ground water supplies are known to exceed the nitrate maximum contaminant level (MCL) of 10 mg/l, as a result of the use of fertilizers or from animal wastes, or septic system (Review of Environ contamination and Toxicology Vol. 107 pp. 117-130).

The studies revealed that in water of Maumee and Sandusky rivers contained the Alachlor residues to the extent of 10-14 ug/l during 1984. In water of Mississippi river near Wikswarg 0.26 to 0.76 ug/l of Metoluchlor, and 0.26 to 0.84 ug/l of Alachlor residues were noted.

A survey conducted at USA, revealed that Alachlor and Metolachlor polluted the water of many rivers, tanks and tube wells. Several samples contained the residues ranging from 1.0-270 ug/l of water (Reviews of Environmental contamination and Toxicology vol 110).

Acrolin a herbicide used for controlling the aquatic weeds remain active upto 6 days in water. The residue of this chemical at 1 ppm is toxic to the fishes.

Several other agrochemical residues are reported at the toxic levels in ground and surface waters. Hence, this study is most important to reduce the water pollution of command area and the resultant long term hazards.

B. Technical programme :

First year

1. Establishment of Lab and equipments for specific residue analytical purpose.
2. Survey of the command areas and catchment topography and other edaphic, biological and infrastructure of the ecosystem.
3. Collection and analysis of water samples :
ground water : tube well, open wells, hand pumps etc.
and surface water : Nallas, Streams, Rivers, Tanks & Dams,
of the command areas.
4. Cataloging of the Agrochemicals being commonly used in different crops & Farming situations of the region.

Second and Third year :

1. Water and soil solution samples from farmers fields with different farming situations will be taken for analysis and will be used to evaluate and develop general models for the residues contents under specific farming situations.
2. The specific field experiments using different agrochemicals will be conducted on farmers' fields.
3. The water samples will be collected for residues analysis from underground and run off water, and its' analysis will be continued.
4. The experiments to develop preventive and remedial measures will be under taken.
5. Residues will be estimated under different methodology normally used for various agrochemicals under field conditions.
6. Report preparation and recommendation on generalized basis.

Fourth and Fifth year if continued:

1. Considering the results of the previous years, the field experiments of the proven technology, on the cultivators' fields would be taken for reducing the residue problems.
2. Collection and analysis of ground water and surface water samples will continue.
3. To evaluate the effect of the residues on the Eco-microbial Environment in the Pedosphere, and it's impact on crops.
4. To evaluate the nature of most commonly used pesticides in relation to the cropping situations, soil types and the prevailing environmental conditions of the zone.
5. Final Report Writing and Recommendations for different Farming Situations will be prepared.

Experimentations :

- * For designing and recommending the suitable remedial measures for residue control under different situations.*

To reduce the herbicidal residues in soil and water, the information will be collected and/or, studies will be conducted to find out the correct formulations, method of application, structure of the chemicals which may decompose easily by light or volatilization in the form of gas, prevention of toxicity by use of antidotes, enhancement of degradation by changing soil pH, organic matter, moisture level, cultivation or inoculation of soil microbes, plant enzymes treatment, and/or by use of muck or peat soils, by growing "trap crops" trap plant species which can metabolize the chemicals into nontoxic forms, and also the measures for checking the leaching as well as surface run off.

D. Facilities :

A. Facilities already available

- i) Some fields in catchment area will be selected for runoff water studies.
- ii) Office facilities are available, however, additional laboratory facilities have to be arranged for this specific work.

B. Additional facilities required:**1. Equipments**

App. Cost in Rs.

a)	GLC. with essential accessories (laboratory estimations of constituents).	3,00,000/-
b)	Integrator (part of GLC)	1,00,000/-
c)	Vacuum evaporator (sample preparation)	10,000/-
d)	Water Bath (2) (sample preparation)	10,000/-
e)	Water analyser kit (field estimations)	15,000/-
f)	Spectrophotometer (UV) (laboratory estimations of constituents).	1,00,000/-
g)	Tensiometer & pizometers (sampling etc.)	10,000/-
h)	Portable conductivity meter & pH meter (field estimations)	10,000/-
i)	Infrared Thermometer with data logger (field estimations at large scale)	1,00,000/-
j)	Servo voltage stabilizer 5KV (Accessories)	25,000/-
k)	Ion-Meter with electrodes etc. (laboratory estimations of ions, i.e. NO ₃).	2,00,000/-
l)	Oxygen-Meter (Microbiological environment estimations)	50,000/-
m)	High speed cooling centrifuge (separation & analysis of constituents)	40,000/-

 SUBTOTAL Rs. 9,70,000/-

2. Implement for sampling & experimentation.
(i.e., different types of samplers, augers, sprayers
and tools for fabrication, maintainance & installation
of tensiometers and pizometers etc.). 50,000/-
3. Equipments & accessories for preparation of
project report and it's presentation.
(i.e. photographs, slides, charts, maps etc.,
and other audio-visible aids, needed.) 50,000/-
5. Miscellaneous equipments as per research needs. 75,000/-
6. Vehicles (Jeep with trolly & One Motor cycle) 3,00,000/-

 TOTAL AMOUNT REQUIRED is Rs. 13,95,000/-

NOTE
Except No. (d) & (f), other Equipments demanded are not available at the campus. One water bath is available yet it is not sufficient in view of the work load & it's small life span (not more than 4 years of use). Further, the spectrophotometer unit available with us is neither as per the project requirement (not covering the range of estimation), nor working satisfactorily.

10. Staff Requirement:

S.No.	Designation	No. of posts	Scale of posts	Qualification prescribed for technical staff
*1.	Senior Scientist	1	4500-7300	M.Sc.(Ag.) and Ph.D. Soil Science with 15 years experience in soil science.
*2.	Scientist	1	3700-5700	M.Sc.(Ag.) with 10 years experience &/or Ph.D. in Soil Sci./Analytical Chem.
*3.	Jr. Scientist	3	2200-4000	M.Sc.(Ag.) in Soil Science/ Crop Physiology/Agronomy.
*4.	Tech. Asstt.	3	1600-2800	M.Sc.(Ag.) with appropriate experience in respective
*5.	Jr. Stenographer cum clerk.	1	1400-2340	English & Hindi Typing & short-hand (english).
**6.	Research Fellows	2	1600/-	Ph.D. Scholars for the research project periods only.
**7.	Field Asstt.	1	1150-1800	Higher Sec./Preferably B.Sc.(Ag.)/B.Sc.
**8.	Lab Tech.	1	1200-2040	B.Sc.(Ag.)/B.Sc.
**9.	Driver	1	950-1530	Higher Secondary

NOTE :

- * These positions will be provided by the Vishwa Vidyalaya.
- ** These positions are emanded in the project.

The positions of Research Fellows are optional. These positions has been demanded considering the suggestion of Director Agriculture (NVDA- Bhopal), for an early & timely completion of the Research work with reliable precision.

11. Estimates of Cost :

S.No. : Items of the expenditure	1st Yr	2nd Yr	3rd Yr	Subl Total	4th Yr	5th Yr	Totals
Univ. Exiting Staff							
LAKH RUPEES							
1. Pay of Officers	1.94	2.00	2.08	6.00	2.12	2.18	10.30
2. Pay of Estt.	1.40	1.44	1.48	4.32	1.52	1.56	7.40
3. Allowances :							
a) DA	2.10	2.16	2.22	6.48	2.28	2.34	11.10
b) HRA	0.35	0.37	0.39	1.11	0.42	0.45	1.95
c) CCA	0.04	0.04	0.04	0.12	0.04	0.04	0.20
d) Medical	0.20	0.20	0.20	0.60	0.20	0.20	1.00
e) Leave Encashment	0.20	0.22	0.24	0.66	0.26	0.28	1.20
f) CPF Contribution	0.33	0.34	0.35	1.02	0.36	0.37	1.75
UNIV SHARE TOTALS	6.58	6.77	6.98	20.31	7.20	7.42	34.93
4. Contingencies:							
A) Recurring							
i) Glassware and Chemicals	1.50	1.50	1.00	4.00	0.50	0.50	5.00
ii) POL etc.	0.30	0.30	0.30	0.90	0.30	0.30	1.50
iii) Inputs Expt.	0.25	0.35	0.35	0.95	0.25	0.25	.45
iv) Miscellaneous expenditures	0.20	0.20	0.20	0.60	0.20	0.20	1.00
v) Scientific Books Literature etc.	0.10	0.10	0.10	0.30	0.10	0.10	0.50
vi) Travelling Allow	0.30	0.30	0.30	0.90	0.30	0.30	1.50
vii) Sym./Conf./Semin Training R.Course etc.	0.05	0.05	0.05	0.15	0.05	0.05	0.25
TOTAL RECURRING	2.70	2.80	2.80	7.80	1.70	1.70	11.20
B) Non-Recurring	13.45	-	0.50	13.95	As per Res. need		13.95+
Total Contingency	16.15	2.80	2.80	21.75	1.70+	1.70+	25.15+
GRAND TOTALS	22.71	9.57	9.78	42.06	8.90	9.12	60.08

NOTE 1

- The cost estimates are proposed considering the current prize of March-April, 1992. The delay in the inception of the project may need revised estimates for equipments, chemical, glassware etc., should be given due consideration at the time of sanctioning the project. This will help for an efficient execution of the Research project even if the prizes are enhanced significantly.
- The additional expenditure in pay and allowances of the staff demanded, has to be sanctioned extra.

CLASSIFIED STATEMENT OF PROJECT COST ESTIMATES TO BE GIVEN BY MVDA
Tentative Expenditures in various heads yearly and totals.

A. Staff :	Positions	Monthly (Expenditures : Rs.)	Annual
	Research Fellow	- 3200/-	38,400/-
	Field Assistant	- 4000/-	48,000/-
	Lab. Technician	- 4000/-	48,000/-
	Jeep Driver	- 3500/-	42,000/-
TOTALS		Rs. 14,700/-	1,76,400/-

Yearly Expenditure in Lakhs

Expenditure Head	1st	2nd	3rd	Total of Three Years	4th	5th	Total of Five Years
A. Staff Salary	1.77	1.79	1.81	5.37	1.83	1.85	8.05
B. Contingency	2.70	2.80	2.30	7.80	1.70	1.70	11.20
C. Equipments	13.45	-	0.50	13.95 (As per res.need)			13.95+
TOTALS	17.92	4.59	4.61	27.12	3.53+	3.55+	34.20+

Total project cost is Rs. 27.12+ lakhs in three years,

Total project cost is Rs. 34.20+ lakhs in five years.

* Some additional cost may be needed for :

- (a) Increased expenditures in pay & allowances.
- (b) Increased cost of Equipments, Chemicals & Glassware needed.
- (c) Additional Equipments if absolutely needed for the research work.

DETAILED PROGRAMME OF WORK

"Proposed Research Programme to Study the Impact of Agrochemicals Run-off from Fields on Surface & Ground Water Quality in Command Areas".

The study is proposed to take up at the sites where irrigation facilities are being availed since five to ten years period or more. Based on the preliminary information, such situations are expected to be available in the Command areas at :

1. Kunda Command.
2. Satal Command.
3. Intensive well irrigated area adjoining to Dhangoon/Kalmukhi villages of Khandwa Distt. (Near Sanawat on Indore-Road).

A. Selection of the Area :

Field locations in the above mentioned zones of the command will be selected for study. To select the appropriate sites, we have to consider that there must be an intensive cultivation since five to ten years period and the agrochemicals (Fertilizers, Pesticides, etc.) are in use at least as per the recommendations or more.

To identify such locations in the command area, a preliminary survey of the area will be done. Also, the basic information pertaining to the important relevant aspects will be collected from the other sources available.

B. Survey of the Area :

A reconnaissance survey of the above three zones will be conducted to collect the information on :

1. Rainfall.
2. Soil types and their characteristics.
3. Topographical features in the areas.
4. Cropping pattern and cropping intensity, in the areas.
5. Irrigation frequency and period.
6. Intensity of Fertilizer/Pesticide/Fungicides/Herbicides and other Agrochemicals being used in different crops and season.
7. Nature/sources of agrochemicals, being commonly used.
8. Ground water conditions in the areas.
9. Nature of run-off out lets etc. ,
10. Any other special information of interest.

C. Site Selection :

Considering the available information, the study at the initial stage of investigation will be concentrated to the field sites where the following cropping sequences are common :

- | | | | |
|----------------------|---|-------------------------|-----------|
| 1. Hybrid cotton | - | Hybrid cotton. | |
| 2. Groundnut | - | Cotton HYV/Sorghum HYV. | |
| 3. Maize/Sorghum HYV | - | Wheat/Gram. | |
| 4. Banana | - | wheat/Gram | - Cotton. |
| 5. Sugarcane | - | Wheat/Gram. | |
| 6. Vegetable | - | Chillies. | |
| 7. Chillies | - | Cotton HYV. | |
| 8. Soybean | - | Wheat/Gram. | |

NOTE : Any seven situations dominating in the area will be selected.

Replications :

The proposed study and sampling will be confined to three locations in each cropping sequence available in the zone. Thus :

3 x 7 x 3 = 63

sites crop sequences replications sampling sites

D. Monitoring :

To monitor the probability of water contamination by the agrochemicals, water samples (runoff & seepage) during rainy season will be collected from the predescribed field sites. Also, the water samples from the wells (irrigation wells & drinking water wells), water bodies and water ways will be collected for analysis.

Water sampling :

Fields : Runoff and seepage water samples from 63 field sites will be collected at the time interval of 15 days in rainy season. It may give 60 samples of runoff & 100 profile water samples at each sampling. In rabi season, water profile samples will be obtained through tensiometers/piezometers, as per irrigation schedule, and in summer season through tensiometers only.

Wells : Water samples from selected wells (5 wells per zone) will be collected at the monthly interval in the post rainy season.

- (a) Command area - Kunda and Satak.
- (b) Outside command area - Dhangan/Kalsukhi.

Canal : Samples of canal water for analysis will be taken at the interval of 2 months (Oct. - Dec. - Feb. - Apr.).

Water table : Monthly and/or as feasible.

WATER SAMPLING PROGRAMME	
Field water sampling	--Rainy--Runoff & seepage--15 days interval Season
	--Rabi--Profile water by tensiometers/piezometers Season as per irrigation schedules.
	--Summer--Profile water by tensiometers. Season
Well water sampling & Water table	--Monthly interval 5 wells per zone.
Canal water quality	--Two months interval.

E. Analysis of Water Samples, Soil & Plant samples :

On the basis of preliminary information, the following constituents are proposed for analysis in a sample. Though, the actual constituents to be estimated in a sample will be decided on the nature of agrochemicals in actual use.

1. Nutrients - Nitrate, Phosphate, Sulphate, Zinc & Boron.
2. Insecticides-
 - Organochlorides : BHC, Aldrin, Endosulfan etc.
 - Organophosphates: Dichlorvos (Novan), Dimethoate (Rogar), Oxydemeton-Methyl (Metasystox), Phosphomidon (Dimecron), Monocrotophos (Novacron), Phorate, Quinalphos (Ekalaux), Malathion etc.
 - Carbamates : Carbaryl (Sevin).
 - Synthetic Pyrethroids : Cypermethrin, Decamethrin & Fenvalerate.
3. Fungicides - Bordeaux mixture, Sulphur, Thiram, Ziram, Zineb, Maneb (M-45), Agrosan, Ceresan etc.
4. Herbicides - 2,4-D, Agromax, Diuron, Fluchloralin (Basalin) etc.

These constituents will be estimated in different water samples. However, the constituents to be analysed in a given sample will be decided considering the information on the nature of agrochemicals being used by the farmers.

Soil Sampling : Surface (15 cm) & Subsoil (30 cm) samples from the selected fields (i) In the command area.
(ii) Outside command area (Rainfed).
(before and after every crop).

Plant analysis : (i) Foliage.
(ii) Seeds.
(iii) Fruits and vegetables.

The constituents to be analysed in the soil or plant parts will be according to the nature of agrochemicals and conditions and/or frequency of its applications.

Micro-organisms : Biospherical analysis (Laboratory studies)
(i) Population.
(ii) Activity.

F. Control Measures :

Field and Laboratory studies will be conducted to evaluate suitable preventive & control measures. The actual plan of work will be formulated after studying the results of first year and the preliminary information of the area under investigation.

G. Progress Reports & Plan of Work:

1. Annual report & plan of work - In September month - 5 copies.
2. Three Years Final Report - In September month of fourth year.
3. Five Years Final Report - In September month of sixth year.


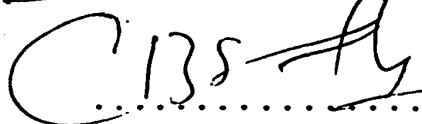
Note : No. of copies of report : after three years - 15 copies &
after five years - 40 copies).

The recommendations on control measures are aspected and possible if the project work continued for five years period.

* * *

CERTIFIED THAT

The research work proposed in the scheme does not in any way duplicate the research work already done and being carried out elsewhere on the subject.

Name	Designation	Signature
1. Dr. D.L. KAURAW.	Principal Investigation	
2. Dr. C.B. Singh,	Dean Campus	
3. Dr. P.L. Bhalla,	ADR (Nimar Zone)	.....
4. Dr. D.P. Nema,	Director Research Services	.....

**STUDY OF IMPACTS OF NARMADA SAGAR PROJECT UPON FLORA
AND FAUNA ALONG WITH ATTENDANT HUMAN ASPECTS**

**Progress Report - IV
(January 1992 to June 1992)**

PROJECT SUPERVISORS

H.S. Panwar, Director
S.N. Prasad, Scientist
Asha Rajvanshi, Scientist

RESEARCH TEAM

Research Fellows:

Parikshit Gautam
L. Raghu Ram Tata
Parthapriya Ghosh

Research Associates:

K.S. Rajpurohit
A.M. Dixit

Wildlife Institute of India
Chandrabani, Post Box No.18, Dehra Dun - 248 001.

INTRODUCTION

The EIA study of Narmada Sagar Project has been in progress for the last two years . Three progress reports have since been prepared by the research group. The research group has identified seven important thrust areas for detailed investigations in the project area.

1. Vegetation communities.
2. Wildlife habitats.
3. Terrestrial wild mammals.
4. Riparian species.
5. Ornithological studies.
6. Remote sensing & GIS studies.
7. People of the project area.

This report is in continuation of the first three reports and provides information on parameters outlined earlier (Progress Report II & III) in the remaining sample areas of the proposed study. In addition, the evaluation of wildlife habitat values of riparian areas , habitat utilization by terrestrial mammals and birds and vegetation classification for different zones in the study area is also presented. Compensatory afforestation sites were visited during this course of field work to evaluate plan and success of compensatory afforestation scheme. Within the socio-economic component of the study area an effort has been made to sample fifteen villages of the proposed submergence area for quantification of existing equation between people and resources for predictions of likely changes in natural resource use pattern, resource availability and socio-economic condition of the people after the proposed project is completed.

1. VEGETATION STUDY

The following aspects of the vegetation have been studied during the January, 1992 to June, 1992.

- 1.1 Floristic values.
- 1.2 Vegetation analysis of submergence zone.
- 1.3 Vegetation analysis of Impact zone.
- 1.4 Vegetation analysis of the contiguous forest, outside the submergence area.
- 1.5 Compensatory afforestation.

1.1 Floristic values : In our earlier report, we had listed 288 plant species of 213 genera and 72 families. However, since then many new species have been collected from the area and submitted to the herbarium of Wildlife Institute of India for the identification and record.

1.2 Vegetation analysis of submergence zone : In earlier reports, the details of sampling for vegetation analysis in the Narmada Sagar submergence area were presented. The sampling has already been completed in this area. In the first step of analysis of data, the vegetation of the area has been classified using Two-Way Indicator Species Analysis (TWINSpan). 62 woody species were analyzed for 288 sampling plots. The clustering of species at different levels showed 7 major species associations in the area having 12, 13, 3, 5, 11, 8 and 10 number of species in different groups as shown in Fig. 1.1 The interpretation for the indicator, differential and non-differential species is also in progress.

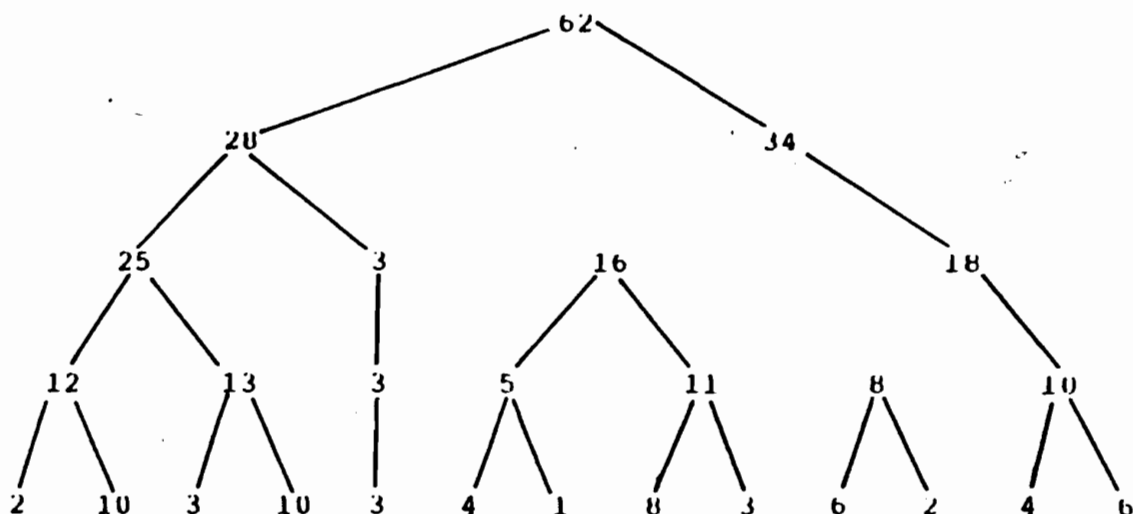


Fig. 1.1: Clustering of species in different levels. (The figures indicate the no. of species involved in the classification).

1.3 Vegetation analysis of impact zone: In earlier report, methodology for the delineation of impact zone was discussed. The impact zone has been defined as the zone presently under the impacts of villagers at the current level of population density and settlement pattern. After the proposed submergence, it is possible that the population influx (oustees) will take place within or near those villages which are currently at the periphery of proposed submergence area in order to get the benefits from draw-down areas. Due to this added influx of population in the already depleting forest scenario, there is a possibility of shift in the current levels of resource demands. The impacts on the forest resources around the periphery is likely to aggravate further due to enhanced number of peripheral villages after the submergence. This increase in pressure, may go beyond the limits of present impact zone of radial distance of 1.5 km. A pilot study in similar sets of conditions such as in Tawa reservoir area, will help in visualizing, the actual impact zone in the post-impoundment

scenario.

Nineteen forest grids from the present impact zone were randomly selected for a detailed study of vegetation. The sampling has already been completed for these areas and analysis of data is underway.

1.4 Vegetation analysis in the area outside the submergence : In order to suggest some alternative habitat for the wild animals and also to restore the biodiversity of the area, which will be affected by submergence of large forest tract, two forest patches in proximity to the proposed submergence boundary were selected. These two patches, however, exclude the impact zone. About 250 sq km forest area of Chandqarh and Punasa ranges in the North and South bank, respectively, have been identified for the detail study. 35 grids have been randomly selected, 19 from Chandqarh and 16 from Punasa ranges. The vegetation sampling for tree, shrub and herb layers were made using the methods discussed in the earlier reports. The sampling has already been completed for these areas and analysis of data is in progress.

1.5 Compensatory afforestation study : Compensatory afforestation sites for Narmada Sagar Project have also been visited. This study has been conducted with the view to assess the success of compensatory afforestation in terms of restoration of species diversity, naturalness, ground and canopy covers, and peoples' dependence on forest resources, in the local area. Twenty two sites for compensatory afforestation, in low density forest (generally termed as "degraded forest") and revenue lands, have already been visited.

2. RIPARIAN HABITAT EVALUATION

Proximity to the river and luxuriant growth of trees, shrubs and herbs compounded with flat flood plains make this riparian belt as an suitable habitat for wildlife. The Narmada Sagar submergence area has an extensive drainage net work of small streams and major tributaries. Swift flow, steep gradient, rapids, falls and terrain of the Narmada river in the proposed NSP submergence zone have rendered the banks of Narmada very diverse in terms of the riparian vegetation. Flat area and low gradient compounded with alluvium deposition have resulted in the formation of many islands known as Kitti Islands between the Joga Kalan Fort and Punghat Kalan. These islands, along channels separating them form an excellent riparian habitat in the NSP submergence zone. Considering the above, a detailed study for evaluation of riparian wildlife habitat was conducted.

2.1. Study area:

Present study includes 30 transects spread over 50 km stretch of riparian belt of the Narmada river from the Joga Kalan Fort to Sakal Ghat, located around five km upstream of dam site (refer map).

2.2. Methodology:

Fifty km stretch of the Narmada river upstream of NSP from Sakal Ghat to the Joga Kalan Fort have been divided into five major zones and were surveyed for a week during winter. Thirty transects were laid, in total on both the banks of the river in the riparian belt. The width of riparian belt determined transect length and sample points. For evaluating wildlife habitat quality characteristics of the riparian belt, two sets of parameters, i.e. natural habitat quality determinants and biotic pressure were considered (Tables 2.1 and 2.2 as also given in Progress Report 111, Section 2.3).

Table 2.1. Natural characteristic determinants for riparian habitat evaluation.

Parameters	Scores		
Slope	1. Steep	2. Gentle	3. Flat
Terrain	1. Rocky	2. Bouldery	3. Clavev
Distance from water	1. >1.5 km	2. 1-1.5 km	3. <1 km
Canopy cover	1. 0-25%	2. 26-50%	3. >50%
Shrub cover	1. 0-25%	2. 26-50%	3. >50%
Herb cover\ha	1. Nil	2. 1-200 cu m	3. >200 cu m

Table 2.2. Biotic pressure determinants for habitat evaluation.

Parameters	Score (at 0.1 ha)		
Path			
Path area	1) >50 sq m	2) 1-50 sq m	3) Nil
Path type	1) Track	2) Trail	3) Nil
Fire	1) High >50%	2) Medium 10-50%	3) Low/Nil <10%
Lopping			
Trees lopped	1) >5	2) 1-5	3) Nil
Lopping rate	1) leaves + branches	2) leaves	3) Nil
Grazing			
Dung domestic animal	1) >50	2) 1-50	3) Nil
Village distance	1) <1 km	2) 1-2 km	3) >2 km
Cut trees	1) >20	2) 1-20	3) Nil

2.3 Riparian habitat evaluation

Out of 30 study transects selected 18 were laid on the northern bank of Narmada river and 12 on the southern bank. It is evident from Table 2.3 that out of the total riparian area sampled the major portion (63% of the area) provides moderate habitat quality and the proportions having high and low habitat quality are relatively low (7 and 30% of area respectively). These quality classes have been determined for entire area sampled by quantification of natural characteristic determinants.

On the northern bank, areas under high quality riparian habitat class are conspicuous by their absence, whereas, low quality category is represented in 23 percent of the area. On the southern bank both low and high quality categories are represented in a total of 14 percent of the area each quality class contributing equally. Although riparian areas of NSP submergence are not found to provide an overall excellent habitat for wildlife, majority of these areas provide moderate habitat potential, the high quality class is represented in the Kitti islands.

Table 2.3. Percentage of area under different habitat quality classes in riparian zone.

	Habitat quality classes		
	High	Medium	Low
North Bank	-	37	23
South Bank	7	26	7
Total riparian zone	7	63	30

Biotic pressure assessment of riparian belt has been presented in Table 2.4. All the biotic pressure parameters were found operating at a minimum level in the areas sampled. This ensures that the riparian belt is fairly free from biotic pressures and therefore only the natural characteristics are shaping the quality of the wildlife habitats in the area.

Table 2.4. Influence of existing biotic pressures on habitat quality of riparian areas.

Habitat quality classes as per natural determinants	Habitat categories								
	High			Medium			Low		
Percent area under different classes	/			63			30		
Existing habitat quality classes as influenced by biotic pressure	HH	HM	HL	MH	MM	ML	LH	LM	LL
Percent area under different classes	50	50	Nil	73	27	Nil	67	33	Nil

Where,

HH= High natural quality with low biotic pressure.

HM= High natural quality with medium biotic pressure.

HL= High natural quality with high biotic pressure.

MH= Medium natural quality with low biotic pressure.

MM= Medium natural quality with medium biotic pressure.

ML= Medium natural quality with high biotic pressure.

LH= Low natural quality with low biotic pressure.

LM= Low natural quality with medium biotic pressure.

LL= Low natural quality with high biotic pressure.

Animal distribution/abundance along the riparian habitat was studied. In addition to the mammals utilizing riparian habitat during winter (Progress Report III, Section 6.5), sambar and Rhesus monkey were also found to be using the riparian area.

2.4. Study of compensatory afforestation areas:

It is mandatory to afforest double the forest area lost under any development project (Forest (Conservation) Act, 1980). Keeping this in view NVDA authorities have also undertaken the compensatory afforestation program in the year 1989-90, for the loss of 403.32 sq km forest area under NSP, which falls in the districts of Khandwa, Dewas and Hoshangabad. More than 80 percent forest area to be submerged by NSP will be in Chandgarh, Balari and Mundi ranges of Khandwa district. The remaining area will be in Satwas range of Dewas district and Handia range of Hoshangabad district. Actual extent of land acquired for this purpose is not yet known but plantation has been done in two categories of land, i.e. low density forest area, and revenue area. To know the quality and extent of plantation and plantation areas, and their existing and future wildlife habitat values an extensive study has been conducted in three districts, i.e. East Nimar, West Nimar, and Hoshangabad. Parameters considered for this study include assessment of natural vegetal cover type, species planted, spacing adopted for plantation, existing survival rate and use by wildlife if any.

2.5. GIS study:

GIS is used as an important tool for research in wildlife and environmental studies for evaluation of wildlife habitat and resource inventories. GIS component has also been included in the present study, in order to obtain detailed evaluation of wildlife habitat, extent and

quality of forest, soil types, water resources, vegetation associations, etc. Maps of submergence zone of NSP and Omkareshwar and areas lying outside the submergence zone (6km radius) have been prepared. These maps will be digitized for analysis using GIS. Maps for themes such as contour, drainage, boundary of submergence, forest boundary and location of villages have been prepared at 1:50,000 scale.3.

3. TERRESTRIAL WILD MAMMALS

In accordance with the work plan outlined earlier in the reports, assessment of the habitat quality in and around the Narmada Sagar Submergence Area is based on 39 randomly placed line transects that have been run with in and outside the submergence zone. Fifteen transects were selected in the reserved forests of Punasa, Chandgarh, Dhanwani, Abhava and Satwas, lying with in the submergence zone and 14 transect have been run out side the submergence area in forest ranges of chandgarh, Punasa and Satwas. Data has been collected on all these transects during winter season(1991-92) and 30 transects have been run so far during summer(1992). Data so far generated will be subjected to analysis to yield HSI values separately for submergence zone and outside submergence zone. Multiplication of these HSI values with the extent of the habitat available for ungulates will give "Habitat Units" for inside and outside submergence zones. This data will also be used to correlate major habitat variables like food, cover and water to habitat utilization by major ungulates in the study area, using multiple regression and analysis of variance.

To estimate abundance and density of wild mammals in and around submergence zone, extensive vehicle census are being conducted. So far 350 Km. of forest roads have been traversed and the data are being analysed by using the following methods: (1) King census method (2). Kelker belt transect method and (3). Fourier series analysis.

From these analysis, densities of herbivore in different strata and forest ranges will be calculated.

During the vehicle census Common Giant Flying Squirrel (*Petaurista petaurista philippensis*) was observed which has not been reported in earlier reports.

4. ORNITHOLOGICAL EVALUATION

The ornithological evaluation approach has been taken as one of the components of wildlife assessment in EIA study of Narmada Sagar Project. The following attributes have been taken for evaluation: size (extent), diversity, and species richness, population size, rarity, habitat fragility and fragmentation.

Details of methodology have been discussed in earlier progress reports, data collection on population and species diversity using line transect is in progress. Some preliminary analysis of data collected for winter (1990-91) and summer (1991) season has been given in earlier progress report II and III. Data has been collected for winter (1991-92) and collection of data for summer (1992) is in progress. This will help in understanding any temporal variation in community structure. Seasonal variation in bird diversity and density has already been discussed in previous reports. A study site has been selected to study the bird communities in riverine forests. Four new species, Little Grebe (*Podiceps ruficales*), Coot (*Fulica atra*), Pheasant-Tailed Jacana (*Hydrophasianus chirurgus*) and Blue throat (*Erithacus svecicus*) have been added in the check list of birds of the area (Appendix 4.1). A total of 195 species representing 52 families have so far been recorded from proposed submergence area of Narmada Sagar Dam.

5. SOCIO-ECONOMIC CONDITIONS OF THE PEOPLE IN AND AROUND THE PROJECT AREA

Based on the methodology discussed in the previous report 15 villages were sampled and data has been analyzed for assessment of existing socio-economic conditions of the people and dependence on natural resource base for Social Impact Assessment (SIA) of the Narmada Sagar Project (Appendix 1).

The People: The central Narmada basin (Nimar region) has wide variety of people. The Hindi speaking population in this region is 30%. The caste configuration is: Gaols (15%) Korkus (40.9%) Bheels, Banjara, Naiks (21.2%) and Brahmins (2.27%) and Harijans (6.8%) and Dhobi, Jats, Rajputs, Kalotha, and Balais (10.12%).

Families in the submergence area are joint, extended as well as nuclear. Almost all the families are patriarchal but women share equal right in social role and functions. Marriages take place in traditional form, which continues for 3 to 5 days. People generally prefer to marry their daughters in the neighbouring villages. Dowry in the marriage includes a pair of ox, wheat or millet, utensils, clothes and jewellery (silver).

Villages are mostly nucleated and are composed of various castes and tribes. Harijans stay at the periphery of the village. The center is occupied by the big land owning class and Gaols. Although there is a social hierarchy but no untouchability and disharmony was apparent.

Large villages are the centers of weekly markets where most of the transaction takes place although people travel to the near by urban areas for their daily needs. For the villages near Karmada,

river is the source of drinking water, bathing, washing and the water source for cattle. Other villages have hand pumps and wells. Health facilities are not available in every village. One has to travel 15 to 20 Km for the medical help. Veterinary services are neither available nor sought after. Cooperative societies are well distributed through out the area surveyed till now.

Assessment of overall income pattern of the people likely to be affected by the proposed project has been made to determine the existing economic status of the people.

Occupation: Sixty four percent of population depend on agriculture for their major source of income. Thirty three percent of population earn its livelihood working as labourers. Two percent of people earn their livelihood through fishing. The collection of Minor Forest Products (MFP) supplement their income in fair proportion. Most of the agricultural produce other than cotton are for self consumption. A very little surplus is sold in the market to fulfil requirements of clothing, food items and requirements of cultural and social rituals. Appendix II shows calendar of activities of the people through out the year.

Eight months of the year are spent in agriculture and related activities. The sowing season starts in the month of July and continues up to the month of March. The combination of Pakrat (cotton seeds) and tilli (*Sesamum indicum*) are sown in the month of July and harvested in the month of March. Paddy (*Oryza sativa*), soyabean and jowar (*Sorghum vulgare*) are also sown in the month of July and harvested in the month of March. Wheat is sown in the month of November and is harvested in the month of December.

Mahua (*Madhuca indica*) flowers and fruits and tendu (*Diospyros melanoxylon*) fruits and leaves are collected during April to June.

Dependence on forest resources:

1. Fuel wood: Forest is the only source of fuel wood for the villagers. A distance of 1.5 kms is covered on an average to collect fuel wood. On an average every household require 30 kg of fuel wood in summer and 50 kg in winter. The common species collected are teak (*Tectona grandis*), dhawra (*Anogeissus latifolia*), khair (*Acacia catechu*) saijla (*Terminalia tomentosa*), anjan (*Hardwickia binata*), palas (*Butea monosperma*), atai (*Helicteres isora*) and sirali (*Nyctanthes arbor-tristis*).

3. Household Industries: Villagers heavily depends on forest for the manufacture of baskets, ropes, and winnows. Bark of anjan (*Hardwickia binata*), and roots of palas (*Butea monosperma*) are used for making ropes. Strips of bamboo and bushes of sirali (*Nyctanthes arbor-tristis*) and atai (*Helicteres isora*) are used for making baskets and winnows.

4. Collection of Minor Forest Products: The collection of minor forest products is also an important source of income for the villagers. The MFPs include mahua flower and fruit, tendu leaves and fruit, achar (*Buchanania lanzen*) and embelica (*Phyllanthus embelica*).

5. Fodder: For fodder the leaves of anjan (*Hardwickia binata*) and atai (*Helicteres isora*) are collected. During rainy season the villagers leave the non milking cattle in the forest and once the rainy season is over they bring them back.

Tree crops: Mahua and tendu are peripheral source of income. On an average a villager collects 2 quintals of Mahua flower and 15 kg of Gulli (Mahua fruits). One quintal of Mahua flower costs Rs.300/- to Rs.450/-. Fruits are sold for Rs.8/kg. Collection of mahua flower contributes 4.6% of the total income. Mahua fruits contributes 0.6% of the total income.

On an average, per household collects 250 qaddis of tendu leaves per day (one qaddi is of 50 leaves), which are sold for Rs.25 per hundred qaddis. Tendu leaves collection contributes 5.2% of the total income.

Dependence on River: River is a source for irrigation, drinking water bathing and water for livestock.

Fishing: The fishing community (Dhimars) is not found in every village. They are mainly concentrated in the villages situated along the river. Even Dhimars do not solely depend on fishing for their livelihood. Most of them also engage themselves in agriculture. Average catch is 4.25 kg/day. *Labeo calbasu*, *Labeo rohita*, *Catla catla*, *Mystus singhala* are the common catches.

Income: The major source of income for the villagers is cotton. The average produce of cotton in the submergence area is 2.65/acre. The other produce are towar, wheat, paddy, maize, chick peas, soyabean and sesamum. But these are mainly for self consumption. A small percentage of these are sold in the market to meet the other demands. Average income of a farmer with a land holding up to 10 acres is Rs.18,800/- and for a farmer with a land holding more 10 acres is Rs.43,653/- from agricultural produce. Sale of cattle products and other livestock contributes 7.5% of the total income.

Agriculture labour: Thirty three percent of population is landless labours and works in the field of other farmers. They are paid Rs.20/day or 2 kg of cereals as its equivalent.

Forest labours: On an average one member of the house works in the forest for 15 to 20 days at Rs.20/day.

6. Remote Sensing/GIS Study:

In order to obtain cloud free, georeferenced imagery at scale of 1:50,000, the quick look imagery and a visit was made to NRSA, Hyderabad in May, 1992. The imagery has now been identified and orders placed for hard copy FCCS with NRSA along with proposed purchase of light table. It is expected that interpretation will begin by August and will be completed by November, 1992.

The GIS study has just begun with identification of various thematic map layers and drawing up of these themes on suitable tracing medium. This would allow us to digitize the maps relatively error free. These maps are being digitized under a contract so that analyses can be expedited. The thematic layers are (a) contours, (b) drainage, (c) forest boundaries (d) village location, (e) submergence zone (f) boundary of anthropogenic influence from the submergence zone and (g) land use. Some additional themes will be added on when the field data is analysed. We have also obtained 1:250,000 scale land use, geomorphology and soils for the study area for a coarse scale analysis.

FUTURE WORK PLAN

Vegetation Study

1. The vegetation study will be conducted in the submergence area of Omkareshwar, during the winter season.
2. Multivariate analysis of data will be carried out in order to classify and ordinate the different vegetation types of the study area.
3. Data will also be analyzed for vegetation in terms of its diversity, density, cover and relationship with other habitat variables.
4. On the basis of TWINSpan analysis, a) vegetation maps for the submergence zone, b) zones of current and future impacts and zones outside of a and b will be prepared. These maps will provide information for the GIS analysis incorporating other layers such as land use and animal habitats.

Wildlife Habitat:

Data collected for preparation of an inventory of the habitat categories from three different zones, i.e. i. forest areas of proposed submergence zone of NSP, ii. peripheral areas outside the submergence zone which are already impacted and would provide as refuge areas for people and wildlife of submergence area, and iii. contiguous forest areas of Chandqarh (150 sq km) and Punasa (150 sq km) ranges outside the submergence will be analyzed. It is important to evaluate the potential of existing wildlife habitats to withstand additional pressures after the proposed submergence takes place and to identify the forest areas for conservation.

During October 1992 Omkareshwar project site will be visited for assessment of floral, faunal and wildlife habitat values.

Terrestrial Wild Mammals

After completion of data collection for summer 1992, data will be analyzed for results on habitat use by wild mammals and different habitat parameters like cover, water and food availability will be correlated with habitat utilization by large mammals. Using HSI models, habitat comparisons between submergence and out side submergence zones will be drawn. A reconnaissance survey of Omkareshwar project has been conducted and based on the results a detailed survey of the area as in the lines of NSP are planned, and a detailed report will follow.

Ornithological Evaluation

After collection of data for summer 1992, final analysis of data for bird diversity, density, effect of habitat fragmentation on bird community and relationship with habitat parameters will be done. Habitat ordination for bird species will be done using Principal Component Analysis. Every species will be classified in different categories of rarity. Data collection in Narmada Sagar area will be finished by the end of June 1992 and in Omkareshwar by the end of December 1992. A reconnaissance survey in proposed submergence area of Omkareshwar Project has been completed. Detailed report on reconnaissance survey will soon follow. Detailed study is planned in the area on the basis of results observed during the survey of the area. It is planned that, study that will be carried out in this area will also yield scientific information on the objectives and parameters similar to those out lined for NSP area.

Social Impact Assessment

Fifteen villages have been sampled so far. Detailed analysis of

likely impacts of the project on socio economic status of the resident villages will be based on responses received through survey technique. 50 villages including the town of Harsud which is under proposed submergence will be sampled in next phase of the study.

Reference:

Forest (Conservation) Act, 1980. Ministry of Environment and Forest, Government of India.

Appendix 4.1 Addition of bird species to the previous check list (Appendix 11 of progress report 111).

PODICIPEDIDAE*

Little Grebe (*Podiceps ruficollis*)

RALLIDAE

Coot (*Fulica atra*)

JACANIDAE*

Pheasant-Tailed Jacana (*Hydrophasianus chirurgus*)

MUSCICAPIDAE

Bluethroat (*Erithacus sevecicus*)

* New families added to previous check list

APPENDIX 5.1 DETAILS OF THE VILLAGES SURVEYED

Villages	status	Population		Household		SC	ST	Others
		Total	Sampled	Total	Sampled			
Dharikotla	Forest	134	31	10	3	0	31	
Balwada	Forest	450	144	80	27		29	
Jamoti	Forest	31	31	4	4	2	29	
Junapani	Forest	701	65	35	9		53	
Pamakheri	Forest	726	92	58	14	58	28	
Bankaplas	Forest	351	65	35	10		51	
Mathani	Forest	384	158	51	21		94	
Kitti	Forest	147	69	36	10	20	4	
Dharampuri	Forest	70	18	18	5		12	
Jindwani	Forest	96	51	22	6		12	
Kittipiplia	Forest	24	24	2	2			11*
Bhoqani	Revenue	276	55	21	7	9	49	
Danq	Revenue	399	23	18	5			
Banasa	Revenue	123	95	41	9		95	
Titwas	Revenue	412	52	11	6	7	42	

* denotes Muslims.

APPENDIX 5.2 ANNUAL CALENDER OF ACTIVITIES

	Months											
Collection	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LABOUR												
Agri.&culti.	-----							-----				
Forest					-----							
Repair of shelter & agri.tools					-----							
COLLECTION												
Mahua flower				-----								
Mahua fruits						-----						
Tendu leaves						-----						
Tendu fruits				-----								
Fuel wood	-----											
Fishing	-----											
Achar											-----	
Aonla											-----	
Fodder	-----											

ANNEX.XV. MIN.V

VIIITH QUARTERLY PROJECT REPORT
(1st April 1992 - 30th June 1992)

**IMPACT ASSESSMENT OF MADHYA PRADESH LANDS TO BE
SUBMERGED UNDER SARDAR SAROVAR PROJECT AND
ADJOINING ECOSYSTEMS : FLORA, FAUNA AND OTHER
BIOTIC COMPONENTS**

DR. RAM PRASAD
IFS
Project Director

State Forest Research Institute, Polipathar
J A B A L P U R (M.P.)

July, 1992

SEVENTH QUARTERLY REPORT AND REVIEW OF PROGRAMME

PERIOD : 1st April 1992 to 30th June 1992

1. TITLE OF THE PROJECT

"Impact assessment of Madhya Pradesh Lands to be submerged under Sardar Sarovar Project and adjoining ecosystem: Flora, fauna and other biotic components."

2. NAME OF THE PRINCIPAL INVESTIGATOR AND INSTITUTION

Director, State Forest Research Institute, Polipathar, Jabalpur - 482008

3. OBJECTIVES

Objectives set for the present investigation have already been discussed in the previous report and therefore these are not being reproduced here.

4. STUDY SITES OR AREA OF WORK

Already given in previous reports.

5. AREA OF INVESTIGATION DURING THE QUARTER UNDER REPORT

During the period from April 1992 to June 1992 various revenue villages and their impact villages of Kasrawad, Thekri, Dharinpuri, Alirajpur, Manawar tehsils were visited and 35 villages which are coming under submergence and 15 villages marked for impact assessment studies were visited (Table 1).

6. PLAN OF WORK FOR THE PERIOD UNDER REFERENCE

- (a) Collection of plant specimens have been done and further proceeding continued.
- (b) Collection of ecological data through laid quadrats in fields have been done and analysis of data was completed.
- (c) Ethnobotanical informations regarding the plants which are used for various purposes were listed in field note book and their mode of application, type of uses and purpose of uses were also listed. Compilation have been done.

.. 2 ..

(d) Various enquiries regarding the wildlifes and birds found in the survey areas were noted in field book.

(e) Socio-economic aspect have been done with special emphasis to livestock, domestic animal population, labour pattern, social status of farmers, agricultural methodology, male, female population, status of various ethnic groups etc. done. Collected data were compiled.

(f) Various forest compartments and revenue submergence villages of SSP were enumerated to findout the wealth of growing stock. Data collected and analysed.

7. METHODOLOGY OF INVESTIGATIONS

Methodology for the collection of the informations pertaining to the ecological status, floristic composition, limnological components, enumeration of growing stock, ethnobotanically important plant species, livestock and socio-economic status was same as described in the previous reports.

8. MONTHWISE WORK DONE

April 1992 : VIth quarterly project report of S.S.P. was finalised. The data collected from January '92 to March '92 was compiled and analysed. The Second Annual Report of this project was also finalised. and submitted vide letter No.SFRI/NVDA/89/1688 dated 22.5.92 and submitted to financing authority vide letter No.SFRI/NVDA/ 92/1260 dated 20.4.92. Leftout areas of Khargone, Alirajpur were again visited for present investigation.

May 1992 : Several forest areas having different vegetation types were visited. The visit was also made in proposed National Park and Sanctuary areas falling in Dhule District of Maharashtra and Turanmal National Park area. Some forest villages under impact areas of Barwani tehsil and revenue villages of Kasrawad, Thekri and Dharampuri teshils (submergence areas) were visited and data regarding the aspect involved in present investigation were collected.

June 1992 : Several villages of Barwani, Dharampuri, Thekri and Mathwar forest ranges were completed and data collected and analysed.

.. 3 ..

9. RESULTS OBTAINED AND ANALYSIS

9.1 Enumeration

During the assessment of growing stock, leftover forest compartments, forest villages and revenue villages of submergence areas were visited. The collected field observations during April '92 to June '92 were analysed and divided into two main groups (a) Enumeration in forest compartments, and forest beats (b) Enumeration in revenue villages.

There were ten forest compartments enumerated the results of which are given in Table 2. Various revenue villages were also surveyed for the enumeration. Data have been summarised in Table 3A & 3B.

9.2 Ethnobotanical and Ecological Study

The information given by the local villagers and inhabitants were noted down in the field proforma and found that no additional information is available which might have been left out in previous report.

Regarding the ecological studies several quadrats were laid and data were collected with special reference to dry biomass and green biomass. After the analysis of data the results are given in Table 4, 4A & 4B.

9.3 Fauna

Nothing new was observed in the villages surveyed.

9.4 Socio-Economics Aspects

Extensive survey was conducted in the submergence area of Kasrawad, Thikari and Barwani Tehsil in Khargone district. 35 villages were surveyed in the quarter as given in Tables 5 to 10 in submergence areas. The main idea of socio-economic survey was to find out the per capital annual domestic energy consumption pattern and source of fodder for livestock. During survey it was observed that where forests are not available the popular substitute for firewood is cotton stalks.

Firewood is also available from lopping of *Pointiana alata* (Sandeshra), *Acacia nilotica*, *Azadirachta indica* etc. planted on field bunds.

.. 4 ..

9.5 Effect of Submergence on Land and Forest

It has been estimated that Madhya Pradesh having an area of 4,42,841 sq km, area under submergence is about 196 sq km. Three districts of Dhar, Jhabua and Khargone having an area of 8149, 6781 and 13441 sq km the forests cover respectively of 1399 ha (5.43%), 1902 ha (9.95%) and 5022 ha (11.94%) areas.

There are 45 forest compartments coming under submergence due to S.S.P. It was observed that 8 compartments have an area ranging from 1-5 ha, 6 compartments with 6-10 ha, 4 compartments with area between 11-20 ha, 16 compartments having 21-50 ha area, 8 compartments with area between 51-100 ha and 3 compartments with 101-205 ha areas in Dhar and Jhabua districts. In Khargone district and Barwani Forest Division instead of compartment, beats are coming under submergence. In this case also the beat areas are getting submerged partly. (Table - II)

Once the certain areas are submerged the remaining forests are likely to get benefitted due to increase in water-level. The area being dry and denuded moisture scarcity is major constraint. With the availability of moisture in the areas the growth and productivity of forests in upper patches is likely to improve. In the near vicinity of water however, change in flora, replacing species of semi-arid species by moisture loving species. However, in the upper reaches of the reservoir water would recede after 10-15 days and species like *Terminalias*, *Acacia nilotica*, *Dalbergia sissoo* would survive and grow better. Even in respect of teak also it would be moist teak replacing dry-scrub type trees of teak. Status of ground flora would also invariably improve with moisture and fresh silt deposits.

10. MODIFICATION REQUIRED

Not necessary at this stage.

11. WORK PLAN FOR NEXT QUARTER

1st July 1992 to 30th September 1992

- i. Survey of villages in impact areas of Khargone and Jhabua districts.
- ii. Collection of plant species present in Jhabua district.

.. 5 ..

- iii. Collection and recording of fauna present in Khargone district.
- iv. Ethnobotanical studies with special reference to collection of information of multipurpose plant species found in Khargone and Jhabua districts.
- v. Enumeration of tree species in different girth and quality classes in the impact and submergence areas of Khargone and Jhabua districts so as to determine the physical depletion of biomass. Value assessment of standing forests in submergence area.
- vi. Assessment of ecological status of flora particularly the plant density, frequency, abundance and cover of ground vegetation and limnological study in Jhabua district.
- vii. Survey and collection of information in various villages regarding dependence of man and his livestock on various forest products in Jhabua and Dhar districts in submergence areas and impact areas.
- viii. Preparation of eighth quarterly report of the SSP and synthesis of results obtained.
- ix. Survey of villages within 2 km and 2 to 5 km from the submergence area. Collection of information on fuel head loads for bonafide use and for earnings. Also gather informations on collection of non-wood forest products.

12. CONSTRAINTS

General mood of the villagers in submergence areas appear to be softening. However, the activists continue to threaten survey parties. Survey work therefore has to be done with pseudo names.

.. 6 ..


13. FINANCIAL PROGRESS

Expenditure incurred upto 30.6.1992

S.No.	Item	Amount (Rs.)
1.	Honoraria/Salaries	6,25,945
2.	Wages for hiring labours to assist	45,766
3.	Contingent field expenses	24,458
4.	T.A./D.A.	38,602
5.	House Rent Allowance	29,177
6.	Organising Seminars	9,629
7.	Maintenance, fuel & oil	81,256
8.	Stationery/Posting/Printing	11,760
9.	Contingent expenses	57,909
10.	Rent expenses for field office/station	18,264
11.	Contractual services photocopy, drawing	13,461
		9,56,227

Certified that an amount of Rs.9,56,227/- (Rs. Nine Lakhs fifty six thousand two hundred twentyseven only has been incurred on scheme during 1990-91 to 1992-93 i.e. from the starting of the scheme i.e. from 1.9.90 to 30.6.92.

Dated:


Project Director
&
Director
State Forest Research Institute,
Jabalpur, M.P.

/francis/

IX. PHYSICAL WORK DISTRIBUTION :

A. OFFICIALS

- | | | |
|----|--|--|
| 1. | Dr. Ram Prasad
Director,
SFRI, Jabalpur | Overall supervision, guidance,
administration of the Project. |
| 2. | Shri S.P. Singh
Dy. Director (Research),
SFRI, Jabalpur | Work Plan and Work Execution |
| 3. | Dr. Jiten Kumar
Dy. Director (Seed)
SFRI, Jabalpur | Organisation of work plan. |
| 4. | Shri G.L. Shrivastava
Nodal Officer (ACF)
SFRI, Jabalpur | Providing guidance of field camp
arrangements, administration,
enumeration, supervision, taking
care of progress etc. |
| 5. | Dr. Pratibha Bhatnagar
SFRI, Jabalpur | Provide guidance for Socio-Econo-
mic studies. |
| 6. | Shri D.L. Bhagat
RRO Napanagar | Assisting in collection of field
data |
| 7. | Shri R.M. Shukla,
Dy. Ranger, Indore | - do - |
| 8. | 3 Forest Guards of RRO Napanagar | |

B. PROJECT ASSISTANTS - FIELD INVESTIGATORS

- | | | |
|----|-------------------------|--|
| 1. | Shri G.P. Date | Compilation and analysis of data,
writing of report etc. |
| 2. | Dr. S.K. Masih | Compilation of data on flora and |
| 3. | Mr. Manish Mishra | fauna |
| 4. | Shri D.P. Dixit | As above. |
| 5. | Shri Sanjay Shrivastava | Socio-Economic Survey. |
| 6. | Shri Anil Shrivastava | - do - |
| 7. | Shri D.K. Ghodke | Cartography (Mapping etc.)
Dealing of important etc. |

Table : 1 Various Submergence villages surveyed during this quarter.

A. District - DHAR

Submergence Village

I Kukshi Tahsil

1. Kothala
2. Kikerwas
3. Nisharpur
4. Katnera
5. Raswa
6. Chikhalda
7. Rakti
8. Bhilsur
9. Dharamrai
10. Chhachhkua

II Dharmapuri Tahsil

11. Sulgone
12. Khatadgone
13. Hatnawar
14. Khujava
15. Dharampuri
16. Guleti
17. Nimola
18. Bhawgone
19. Nagjhhiri
20. Pipaldagari
21. Lunehara
22. Khalkhurd
23. Morgarhi
24. Shahpura
25. Khalbuzurg
26. Beganda
27. Uchchawat
28. Lasangone
29. Sala
30. Gajipura

III Manawar Tahsil

31. Baravara
32. Ratwa
33. Jatpur
34. Sarasgone
35. Achhoda
36. Dagadpura
37. Sharikpura
38. Narayanpura
39. Perkhad
40. Semlda

B. Distict - JHABUA

Submergence Villages

IV Alirajpur Tahsil

1. Mahalgone
2. Chilkada
3. Jalsindhi
4. Kakersela
5. Amma (Bada)
6. Dubkhadda
7. Sakarja

C. District - KHARGONE

Submergence Villages

V. Kasrawat Talsil

1. Dalkheda
2. Mubarkbad
3. Adalpura
4. Kothora
5. Bhatbadiya
6. Gyanpura
7. Bhoinda
8. Ghatbadiya
9. Rehampura
10. Khalkhurd
11. Chichli
12. Khalbuzurg
13. Akbarpura
14. Jalanpur
15. Belgone

VI. Thikari Tahsil

16. Kesharpura
17. Panya
18. Kirmohi
19. Pichhola
20. Khedikhurd
21. Takayapur
22. Lohara
23. Mandwara
24. Nalwai
25. Vishwanathkheda
26. Mahgaon
27. Lankhangaon
28. Gawla (Nalwai)
29. Brahmangaon
30. Mohipura

VII. Barwani Tahsil

31. Bijasan
32. Bhawti
33. Segome
34. Sondul
35. Simrali

VIII. Maheshwar Tahsi

36. Semlda
37. Jalkoti

Table : 2 Tree growth standing in forest compartments of district Jhabua

Compartment No.	Different Girth Classes								Total
	up to 20 cm	20/30	31/45	46/60	61/90	90/120	120/150	Over 150	
37	136	51	22	18	20	7	4	-	258
38	3084	1986	247	350	239	122	30	10	6068
55	1262	1097	305	269	136	88	13	7	3317
56	982	585	151	149	83	13	5	4	1972
58	413	158	181	74	62	26	4	7	925
60	1293	330	30	26	16	4	2	-	1701
75	842	428	239	114	74	41	14	5	1757
76	1288	724	16	20	4	3	3	-	2058
77	525	282	153	121	37	18	8	2	1146
87	683	388	368	169	166	26	6	2	1808
Total 10	10508	6029	1712	1310	837	348	89	37	20870

Table 3: Tree growth standing revenue village in S.S.P. Areas

Name of Village (District)	Different Girth Classes								Total
	up to 20 cm	20/30	31/45	46/60	61/90	90/120	120/150	Over 150	
Jangarwa (Jhabua)	8044	2753	2162	1524	377	169	37	27	15088
Bhamta (Jhabua)	8074	4503	1709	1177	755	183	55	13	16469
Sondul (Khargone)	6905	2383	2267	1538	1054	375	20	3	14445
Pipri ("")	3645	793	1579	746	212	37	16	10	7038
Ghatbodya ("")	2200	1276	880	240	156	15	10	6	4783
Adalpura ("")	3111	612	237	45	126	11	14	7	4163
Total	31879	12320	8834	5270	2680	790	152	66	61991

Table 3B: Enumeration of Tree standing in the submergence Areas of S.S.P. (Work done during April 92 - June 92)

Name of Villages		Total No. of trees	Density /ha
1	Bijasan	6429	
2	Borkhedi	7295	18.91
3	Morkatta	9567	28.30
4	Bhawati	8662	16.93
5	Amlali	6609	19.42
6	Awalda	3784	12.96
7	Jangarwa	15088	58.03
8	Bharuta	16469	53.82
9	Sondul	14445	24.49
10	Pipai	7028	36.70
11	Ghatbadva	4783	20.35
12	Adalnura	4163	19.54

404322

Table 4: Green Biomass on grounds in Kasrawad Tahsil (W.N.)

No. of Samples laid	Biomass g/1mx1m	Biomass t/ha
1	1250	12.5
2	1100	11.0
3	1200	12.0
4	1150	11.5
5	1500	15.0
6	1800	18.0
7	1540	15.4
8	1650	16.5
9	1100	11.0
10	1250	12.5
11	1290	12.9
12	1300	13.0
13	1340	13.4
14	1700	17.0
15	1540	15.4
16	1125	11.2
17	1650	16.5
18	1450	14.5
19	1320	13.2
20	1530	15.3
<hr/>		
	27785	
	1389.25	
	209.34	
	SD \pm 214.78	
	SE \pm 10.73	

Table 4 A: Dry Biomass On grounds in Kasrawad Tahsil.

No. of Samples laid	Biomass g/1mx1m	Biomass t/ha
1	450	4.5
2	445	4.5
3	420	4.2
4	390	3.9
5	1295	12.9
6	290	2.9
7	450	4.5
8	600	6.0
9	450	4.5
10	440	4.4
11	350	3.5
12	625	6.2
13	450	4.5
14	425	4.2
15	500	5.0
16	295	2.9
17	360	3.6
18	270	2.7
19	480	4.8
20	460	4.6
<hr/>		
Total	9500	
Mean	475	
SD \pm	.467	
SE \pm	.02	

Table 4B: Biomass Productivity

No. of quadrates	Different Ecological Sites	
	Green	Dry
Mean Biomass (g/m ² /m)	1323.25	475.00
Mean Biomass (kg/ha)	13.23	4.75
SD ±	758.79	0.465
SE ±	17.08	0.02

Table 5: Per Capita Annual Domestic Energy Consumption in submergence area of S.S.P. in Khargone District (Tehsil Kasnawat)

S.No.	Distance from forest	Name of village	No. of Respondent	Per Capita Annual Energy Consumption in quintals		
				Fuelwood	Agri. Residue	Dung Cake
1.	Away from Forest	Kesharpura	98	0.97	6.09	1.08
2.	-do-	Panya	210	1.08	5.97	1.32
3.	-do-	Kirmoni	156	1.16	5.33	1.44
4.	-do-	Pichhola	195	1.08	5.72	1.40
5.	-do-	Khedikhurd	135	1.22	5.89	1.31
6.	-do-	Takayapur	170	1.53	5.67	1.72
7.	-do-	Lohara	190	1.24	5.14	1.84
8.	-do-	Mandawada	847	1.63	5.21	1.93
9.	-do-	Nalwai	166	1.46	6.02	1.04
10.	-do-	Vishwanatkhedha	215	1.83	5.92	1.14
11.	-do-	Mehgone	185	1.17	5.07	1.69
12.	-do-	Lakhangone	227	1.28	5.93	1.45
13.	-do-	Gawala (I)	60	1.42	5.82	1.29
14.	-do-	Brahamangone	418	1.31	5.97	1.71
15.	-do-	Mohipura	461	1.43	5.88	1.35

Table 6: Per Capita Annual Domestic Energy Consumption in submergence area of S.S.P.
in Khargone District (Tehsil Kasrawar)

Distance from forest	Name of village	No. of Respondent	Per Capita Annual Energy Consumption in quintals		
			Fuelwood	Agri. Residue	Dung Cake
1. Away from forest	Dalkhoda	150	1.62	5.54	1.30
2. -do-	Mubarakabad	95	1.53	6.01	0.93
3. -do-	Adalpura	45	1.32	5.87	1.01
4. -do-	Kathora	300	.98	5.98	1.53
5. -do-	Bhoinda	400	.89	8.10	1.41
6. -do-	Ghatbadiya	40	1.71	5.79	1.12
7. -do-	Khalkurd	200	0.93	5.89	1.27
8. -do-	Chichli	312	1.02	6.03	0.89
9. -do-	Khalbuzurg	178	1.13	5.63	1.19
10. -do-	Akawarpura	102	.94	6.19	1.68
11. -do-	Jalanpur	65	1.68	5.75	1.75
12. -do-	Balgone	200	1.29	5.94	1.64

57

Table 7: Per Capita Annual Domestic Energy Consumption in submergence area of S.S.P.
in Khargone District (Tehsil Barwani)

S.No.	Distance from forest	Name of village	No. of Respondent	Per Capita Annual Energy Consumption in quintals		
				Fuelwood	Agri. Residue	Dung Cake
1.	Surrounded by Forest	Simrall	90	6.20	0.95	0.53
2.	Near Forest	Bijason	323	4.68	2.07	0.96
3.	-do-	Bhawti	406	4.73	2.18	0.88
4.	-do-	Segone	139	4.84	2.32	1.04
5.	-do-	Sondul	619	4.72	1.98	1.10

Table 8 Showing percentage of cattle grazing in agriculture and forest areas according to the distance from submergence area in Khargone District (Tehsil Kasrawat)

S.No.	Name of village	Limit of cattle grazing	Percentage of cattle grazing		Distance of village from forest	Type of forest
			Agri Area	Forest Area		
1.	Dalkheda	4 km	100	-	above 25 km	Cultivated area
2.	Mutarakabad	3 km	100	-	-do-	-do-
3.	Adalpura	3 km	100	-	-do-	-do-
4.	Kothora	4 km	100	-	-do-	-do-
5.	Bhoinda	3 km	100	-	-do-	-do-
6.	Ghatbadiya	3 km	100	-	-do-	-do-
7.	Khalkhard	2 km	100	-	-do-	-do-
8.	Chichli	3 km	100	-	-do-	-do-
9.	Khalbuzurg	2 km	100	-	-do-	-do-
10.	Akawerpura	4 km	100	-	-do-	-do-
11.	Jalanpur	4 km	100	-	-do-	-do-
12.	Balgone	3 km	100	-	-do-	-do-

Table 9 Showing percentage of cattle grazing in agriculture and forest areas according to the distance from submergence area in Khargone District (Tehsil Thikari)

S.No.	Name of village	Limit of cattle grazing	Percentage of cattle grazing		Distance of village from forest	Type of forest
			Agri Area	Forest Area		
1.	Kesharpura	3 km	100	-	above 25 km	Cultivated area
2.	Panya	3 km	100	-	-do-	-do-
3.	Kirmohi	3 km	100	-	-do-	-do-
4.	Pichhola	3 km	100	-	-do-	-do-
5.	Khedikhurad	3 km	100	-	-do-	-do-
6.	Takayapur	3 km	100	-	-do-	-do-
7.	Lohara	2 km	100	-	-do-	-do-
8.	Mandawada	3 km	100	-	-do-	-do-
9.	Nalwai	4 km	100	-	-do-	-do-
10.	Vishwantakheda	3 km	100	-	-do-	-do-
11.	Mehgone	2 km	100	-	-do-	-do-
12.	Lakhangone	2 km	100	-	-do-	-do-
13.	Gawala (Nalwai)	2 km	100	-	-do-	-do-
14.	Brahmangone	2 km	100	-	-do-	-do-
15.	Mohipura	3 km	100	-	-do-	-do-

Table 10 Showing percentage of cattle grazing in agriculture and forest areas according to the distance from submergence area in Khargone District (Tehsil Barwani)

S.No.	Name of village	Limit of cattle grazing	Percentage of cattle grazing		Distance of village from forest	Type of forest
			Agri Area	Forest Area		
1.	Simrali	3 to 4 km	8	91	0 km	Poor IV + b. quality in very few areas and revenue areas of mixed forest /shrubs and havily encroached
2.	Bijason	3 to 4 km	20	80	3 to 5 km	-do-
3.	Bhawti	3 to 5 km	22	78	-do-	-do-
4.	Segone	3 to 5 km	18	82	-do-	-do-
5.	Sondul	3 to 5 km	25	75	5 to 7 km	-do-

File Name = a:nvda1 (Nvda - ws)

Table 11 : Percentage Effect of Submergence on Geographical and Forest Areas

Sardar Sarovar Submergence Area effect in Madhya Pradesh		
Total Geographical area of M.P. in sq kms	(Area in sq km) Total Submergence area in sq kms	% of Submergence area with respect to total Geographical area
4,42,841	196	0.0442596

Table 12 : Districtwise details of Submergence

Name of District	Total Geographical area	Total Forest area of District	Submerge forest
Jhabua	6781	1902	9.35
Dhar	8149	1399	5.43
West Khargone	13441	5022	11.94
Total	28371	8323	27.32
Submergence Area	196	27.32	-
Percentage	0.690	0.325	-

Table 13 : Forest Submergence Areas effected according to Compartments

Districts	Submergence area in ha	No. of Compartments
Jhabua and Dhar	1 to 5	8
	6 to 10	6
	11 to 20	4
	21 to 50	16
	51 to 100	8
	101 to 205	3

@ 45 Compts.

Note : R.F. area of Badwani (Khargone) has not been divided into Compts. hence the information could not been given. @ Each compt's area is about 200 to 250 ha

Average width of Sardar Sarovar Submergence water in forest blocks from its boundary lines

Less than 1/4 to 1/2 km width strip

1. Dhar District 20 kms
2. Jhabua District 37 kms
3. West Nimar (Khargone) 28 kms

NARMADA CONTROL AUTHORITY

Environment Sub Group

16th meeting

9th November 1992

Agenda

AGENDA FOR 16TH MEETING OF THE ENVIRONMENT SUB-GROUP
NCA TO BE HELD ON 9TH NOVEMBER, 1992 AT PARYAVARAN BHAVAN,
NEW DELHI

I N D E X

Item Nos.	Contents	Page No.
XVI-1(82)	Confirmation of the Minutes of the Fifteenth meeting of the Environment Sub-Group.	1
XVI-2(83)	Review of Action taken on the decisions of previous meetings.	2 - 9
XVI-3(84)	Present status of Studies/ Surveys and Environmental Action Plans.	10 - 20
	Any other Item	21
	Date & Venue of next meeting	21

ANNEXURES

XVI-1	Letter of AIS & LUSO regarding report on catchments.	1
XVI-II	NGVOs desires to carry out catchment area treatment works.	2 - 17
XVI-III	Status report of Environmental aspects for the period ending September, 1992.	18 - 33
XVI-IV	Copy of letter to Govt. of Maharashtra to enlist the support of NGVOs for catchment area treatment works	34
XVI-V	Comments of Member (E&R) on the proposals of JL University.	35
XVI-VI	List of sub-watersheds of high & very high categories identified by AIS & LUSO & as per guidelines of Min. of Water Resources.	36 - 45

**Item No. XVI-1(82) : CONFIRMATION OF THE MINUTES OF THE
FIFTEENTH MEETING.**

Minutes of the fifteenth meeting of Environment Sub-group of Narmada Control Authority were circulated to all Members and Invitees separately vide letter No.ENV/34(15)/92/2023 dated 23rd September, 1992. No comments have been received.

The minutes may be confirmed.

Item No.XVI-2(83): REVIEW OF ACTION TAKEN ON THE DECISIONS OF THE PREVIOUS MEETING

1. Consideration of Policy Issues

a) Extent of Catchment Area Treatment at Project Cost (Item No. XV-2(79) (a)):

The issue of the extent of catchment area to be treated at project cost was decided by the Govt. of India during June, 1992. Accordingly critically degraded sub-watersheds of very high and high priority category directly draining into the reservoir are being treated up at project cost in addition to the catchment area which is directly damaged by the project activities.

The states were directed to prepare and submit plans for treatment of the balance of the critically degraded "Very High" and "High" categories of the sub-watersheds to be executed early but seperately by funds from centrally sponsored schemes of Ministry of Agriculture or any other source.

b) Extension of Time for Environmental and Forestry Approval (Item No.XV-2(79)(b)):

NCA already addressed MOE&F on the issue. The revised construction schedule and the sche-dule for implementation of action plan of environmental safeguard measures was enclosed with the agenda of the 15th meeting of environment sub-group and will also be made available, if necessary during the meeting for review of the sub-group.

2. Submission of Catchment Area Treatment plans for freely draining critically degraded sub watersheds. (Item No. XV-2(79)(a))

During the last Environment Sub-group meeting Govt. of Maharashtra agreed to submit a plan for balance of the critically degraded freely draining sub-watersheds whereas GOMP stated that with regards to NSP, reports for the four sub catchments are still awaited from AIS & LUSO whereas with regard to SSP NVDA was to reconcile figures with AIS & LUSO. In response to a letter from Member (Civil), NCA, AIS & LUSO indicated that reports for 2 sub catchment out of 4 are likely to be issued by July, 1992 whereas balance 2 reports are at draft stage, letter received from AIS & LUSO is annexed as XVI-1. The issue was further discussed by Executive Member, NCA with AIS & LUSO on 22nd October, 1992. It is indicated that reports are getting finalised. Dr. Thawakar, Director has been invited to attend the sub-group meeting on 9th November, 1992 and he will give the latest picture in the meeting.

Govt. of Maharashtra and Govt. of Madhya Pradesh are to report the progress on the issues referred above. Since the reconciliation of figures is over, the clear picture of directly draining high and very high areas of SSP, Maheshwar and Omkareshwar maybe indicated by GOMP.

Several Non governmental voluntary organisations have approached Ministry of Water Resources and NCA and there are some non governmental organisation who have done commendable works on soil conservation and catchment treatment. Sub-group may like to consider recommending some such agencies for engaging them in catchment area treatment works or preparation of plans in the states of Madhya Pradesh and Maharashtra may be under direct supervision of Govt. of India/autonomous organisations. Copies of correspondence in this matter are enclosed as Annexure XVI-II.

3. Time frame for Environmental Studies. (Item No. XV-2(79)(b)).

During the last Environment Sub-group meeting Chairman desired that NCA as well as Govt. of Maharashtra should keep in touch with the project Director, School of Environmental Science, Pune University, Pune to emphasis the need for quick completion of the studies under progress for the areas coming under submergence in Maharashtra. In pursuance a meeting was held on 9th September, 1992 at Pune wherein officers of NCA, Govt. of Maharashtra and Scientists of the investigating team participated. During the meeting project Director, School of Environmental Science and his colleagues agreed to scrutinise all available reports and data

currently available with sister organisations and to submit an interim report by the end of December, 1992. They also agreed for quick completion of the studies in the submergence area but emphasised the need for detailed investigations in the area above submergence so as to recommend effective mitigative measures. GOM would like to follow up to avoid any possible infringement of pari passu clause.

4. **Cost Estimates for preparation of Action Plan and implementation of Environment Safeguard Measures (Item No. XIV- 2(77))**

The fragmented information on estimated cost and expenditure incurred by the party states as available in NCA secretariat were compiled and presented during the 15th environment sub-group meeting. Some corrections suggested by GOMP were incorporated and the information as available during the meeting was circulated alongwith the minutes. No further details are received from any other party states. Governments of Madhya Pradesh, Maharashtra, Gujarat and Rajasthan are requested again to kindly submit the information in the format presented. The figures supplied during the last environment sub-group meeting may also be updated upto September, 1992.

CATCHMENT AREA TREATMENT**Studies**

- i) Prioritization of catchment by AIS&LUSO, New Delhi**
- ii) Prioritization & thematic mapping by ISRO for area in Gujarat.*

Implementation (Phy. ha, Fin. Rs. Crores)

Treatment	Targets		Achievements		Date
	Phy.	Fin.	Phy.	Fin.	
<u>A. Govt. of Gujarat</u>					
a) Non-forest Area	3025	2.41	1171	1.1	June'92
b) Forest Area	27204	32.68	9309	6.08	June'92
<u>B. Govt. of Madhya Pradesh</u>					
a) Non-Forest Area	72000	25.20	7650*	2.09*	June'92
b) Forest Area	18000	18.73	-	-	
<u>C. Govt. of Maharashtra</u>					
a) Non-Forest Area	21200	29.41	-	-	
b) Forest Area	4200	2.2	-	-	
Say	145630	107.38	16470	8.43	

II. COMPENSATORY AFFORESTATION (Physical target in ha & Fin. in Rs. Crores)

	<u>Targets</u>		<u>Achievements</u>		<u>Date</u>
	Phy.	Fin.	Phy.	Fin.	

A. <u>Govt. of Gujarat</u>					
a) Non Forest	4650	8.15	2500	2.98	June, 92
b) Degraded Forest	9300	9.42	2834	2.45	June, 92
B. <u>Govt. of Madhya Pradesh</u>					
a) Non Forest	21901		10891		
b) Degraded Forest	65471	18.00	13321	3.76	June, 92

	<u>Targets</u>		<u>Achievements</u>		<u>Date</u>
	Phy.	Fin.	Phy.	Fin.	

C. <u>Govt. of Maharashtra.</u>					
a) Non Forest	9000:	37.00	-	-	June, 92
b) Degraded Forests	13000:		8383	9.42	

	44687	72.57	16138	16.43	

* Incomplete works

** Works were carried out under the budget of AIS&LUSO.

III. Flora fauna (including wildlife & fisheries) & Carrying Capacity (FFC) of the areas adjoining submergence.

(In Rs. Crores)

Estimated Cost Cost incurred

A. Govt. of Gujarat.

a) Studies in 1982 by M.S. University.	-	-
i) Sanctuary improvement works	0.75	0.59
ii) Downstream fisheries by CICFRI**	-	-
b) Studies on FFC by M.S. University in 1992	0.34	0.20
c) Studies on wildlife management 1992	0.16	0.05
d) People's participation in sanctuary management by VIKSAT***	-	-
e) Fisheries plan for Estuary & Command *	4.00	-

B) Govt. of Madhya Pradesh

a) Studies by State Forest Research Institute on flora, fauna (wildlife)	0.203	0.103
b) Liminological studies by three universities (Aquatic fauna & Water quality)	0.19	0.14
c) Fisheries plan (SSP)*	0.82	-

	<u>Estimated Cost</u>	<u>Cost incurred</u>
C) <u>Govt. of Maharashtra.</u>		
a) Flora, Fauna, Carrying Capacity by School of Environmental Science, Pune University, Pune.	0.38	0.16
b) Fisheries plan (Tank * pond & reservoir fisheries)	1.66	-
D) <u>Narmada Control Authority</u>		
a) Sociological Survey of fishing families.	0.14	0.14
IV. <u>COMMAND AREA DEVELOPMENT.</u>		
<u>Govt. of Gujarat.</u>		
a) Studies	1.58	-
b) Implementation	685.00	-
<u>Govt. of Rajasthan</u>		
a) Studies	-	-
b) Implementation	-	-
V. <u>HEALTH ASPECT.</u>		
a) <u>Govt. of Gujarat.</u>		
i) Hospital	0.47	0.5
ii) Laboratories	2.36	
iii) Infrastructure	1.77	
iv) Anti Malaria	3.44	
v) Insecticidal spray	30.06	
	38.00	
b) <u>Govt. of Madhya Pradesh.</u>		
a) Surveillance of malaria	0.11	0.018
b) Implementation for NSP, Omkareshwar, Maheshwar & SSP projects.	7.49	
	7.60	
* From State Budget		
** Project under Ministry of Agriculture		
*** Studies by World Bank's assistance.		

	<u>Estimated Cost</u>	<u>Cost incurred</u>
c) <u>Govt. of Maharashtra.</u> <u>R&R site.</u>		
a) Establishment of PHC & 3 sub-centres at R&R site.	0.2315	
<u>10 km belt around SSP.</u>		
a) 12 new sub-centres	0.3124	
b) Mobile health unit	0.0323	
c) Education health material	0.0200	

	0.5962	

Say Rs. 0.60 Crores		

VI. RIM STABILITY & SEISMICITY. (to be reported by All the States)

- a) Cost of studies
- b) Implementation

VII. ARCHAEOLOGICAL/ANTHROPOLOGICAL.

a). <u>Govt. of Gujarat.</u>		
i) Cost of survey		
ii) Cost of Implementation		
b). <u>Govt. of Madhya Pradesh.</u>		
i) Cost of Survey		
ii) Cost of Implementation		
c). <u>Govt. of Maharashtra.</u>		
i) Cost of Survey	-	-
ii) Cost of Implementation	-	-
e) <u>Rashtriya Manav Sanghralya*</u>		
i) Paleontological studies	0.019	0.01
ii) Ethneological studies	0.007	0.007
iii) Tribal Art & culture	0.026	0.026
f) <u>Anthropological Survey of India*</u>		
i) People of India	-	-
ii) Narmada salvage plan	-	-

N.B : The missing information may please be furnished by all concerned immediately.

Item No. XVI-3(84): **PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS**

The latest status report of studies and activities on environmental issues under consideration of the sub-group for the quarter ending September, 1992 is placed at annexure XVI-III. The progress/present position of the issues under consideration is briefly given below for review by the Sub-group.

A list of free draining sub-watersheds (with identifying codal markings) of high and very high priority categories as identified by AIS & LUSO together with a list of such sub-watersheds directly draining identified as per guidelines of Ministry of Water Resources is enclosed at Annexure XVI-VI. Maps are very voluminous and hence cannot be enclosed. A set is already made available to the Ministry of Environment & Forests. A set will also be made available during the meeting for consultation if required.

i) **Phased Catchment Treatment**

Narmada Sagar Project

According to the details of critically degraded sub-watersheds to be treated at project cost, given in the status report annexed herewith, GOMP is required to treat sub-watersheds spread to 58510 ha. GOMP has taken up the treatment of entire 58510 ha identified so far and has submitted action plans in June, 1991 to be completed by 1996-97 covering a total non forest area of 47,000 ha and a forest area of 6,424 ha at a total cost of Rs.

22.23 crores. The GOMP may please submit the plan for the balance area of 5086 ha for catchment area treatment to make 11,510 ha of forest area.

During review in the last sub-group meeting GOMP indicated a short fall of 4925 ha out of total target of 6000 ha for 1991-92 and indicated revised target of 13925 ha of non forest area and 2175 ha of forest areas to be treated during 1992-93 which included the above short fall.

The total progress reported is 683 ha in forest area and 5890 ha non forest area totalling to 6573 ha till the quarter ending of September, 1992. The up to date progress may be reported and the total targets under compensatory afforestation and catchment area treatment should be clearly indicated after adjusting the figures as desired by the Chairman, Environment Sub-group earlier.

Sardar Sarovar Project

Govt. of Madhya Pradesh

According to the details of critically degraded sub-watersheds contained in the status report annexed GOMP is required to treat sub-watersheds spread to 90,000 ha and submitted the plan to MOE&F for the same. According to the plan submitted it is proposed to treat 72,000 ha of degraded forest and 18,000 ha of non forest areas.

According to the action plan submitted GOMP was required to treat 6000 ha of non forest areas during 1991-92. But the works could not be completed in all respects in any of the areas.

During the last sub-group meeting GOMP indicated a total target of 17100 ha on non forest areas in addition to 4000 ha of forest areas for the year 92-93. However GOMP reported that there is no progress on treatment of forest areas for the simple reason that the officers and staff could not be posted in time and indicated that the progress will be achieved during 93-94 monsoon only. Regarding the non forest areas also, against the target of 17100 ha GOMP reported a progress over 968 ha area only. GOMP would like to indicate the reasons for the short fall and also may like to take up other measures of treatment than planting in forest areas during non monsoon period.

Govt. of Gujarat

According to the details of critically degraded catchment of high and very high priority categories contained in status report annexed herewith GOG is required to treat 29575 ha of directly draining sub-watersheds of high & very high priority categories. However according to GOG the actual catchment area is 30229 ha and the entire area is taken up for treatment. The detailed action plan alongwith the drawing were supplied to the MOE&F. Govt. of Gujarat vide letter No.

SSNNL/ENV/271/91 dated 27.6.91 has revised the plan for completion by 1994-95. Against a cumulative target of 9310, the achievement was 9298 ha till 1991-92. During 92-93 Govt. of Gujarat was to carry out the treatment works over 6000 ha areas. Upto date progress may be reported. Besides, GOG is yet to report the progress on reconciliation of the extent of catchment area in Gujarat upstream of Sardar Sarovar Project.

Govt. of Maharashtra

According to the details on critically degraded sub-watersheds of high and very high priority categories GOM is required to treat 25395 ha of sub-watersheds.

Serious concern has been expressed by Chairman for non commencement of catchment area treatment works in Maharashtra as per the plans submitted earlier and pointed out that this is infringing the pari passu clause. In order to avoid any complication later on he desired that GOM may like to prepare a contingent plan to complete the treatment works in a short time of 3 years. This plan should cover treatment of the areas synchronising with commencement of impoundment due to dam during the current season.

The progress on preparation of contingent plan to treat the entire area in 3 years is yet awaited.

During the last sub-group meeting GOM was requested to carry out works in areas where no hostility existed. No progress has been reported by GOM as yet. In the recent past some of the NGOs have expressed willingness

of taking up the catchment area treatment works based on successful experience derived by them elsewhere. In this connection the letter received from Ministry of Water Resources were addressed to GOM to enlist the support of such NGOs. A copy of the letter is annexed as Annexure-XVI-IV. Sub-group may like to review present position on non commencement of catchment area treatment works in Maharashtra.

ii) Compensatory Afforestation

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP has a target of 14062 ha during 92-93 and reported a progress over 11919 ha in degraded forest areas and 1390 ha on non forest areas. Thus a total of 13309 ha of afforestation works are completed against the target of 14062 till September, 1992. The upto date progress may be reported by GOMP.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP is required to afforest 1960 ha of degraded forest in addition to 427 ha of non forest land during 92-93 adding upto 2387 ha areas. Against this target GOMP reported a progress over 2400 ha by the end of September, 1992. This included 1200 ha each of forest and non forest land in district Khargone, Jabua and Dhar. The figures may be confirmed.

Govt. of Gujarat

GOG reported that works are going on as scheduled and only two seasons are left for completion. The cumulative progress reported for afforestation in non forest area is 2500 ha against a target of 4650 ha and in forest area 2834 ha against 9300 ha. However upto date progress is to be reported by GOG.

Govt. of Maharashtra

The cumulative progress reported for reforestation in degraded forest area is 8383 ha against a total target of 13,000 ha. Progress of afforestation in non forest area is not reported so far. The target for afforestation of non forest area for 92-93 is 2290 ha and cumulative target is 9190 ha. GOM is to report the progress of afforestation on non forest and degraded forest land and upto date progress on the works initiated/completed so far. GOM may also like to submit location map of the areas being planted up alongwith details of composition of species, survival rate, spacing and other inputs provided to the crop.

iii) COMMAND AREA DEVELOPMENT

Narmada Sagar Project

Govt. of Madhya Pradesh

The progress in awarding the work of drawing up the drainage master plan may be reported. Regarding effect of insecticides and pesticides from the run off from the fields and the proposal received from JL University by NVDA formed the annexure of the minutes of the 15th

meeting, the comments sent by Member (Civil), NCA on the same are enclosed and marked as Annexure-XVI-V. GOMP is to report on drawing terms of reference for carrying capacity studies of the command area in line with the studies being carried out in Gujarat.

Sardar Sarovar Project

Govt. of Gujarat

During the last environment sub-group meeting GOG was directed to make available a copy of the TOR finalised by GOG for undertaking impact assessment studies for the areas in Kutch. The TOR is not yet made available. GOG also agreed to furnish all the relevant details desired by Chairman for incorporating in the bar charts. However the same are also still awaited.

Govt. of Rajasthan

Govt. of Rajasthan would like to report the complete details of the studies entrusted on impact assessment on the line that are being taken up by Gujarat.

iv) SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES

Narmada Sagar Project

Govt. of Madhya Pradesh

NVDA would like to report the developments of the meeting held by it on 26th August, 1992 on the reports submitted by Friends of Nature Society. A copy of the report of Friends of Nature Society desired by MOEF during the last sub-group meeting is yet awaited.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP would like to submit the progress report for the quarter ending September, 1992 from the State Forest Research Institute, Jabalpur.

Govt. of Gujarat.

A seminar was organised by Govt. of Gujarat on 25th August, 1992 at Vadodara to discuss the draft final report submitted by M.S. University. GOG may like to report further developments with respect to preparation of action plans, cost estimates etc for implementation of the resulting recommendations.

Govt. of Maharashtra

The progress of studies being carried out by School of Environmental Science, University of Pune may be reported.

v) ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY

ANTHROPOLOGY

Anthropological Survey of India has earlier indicated that in view of the studies going on no further studies are required on anthropological aspect. However during the last sub-group meeting Dr.K.S.Singh indicated that AnSI would like to carry out intensive studies in 4 to 5 villages within a short period of 1 to 2 months with the help of NVDA and other project agencies. Director, AnSI has been addressed in this regard by NCA. The steps taken for quick completion of the studies may be reported by Director, AnSI.

ARCHAEOLOGY

Government of Madhya Pradesh

Narmada Sagar Project

The progress of preparation of action plans for relocation/protection of centrally protected monuments viz Joga Fort and Chatri of Bhaji Rao Peshwa as well as state protected monuments may be reported.

Sardar Sarovar Project

The action plan was scheduled for submission by Department of Archaeology and Museum, GOMP initially by end of June, 1992 and extended later to September, 1992. GOMP is yet to report the progress.

Govt. of Gujarat.

GOG is to report further progress on construction of the temple to house the deity of Shoolpaneshwar Mahadev and also the action plan for relocation of Hamfeshwar temple.

vi) SEISMICITY AND RIM STABILITY OF RESERVOIR

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP is to report the progress on rim stability studies.

Sardar Sarovar Project

In pursuance of the draft report on rim stability submitted by GSI, some tracer studies were suggested to confirm or deny the suspected loss of water in the reach between Mandleshwar and Rajghat. Chief Engineer, NVDA had discussion on this issue with CW&PRS at Pune in the

first week of June, 1992 subsequently Executive Member, NCA alongwith Dr. Shenoi of GSI had a meeting with research team of CW&PRS at Pune on 9th September, 1992 wherein it was decided that the research team of CW&PRS would visit the site in November alongwith the officers of GSI to prepare an action plan and also cost estimates for conducting studies, if required.

vii) **HEALTH ASPECTS**

Govt. of Madhya Pradesh

Narmada Sagar Project and Sardar Sarovar Project

GOMP has reported that the construction of hospital at Nisarpur will be taken up at Stage-II for catering to the needs of population rehabilitated for Sardar Sarovar Project. However it indicated that surveillance of malaria and other diseases is being carried out by Gandhi Medical college, Bhopal. The progress on other components like parameters of water quality suggested by MOE&F on the health plan may be reported.

Sardar Sarovar Project

Govt. of Gujarat

GOG would like to report the progress on implementation of health plan.

Govt. of Maharashtra

Chairman expressed unhappiness over non finalisation of health plan by GOM for the last fifteen months. The plan incorporating baseline data is not yet made available. The progress may be reported by GOM.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

Govt. of Madhya Pradesh

GOMP was requested to bring out a clear picture on the conservation aspect of the fisheries based on the reports of Friends of Nature Society, Liminological studies etc, these are still awaited.

Govt. of Gujarat

During the last environment sub-group meeting, Secretary, SSCAC informed the sub-group that a study has been commissioned on fisheries by GOG recently, the terms of reference required to be submitted to the sub-group by GOG as desired by the Chairman, are still awaited. A copy of the annual report for the period 1991-92 of CICFRI regarding works in Gujarat is yet to be furnished by GOG.

Govt. of Maharashtra

Fisheries plan prepared by GOM was made available to MOE&F, comments are awaited.

Narmada Control Authority

Desk review studies on status of studies on fish conservation in Narmada Sagar and Sardar Sarovar Projects and its downstream is entrusted to CICFRI.

Any Other Item

Date & Venue of next meeting.

ANNEXURES

ANNEX - XVI - (I)

Phone : 622293
634731
Gram : SOILSURVEY



भारत सरकार
Government of India
कृषि मंत्रालय
Ministry of Agriculture
(कृषि तथा सहकारिता विभाग)
(Department of Agriculture & Cooperation)
अखिल भारतीय मृदा एवं भू उपयोग सर्वेक्षण
ALL INDIA SOIL & LAND USE SURVEY
सी. पी. डब्ल्यू. डी. काटोल रोड कॉलोनी,
C. P. W. D. Katol Road Colony

नागपुर-४४००१३
NAGPUR-440013

No. T.6/1992/AISN/786

Date 1-7-92

To
✓ The Member (Civil),
Narmada Control Authority,
Vishal Tower, Indira Complex,
Navlakha, Indore-452001.
(M.P.)

Sub. : Priority delineation reports and maps in respect
of Narmada Catchment (Narmada Sagar).

Sir,

I am directed to refer to your letter No. Env-4(2)/92/1021 dated 18.5.92 on the aforesaid subject. The status of the different reports pertaining to Narmada Sagar is furnished below for your information. The steps have already been taken to expedite the early issue of the remaining reports pertaining to Narmada Sagar of Narmada Catchment.

<u>Subcatchment</u>	<u>Status of Report</u>
1. Nk	Report issued (AGRI- 771) & AGRI-839.
2. Nm	-do- AGRI-845
3. Nn	-do- AGRI-771
4. Np	-do- AGRI-845
5. Nq	-do- AGRI-845
6. Nr & Nr'	Likely to be issued in July, 1992.
7. Ns & Ns'	Draft report is with the H.Q. New Delhi for approval.
8. Nt	Likely to be issued in July, 92.
9. Nu & Nu'	The report is in drafting stage.

Yours faithfully,

(S.N.Das.)

Sr. Soil Survey Officer.

Copy to the Chief Soil Survey Officer, AIS&LUS, New Delhi-12 for
information with ref. to his letter No. T.1-2/92-AIS/3435 dt. 18.6.92.

(S.N.Das.)
Sr. Soil Survey Office

ANNEX - XVI (II)

D.C. DEBNATH
EXECUTIVE MEMBER

D.O.No. F04(2)/91/1002

April 28, 1991

3.

Dear Shri Oke

On 26th April morning, we visited Adgaon village to see the Soil and Water Conservation works carried out by Adgaon Vikas Trust under the overall guidance of Shri Vijay Borade. In the background of the information furnished by Shri Borade in respect of the conditions obtaining in the area earlier, the job done by him appears to be simply wonderful. Irrespective of the Basic Data furnished by him, his dedicated service and the selfless leadership which infused a spirit of work in the farmers is really praiseworthy. Subject to being situated in the similar natural conditions and facilities like electricity etc. extended to the area, the achievements made are really worth replication at other places.

I am told that the Research Division based at Aurangabad has your directive to monitor the basic data in respect of the project. The information furnished to us by Shri Borade is as under:

1. The total area of the catchment is about 3000 ha-60% of the area is utilised for recharge and rest of the area for cultivation.
2. In the recharge area also, they are planting crops; in fact in some areas afforestation has also been done.
3. The basic principles of Soil & Water Conservation appear to have been followed.
4. At a number of places check dams have been constructed to arrest silt and impound storm water with a view to improving the underground recharge.
5. It is reported by Shri Borade that the ground water table was rather very very low before they took up the area in 1982. Even drinking water was not available from the Wells and Government had to arrange for supply of drinking water through water tankers.

6. With a number of check dams and the pondage created thereby ground water recharge takes place very significantly. In addition, parallel ridges constructed in the recharge zone also hold water and in addition to recharge, help raising of crops in the space between ridges. With this, in addition to meeting the drinking water demand they are in a position to raise two crops from June to February with the help of lift irrigation through pumping from some 154 open large dia wells.

We inspected one well located near one such check dam and found water even on our day of inspection i.e. 26th April. The water level in the well was almost as deep as the bottom of the adjoining pond or at best may be a little deeper but only marginally.

7. On some fields we found very good field crops and at places they are also adopting drip irrigation for ~~these~~ crops.
8. We went inside the village Adgaon and had some discussions with the villagers. Most of them are having pucca buildings and it appears that they are all happy.

Some basic questions in respect of the data ~~given~~ as intimated by Shri Borade require to be verified as under:

1. The pond capacity and depth of water etc. behind the check dams do not give a convincing idea that there could be so much of recharge to the ground water as has been claimed by Shri Borade. The depth of the natural ground water table therefore requires to be ascertained. It would be very nice, if you could arrange to get data of the ground water table of this village or one of the adjoining localities starting from 1982 from which year he stated that they had started the work in Adgaon.
2. The depth of ground water table also required to be monitored specially just before the first rains of pre-monsoon and before the onset of regular monsoon when the water table is supposed to be the lowest.
3. Soil characteristics especially its water holding capacity, permeability, infiltration characteristics etc. are also required. Normally in black ^{soil} soil, infiltration and permeability are supposed to be very low.

At a number of places in the plain areas, lift irrigation is done from large dia dug wells which indicates there is plenty of ground water and the level of the ground water is also quite high. In that event agriculture is definitely possible and recharging phenomenon as reported to me may not be of such significance.

The soil cover in the area has also to be ascertained to form an idea as to whether water percolates down into the soil or just gets accumulated over the underlying rock strata.

I am requesting for this information with a view to arriving at a scientific explanation of the achievements made by Shri Borade. Whether recharge is there or not, there is no question of in anyway under-estimating the service rendered by him. The above information may, therefore, kindly be furnished ~~information~~ so that we can form a view of replicating the process in some of the river basins of the country, especially Narmada.

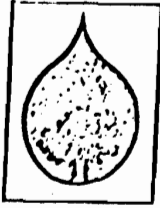
While in Adgaon, I was informed that the Irrigation Research Division, Aurangabad under the control of the Director (Research), Pune, has installed broad crested weirs for measurement of flow in the expected recharge zone. Possibly this Division may already have the data sought by me and can also be instructed to monitor the water levels in the wells in the irrigated zone on a monthly basis in addition to recording the flows for which arrangements have been made by it.

An early reply is requested.

Yours Sincerely,

Dr 29/4/91
(D.C. DEBNATH)

Shri M.Y. Oke,
Commissioner (CADA) & Secretary (Irrigation),
Government of Maharashtra,
Mantralaya, BOMBAY-400 032.



गंगोत्री
श्रम... विकास प्रवाहिका

Pune
1st January 1992

Ms Radha Sinh.

Joint Secretary,
Ministry of Water Resources,
Shrama Shakti Bhavan,
New Delhi, 110 001.

Subject : Participation of 'GANGOTREE' in the Catchment
Area Treatment of Sardar Sarovar.

Dear Madam,

We thank you for sparing your valuable time for discussions with us, at the Shrama Shakti Bhavan, last month. Your valuable guidance in the Water Resource Planning will definitely help us in future.

During the discussions, you had enquired whether we could take up the work of planning for the Catchment Area Treatment of Sardar Sarovar, for the Ministry of Water Resources. After giving a careful thought to this proposal, we communicate here, to offer our services to the Ministry of Water Resources.

To crystallise the ideas further, we would like to have some more clarification regarding the following items. What will be the scope of this assignment? What will be the time duration? How and from where will the project start? What will be the financial arrangement? With whom should we establish further contact concerning this project? We would further like to know what the Ministry of Water Resources has done so far in this connection.

झोपले अजून माळ तावकीत नासा ।
असंछा या नद्या अजून वाहतात कासा ॥
अजून हे अपार दुःख काट पाहतारे ।
अजून हा प्रचंड देश भिक मागतारे ॥

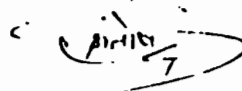
पत्ता : प्रदीप समूह, १०७०, शुक्रवार पेठ, पुणे ४११ ००२. दूरध्वनी : ४२०९२८, ४३०९४२.

51

This information will help us to formulate a formal proposal. More details can be worked out and discussed after we visit the project area. It will be convenient for us in the beginning, to work in the catchment area from within the State of Maharashtra.

Awaiting your communication and wishing you a very
HAPPY NEW YEAR, we remain,

Yours sincerely,



(Santosh Gondhalekar)

Gram : NARCONTROL
Phone : 0731-461381



नर्मदा नियंत्रण प्राधिकरण
NARMADA CONTROL AUTHORITY

IMMEDIATE

D.C. DEBNATH
EXECUTIVE MEMBER

विशाल टावर,
इन्दिरा परिसर, नवलखा
इन्दौर-452 001 (म. प्र.)
Vishal Tower,
Indira Complex, Navalakha
INDORE-452 001 (M. P.)

D.O.No. E-4(2)/91/ 1903

Dated the 21st August, 1991.

Dear Shri Thapliyal,

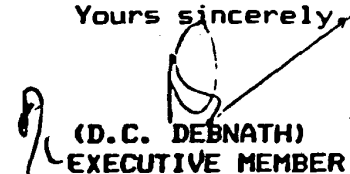
You might perhaps be aware of soil & Water Conservation works carried out by Adgaon Vikas Trust under the overall guidance of Shri Vijay Borade in Adagaon village, Aurangabad, Maharashtra. The work, dedicated service and unique leadership depicted by Shri Borade has been appreciated by everybody who visited his work. The Chairman, NCA desires if we could utilise the services of Shri Borade to get some such model work done in Madhya Pradesh which could be replicated. We need a small water shed of 1000 ha or so with a small village so that the planning as done for Adgaon could be done here also at the time of the visit of Shri Vijay Borade. Instead of one such locations it would be advisable to keep a number of such locations/sites so that after the visit he could select one for adoption.

I would request you to kindly look into the matter and on getting a positive response from you, we would invite Shri Vijay Borade for visiting the site. I am sure during his visit you will also kindly remain present.

A very early action is requested.

With regards,

Yours sincerely,


(D.C. DEBNATH)
EXECUTIVE MEMBER

Shri Thapliyal,
Member (Env. & Forest),
Narmada Valley Development Authority,
Narmada Bhawan,
Tulsi Nagar,
Bhopal.



माधव चितले
M.A. CHITALE
Tel. 3710305

सचिव
भारत सरकार
जल संसाधन विभाग
SECRETARY TO THE GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
BHARAM BHAKTI BHAWAN, RAJI MARG

नई दिल्ली-११०००१, दिनांक 27 अगस्त, 1991
New Delhi-110001

19

प्रिय संतोष,

आपका 18 अगस्त का पत्र प्राप्त हुआ। यह छर्प की बात है कि आप के साथ और भी नये युवा अभियंता जल स्रवण क्षेत्र के विकास कार्य में जुट जाना चाहते हैं।

अब तक आपने जो पानी के संतुलित हिसाब के अध्ययन किये हैं उसके निष्कर्ष आप इंडियन वाटर रिसोर्सिज सोसायटी के जर्नल में प्रकाशित कर पायेंगे जिससे इस सोसायटी के सदस्यों सदस्यों को भी आपके अध्ययन से लाभ मिल पायेगा।

पानी के संतुलित हिसाब के साथ साथ ऊर्जा के संतुलित हिसाब और पोषण द्रव्यों का संतुलित हिसाब जोड़ना काफी कठिन रहेगा, किन्तु उस दिशा में आप जो प्रयास कर रहे हैं उनकी अवश्य सराहना होगी। इस विषय में भी जैसे जैसे आप आगे बढ़ेंगे, वैसे वैसे आपके निष्कर्ष प्रकाशित करने की कार्रवाई अवश्य करें।

आपको विदित होगा कि सरदार सरोवर जैसे महा प्रकल्पों में भी जलप्रपातों के तटों पर विद्यमान छोटे छोटे जल स्रवण क्षेत्रों का 12 हजार हेक्टर से 5 हजार हेक्टर का एकक मानकर पर्यावरणीय विकास करने का प्रावधान किया हुआ है। इस प्रकार से कुछ 1.5 लाख हेक्टर का 200 किलोमीटर लम्बाई के सरदार सरोवर जलप्रपात के तटों पर विकास करना है। इसके लिए 45 करोड़ रुपये की मंजूरी भी प्राप्त है। किन्तु कठिनाई इस बात की है कि इस प्रकार के पेचीदे काम में सफलता प्राप्त कुशल संपर्कों की कमी है। इसीलिए अगर गंगोत्री की ओर से इनमें से किसी क्षेत्र - एककों के विकास के लिए आप कार्य स्वीकार करें तो इस काम में आपका बड़ा सहयोग हो पायेगा। इस दृष्टि से आप महाराष्ट्र के निम्नलिखित सचिव से कृपया तुरन्त अवश्य सम्पर्क करें :

श्री माधव राव ओक,
सचिव, कमान क्षेत्र विकास,
महाराष्ट्र शासन,
"मंत्रालय" मुम्बई ।

अगर आप महाराष्ट्र के बाहर भी मध्य प्रदेश अथवा गुजरात में काम करना चाहेंगे तो नर्मदा नियंत्रण प्राधिकरण के कार्यकारी सदस्य श्री डी० सी० देवनन्द से सम्पर्क करें जिनका

.....2/-

- 2 -

पता इस प्रकार है :-

श्री डी०सी० देबनाथ,
कार्यकारी सदस्य, नर्मदा नियंत्रण प्राधिकरण,
विशाल टावर, इन्दिरा कम्प्लेक्स,
नौलखा, इंदौर -452 001 [मध्य प्रदेश]

छोटे छोटे जल स्रवण क्षेत्रों का बड़ा प्रकल्पों के साथ प्रयोग औपचारिक तौर पर पहली बार सरदार सरोवर प्रकल्प में ही किया जा रहा है अन्यथा बड़े जल स्रवण क्षेत्रों को भिन्न और छोटे जल स्रवण क्षेत्रों को भिन्न क्षेत्रों में प्रयोग होता रहता था। सरदार सरोवर प्रकल्प के अनुभव के आधार पर आगे चलकर इस दिशा में और क्या सुधार हो सकते हैं इस पर गौर करना संभव होगा।

कुछ बड़े प्रकल्पों का आप अध्ययन करना चाहते हैं तो इस बारे में महाराष्ट्र की उपलब्धियों पर आप आसानों से अपना ध्यान केन्द्रित कर सकते हैं। सोलापुर जिले में स्थित भीमा प्रकल्प, पुणे और अहमदनगर जिले में कुकडी, जलगांव में गिरणा प्रकल्प, परभणी जिले में पूर्णा और बोड जिले में मंजारा प्रकल्प आप नमूने के तौर पर आपके अध्ययन के लिए अवश्य दृष्टि में लें। वहां के अधिकारी आपको सहयोग देंगे और जो कुछ जानकारी प्रकल्प के संदर्भ में आप चाहते हैं, आपको अवश्य दे पायेंगे। इन प्रकल्पों के क्षेत्रीय अधिकारियों के पते आपको सिंचाई सचिव, श्री माधव राव ओक जी से मिल पायेंगे। आप कृपया उनसे सम्पर्क करें।

पुणे में कार्यरत पाटबंधारे संशोधन तथा विकास संचालनालय जिसके श्री सु०य० कुलकर्णी संचालक हैं और औरंगाबाद में स्थित जल तथा भूमि व्यवस्थापन संस्थान जिसके संचालक मधुकर जी पेंडसे हैं इनसे भी आप जल स्रवण क्षेत्र विकास के संबंध में तथा अन्य सिंचाई योजनाओं के कार्यान्वयन के संबंध में जानकारी प्राप्त कर पायेंगे। उनके पत्राचार के पते इस प्रकार हैं :

श्री सु०य० कुलकर्णी,
अधीक्षक अभियंता एवं निदेशक,
पाटबंधारे संशोधन तथा विकास,
8, मोलेडीना रोड,
अरोड़ा टावर के सामने, पुणे-411 001

पत्रकारिता की विश्वविद्यालयीन पदवी प्रथम श्रेणी में प्राप्त होने के उपलक्ष में आपका हार्दिक अभिनन्दन। जैसाकि आपने लिखा है इंडियन वाटर रिसोर्सिज सोसायटी के सदस्य आप अवश्य बनें, जिससे आपका अखिल भारतीय अभियंताओं के विचार-मंचन से सम्पर्क बना रहेगा। महाराष्ट्र में 20 से 30 सितम्बर के बीच मेरे आने की संभावना

.....3/-

- 3 -

है। शायद 27 और 28 सितम्बर को मैं औरंगाबाद में रहूँगा। आप भी घेड़से जा से मेरे कार्यक्रम के बारे में पूछताछ कर पायेंगे।

गंगोत्री के संदर्भ में जो छोटा सा प्रस्तुती पत्र आपने भुझे भेजा है, उसके एक एक प्रति कृपया ऊपर लिखे सभी अधिकारियों को जानकारी के लिए भक्ष्य भेजें।।

आपका शुभेच्छु,

Madhava

माधव चितले

श्री संतोष गोपळेकर,
"गंगोत्री" पत्रिका कार्यालय,
प्रबोध समूह, 1070,
शुक्रवार पेठ, पुणे 411 002

प्रति, श्री डी०सी०देबनाथ, कार्यकारी सदस्य, नर्मदा नियंत्रण
प्रधिकरण, नैलम्बा, इन्दौर ।

2. श्री माधव राव ओक, सचिव, कमान क्षेत्र विकास
महाराष्ट्र शासन, मंत्रालय, मुम्बई।

यथोचित कार्रवाई के लिए।

प्रति, संयुक्त सचिव [पी०पी०] को आवश्यक जानकारी के लिए।

No. Env-4(2)/92/ 1022

13th May, 1992

To

Shri Santosh Gondhalekar,
Gangotree Prabodh Samooh,
1070, Shukrawar Peth,
PUNE - 411 002.

Ref: Your letter dated March 1, 1992.

Dear Sir,

With reference to your letter addressed to Smt. Radha Singh, Joint Secretary, Ministry of Water Resources, Govt. of India referred above, your kind attention is invited to the letters addressed to you by Secretary to the Govt. of India, Ministry of Water Resources, a copy is enclosed herewith (which is self explanatory) for ready reference. However for the catchment treatment works in Madhya Pradesh areas, a letter is already addressed to Shri D.R. Thapliyal of NVDA by this office on 13.9.91. You may like to get in touch with him. His address is given below.

Shri D.R. Thapliyal
Member (Env. & Forests)
Narmada Valley Development Authority,
Narmada Bhawan, Tulsi Nagar,
BHOPAL -(M.P.)

Yours faithfully,

(K.M. JOSEPH)
Member (Civil)

Copy forwarded to Shri A.K. Barua, Under Secretary to the Govt. of India, Ministry of Water Resources, with reference to his letter dated 31.3.92 for information.

(K.M. JOSEPH)
Member (Civil)



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

No.Env-4(2)/92/1157

3rd June, 1992

To

Shri U.K. Mukhopadhyay,
Secretary (Environment),
Government of Maharashtra,
Mantralaya,
Bombay

Sir,

Kindly find enclosed herewith a copy of Vetiver news letter of June, 1991 published by the World Bank. Vide page-3 it is seen that Dr. Bharad from PKV University in Akola, Maharashtra has been awarded the second prize by a panel of two judges for consistantly excellent research work carried out over the last four years on measuring the on-farm impacts of contour vegetative barriers of vetiver grass. In this connection kindly refer to the khus plantation work being carried out by your organisation as a part of the Catchment Area Treatment programme with respect to Sardar Sarovar Project. If the need requires Dr. Bharad may be consulted. The extract of his findings to be perused at page 15 and 16 of the enclosed news letter and his address would be perused at page 3.

Yours faithfully,

Encl: As above


(Dr. Pawan Kumar)
Specialist (Environment)



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

No.Env-4(2)/92/1156

3rd June, 1992

To

Shri D.R. Thapliyal,
Member (Environment),
Narmada Valley Development Authority,
Tulsi Nagar,
Bhopal

Sir,

Kindly find enclosed herewith a copy of Vetiver news letter of June, 1991 published by the World Bank. Vide page-3 it is seen that Dr. Bharad from PKV University in Akola, Maharashtra has been awarded the second prize by a panel of two judges for consistently excellent research work carried out over the last four years on measuring the on-farm impacts of contour vegetative barriers of vetiver grass. In this connection kindly refer to the khus plantation work being carried out by your organisation as a part of the Catchment Area Treatment programme with respect to Sarder Sarovar Project. If the need requires Dr. Bharad may be consulted. The extract of his findings to be perused at page 15 and 16 of the enclosed news letter and his address would be perused at page 3.

Yours faithfully,

Encl: As above


(Dr. Pawan Kumar)
Specialist (Environment)



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

No.Env-4(2)/92/1158

3rd June, 1992

To

Shri N.C. Dave,
Secretary (E&R),
Government of Gujarat,
New Sachivalaya Complex,
Gandhinagar

Sir,

Kindly find enclosed herewith a copy of Vetiver news letter of June, 1991 published by the World Bank. Vide page-3 it is seen that Dr. Bharad from PKV University in Akola, Maharashtra has been awarded the second prize by a panel of two judges for consistantly excellent research work carried out over the last four years on measuring the on-farm impacts of contour vegetative barriers of vetiver grass. In this connection kindly refer to the khus plantation work being carried out by your organisation as a part of the Catchment Area Treatment programme with respect to Sardar Sarovar Project. If the need requires Dr. Bharad may be consulted. The extract of his findings to be perused at page 15 and 16 of the enclosed news letter and his address would be perused at page 3.

Yours faithfully,

Encl: As above


(Dr. Pawan Kumar)
Specialist (Environment)

VETIVER NEWSLETTER

NEWSLETTER OF THE VETIVER INFORMATION NETWORK, ASTAG*,
WORLD BANK, NUMBER 6, JUNE 1991.

Second Place (US\$ 2000) - Dr. G.M. Bharad from PKV University in Akola, Maharashtra, India for the consistently excellent research work he has carried out over the last four years on measuring the on-farm impacts of contour vegetative barriers of vetiver grass and leucaena, of graded earthen bunds and of farming with no conservation measures. Dr. Bharad was one of the people who early on grasped the importance of vetiver grass and the opportunities it opened up in conservation farming;

Third Place (US\$ 1000) - Drs. P.N. Truong, I.J. Gordon and M.G. McDowell from the Land Management Research Branch of the Queensland Department of Primary Industries, Brisbane, Australia for their work on the effects of salinity on vetiver grass. Prior to this work indications from both the literature and other sources had led to the unchallenged belief that vetiver grass was highly sensitive to saline conditions; this work arrives at different conclusions and potentially opens up tens of thousands of hectares of degrading saline lands worldwide as sites where contour vegetative barriers of vetiver grass may be utilized to halt and reverse land degradation. Dr. Truong has also been active in introducing and spreading the word about the vetiver system in Australia.

The Panel also chose four recipients to receive US\$ 500 awards for their work. The awardees are: Dr. Zhang Xinbao of the Institute of Mountain Disaster and Environment in Chengdu, China; this award is given for the All China Vetiver

Information Network of which Dr. Zhang is the head. The role of the network in popularizing and providing practical information on vetiver within China is invaluable and represents the best of local initiative and innovation in extending technologies for sustaining agriculture. Mr. Wang Zisong, Deputy Director of the China Red Soils Project; this award is given to further the excellent work of those in Fujian Province who over the last two years have been working to define management systems, carry out trials and demonstrate the usage of vetiver grass while working with farmers to extend the vetiver technology. Dr. S. Subramanian, Professor and Head, Regional Research Station, Aruppukottai, Tamil Nadu, India for his work on effects of contour vegetative barriers on soil moisture which compared vetiver, leucaena, desmanthus and cenchrus hedgerows. Dr. Subramanian's work has also included the management of vetiver. Dr. Françoise Dinger of the French Institute of Agricultural Engineering Research, Grenoble Regional Centre, Natural Hazards and Upland Erosion Control Division, St-Martin d'Hères, France for his work on multiplication (vegetative and tissue culture) and adaptability to sub-humid mediterranean climatic conditions in nutrient poor, eroded sites. Dr. Dinger's work could potentially introduce vetiver grass into a zone in which erosion rates (as a result of removal of native vegetation) are very high and, for climatic reasons, revegetation is extremely difficult.

The Network also had offered a US\$ 2000 award for any

other plant species that would be at least as suitable as vetiver for creating contour vegetative barriers. A number of individuals expressed interest in presenting alternative species, however, in the end only three people did. The review panel felt that while the information presented was interesting, none of the three submissions presented sufficient information for judging and/or they presented information on species which are known not to meet the criteria of, at a minimum, being as suited as vetiver as a contour vegetative barrier. The Network would like to thank these individuals: Mr. N.B. Hiremath of Karnataka, India (Subabul - *Leucaena leucocephala*), Mr. Gao Welsin of Chengdu, China (Napier grass - *Pennisetum purpureum*), and Messrs. Wang Jing, Su Zhongren, and Liu Zhengjie (Bhabar grass - *Eulaliopsis binata*). As the US\$2000 was not awarded, the Network has utilized these funds to print copies of Dr. P.K. Yoon's excellent report; the copies are being disseminated to a number of individuals and institutions around the world who are active in farming systems and natural resource conservation concerns. One copy each will also be sent to those who submitted alternative species. The Network can have copies of Dr. Yoon's report printed for interested individuals, though the printing costs are US\$ 35/copy as the report contains quite a number of color photographs. An unbound black and white copy may be had for free through the Network—as can any other report featured in this or other Newsletters.

The Network would like to

**EXTRACTS FROM ROLE OF
VETIVER GRASS IN SOIL AND
MOISTURE CONSERVATION BY
DRS. G.M.BHARAD AND B.C
BATHKAL**

Around 90 percent of the area in Vidarbha, apart of semi arid tropics, are put to rainfed agriculture. Rainfall in these areas is seasonal, limited and uncertain creating dry spell situations which result in high between-year annual variances in yield. Improvement in agro-ecosystems (productivity, stability, sustainability and equitability) in these areas is a priority. Rain water management for improved in-situ conservation of natural resources (viz. water and soil) has been identified as a main concern for this rainfed agriculture.

Very recently the watershed has become accepted as basic unit for the management of organic and biophysical resources. However, in India, unlike some other countries, the land holdings owned by farmers are very small and are often divided along (up and down) the slope; the farmers have a very strong sense of possession for their land.

Taking mechanical (structural) measures to control erosion and runoff from these fields is often not feasible in these areas. The cost of structures also act as an inhibitory factor.

Greenfield (1987) introduced the concept of vegetative hedges (Vetiver) on the contour for in-situ conservation of soil and water in rainfed areas under the World Bank-aided Manoli Watershed Development Project. Punjabrao Krishi Vidyapeeth University was given the task of carrying out the research and training component of this project. Comprehensive on-station and on-farm research was formulated and is being executed with continuous refinement since the 1987 kharif season.

Materials and Methods

The on-station research programme was located in a model watershed (25 ha) developed in 1987 with the central objective of dealing with planning for development, execution and monitoring of watershed management activities. Along with the development of various systems, a monitoring block with seven large runoff plots (128m x 28m) was established with the required equipment to look at crop

productivity, surface runoff and soil loss. The average main and lateral slopes are 1.6% and 0.7%, respectively. Three plots have a shallow soil with a sandy loam texture and the other four are medium-deep soils with a clay loam texture. The treatments on the shallow soil plots consist of: i) across the slope cultivation; ii) contour cultivation along a Leucaena keyline and; iii) contour cultivation along a Vetiver keyline. In the medium-deep soils a fourth treatment was added - cultivation along a graded bund (0.2% grade). On-farm trials were initiated in the 1988-89 season on farmer's fields in the Chambhai micro-watershed (very shallow soil) where the average slope is less than 2%. The treatments are: i) along the slope sowing; ii) contour sowing along a vetiver keyline; iii) untreated nonarable lands and; iv) nonarable land with continuous contour trenches.

Results and Discussion

1. Productivity

1.1 Shallow Soils (Model Watershed, University farm)

Mean productivity of crops viz. green gram + Pigeon Pea-Safflower (1987-88), Pearl millet-Safflower (1988-89) and pearl millet (1989-90) grown on shallow soils was seen to be favorably influenced by contour cultivation. The average productivity recorded by contour cultivation along vetiver, followed by leucaena and across the slope (Table 4)

1.2 Medium Deep Soils (Model Watershed, University farm)

Productivity of sorghum hybrid CS11-9 (1988-89) with contour cultivation along vetiver key line was highest. Grain yield

Table 4. Effect of conservation measures on crop productivity (Q/ha) on Shallow Soils in Model Watershed

Treatment	1987-88	1988-89	1989-90	Total	Mean	% (+) Increase (-) decrease
Across Slope Cultivation (T ₁)	11.05	20.91	13.72	45.68	15.23	
Contour Cultivation Along Leucaena (T ₂)	14.21	21.76	14.91	50.88	16.96	+ 11.35
Contour Cultivation Along Vetiver (T ₃)	17.34	22.88	18.50	58.72	19.57	+ 28.50

of hybrid Sorghum was seen to be reduced with the graded bund system when compared with across the slope sowing during a season with very high rainfall (1356 mm.). During the year 1989-90 the increase recorded in yield of sorghum R-73 by contour cultivation along vetiver was again the highest. (Table 5).

1.3 Very Shallow Soils (Manoli Project Area)

On farmers field in the Chambhai micro-watershed, contour cultivation along a vetiver keyline increased yields 45% in 1988-89 (rainfall = 1109mm) and 25% in 1989-90 (rainfall = 669mm) compared to along the slope cultivation.

2. Surface Runoff

2.1 Shallow Soils (Model Watershed, University Farm)

Contour cultivation along vetiver keylines resulted in lower total runoff over the three seasons. Runoff from the contour cultivation along Leucaena keylines was lowest in year one; Contour cultivation along vetiver keylines was lowest in the second and third years (Table 6).

2.2 Medium Deep Soils (Model watershed University farm)

The surface runoff from Sorghum was consistently less from the contour cultivation along vetiver keylines plot for all three years. The runoff from the graded bund system recorded from July to August 1989 was recorded, however, the runoff from September onwards could not be recorded due to over-topping (Table 7).

2.3 Very Shallow Soils (Manoli Project Area)

The rainfall recorded at the Chambhai micro-watershed during 1988 and 1989 seasons was about 1778 mm (1109mm first

Treatment	1987-88	1988-89	Total	Mean	% (+) increase (-) decrease
Across Slope Cultivation (T ₁)	29.28	38.24	67.50	33.75	
Contour Cultivation Along Leucaena (T ₂)	31.80	41.88	73.68	36.84	+ 9.15
Contour Cultivation Along Vetiver (T ₃)	33.28	43.80	77.08	38.54	+ 14.19
Cultivation Along Graded Bund (T ₄)	27.00	42.82	69.82	34.91	+ 3.43

Table 5. Effect of conservation measures on crop productivity (Q/ha) on Medium Deep Soils in Model Watershed

season and 669 mm the second). Total runoff from along the slope sowing, contour sowing along a vetiver keyline, untreated nonarable lands and nonarable land with continuous contour trenches was 445mm, 171mm, 378mm, and 87mm, respectively.

3. Soil Loss

3.1 Shallow Soil (Model Watershed, University Farm)

Maximum soil losses were recorded during the month of July followed by August. Soil losses were highest 1989 due to the high rainfall and increased runoff. Cumulative and average soil losses were less from the contour cultivation with vetiver keyline system than that from the other plots (Table 6).

3.2 Medium Deep Soil (Model Watershed, University Farm)

The same pattern for soil loss was observed in the Medium Deep Soils as was observed in the Shallow soils with contour cultivation with vetiver keyline system showing the least soil losses.

Conclusions

Higher productivity of crops under on-station and on-farm trials with adoption of contour cultiva-

tion was mainly due to uniform in-situ soil and moisture conservation over the entire toposequence reflected in terms of lesser surface runoff and soil loss. Similarly contour cultivation along the vetiver key line was found to be more effective in terms of arresting surface runoff and soil than with the leucaena key line. This is attributed to the formation of a dense, uniform and continuous barrier. This has also resulted in higher productivity. In case of Leucaena, during the first year the barrier was quite good. However, with age, some shoots began to dominated the adjoining seedlings resulting in open barriers adjacent to the ground surface.

The graded bund system was found to enhance runoff and soil loss and in high rainfall situations the productivity was lower than even the across the slope sowing plots. The vetiver barriers functioned both in low and high rainfall situations and did not effect the crop in any way. In view of the above results, it could be inferred that the contour cultivation along vetiver key lines for raising crops is necessary to

ANNEX - XVI - (III)

STATUS REPORT OF STUDIES AND ACTIVITIES
REGARDING THE ENVIRONMENTAL ASPECTS OF
SARDAR SAROVAR PROJECT (SSP)
SEPTEMBER, 1992

The present status of studies/preparation of action plans and implementation, in respect of suggested Environmental Safeguard Measures is as indicated below:

Suggested Environmental Safeguard Studies/Measures

- 1) Phased Catchment Area Treatment.
- 2) Compensatory Afforestation.
- 3) Command Area Development.
- 4) Flora, Fauna & Carrying Capacity.
- 5) Seismicity.
- 6) Health Aspects.
- 7) Archaeological & Anthropological Studies.
- 8) Fisheries.
- 9) Rim Stability Analysis.

1) PHASED CATCHMENT AREA TREATMENT

- All India Soil & Land Use Survey Organization, New Delhi submitted its report on prioritization of watersheds in April, 1991.

- The total catchment area of SSP below NSP is 2468973 ha.

	Madhya Pradesh	Gujarat	Maharashtra	Total for the Basin
Total Catchment	2248601	36761*	163611	24,68,973 ha
Very High & High	541825	35412	163354	6,93,591
Directly draining Very High & High	90000	29575	25395	1,44,973

*According to Govt. of Gujarat, the actual catchment area is only 30229 ha and entire area is planned for treatment.

- In accordance with the decision of the Govt. of India on the extent of catchment area to be treated at the project cost, the lands identified as of 'high' and 'very high' erodibility categories situated in the Sub-watersheds directly draining into the reservoirs in addition to the areas damaged directly by the project activities are being taken up for treatment by the State Governments.

Government of Madhya Pradesh (90,000 ha)

In SSP catchment in M.P., 34 sub-watersheds have been identified for treatment. They cover an area of about 90,000 ha., 20% of which is estimated to be forest land. Treatment has been planned separately for forest and non forest areas.

The programme and progress is given below:

Programme and Progress of Catchment Area Treatment in M.P. (90,000 ha) (in ha.)

	92-93 Target/ Progress	93-94	94-95	95-96	96-97	Total esti- mated cost at price level of 1990 (Rs.crores)
Non-forest area/ha (72,000 ha)	17100 968*	17000	16900	15000	6000	25.20
Forest area/ha (18,000ha)	4000 Nil	4000	4000	4000	2000	18.33
Total 90000	21100	21000	20900	19000	8000	43.53

*10,450 ha. is planted up with Khus plantations during 1992-93

Government of Maharashtra (25,400 ha)

The total catchment area of the SSP in Maharashtra is 163611 ha. Out of this, 25400 ha is proposed to be treated. The treatment plans for the non-forest and forest areas are prepared separately.

Programme and Progress of Catchment Area Treatment (in ha.)
in Maharashtra

	92-93	93-94	94-95	95-96	96-97	Total Cost
Forest Area (21,227ha)	8427	3200	3200	3200	3200	21227 29.41
Non Forest Area (4,171) 25398 ha	2848	815	512	-	-	4171 2.20

Say 25,400 ha

The catchment area treatment works are yet to commence.

Government of Gujarat (30,229 ha)

The total catchment area of the SSP in Gujarat is 36,761 ha. of this, a total of 29,575 ha is identified for treatment. However Govt. of Gujarat has planed to treat 30229 ha.

The catchment area treatment measures have been planned separately for forest and non-forest areas covering 27204 ha and 3025 ha respectively. Plan of the work is submitted to MOE&F. The programme and progress is given below:-

a) Forest Area (27,204 ha)

Programme and Progress for treatment (Area in ha.)

1990-91	1991-92	1992-93	1993-94	1994-95
4560/4528	4750/4770	6000	6200	5700

b) Non-Forest Area (3025 ha.)

Upto 90-91	91-92	92-93	93-94
897	830/274	662	636

Survey & Planning works is completed over an area of 3025 ha. Programme of Treatment of non forest areas includes contour bunding on 1276 ha, terracing in 980 ha pasture development over 307 ha, afforestation works over 534 ha, in addition, Nala plugging of 100 Nos. Works are completed in 1171 ha upto 1991-92.

2) Compensatory Afforestation

Government of Madhya Pradesh

A total of 6547 ha of degraded forest and 2190 ha of non-forest land located in districts of Jabua, Dhar and Khargone is identified for afforestation works in lieu of submergence of 2732 ha forest area. The work of compensatory afforestation in the districts of Dhar and Jabua has been assigned to Madhya Pradesh Van Vikas Nigam (MPVVN). The compensatory afforestation work in non-forest and degraded forest land identified in Khargone district has been entrusted to the Divisional Forest Officer, Kaveri Forest Division.

Programme and Progress of Afforestation (Area in ha.) in Madhya Pradesh

Plantation Year	<u>DEGRADED FOREST</u>		<u>NON FOREST</u>		<u>TOTAL</u>	
	Pro- gramme	Pro- gress	Pro- gramme	Pro- gress	Pro- gramme	Pro- gress
1990-91	132	132	716	716	848	848
1991-92	1580	1200	400	373	1980	1573
1992-93	1580	1200	400	1200	1980	2400
1993-94	1580		400	-	1980	
1994-95	1698		274	-	1952	
	6550	2532	2190	2289	8740	

Government of Maharashtra

The forest area diverted due to submergence is 6488 ha. The total area to be put under compensatory afforestation is 19205 ha being 6205 ha non-forest area and 13000 ha of degraded forest. A detailed compensatory afforestation scheme has already been submitted by the Government of Maharashtra to the Ministry of Environment & Forests on 14.05.90 for approval. Ministry of Environment & Forests has sought certain clarifications from Govt. of Maharashtra which are still awaited. A plan on compensatory afforestation prepared by Govt. of Maharashtra was submitted to World Bank during Sept. 1991. According to this plan the programme of compensatory afforestation is given below:-

In addition, compensatory afforestation is also required to be undertaken in 2,700 ha of non-forest land in lieu of the forest land in taloda area released for resettlement works. For this, non-forest land to the extent of 2,700 ha has already been identified. The GOM has issued order to transfer these lands to the forest department. Scheme for raising compensatory afforestation in 2,700 ha area is under preparation.

Programme of Compensatory Afforestation

Revised Plan: Govt. of Maharashtra has revised it's earlier plan as follows.

- Programme of Compensatory afforestation under implementation: in Maharashtra

Targets/Achievements (in ha)

		Plantations		
		91-92	92-93	93-94
Degraded Forests Area				
(13000 ha)		8383	4596	-
		8383		
Non forest Area				
(i) In lieu of submergence	:			
(6490 ha)	:	9190	-	2290
	:			6900
(ii) In lieu of R&R works at Taloda.	:			
(2700 ha.)	:			

Government of Gujarat

A total of 4165.9 ha of forest area has been diverted for SSP in Gujarat. A work plan for 4650 ha of non-forest land in nine villages of Kutch district and of 9300 ha of degraded forest land outside the basin, in the districts of Surat, Bharuch, Vadodara, Panchmahals and Sabarkantha, is under implementation. Besides 24560 ha of the forest area below density 0.6 in the catchment is also planned for afforestation works.

The programme and progress is as follows:

Target/Progress (Area in ha)				
	Work done till rains of 1991	1992-93	1993-94	1994-95
Non Forest Area (4650 ha)	2500	800	800	550
Degraded forest (outside the catch- ment) (9300 ha)	2834	2250	2250	1966
13,950 ha. (Total)				
Degraded forests (within the catchment) 24560 ha				
(i) 2000 plants/ha (12638 ha)	4078	3000	3000	2560
(ii) 400 plants/ha (11922 ha)	3330	2976	3000	2616

Plantations along Canal banks:

The total potential of canal bank plantations is estimated as 18000 ha. A project report prepared by forest Deptt. is under scrutiny of SSNNL. A programme of plantation is likely to be launched effectively from the year 1992. However to give start to the work of canal bank plantations, early plantations on 140 ha are already established till the rains of 1991.

Additional Activities

(a) Dam Vicinity Plantation (235 ha)

Planted till rains of 1990 - 202.5 ha

(b) Forest Plantation (500 ha)

Ravine lands on the left bank of the Sabarmati in village Ratanpur (300 ha) and Pirojpur (200 ha). In Pirojpur an area of 60 ha is planted against the target of 35 ha till Sept. 91.

(c) Additional Plantation in Non-forest Areas (1088 ha)

Non-forest land in Kutch district. Lands have already been released. The plantations will be completed by 1994-95.

3) COMMAND AREA DEVELOPMENT (INCLUDING DRAINAGE STUDIES)

Government of Madhya Pradesh

No command area in Madhya Pradesh.

Government of Maharashtra

No command area in Maharashtra.

Government of Gujarat

Master Plan for surface and sub-surface drainage has been prepared upto Mahi River Crossing. Services of six Consultants have been engaged for carrying out studies beyond Mahi Crossing. These include studies related to ground water, drainage, conjunctive use of surface and ground water, silting aspects of main canal, planning and design of micro-level canal net work etc. Reports were expected by March, 1992. Progress is not reported.

Government of Rajasthan

The Government of Rajasthan, has submitted a report on Environmental & Ecological aspects and remedial measures for Narmada Canal Project. Copy of the report is submitted to Ministry of Environment and Forests. Govt. of Rajasthan is directed to carry out Impact Assessment Studies on the lines

followed by Govt. of Gujarat. Terms of Reference are made available to Govt. of Rajasthan.

4) FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

In depth studies on flora, fauna, wildlife and carrying capacity are progressing in the forest areas coming under submergence of Sardar Sarovar Project spread to 13400 ha area. Studies are already completed in 4500 ha area in Gujarat and are likely to be completed in another 2800 ha area in Madhya Pradesh by 1993 and for the areas in Maharashtra the studies will be completed by 1994. According to the studies completed earlier in the areas falling in Gujarat and Maharashtra and part area of the basin in Madhya Pradesh no endemic rare endangered or threatened species is to be wiped out from the country. In depth studies completed so far have confirmed the above findings. Regarding the carrying capacity of the adjoining areas massive afforestation and greening of the impact area are in progress in Gujarat and Maharashtra to cater the needs of the wildlife moving from the submergence areas. Felling plan have been prepared to provide corridors for the wildlife likely to migrate from the submergence areas.

Government of Madhya Pradesh

Study has been entrusted to the State Forest Research Institute, Jabalpur, in collaboration with H.S.G University, Sagar and Rani Durgavati University, Jabalpur. The study commenced in April, 1990 and is expected to be completed in three years by March, 1993. Action plan will be ready by March, 1994 and implementation will be done by March, 1996. The Institute has submitted quarterly reports. The last report for quarters ending June, 1992 is furnished by the Institute. A felling plan prepared by State Forests Research Institute is also submitted, this will be placed before the Wildlife Committee for consideration.

Government of Gujarat

1) Basic Studies

Studies were conducted by M.S. University, Vadodara in 1983. Fresh study for the SSP submergence area in Gujarat were been entrusted again to M.S. University, Vadodara. An inception report & interim reports I to III have been furnished. Draft final report is also submitted in May, 1992 and is under scrutiny of SSNNL.

2) Wildlife Conservation Measures

The area of the Shoolpaneshwar Sanctuary has been enlarged from 151 sq.kms. to 448 sq.kms. Habitat improvement measures in the enlarged Shoolpaneshwar Wildlife Sanctuary to foster the flora and fauna of the area are scheduled for

completion in five years. Notification, declaring Shoolpaneshwar sanctuary is issued. A study on people's participation in wildlife management Shool-paneshwar Sanctuary by VIKSAT commissioned by World Bank is also submitted in December, 1991.

3) Wildlife Management Study for Sardar Sarovar Submergence Area

The above study has been assigned to a group with a Principal Investigator (of the rank of Conservator of Forest) on approaches to integrated wild-life management in Gujarat was organised in October, 1990. Report of the workshop is made available. A report is submitted by Principal Investigator on Wildlife Management which is under consideration of SSNNL.

4) Additional Environment Improvement Programme.

Sardar Sarovar Narmada Nigam Ltd, has decided to undertake the following additional environmental improvement programme in the catchment area and its vicinity.

- i) Creation of a habitat for the great Indian Bustard (highly endangered bird of the country). Improvement of support watering facility at six locations. Providing inspection and transport facilities.

Government of Maharashtra

School of Environmental Science, Pune University were assigned the work. Terms of Reference are finalised. Work is planned for completion in two years i.e. by March, 1994. Vide Govt. of Maharashtra decision No.RPA/3190/93/89/-C-R-61/C-3 dated 20th March, 1992. 40% of the total expenditure (37,98000) Rs. 1519000 is granted to Pune University as first instalment. Studies have commenced.

5) SEISMICITY

Government of Gujarat

The design of the dam allows for a horizontal seismic coefficient of 0.125 g., and it covers additional risk due to reservoir induced seismicity. An eminent Indian Consultant Dr. Jai Krishna, who was the Vice Chancellor of the Roorkee University had been engaged as the Consultant to the Project. The design of the dam had also been referred to the Central Water & Power Research Station, Pune, and Earthquake Engineering School at Roorkee, for dynamic analysis. Advice was also obtained from the World Bank Consultants viz - Dr. Glough and Dr. Bolt, of Burkley University. The design of the dam has also been approved by the Dam Safety Panel comprising eminent engineers.

Establishing Seismological Observatories:

Installation and Commissioning of seismological instruments have been completed in four observatories at Kevadia, Naswadi, Karjan and Kawant. The remaining five observatories viz. Aliraj-pur, Barwani, Sagbara, Kukshi and Shahada are being commissioned. No separate study regarding Seismicity Aspect is required in Madhya Pradesh and Maharashtra.

6) HEALTH ASPECTS

Government of Madhya Pradesh

The State Director of Health Services, has conducted detailed survey during 1982-83. Health plan regarding immediate service to be provided and continued health services to the population has been prepared. Provision for hospitals, dispensaries, mobile units and evaluation cell & monitoring cell has been made. The total anticipated expenditure including the cost of strengthening of health institutions has been worked out as Rs.748.73 lacs. The agreement for surveillance & control of Malaria is signed between Gandhi Medical College, Bhopal and NVDA and the surveillance is going on not only for malaria but other diseases also.

Government of Maharashtra

Report has been prepared on the following aspects:

- a) Strengthening anti malaria programme in the border area.
- b) Provision of mobile dispensaries.
- c) Providing sub centres.
- d) Construction of primary health services.

The total expenditure anticipated is Rs.2,577.00 lacs.

Government of Gujarat

Two studies relating to schistosomiasis had been carried out in 1985 by the National Institute of Communicable diseases and concluded that there is no threat to the people in the project area. Subsequently, a team led by the Chief of Schistosomiasis Division WHO, Scientist from British Council, London, and Environment Advisor, World Bank carried out investigations and confirmed the above.

The work plan on health aspects has been furnished to the Ministry of Environment & Forests, and World Bank. Total implementation will take about 17 years time. The programme covers the villages on the periphery of reservoir and the command area.

The work plan submitted would be implemented in a phased manner keeping in view the progressive development of irrigation in the vast command area of the project. A twenty five bed hospital is already set up and operating in the main colony of the project.

7) ARCHAEOLOGICAL SURVEY AND ANTHROPOLOGICAL STUDIES

ARCHAEOLOGICAL SURVEY

Government of Madhya Pradesh

Survey for identification of monuments being carried out by the State Department of Archaeology and Museum is completed. Inspection for selection of monuments of archaeological significance is going on. Detailed action plans are under formulation & are expected to be ready by the end of September, 1992. Excavation at Navadatoli are already completed by Prof. Shankhilya of Pune as per the direction from ASI.

Government of Gujarat

Inventory survey of 19 villages, coming under submergence carried out by the Director of Archaeology, has identified the following two temples for shifting.

- 1) Shoolpaneshwar Mahadev Temple at Surpan, District Bharuch.
- 2) Hamfeshwar Mahadev Temple in Chhota Udaipur Taluk.

Shifting of these monuments is proposed in three phases. Identified monuments are not listed as protected monuments. Sites have been finalised to relocate Shoolpaneshwar and Hamfeshwar temples in consultation with trustees of the temples. Shoolpaneshwar temple will be shifted & reconstructed near Gora, about 15 kms., down-stream on the same bank. Whereas, Hamfeshwar temple will be shifted and reconstructed at a higher elevation near the present location.

Government of Maharashtra

No work is proposed.

ANTHROPOLOGICAL STUDIES

Government of Madhya Pradesh

Government of Madhya Pradesh has informed that in view of the studies being carried out in connection with Narmada Sagar Project, no separate anthropological studies are required and that the Director General, Anthropological Survey of India has also expressed the same view. M.P. State Adivasi Kala

Parishad has submitted its report on Tribal arts & culture. Besides Anthropological Survey of India has informed that Narmada Basin is already covered extensively under the project "people's of India".

Government of Maharashtra

No study is proposed.

Government of Gujarat

No study is proposed.

8) FISHERIES

Government of Madhya Pradesh

Studies of important fish/fauna specially the Mahaaseer has been included in the studies being conducted by the three Universities of the State viz. for the upper Narmada, Rani Durgavati University, Jabalpur, Middle Narmada, Barkatullah University, Bhopal and lower Narmada, Vikram University, Ujjain. All the three Universities have initiated the studies in their respective areas as per MOU in 1989. Progress report for the period ending Sept. 1991 has been received. The study period is three years, and will be completed by December, 1992.

Government of Maharashtra

Department of Fisheries, Government of Maharashtra, has submitted a draft outline for the fresh water fisheries development in Maharashtra area.

Government of Gujarat

Central Inland Capture Fisheries Research Institute, Barrackpore, Calcutta, (Local office at Vadodara) has undertaken the studies in respect of aquatic life upstream and downstream of Sardar Sarovar in Narmada River in Gujarat State. Report of the first phase of pre-impoundment survey has been received.

The design plans and estimates for a 10 ha., fish farm and fish hatchery complex have been finalised. The plan is to be implemented in 9 years and will include Hydrobiological studies, establishment of fish hatchery and fish farm training of Fishermen, establishing and assisting primary fishermen's cooperatives, establishing and assisting an Inter-state Fisheries Development Board and a Cell at Directorate for monitoring.

NARMADA CONTROL AUTHORITY

The Narmada Control Authority, had commissioned a socioeconomic study by Central Inland Capture Fisheries Research Institute, Barrackpore, for possible fisheries development in the entire Narmada Basin excluding Bargi reservoir to the confluence of the Narmada with the Arabian sea including estuarine areas. The proposals to establish an Inter-state Apex Body with participation by the States and NCA is under consideration.

Regarding status of studies on fisheries in the reservoir & its downstream a desk review study is entrusted to CICFRI, Barrackpore. Study period will be 3 months from the date of commencement.

9) RIM STABILITY ANALYSIS

Government of Madhya Pradesh & Govt. of Maharashtra

Geological Survey of India, Nagpur Division, was assigned the work by SSNNL Gujarat. Now the work has been transferred from Nagpur Division to Bhopal Division and is in progress. GSI has completed works in 130 sq.km area in Madhya Pradesh and entire area in Gujarat. The work on remaining areas measuring 170 sq.km in Madhya Pradesh and entire area in Maharashtra was expected to be completed by the end of April '92. However work may not be completed as scheduled due to law & order problems, Revised schedule is awaited from Director, GSI.

Government of Gujarat

Rim Stability analysis has been completed by the Geological Survey of India, Jaipur Branch, in the Gujarat portion of the reservoir. No more work in this respect is required.

STATUS REPORT OF STUDIES & ACTIVITIES
REGARDING THE ENVIRONMENTAL ASPECTS OF
NARMADA SAGAR PROJECT
SEPTEMBER, 1992

1) PHASED CATCHMENT AREA TREATMENT:

The free draining area of Narmada Sagar Project down-stream of Bargi Dam is about 38,952 sq.kms. As per the guidelines of MDWR, directly draining watersheds of 'very high' and 'high' priority categories only are to be treated. This is, however, subject to a final decision on the subject yet to be arrived at. Works on prioritisation of the watershed was entrusted earlier to GSIT&S, Indore. However, the work is now entrusted to "All India Soil & Land Use Survey Organisation, New Delhi, and they are carrying out the prioritisation for the entire catchment of NSF.

AIS&LUS has divided the catchment area down-stream of the Bargi Dam into nine sub-catchments. These sub-catchments are further divided into watersheds and sub-watersheds. Preparation of maps and reports relating to five sub-catchments has been completed and these cover the entire area around the periphery of the Narmada Sagar Reservoir. Out of 638 Sub-watersheds, only 25 sub watersheds of 'high' and 'very high' priority are directly draining into the reservoir. An area of 58,510 ha is proposed to be treated. About 20% of this area i.e. 11,510 ha is estimated to be forest land and the rest 47000 ha non forest land.

Programme and Progress of Works

Programme of Catchment Area Treatment(58510)

	91-92 Target/ Progress	92-93 Target/ Progress	93-94	94-95	95-96	96-97
Non-forest area (47000ha)	6000 1075*	9000 5890*	9000	9000	9000	5000
Forest area (6424ha)**	1199 1200	2175 683	1050	1000	1000	-
53,424 ha						

*Area planted up with khus plantation in 1991-92 spread to 6410 ha and in 92-93 to 9300 ha.

**Against 11510 ha area plan is furnished for treating 6424 ha area only. Balance areas are already identified for compensatory afforestation. However GOMP is directed to substitute the areas & to furnish the plan for the balance areas.

2) COMPENSATORY AFFORESTATION:.

A total of 40332 ha forest land would come under submergence and an additional 779.9 ha of forest land has been diverted for the residential colony, power house complex, dam, saddle dam and approach roads. Subsequently, another 308.4 ha of forest land was permitted to be diverted for power house. Thus a total of 41420 ha of forest land has been permitted to be utilised for the construction of ISP.

The Government of Madhya Pradesh, has identified 10143 ha of non-forest and 70802 ha of degraded forest land. Till the end of March, 1992 NVDA has taken over an area of 6512 ha of non-forest land from revenue authorities.

Programme of Compensatory Afforestation

	Commulative progress till 1991-92	92-93 Target/ progress	93-94	94-95	95-96
Degraded forest area (70,802ha)	23048	<u>12528</u> 11919	12400	12400	12370
Non Forest Area (10,143ha)	5239	<u>1534</u> 1390	1500	1500	1037
(80,945) (Say 81,000)	28287	<u>14062</u> 13309	13900	13900	13407

3) COMMAND AREA DEVELOPMENT

The Government of Madhya Pradesh has submitted command area development plan. The project on completion will provide annual irrigation to 1.69 lakh ha of cropped area over a net C.C.A. of 1.23 lakh ha.

The implementation of the plan would be taken up in three phases for completion in 6/2007. Monthly observation of water levels started in November, 1991 for subsequent supply of this data to the consultants, already shortlisted, are likely to be continued for 2 seasons to draw inference for preparation of master plan for drainage. NVDA has addressed J.L. Agricultural University for studies on effect of pesticides, insecticides in the command and a project report is under scrutiny of NVDA/Environment Sub-group.

4) FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

Studies on these aspects were entrusted to Wildlife Institute of India, Dehradun in December, 1989 and are expected to be completed by March 1993. Action plan will be ready by March, 1994. Implementation of the action plan will be completed by March, 1996. Progress report upto June, 1992 has been submitted by Wildlife Institute of India.

Friends of Nature's Society, Bhopal, is entrusted with preparation of Wildlife Retrieval and Conservation Plan. They have submitted the final draft which is under scrutiny of NVDA.

5) SEISMICITY AND RIM STABILITY

The reservoir competency survey has been done by GSI and report is submitted. In the report, GSI has suggested further studies for some patches of narrow water divide. These studies are to be taken up by CWPRS, Pune in consultation with GSI. Joint inspection of problematic area is proposed in November, 1992.

Establishment of Seismic observatories in the Narmada Sagar Complex area is under correspondence with IMD, DGTD and CWC. Meeting of IMD, CWC, DGTD and NVDA Officers for finalising the issue was held on 18.3.91. A list of instruments and broad specifications were agreed. Procurement of the instruments is to be done in consultation with IMD. IMD has been requested by NVDA to supply the instruments (Micro earthquake recorders and wood anderson-2 component seismo meters) and for collection of data on pre-impoundment seismic data under Phase-I. Consultants carried out noise survey during March, 1992 to finalise the sites proposed for observatories. Report is received and is under consideration of NVDA.

6) HEALTH ASPECTS

A note on health aspects of NSP prepared by NVDA was examined in the Ministry of E&F and comments were sent for modifying the report. NVDA has submitted the revised plan costing Rs.748.73.lacs for the preventive and curative aspects of health. Regarding preventive aspects, a MOU is signed with the Department of Preventive and Social Medicine, Gandhi Medical College, Bhopal, whereas, for studies on health aspect in project impact areas of SSP and NSP work is proposed through a cell of monitoring and evaluation under Directorate of Health Services, Bhopal. The approved health plan is being implemented.

Pre-impoundment and post-impoundment Limnological studies being carried out by three Universities will take care of water quality aspect.

7) FISHERIES DEVELOPMENT

The aspect relating to study of the availability of important aquatic fauna/fish, especially the migratory species has been included in the Limnological studies being conducted by the 3 Universities of the State; the Upper Narmada, (Bargi Reservoir) Rani Durgavati University, Jabalpur, Middle Narmada (Tawa, Barna and Kolar Reservoirs) Barkatullah University, Bhopal, Lower Narmada, Vikram University, Ujjain. All the three Universities have initiated the studies in their respective areas as per MOU. Their report for the period 1991 is submitted. Aquatic fauna is also covered under the studies completed by Friends of Nature Society, Bhopal. Studies are Scheduled completion by December, 1992.

8) ARCHAEOLOGICAL AND ANTHROPOLOGICAL SURVEY

A survey of the 254 villages is required for identification of the archaeological monuments falling within the submergence area. State Department of Archaeology and Museum was entrusted with the survey of 87 villages which has been completed. Archaeological Survey of India has also completed the survey for 167 villages assigned for identification of the monuments of significance. Report is submitted to head office and is under scrutiny.

Action plan would be ready by June, 1994. Action will be taken to preserve material of archaeological importance in consultation with experts.

As only lower bastion in north of the Joga Fort is likely to be affected by scour action of water and the Siddeshwar temple is well above the FRL of 860 ft., these two structures are not considered as affected by the project. However, other structures/ monuments will be considered for shifting or protection after their archaeological significance is established through joint inspection of the competent authorities.

ANTHROPOLOGICAL STUDIES

Efforts are being made for retrieval of bio-cultural material from the Narmada Basin. A lot of information is gathered from the field which generates immense data of Socio-Anthropological significance.

Kashtriya Manav Sangrahalaya has constituted a working group for the retrieval of bio-cultural material in Narmada Basin. Survey of tribal art and handicraft entrusted to M.F. Adivasi Kala Parishad is completed and report is available. Besides Anthropological Survey of India has covered these studies under its own project called "peoples of India". The report is in 61 volume out of which 7 volume are under final editing. A Narmada Salvage plan is also launched by Anthropological Survey of India recently and the entire area is scanned and some ancient tools have been found.

ANNEX - XVI - (IV)



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

No.Env-4(2)/92/ 1154

3rd June, 1992

To

Shri M.S. Gill,
Additional Collector,
Dhule, Maharashtra

Sir,


Kindly refer to the enclosed letter addressed to Mrs. Radha Singh, Joint Secretary, Ministry of Water Resources dated 1st January, 1992 from Mr. Santosh Gondhalekar, wherein he has communicated his offer for services for catchment area treatment works in the state of Maharashtra. I am directed to request you to kindly get in touch with him for the needful, under intimation to this office.

Yours faithfully,

Encl: As above


(Dr. Pavan Kumar)
Specialist (Environment)

Copy to Shri Santosh Godhalekar, Gangotree Prabodh Samoo, 1070, Shukrawar Peth, Pune- 411 002.


(Dr. Pavan Kumar)
Specialist (Environment)

ANNEX - XVI (v)



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

No. Env-4(4)/92/ 2846

25th September, 1992

To

Shri S.B. Lowlekar,
Member (Env. & Forests),
NVDA, Narmada Bhawan,
Tulsi Nagar,
Bhopal.

Sub: Impact of Agro Chemicals run-off from fields on ground water and surface water in command areas of Narmada Sagar Complex Projects.

Sir,

Kindly refer to your letter No. NVDA/Agri/92/463/1562 dated 10.9.92 to Executive Member, NCA through which you desired our comments on modified research project proposal received from Jawaharlal Nehru Krishi Vishva Vidyalaya on the subject under reference. While the comments on the proposals will be communicated to you after the same is discussed by the Environment Sub-group (as the proposal received from you is the annexure of the minutes of 15th environment sub-group meeting held on 19.8.92). In the meantime, however I would like to inform you that Dr. R.S. Srivastava, under Man and Biosphere programme of UNESCO has already submitted a technical report on effect of Pesticides on Aquatic Fauna of Malwa Region in 1987 for the studies conducted in Holter Science College, Indore (M.P.). Besides a number of research papers have appeared in various journals on Pesticidal residue in fruits and vegetables. Dr. Gyanendernath who is the project officer in Department of Science and Technology, Govt. of India, New Delhi has already guided several doctoral thesis on the above aspect and will be in a position to give you further references.

As far as I understand a lot of literature exists and the present need is to correlate the past findings with the works proposed in the command area of Narmada Sagar specially with reference to pollution aspect of the additiveness of insecticides or pesticides. Objective of the study should invariably include the remedial actions required in case outcome of the studies suggests dangerous level of pesticidal pollution in the reservoir. Findings may also compare the level of such pollution in other parts of India or other countries.

I hope the suggestions given above may be of some help to you.

Yours faithfully,


(K.M. JOSEPH)
MEMBER (CIVIL)

विशाल टॉवर, इन्दिरा परिसर, नवलखा, इन्दौर-452 001 (म. प्र.)

Vishal Tower, Indira Complex, Navlekha, Indore-452001 (M.P.)

Phones : 461381, 462573 (E.M.) 462571 M. (C), 462572 M. (P)

463780 (Secretary) EPABX - 463773 - 74

Gram : NARCONTROL

Fax : 91-731-463772

ANNEX. XVI-VI

Grading of subwatersheds in Na, Nb, Nc, Nd, Ne, Ng, Nh and Nj
Subcatchments of SARDAR SARVAR Catchment in Narmada Basin of
Madhya Pradesh, Maharashtra and Gujarat

S.No.	Subwatershed Code	Area (ha.)	S.Y.I.	Distt.	(State)
<u>VERY HIGH (ABOVE 1300)</u>					
1.	Nc6d	2522	1653	Dhar	M.P.
2.	Ng3n	264	1607	Khargaon	M.P.
3.	Nh5g	2425	1599	Khandwa	M.P.
4.	Nh1g	1115	1574	Khargaon	M.P.
5.	Nf2a	1289	1561	Khargaon	M.P.
6.	Nh6c	500	1538	Khandwa	M.P.
7.	Nb3n	1136	1530	Jhabua	M.P.
8.	Ng7y	633	1525	Khargaon	M.P.
9.	Nb3h ✓	4681 ✓	1518	Dhar	M.P.
10.	Nb2b	2334	1498	Jhabua	M.P.
11.	Nb2g	1926	1494	Jhabua	M.P.
12.	Nb3b	3058	1490	Jhabua	M.P. (1300)
				Dhar	M.P. (1400)
13.	Nf4v	831	1490	Khargaon	M.P.
14.	Nd2g	1625	1479	Khargaon	M.P.
15.	Nb3j	3546	1477	Jhabua	M.P. (400)
				Dhar	M.P. (200)
16.	Nd1p	1425	1476	Khargaon	M.P.
17.	Nd2p	2112	1475	Khargaon	M.P.
18.	Nf7a	585	1474	Khargaon	M.P.
19.	Nh7d	650	1465	Kandwa	M.P.
20.	Nb3c ✓	4119 ✓	1464	Jhabua	M.P.
21.	Nc2f	3273	1464	Dhar	M.P.
22.	Nc1f	4528	1459	Dhar	M.P.
23.	Nd1m	1750	1455	Khargaon	M.P.
24.	Nb2h	2871	1445	Jhabua	M.P.
25.	Nb2d ✓	3300 ✓	1441	Jhabua	M.P.
26.	Nf4c	999	1436	Khargaon	M.P.
27.	Nd4j	2045	1426	Khargaon	M.P.
28.	Nd7v	1560	1423	Khargaon	M.P.
29.	Nb3g ✓	5318 ✓	1418	Jhabua	M.P. (200)
				Dhar	M.P. (5000)
30.	Na6b ✓	1500 ✓	1418	Khargaon	M.P.
31.	Na3d	1337	1417	Dhule	M.S.
32.	Ng5a	627	1415	Khargaon	M.P.
33.	Nd3u	2950	1413	Khargaon	M.P.
34.	Nd8d	4000	1413	Khargaon	M.P.

35.	Nc3g	2112	1412	Jhabua	M.P.
36.	Nc1g	3958	1411	Dhar	M.P.
37.	Nb5b	1997	1406	Dhar	M.P. (37)
				Jhabua	M.P. (1865)
38.	Nb3f	4557	1405	Jhabua	M.P.
39.	Nd7w	2500	1403	Khargaon	M.P.
40.	Na3a	1800	1402	Dhule	M.S.
41.	Na8k	1900	1402	Khargaon	M.P.
42.	Nc5d	2070	1400	Dhar	M.P.
43.	Nc1a	3010	1398	Dhar	M.P. (2702)
				Jhabua	M.P. (318)
44.	Nd3v	1825	1391	Khargaon	M.P.
45.	Nb3a	3186	1389	Jhabua	M.P. (1374)
				Dhar	M.P. (11)
46.	Na8a	1625	1388	Dhule	M.S.
47.	Nb5c	3445	1387	Dhar	M.P.
48.	Nd7d	1700	1386	Khargaon	M.P.
49.	Nc1b	1710	1385	Dhar	M.P.
50.	Na3f	2525	1384	Dhule	M.S.
51.	Nc2a	4404	1383	Dhar	M.P.
52.	Na8f	2600	1377	Dhule	M.S.
53.	Nc3h	805	1376	Dhar	M.P.
54.	Nb5b	1725	1373	Dhule	M.S.
55.	Na8c	1175	1373	Dhar	M.P.
56.	Nc1d	1938	1372	Dhar	M.P.
57.	Nb2c	4719	1369	Jhabua	M.P.
58.	Nb1b	2062	1369	Bharauch	Guj.
59.	Nd2e	3500	1369	Khargaon	M.P.
60.	Nc2p	2666	1367	Dhar	M.P.
61.	Nb2f	1908	1366	Jhabua	M.P.
62.	Na2p	3450	1365	Dhule	M.S.
63.	Na6f	3215	1365	Dhule	M.S.
64.	Na8p	1400	1364	Dhule	M.S.
65.	Nd5g	2750	1363	Khargaon	M.P.
66.	Nd1r	1725	1362	Khargaon	M.P.
67.	Nc5f	3353	1362	Dhar	M.P.
68.	Nc6a	2476	1360	Dhar	M.P.
69.	Nd1n	2475	1359	Khargaon	M.P.
70.	Na2b	675	1358	Bharauch	Guj.
71.	Na7f	1512	1357	Dhule	M.S.
72.	Na8d	1600	1357	Dhule	M.S.
73.	Nc3u	1883	1357	Dhar	M.P.
74.	Nc3t	1206	1352	Dhar	M.P.
75.	Nd1h	2025	1352	Khargaon	M.P.
76.	Nc5r	2691	1351	Dhar	M.P.
77.	Na7d	2312	1350	Dhule	M.S.
78.	Nb5a	4202	1345	Jhabua	M.P. (4015)
				Dhar	M.P. (137)
79.	Nb6a	1219	1345	Khandwa	M.P.
80.	Nd1e	3700	1345	Khargaon	M.P.
81.	Nd1e	3550	1345	Khargaon	M.P.
82.	Na2b	1450	1344	Dhule	M.S.
83.	Na8r	1537	1344	Dhule	M.S.
84.	Nd4r	3215	1341	Khargaon	M.P.
85.	Na8e	1900	1336	Dhule	M.S.

86.	Nd1u	2500	1336	Khargaon	M.P.
87.	Nh5b	868	1334	Khargaon	M.P.
88.	Na1a	1250	1334	Khargaon	M.P.
89.	Nd1t	2450	1334	Khargaon	M.P.
90.	Nc4a	2847	1334	Dhar	M.P.
91.	Nq6r	787	1333	Khargaon	M.P.
92.	Nd4g	2275	1331	Khargaon	M.P.
93.	Na9b	1225	1330	Khargaon	M.P.
94.	Nq7j	535	1329	Khargaon	M.P.
95.	Nq7z	871	1329	Khargaon	M.P.
96.	Na3c	3800	1329	Dhule	M.S.
97.	Nd1k	3175	1329	Khargaon	M.P.
98.	Nd4k	2450	1325	Dhule	M.S.
99.	Nf3a	2750	1324	Khargaon	M.P.
100.	Nh7h	452	1324	Khandwa	M.P.
101.	Nd9b	2250	1324	Khargaon	M.P.
102.	Nd1s	2550	1323	Khargaon	M.P.
103.	Na3h	1650	1321	Dhule	M.S.
104.	Nb5f	3046	1320	Jhabua	M.P.
105.	Nb4a	3445	1320	Jhabua	M.P.
106.	Nb5u	1797	1320	Jhabua	M.P.
107.	Na8q	1750	1319	Khargaon	M.P.
108.	Nd1j	2087	1318	Khargaon	M.P.
109.	Nh6k	2040	1316	Khandwa	M.P.
110.	Na7a	2200	1315	Dhule	M.S.
111.	Nd5w	2500	1315	Khargaon	M.P.
112.	Nd9a	2050	1315	Dhule	M.S.
113.	Na4t	1700	1310	Dhule	M.S.
114.	Nf2k	2475	1307	Khargaon	M.P.
115.	Nc36	3276	1307	Dhar	M.P. (1278)
				Jhabua	M.P. (1248)
116.	Na3g	3162	1307	Dhule	M.S.
117.	Nd4k	3800	1307	Khargaon	M.P.
118.	Na6c	1862	1306	Dhule	M.S.
119.	Na8h	2175	1305	Dhule	M.S.
120.	Na4r	1225	1304	Dhule	M.S.
121.	Nh8c	1112	1303	Khandwa	M.P.
122.	Na7c	2625	1300	Dhule	M.S.
123.	Nb5j	1710	1300	Jhabua	M.P.

S.No.	Subwatershed Code	Area (ha.)	S.Y.J.	Distt.	(State)
HIGH (1200 TO 1299)					
1.	Na2a	2100	1299	Bharauch	Gujarat
2.	Na2c	2263	1299	Dhule	M.S.
3.	Nd3f	1925	1299	Kharggaon	M.S.
4.	Na7h	2475	1298	Dhule	M.S.
5.	Nd2j	1700	1298	Kharggaon	M.S.
6.	Nc1c	4847	1296	Dhar	M.S.
7.	Na6y	2225	1295	Dhule	M.S.
8.	Na2f	3100	1294	Bharauch	Gujarat
9.	Nf3r	2246	1294	Kharggaon	M.S.
10.	Na6h	2900	1292	Dhule	M.S.
11.	Ng5t	333	1292	Kharggaon	M.S.
12.	Nc5g	4290	1290	Dhar	M.S.
13.	Na4c	1525	1289	Dhule	M.S.
14.	Na6s	2462	1289	Dhule	M.S.
15.	Ng3k	1407	1289	Kharggaon	M.S.
16.	Na5a	1187	1288	Dhule	M.S.
17.	Nc2h	5848	1287	Dhar	M.S.
18.	Na4h	1325	1286	Dhule	M.S.
19.	Nd7s	1700	1286	Kharggaon	M.S.
20.	Nd1v	2650	1285	Kharggaon	M.S.
21.	Nh7b	3375	1285	Khandwa	M.S.
22.	Nf3b	3088	1284	Kharggaon	M.S.
23.	Nb3k	3567	1284	Jhabua	M.S.
24.	Na2n	3080	1283	Dhule	M.S.
25.	Nd4n	4400	1282	Kharggaon	M.S.
26.	Nc5v	2255	1282	Dhar	M.S.
27.	Nb2a	3920	1281	Jhabua	M.S.
28.	Na2h	4400	1281	Dhule	M.S.
29.	Na3j	1200	1280	Dhule	M.S.
30.	Nd7u	1125	1280	Kharggaon	M.S.
31.	Nd5d	3602	1280	Jhabua	M.S.
				Dhar	M.S.
32.	Ng3h	672	1279	Kharggaon	M.S.
33.	Na2m	2837	1278	Dhule	M.S.
34.	Ng5g	2250	1278	Dhule	M.S.
35.	Nh5a	1000	1278	Kharggaon	M.S.
36.	Na8j	2200	1277	Dhule	M.S.
37.	Nd3w	600	1277	Kharggaon	M.S.
38.	Nd6v	1587	1277	Kharggaon	M.S.
39.	Nd8j	2000	1277	Kharggaon	M.S.
40.	Nc6r	2472	1276	Dhar	M.S.
41.	Nc5p	3491	1275	Dhar	M.S.
42.	Na7k	3112	1274	Dhule	M.S.
43.	Nf4g	2610	1274	Kharggaon	M.S.
44.	Nd2r	1112	1270	Dhule	M.S.
45.	Nd5y	2450	1269	Kharggaon	M.S.
46.	Nd3s	2671	1261	Kharggaon	M.S.

47.	Nd5d	1725	1267	Khargaon	M.P.
48.	Nd5p	3625	1267	Khargaon	M.P.
49.	Nc3j	1808	1266	Jhabua	M.P.
50.	Na6q	2875	1266	Dhule	M.S.
51.	Na6u	1875	1266	Dhule	M.S.
52.	Nd1x	1825	1264	Khargaon	M.P.
53.	Nd1f	1875	1262	Khargaon	M.P.
54.	Ng3j	1392	1260	Khargaon	M.P.
55.	Nd5x	2750	1260	Khargaon	M.P.
56.	Nd5z	2650	1260	Khargaon	M.P.
57.	Nd9x	2000	1260	Khargaon	M.P.
58.	Nh1a	1059	1260	Khargaon	M.F.
59.	Nd2n	1938	1259	Khargaon	M.P.
60.	Nc2j	4854	1258	Dhar	M.P.
61.	Nc5w	2593	1257	Dhar	M.P.
62.	Nf2j	3202	1256	Khargaon	M.P.
63.	Na6b	2112	1254	Dhule	M.S.
64.	Na8u	2100	1254	Dhule	M.S.
65.	Nh5c	1300	1252	Khargaon	M.P.
66.	Nh8k	1840	1252	Khandwa	M.P.
67.	Nc3v	1694	1251	Dhar	M.P.
68.	Nc5t	3024	1251	Dhar	M.P.
69.	Nc3n	2637	1250	Dhar	M.P.
70.	Nf3g	3220	1250	Khargaon	M.P.
71.	Nd2h	1700	1249	Khargaon	M.P.
72.	Na7b	1525	1248	Dhule	M.S.
73.	Nd8h	1425	1247	Khargaon	M.P.
74.	Nd5n	1500	1245	Khargaon	M.P.
75.	Na4a	2150	1244	Dhule	M.S.
76.	Nc4q	4142	1244	Dhar	M.P.
77.	Nc7n	6537	1243	Dhar	M.P.
78.	Nb5k	2460	1242	Jhabua	M.P.
79.	Nd1w	2350	1242	Khargaon	M.P.
80.	Nc5a	3467	1241	Dhar	M.P.
81.	Nc7t	5442	1241	Dhar	M.P.
82.	Nb4j	2604	1240	Jhabua	M.P.
83.	Nc7u	5304	1239	Dhar	M.P.
84.	Na3k	837	1238	Dhule	M.S.
85.	Nd4a	2950	1238	Khargaon	M.P.
86.	Nd5f	3500	1238	Khargaon	M.P.
87.	Nd6t	2400	1238	Khargaon	M.P.
88.	Nd3h	2750	1237	Khargaon	M.P.
89.	Nd6u	2050	1236	Khargaon	M.P.
90.	Nf6f	3610	1236	Khargaon	M.P.
91.	Nd2m	1150	1235	Khargaon	M.P.
92.	Nd9g	1625	1234	Khargaon	M.P.
93.	Nb5s	4219	1234	Jhabua	M.P.
94.	Nc5m	3733	1233	Dhar	M.P.
95.	Na6x	1680	1233	Dhule	M.S.
96.	Nh8b	1022	1233	Khandwa	M.P.
97.	Ng3a	2076	1232	Khargaon	M.P.
98.	Nb2j	1872	1232	Jhabua	M.P.
99.	Nc2d	4732	1232	Dhar	M.P.
100.	Nd3q	2800	1231	Khargaon	M.P.
101.	Na5f	2075	1228	Dhule	M.S.

102.	Nd1b	2612	1228	Khargaon	M.P.
103.	Nh8h	1483	1228	Khandwa	M.P.
104.	Nc7r	5385	1227	Dhar	M.P.
105.	Nb2p	3945	1224	Jhabua	M.P.
106.	Nd7p	2625	1224	Khargaon	M.P.
107.	Nd9j	2425	1224	Khargaon	M.P.
108.	Nc7y	3683	1222	Dhar	M.P.
109.	Nc8q	2775	1222	Dhar	M.P.
110.	Nc3k	2858	1221	Jhabua	M.P. (512)
				Dhar	M.P. (1956)
111.	Na7j	3175	1220	Dhule	M.S.
112.	Nb6a	1669	1220	Jhabua	M.P.
113.	Nd4c	2300	1219	Khandwa	M.P.
114.	Ng9g	1855	1219	Indore	M.P.
115.	Na4v	2125	1218	Dhule	M.S.
116.	Nh3c	1662	1217	Khargaon	M.P.
117.	Na9k	2324	1216	Khargaon	M.P.
118.	Nd2b	1075	1216	Khargaon	M.P.
119.	Nd2d	1925	1216	Khargaon	M.P.
120.	Nd9q	2075	1216	Khargaon	M.P.
121.	Nd9d	1050	1215	Khargaon	M.P.
122.	Nd3j	2675	1214	Khargaon	M.P.
123.	Nd3t	2200	1214	Khargaon	M.P.
124.	Nd5h	3500	1214	Khargaon	M.P.
125.	Nd9y	4025	1214	Khargaon	M.P.
126.	Nb5w	3482	1214	Jhabua	M.P.
127.	Nc5x	3280	1212	Dhar	M.P.
128.	Nb1h	3505	1211	Vadodara	Gujarat
129.	Nc3m	2468	1211	Jhabua	M.P. (2454)
				Dhar	M.P. (15)
130.	Nc7q	5737	1210	Dhar	M.P.
131.	Ng1z	1943	1210	Dhar	M.P.
132.	Na6j	2387	1210	Dhule	M.S.
133.	Nd1d	2850	1210	Dhule	M.S.
134.	Na9h	1887	1209	Indore	M.P.
135.	Nb4k	3510	1208	Jhabua	M.P.
136.	Nb1s	3533	1207	Jhabua	M.P.
137.	Nc2q	4081	1207	Dhar	M.P.
138.	Nc8g	1083	1207	Dhar	M.P.
139.	Nb6b	5626	1206	Jhabua	M.P.
140.	Na7g	1275	1206	Dhule	M.S.
141.	Nc7w	3440	1202	Dhar	M.P.
142.	Nc8p	2325	1201	Dhar	M.P.
143.	Nd3m	2475	1201	Khargaon	M.P.
144.	Na9c	825	1200	Khargaon	M.P.
145.	Nh3k	1625	1200	Khargaon	M.P.
146.	Nh8a	700	1200	Khandwa	M.P.
147.	Nb1a	4778	1200	Bharauch	Gujarat
148.	Nb1b	5074	1200	Bharauch	Guj. (4534)
				Vadodara	Guj (540)
149.	Nb1c	2351	1200	Vadodara	Guj.
150.	Nb1d	1045	1200	Vadodara	Guj.
151.	Nb1f	3694	1200	Vadodara	Guj.
152.	Nb1g	3355	1200	Vadodara	Guj.
153.	Nb1j	2275	1200	Vadodara	Guj.. (1208)

154.	Nb1k	1925	1200	Jhabua	M.P. (405)
				Vadodara	Guj. (555)
				Jhabua	M.P. (1378)
155.	Nb1m	2883	1200	Jhabua	M.P.
156.	Nb1n	4219	1200	Jhabua	M.P.
157.	Nb1p	3107	1200	Jhabua	M.P.
158.	Nb1q	3508	1200	Jhabua	M.P.
159.	Nb1r	2359	1200	Jhabua	M.P.

**LIST OF SUB WATERSHEDS DIRECTLY DRAINING
INTO THE SARDAR SAROVAR PROJECT**

<u>Sub- Catchment</u>	<u>S.No.</u>	<u>Sub Watershed Code</u>	<u>Area in Ha</u>		<u>Total</u>
			<u>Very High</u>	<u>High</u>	
Na	(01)	Na9L	1225	-	1225
	(02)	Na9c ✓	-	825 ✓	825
	(03)	Na9d ✓	-	1050 ✓	1050
	(04)	Na9h	-	1887	1887
	(05)	Na9i	-	2324	2324
Nb	(06)	Nb1j ✓	-	405 ✓	405
	(07)	Nb1k ✓	-	1370 ✓	1370
	(08)	Nb1n ✓	-	4219 ✓	4219
	(09)	Nb1r ✓	-	2883 ✓	2883
	(10)	Nb1pl ✓	-	3107 ✓	3107
	(11)	Nb1r ✓	-	2359 ✓	2359
	(12)	Nb1r ✓	-	3533 ✓	3533
	(13)	Nb1q ✓	-	3508 ✓	3508
	(14)	Nb2a	-	3920	3920
	(15)	Nb3a ✓	3180 ✓	-	3180
	(16)	Nc1a ✓	3010 ✓	-	3010
	(17)	Nc1b	1710 2062	-	1710
	(18)	Nc1c ✓	-	4847 ✓	4847
	(19)	Nc1d ✓	1938 ✓	-	1938
	(20)	Nc1g ✓	3958 ✓	-	3958
Nc	(21)	Nc2a ✓	4404 ✓	-	4404
	(22)	Nc4a ✓	2847 ✓	-	2847
	(23)	Nc6a ✓	2476 ✓	-	2476
	(24)	Nc6c ✓	2522 ✓	-	2522
	(25)	Nc6e ✓	-	2472 ✓	2472
	(26)	Nc7y ✓	-	3683 ✓	3683
	(27)	Nc1f ✓	4528 ✓	-	4528
	(28)	Nd1b ✓	-	2612 ✓	2612
	(29)	Nf2a ✓	1289 ✓	-	1289
	(30)	Nf2j ✓	-	3207 ✓	3207
Nf	(31)	Nf2k ✓	2475 ✓	-	2475
	(32)	Ng5a ✓	627 ✓	-	627
	(33)	Ng1z ✓	-	1943 ✓	1943
			<u>36195</u>	<u>50149</u>	<u>86344</u>

262

**AREAS OF VERY HIGH AND HIGH PRIORITY DIRECTLY DRAINING INTO
THE SARDAR SAROVAR RESERVOIR IN MAHARASHTRA**

<u>Watershed Code No.</u>	<u>Area (in ha.)</u>
<u>Very High Category</u>	
Na 3c ✓	3,800 ✓
Na 3h ✓	1,650 ✓
Na 3g	3,562
✓ Na 3k ✓	837 ✓
✓ Na 5f ✓	2,075 ✓
✓ Na 3d ✓	1,337 ✓
Na 3a ✓	1,800 ✓
Na 3f ✓	2,525 ✓
✓ Na 5g ✓	1,725 ✓
Na 3b ✓	1,450 ✓
Sub-total:	20,761
<u>High Category</u>	
Na 5a ✓	1,187 ✓
Na 3j ✓	1,200 ✓
Na 5g ✓	2,250 ✓
	4,637
Grand Total:	25,398 *****

GOVERNMENT OF GUJARAT

The entire area in Gujarat has been
taken up for treatment.

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण **NARMADA CONTROL AUTHORITY**

पर्यावरण उपदल
Environment Sub-Group

सोलहवीं बैठक का कार्यवृत्त
Minutes of the Sixteenth Meeting

9 नवम्बर, 1992
को
पर्यावरण भवन, नई दिल्ली में हुई

Held at Paryavaran Bhawan New Delhi
9th November, 1992

इन्दौर
जनवरी, 1993
INDORE
January, 1993

**MINUTES OF THE 16TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 9TH NOVEMBER, 1992
AT PARYAVARAN BHAWAN, NEW DELHI.**

I N D E X

Item No.	Contents	Page No.
	Introduction	1
XVI-1(86)	Confirmation of the Minutes of the 15th meeting.	2
XVI-2(87)	Review of action taken on the decisions of previous meeting.	3 - 9
XVI-3(88)	Present Status of Studies/ Surveys and Environmental action plans.	10 - 17
XVI-4(89)	World Bank assistance & performance bench mark on Environmental issues.	18
XVI-5(90)	Any Other item Date and Venue of next meeting	19

A N N E X U R E S

XVI.Min.I	List of participants of XVith meeting.	1 - 2
XVI.Min.II	Summary of studies completed by M.S. University.	3 - 26

MINUTES OF THE 16TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 9TH NOVEMBER, 1992 AT 11.00 A.M.
IN PARYAVARAN BHAWAN, NEW DELHI.

Shri R. Rajamani, Secretary, Ministry of Environment & Forests and Chairman of the Environment Sub-group of NCA welcomed the Members and invitees to the 16th meeting of the Environment Sub-Group. The list of participants is enclosed at Annex.XV. Min.I.

Discussions on the agenda items were taken up thereafter.

Item No.XVI-I(86): CONFIRMATION OF THE MINUTES OF THE 15TH MEETING

Minutes of the 15th meeting of the Environment Sub-Group of Narmada Control Authority were circulated to all members and invitees separately vide letter No. Env-34(15)/92/2023 dated 23.9.92 and comments received on minutes of the 15th meeting were circulated to all members.

Minutes were confirmed with the following modifications:

On Page-2, para 3 under Govt. of Maharashtra, following is to be added at the end of the para.

"It was observed that the work has not yet been started in the catchment area within the state of Maharashtra".

On page-3 of the minutes, First para, line 12 to 15 is reworded as follows:

".....project cost and further stated that other sub-watersheds of the catchment even if not directly..."

On Page-10 under Phased Catchment Treatment, following is added.

"Sub-group looked at the bar charts and tables on the work schedule enclosed with the agenda with appreciation and felt that the status of the impoundment and the work to be proceeded may be clarified further".

On Page-13, para 3, under Govt. of Gujarat, the rewording will be as follows:

Chairman thanked the Central Regional Office, Bhopal for the efforts and monitoring the compensatory afforestation works. He stated that presentation by Mr. Mehta, Chief Conservator of Forests, SSNNL has set at rest the doubts over efficacy of plantations in Kutch. However, he desired that the Ministry may verify the plans for the compensatory afforestation works being undertaken there".

On Page-17 under Health Aspects relating to Govt. of Gujarat, the following is added :

"Dr. Shekhar Singh stated that in case, use of pesticides is to be a major strategy for vector control, the vector becoming immune to the pesticides is required to be addressed properly".

Item No.XVI-2(87) :REVIEW OF ACTION TAKEN ON THE DECISIONS OF PREVIOUS MEETINGS

1. Consideration of Policy Issues (Item No.XVI-2(83) (a))

a) Extent of Catchment Area Treatment:

Sub-Group noted the decision of the Govt. of India.

b) Extension of Time for Environmental and Forestry Approval: (Item No.XVI-2(83) (b))

Chairman informed the sub-group that a letter had been received by the Ministry of Environment & Forests seeking concurrence for extended dates of completion of certain studies and surveys rather than extension of the approval beyond 1989. The matter views on the same will be communicated to the Ministry of Water Resources shortly.

2. Time frame for preparation of Action Plan and implementation of Environmental Safeguard Measures (Item No.XVI-2(83) 2)

Chairman enquired about the plan for treatment of the balance of the critically degraded "very high" and "high" categories of sub-watersheds. Dr.Maudgal, Advisor, Ministry of Environment & Forests stated that submission of this plan is essential for possible inclusion of some more areas from this plan for treatment during Phase-I itself. He further clarified that the plan to be prepared for the entire freely draining catchment should include the extent of area already under treatment in Phase-I as critically degraded directly draining sub-watersheds at project cost in addition to those sub-watersheds within the catchment of Sardar Sarovar which are either already treated or under treatment or proposed for treatment under any other project as Phase-II of the plan. The Phase-III plan should include the balance critically degraded freely draining sub-watersheds within the SSP/NSP catchment. Chairman also emphasised that prime requirement is submission of this plan on priority so that the same could be examined by the Ministry of Environment & Forests urgently. It is just possible that states may have financial constraints for treating the entire areas, but the aspects of mobilisation of financial resources within a stipulated time frame could be considered only when plans are available.

Shri T. Balaraman, Secretary (Forests), Govt. of Maharashtra stated that the forest divisions were conducting surveys and preparing the plan. As it involves extensive work, it is likely to take one more year for completion. The plan for the directly draining area will, however, be ready by March, 1993. Govt. of Madhya Pradesh indicated that it would be possible for NVDA to submit the plans for entire freely draining critically degraded sub-watersheds within the catchment of Sardar Sarovar Project within one year and submission of plans for Narmada Sagar Project depends on availability of all reports from All India Soil & Land Use Survey Organisation, New Delhi. The plans for directly draining areas will also be ready by March, 1993. As the Director, All India Soil & Land Use Survey Organisation could not attend the meeting, Chairman desired that latest position of reports on delineation of priority watersheds for Narmada Sagar Project may be ascertained and reported to the sub-group. Govt. of Gujarat officials however indicated that they are treating the entire catchment and the plans are made available to the Ministry of Environment & Forests and works are already under progress.

GOMP welcomed the suggestion of involving the NGVDs in planning/execution of the catchment area treatment works but stated that this is a policy matter which has to be decided at government level.

3. Time frame for Environment Studies. (Item No. XVI-2(83)3).

Govt. of Maharashtra submitted a preliminary report of field survey on flora and fauna in and around Sardar Sarovar Project catchment prepared by School of Environmental Science, Pune University, Pune. However, in the report it is stated that they could carry out only a limited survey due to volatile situation in the submergence area and unless the problem is solved any kind of survey in the submergence area seems to be impossible. Chairman desired that Govt. of Maharashtra should take necessary steps immediately to resolve the crisis.

4. Cost Estimates for preparation of Action Plan and implementation of Environmental Safeguard Measures (Item No. XVI-2(83) 4).

Some of the cost and expenditure estimates were supplied during the meeting and the picture available to the sub-group is presented below: However, complete

information is not yet available, and therefore, all concerned were once again requested to furnish the details.

The representative of Min. of Environment & Forests enquired about the cost per hectare being incurred by the 3 states on catchment treatment works. It was observed that there is a wide difference in expenditure per unit of catchment area treatment between the states of Maharashtra, Madhya Pradesh and Gujarat. Chairman observed that the expenditure incurred by GOMP on catchment area treatment is very much on lower side and, therefore, he desired that the type of work being done by them to treat the catchment area may be examined in detail. It was, however, explained that the cost of the treatment was directly related to the geography, terrain, type of soil in the area and consequently the genus of treatment. Yet, observing the concerns of the members on this account, chairman stated that if one or more members of the sub-group intended seeing the area where the catchment works were under execution they might visit the site and the NCA would arrange for the same in consultation with NVDA, Bhopal at a date and time convenient to all the members desiring to visit the area. GOMP officials informed that they were convening a meeting on Catchment Area Treatment works very soon. Chairman desired that Specialist (Env) of NCA may attend the meeting and examine the issue and may report to the sub-group during its next meeting for information of the members.

CATCHMENT AREA TREATMENT

Studies

- i) Prioritization of catchment by AIS&LUSO, New Delhi**
- ii) Prioritization & thematic mapping by ISRO for area in Gujarat.*

Implementation (Physical target in ha, and Fin. Rs. Crores)

Treatment	Targets		Achievements		Date
	Phy.	Fin.	Phy.	Fin.	
<u>A. Govt. of Gujarat</u>					
a) Non-forest Area	3025	2.41	1171	1.1	Sept '92
b) Forest Area	27204	32.68	15311	8.32	Sept '92

Treatment	Targets		Achievements		Date
	Phy.	Fin.	Phy.	Fin.	
<u>B. Govt. of Madhya Pradesh</u>					
a) Non-Forest Area	72000	25.20	10450*	2.91*	Sept '92
b) Forest Area	18000	18.73	-	-	
<u>C. Govt. of Maharashtra</u>					
a) Non-Forest Area	21200	29.41	-	-	
b) Forest Area	4200	2.2	-	-	
Say	145630	107.38	16470	8.43	

II. COMPENSATORY AFFORESTATION (Physical target in ha & Fin. in Rs. Crores)

A. Govt. of Gujarat

a) Non Forest	4650	8.15	3299	3.30	Sept '92
b) Degraded Forest	9300	9.42	5389	3.23	Sept '92

B. Govt. of Madhya Pradesh

a) Non Forest	21901		22891		
b) Degraded Forest	65471	18.00	25321	4.67	Sept '92

C. Govt. of Maharashtra.

a) Non Forest	90001	37.00	-	-	June, 92
b) Degraded Forests	130001		8383	9.42	
	44687	72.57	16138	16.43	

* Incomplete works

** Works were carried out under the budget of AIS&LUSO.

III. Flora fauna (including wildlife & fisheries) & Carrying Capacity (FFC) of the areas adjoining submergence.
(In Rs. Crores)

	Estimated Cost	Cost incurred
A. Govt. of Gujarat.		
a) Studies in 1982 by M.S. University.	0.042	0.040
i) Sanctuary improvement works	0.75	0.55
ii) Downstream fisheries by CICFRI**	-	-
b) Studies on FFC by M.S. University in 1992	0.34	0.20
c) Studies on wildlife management 1992	0.16	0.11
d) People's participation in sanctuary management by VIKSAT***	-	-
e) Fisheries plan for Estuary & Command *	4.00	Nil
B) Govt. of Madhya Pradesh		
a) Studies by State Forest Research Institute on flora, fauna (wildlife)	0.203	0.156 (Sept '92)
b) Limnological studies by three universities (Aquatic fauna & Water quality)	0.19	0.14 (Sept '92)
c) Fisheries plan (SSP)*	0.82	-
C) Govt. of Maharashtra.		
a) Flora, Fauna, Carrying Capacity by School of Environmental Science, Pune University, Pune.	0.38	0.16
b) Fisheries plan (Tank * pond & reservoir fisheries)	1.66	-
* From State Budget		
** Project under Ministry of Agriculture		
*** Studies by World Bank's assistance.		

	<u>Estimated Cost</u>	<u>Cost incurred</u>
D) <u>Narmada Control Authority</u>		
a) Sociological Survey of fishing families.	0.14	0.14
IV. <u>COMMAND AREA DEVELOPMENT.</u>		
<u>Govt. of Gujarat.</u>		
a) Studies	1.58	0.14
b) Implementation	685.00	Nil
	(Fig. being reviewed)	
<u>Govt. of Rajasthan</u>		
a) Studies	-	-
b) Implementation	-	-
V. <u>HEALTH ASPECT.</u>		
a) <u>Govt. of Gujarat.</u>		
i) Hospital	0.47	0.70
ii) Laboratories	2.36	
iii) Infrastructure	1.77	
iv) Anti Malaria	3.44	
v) Insecticidal spray	30.06	
	38.00	
b) <u>Govt. of Madhya Pradesh.</u>		
a) Surveillance of malaria	0.11	0.010
b) Implementation for NSP, Omkareshwar, Maheshwar & SSP projects.	7.49	
	7.60	
c) <u>Govt. of Maharashtra.</u>		
<u>R&R site.</u>		
a) Establishment of PHC & 3 sub-centres at R&R site.	0.2315	
<u>10 km belt around SSP.</u>		
a) 12 new sub-centres	0.3124	
b) Mobile health unit	0.0323	
c) Education health material	0.0200	
	0.5962	
Say Rs. 0.60 Crores		

Estimated Cost Cost incurred

VI. RIM STABILITY & SEISMICITY. (to be reported by All the States)

- a) Cost of studies
- b) Implementation

VII. ARCHAEOLOGICAL/ANTHROPOLOGICAL.

a). Govt. of Gujarat.

- | | | |
|----------------------------|-----------------|-------|
| i) Cost of survey | 0.013 | 0.004 |
| ii) Cost of Implementation | To be finalised | 0.15 |

b). Govt. of Madhya Pradesh.

- | | | |
|----------------------------|---|------|
| i) Cost of Survey | - | 0.35 |
| ii) Cost of Implementation | - | - |

c). Govt. of Maharashtra.

- | | | |
|----------------------------|---|---|
| i) Cost of Survey | - | - |
| ii) Cost of Implementation | - | - |

e) Rashtriya Manav Sanghralaya*

- | | | |
|----------------------------|-------|-------|
| i) Paleontological studies | 0.019 | 0.01 |
| ii) Ethnological studies | 0.007 | 0.007 |
| iii) Tribal Art & culture | 0.026 | 0.026 |

f) Anthropological Survey of India*

- | | | |
|--------------------------|---|---|
| i) People of India | - | - |
| ii) Narmada salvage plan | - | - |

N.B : The missing information may please be furnished by all concerned immediately.

Item No. XVI-3(88): PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS

i) Phased Catchment Treatment

Government of Madhya Pradesh

Nareada Sagar Project

GOMP indicated that so far as the catchment area treatment plan for 5086 ha was concerned, it was already included in the plan submitted earlier in June, 1991. Therefore, there would be no problem in treating this area under catchment treatment works in place of compensatory afforestation as directed by the Sub-group earlier.

Regarding progress on works, GOMP indicated that against the rescheduled target of 13925 ha of non forest area and 2175 ha of forest area for 1992-93, the total progress upto September, 1992 is 4815 ha of non-forest area and 683 ha of forest area. Besides, an area of 3410 ha planted with "khus" is also available for taking up other measures. However, GOMP indicated that non-availability of fields due to standing crops and financial constraints were the main reasons for the shortfall.

GOMP indicated that out of the 5086 ha of the catchment area, 2997 ha was under compensatory afforestation which was now slated for additional catchment treatment measures. And, an equal area is being identified for compensatory afforestation as directed by the sub-group.

Sardar Sarovar Project

Regarding the Sardar Sarovar Project, GOMP informed that "khus" plantations were carried out over 7650 ha and 2800 ha during 1991-92 and 1992-93 respectively. As these areas were not treated with all items of the menu, these have not been adjusted against the target. The main reason for shortfall in progress, as reported by GOMP, is hindrances due to anti-dam agitations in the early period of current financial year, non availability of fields due to standing crops and financial constraints. It was observed by the Chairman that due to marking of submergence from the

survey of India topo sheets and the AIS&LUSO maps the total area under directly draining category stands increased to 1,15,000 ha. from 90,000. He desired to know whether GOMP has rescheduled its target and that whether the progress of works is in line with the rescheduled targets. The officials of GOMP admitted slippages and promised that they were working for improvement.

Chairman expressed unhappiness over the slow progress of works in Madhya Pradesh and desired that the Chief Secretary should be apprised of the facts and directed that GOMP should immediately revise the target keeping in mind the submergence schedule and that the treatment works should be planned in a realistic manner for pari-passu completion of the works.

Government of Maharashtra

Shri T. Balaraman, Secretary (Forests) informed that out of 21000 ha of forest area only 13000 ha would require treatment and indicated that it would be possible for Govt. of Maharashtra to treat the entire area within a 3 year's period. He further stated that it was planned to take up 1500 ha area during the monsoon 1992-93 and the balance area during 1994 and 1995 monsoons. However, It was observed by the Chairman that the area requiring treatment has now gone up to 31000 ha from 25400 ha in Maharashtra and as a result more area would require treatment. If the submergence commences in Maharashtra by next monsoon, it seems quite impossible that the areas bordering impoundment could be treated as per the schedule indicated by Environment sub-group during 14th and 15th meetings.

Members of the sub-group expressed serious concern on the failure of Govt. of Maharashtra in treating the areas pari-passu with submergence. Chairman, therefore, directed that GOM should initiate all possible steps to treat the entire area by 1994-95 and further observed that since GOM had planned to treat only 1500 ha area during 1993 monsoon there should not be any impoundment next year.

Sub-group, therefore, recommended that "If the Environmental amelioration works are not accelerated, the construction schedule should be readjusted so as not to result in any submergence in Maharashtra". Shri T. Balaraman, Secretary (Forests), promised to look into the problem and work out the details to report back to the sub-group before the next meeting.

No comments were received from GOM on the issue of involving NGVDs in planning/execution of catchment area treatment works.

Govt. of Gujarat

GOG reported that against the scheduled target of 6000 ha area, 6013 ha has already been treated. The progress of treatment of non-forest areas is still awaited. Compliance on reconciliation of figures on extent of catchment area by GOG as directed in the 12th sub-group meeting is still awaited.

ii) Compensatory Afforestation

Govt. of Madhya Pradesh

Narmada Sagar Project

No further progress was reported by GOMP on compensatory afforestation works.

Sardar Sarovar Project

Targets for the current year have already been completed and were reported to the sub-group.

Govt. of Gujarat

Sub-group noted that the progress was on schedule.

Govt. of Maharashtra

GOM reported that the progress on non-forest area could be achieved on 84 ha against the scheduled target of 6488 ha whereas the progress of reforestation of degraded forest area is 12961 ha. against the scheduled target of 12970 ha.

Regarding compensatory afforestation on non forest areas in lieu of the land relased for the Taloda forests Shri T. Balaraman indicated that the progress achieved so far is 2192 ha against the scheduled targets of 62700 ha area as the areas identified earlier were heavily encroached. Plantation works on another 180 ha area in District Dhule are under progress. He further reported that the joint survey is being done on 2000 ha area for identification of encroachment free non-forest areas for the purpose of compensatory afforestation.

Dr. Shekhar Singh desired to know, when the non forest land could be identified for compensatory afforestation why the tribals could not be settled on such lands in place of the forest lands ?. Shri T. Balaraman, Secretary (Forests) explained that the land of the Taloda forest was released in accordance with the wishes of the PAPs who wanted to settle down only in the forest areas. Chairman, however, stated that the release of the Taloda forest land was an exceptional case which could not be a precedent for release of any further land for the R&R works.

Location map of the areas being planted alongwith the details of composition of species, survival, spacing and other inputs provided to the crop are still awaited.

iii) COMMAND AREA DEVELOPMENT

Narmada Sagar Project

Govt. of Madhya Pradesh

On the issue of proposal of studies on effect of insecticides and pesticides from the run-off from the fields GOMP indicated that a meeting for finalising the technical aspects of the proposed studies was fixed on 16.11.92. GOMP also indicated that the basic field data being collected since November, 1991 had been compiled and a consolidated report was expected to be made available shortly. Further action would be taken after the entire report is studied.

Sardar Sarovar Project

Govt. of Gujarat

GOG circulated during the meeting the terms of references for the various studies recommended for consideration by the sub-group. Chairman observed that since the terms of reference were circulated during the meeting, the members should study these and offer their comments directly to GOG with a copy to MOE&F and NCA so that the same may be discussed in the next meeting of the sub-group.

Govt. of Rajasthan

Details are awaited.

iv) SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES

Narmada Sagar Project

Govt. of Madhya Pradesh

A copy of the report submitted by Friends Nature Society, Bhopal in 3 volumes was submitted during the meeting by GOMP.

Sardar Sarovar Project

Govt. of Madhya Pradesh

Quarterly report for the quarter ending September, 1992 is still awaited from GOMP. GOMP informed that the delay in submission of report had occurred due to transfer of Director of State Forest Research Institute, Jabalpur and efforts were being made to get the draft report quickly.

Govt. of Gujarat

GOG submitted summary of the studies completed by M.S. University, Vadodara enclosed as Annexure-Min-II. However action plan, cost estimates etc are still awaited.

Govt. of Maharashtra

The School of Environmental Science, Pune University, Pune has submitted a preliminary report on field survey of flora and fauna in and around the SSP, Florastic report of Akkalkuwa taluk, District Dhule. Phytosociological studies in Dhankhadi near Chimankhadi and Manibeli sities were also carried out and 2 species of plants were found to be rare in the region. School of Environmental Science has submitted Faunal Report also giving the list of birds, mammals, reptiles sighted in the area. Further phytoplanktonic and zooplanktonic studies are under progress.

v) ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY

ANTHROPOLOGY

GOMP reported that the detailed discussions were held with Dr. K.S. Singh, Director, Anthropological Survey of India during August, 1992 and steps are being

taken to expedite the studies as quickly as possible. However Dr.K.S. Singh was not present in the meeting for any further discussion on the matter.

ARCHAEOLOGY

Govt. of Madhya Pradesh

Narmada Sagar Project and Sardar Sarovar Project

GOMP informed that the Archaeological Survey of India(ASI) was reported to have prepared the action plan. The same is not yet submitted to NVDA and no sooner it is made available by ASI, the sub-group will be informed.

Sardar Sarovar Project

Govt. of Gujarat

GOG indicated that for Shoolpaneshwar temple, the inner hall (Garbh Griha) was already constructed and land scaping for the temple site entrusted to a consultant specialising in the field of temple construction all over Gujarat. Regarding Hamfeshwar temple, it is indicated that the land is identified and plans are also finalised. Further works are being taken up there.

vii) SEISMICITY AND RIM STABILITY OF RESERVOIR

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP indicated that the GSI had been requested to complete the balance studies and further progress in this regard awaited.

Sardar Sarovar Project

GOMP is to report the progress on joint visit to site by the research team of officers of CW&PRS, Pune and GSI during the next meeting of the sub-group.

vii) HEALTH ASPECTS

Govt. of Madhya Pradesh**Narmada Sagar Project and Sardar Sarovar Project**

It is reported by GOMP that the water quality studies have been included in the liminological studies being carried out presently by the 3 universities of Jabalpur, Bhopal and Ujjain and these studies will be completed by the end of December, 1992. Half yearly reports are being received regularly.

Sardar Sarovar Project**Govt. of Gujarat**

It is indicated by GOG that the health plan is being reviewed by the Health Department in which the Environmental Impact Assessment studies with prevention aspect are already incorporated.

Govt. of Maharashtra

Serious concerns were expressed by the sub-group for non-finalisation of health plan by GOM even though the submergence is likely to commence very soon. Chairman directed that GOM should immediately finalise the health plan.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

Govt. of Madhya Pradesh

It is indicated by GOMP that so far as the conservation aspect of fisheries (in NSP) is concerned, the main findings of the study report submitted by "Friends of Natutre Society" are as under :-

- (1) Experiences of rerservoirs like Gandhi Sagar, Tawa and Sukta show that most of the original fish fauna of the river not only survives but also breeds well in the reservoir. Carps, both indigenous and exotic, have demonstrated their inbuilt capability of adopting to new environment.
- (2) Recent and past experiences thus indicates that there need not be any apprehension of an adverse effect on fisheries in Indira Sagar consequent upon the formation of the reservoir. It can, on the other hand, be safely said that the reservoir shall rather lead to an upsurge in the production of fish.

Limnological studies are nearing completion. The clear picture on the conservation aspect of fisheries will emerge only after these studies get completed and final reports drawn.

It was, however, again emphasised that introduction of Carp varieties in the reservoirs is not conducive to conservation of aquatic fauna and that careful studies are needed to ascertain the present status and likely impact on the aquatic flora due to impoundment as well as introduction of commercial species.

Govt. of Gujarat

GOG submitted a copy of terms of reference for consideration by the sub-group as desired by the Chairman. Dr. S.N. Singh, Senior Scientist and Head of Eastuarine Research Centre, CICFRI, Vadodara made a presentation on the works being done by the research centre there at Vadodara for information of the sub-group. A copy of the annual report for the period 1991-92 was also made available to the sub-group.

Govt. of Maharashtra

It is reported by GOM that the comments from Ministry of Environment & Forests on the fisheries plan submitted to it are still awaited.

Narmada Control Authority

The desk review study entrusted to CICFRI are under progress and may be available by 31st December, 1992.

Item No.XVI-4(89):WORLD BANK ASSISTANCE & PERFORMANCE BANCH
MARK ON ENVIRONMENTAL ISSUES

The sub-group noted the information contained in the agenda. Chairman desired that while dealing with the World Bank, the issues related with Environment, should be discussed in detail in the Sub-group.

Item No. XVI-5(90): **ANY OTHER ITEM**

DATE AND VENUE OF NEXT MEETING:

ANNEXURES

ANNEX XVI. MIN. I

LIST OF PARTICIPANTS WHO ATTENDED THE 16TH MEETING
OF ENVIRONMENT SUB-GROUP OF NCA HELD AT PARYAVARAN
BHAWAN, NEW DELHI ON 9TH NOVEMBER, 1992 AT 11.00 AM.

1. Shri R. Rajamani, Secretary, Ministry of Environment & Forests, New Delhi. - Chairman
2. Shri D.C. Debnath, Executive Member, NCA, Indore.
3. Shri N.C. Dave, Secretary (R&R), Govt. of Gujarat.
4. Shri N. Suryanarayanan, Commissioner (PP), Ministry of Water Resources, New Delhi.
5. Shri T.N. Chaudhary, Addl. Director General (IWM), ICAR, New Delhi.
6. Prof. S. Ramaseshan, Professor, DCE, IIT, Kanpur.
7. Dr. Shekhar Singh, IIPA, New Delhi.
8. Prof. R.K. Katti, Director & Consultant Uneecs Pvt. Ltd, Bombay.
9. Shri M.K. Jiwarajka, DIG (FC), MOE&F, New Delhi.
10. Shri S.B. Lowalekar, Secretary (E&F), NVDA, Bhopal.
11. Dr. S. Maudgal, Advisor, MOE&F, New Delhi.
12. Shri R.S. Varadarajan, Secretary, NCA.
13. Shri T. Balaraman, Principal Secretary (Forests), Govt. of Maharashtra, Mantralaya, Bombay.
14. Shri R.V. Rao, Director (EM), CWC, New Delhi.
15. Shri K.A. Kushalapa, CCF(C), MOE&F Regional Office, Bhopal.
16. Shri N.V.V. Char, Secretary, SSCAC, Vadodara.
17. Shri M.B. Mehta, CCF, SSP, Vadodara.
18. Shri S.P. Mathur, Addl. Secretary, Deptt. of Environment, Govt. of Rajasthan, Jaipur.
19. Shri H.N. Mathur, Director, Irrigation, Govt. of Rajasthan.
20. Smt. Nalini Bhat, Joint Director, MOE&F, New Delhi.

21. Dr. Pawan Kumar, Specialist (Env.), NCA, Indore.
22. Dr. S.N. Singh, Senior Scientist, CICFRI, Vadodara.
23. Shri R.K. Behre, SMS (Hydro & Sedimentation), NVDA, Bhopal.
24. Shri S.K. Soni, Executive Engineer & TA. Minior Irrigation Scheme, Govt. of Rajasthan.

ANNEX.XVI.MIN.II

WILDLIFE MANAGEMENT STUDIES IN THE SUBMERGENCE AND
CATCHMENT AREAS OF NARMADA PROJECT : WITH SPECIAL
REFERENCE TO SHOOLPANESHWAR WILDLIFE SANCTUARY

SUMMARY

Sanat A. Chavan

CONSERVATOR OF FOREST & PRINCIPAL INVESTIGATOR

- 3 -

MAY 1992

- 3 -

The study area of Sardar Sarovar submergence and catchment area of Gujarat once formed a part of continuous forest belt stretching over adjoining states, and extending from Panchmahal to Dang. Once land of rich faunal and floral diversity, these areas have become barren due to the human pressures on the forests for forest resources, cultivation and cattle grazing. The study team investigated both right bank and left bank of Narmada. As the right bank area showed no significant presence of wildlife and its habitat, Shoolpaneshwar Sanctuary on left bank was investigated, on the suggestion of World Bank Team. Sanctuary area covered 607 sq. km.

Past history mentions of moist deciduous to evergreen forests which were inhabited by Wild Elephants, Bison, Tiger, Panther, Chital, Sambar, Nilgai, Wolf, Wild Dogs, and smaller cats. Area was rich with avifauna.

Vegetation : Human and cattle pressure has made right bank area, virtually barren to dry deciduous open scrub, while, on the left bank rich forests still exists.

The study group has identified five major forest types, based on Champion and Seth's revised classification.

- (1) Moist Teak Forest (3B/C16).
- (2) Southern Moist Mixed Deciduous Forest (3B/C2).
- (3) Dry Deciduous Scrub (5/DS1).
- (4) Dry Bamboo Breaks (5/E9).
- (5) Dry Tropical Riverain Forest (5/IS1).

Most of the plains and flat areas of the sanctuary are encroached by cultivation and habitations. Good forests are left mostly in hilly, undulating areas. Pure bamboo breaks exists in Vav, Kalvat, Chopadi areas. On hills, teak and bamboo are two important species - where grazing is severe, undergrowth contains Cassia tora, Xanthium strumarium, Neuracanthus Sphaerostachyus, Achyranthes aspera, etc.

Wildlife :

Not much of wildlife was present on rightbank area. Common creatures like Jackal, Hare, rarely a Hyaena & Panther were observed. Left bank with its sanctuary area provided great animal diversity. Carnivorous animals observed on the left bank & the sanctuary area were Panther, Jungle Cat, Rusty-spotted Cat, Leopard Cat, and Toddy Cat. While the herbivores included Four-horned Antelope, Barking Deer and remnant population of handful of Sambar. Chital has already vanished from the sanctuary & surrounding area. Other animals includes omnivores like Sloth bear & Wildboar, primates like Langurs & Rhesus macaque. Most of the wildlife was observed in the pockets of proposed central core area with dense forests & waterholes. 62 percent of wildlife sightings were on the hill slopes. Out of this 52 percent was in moist deciduous forests. There were no sightings, of kill, or any other signs of tiger in the study area. This clearly indicates that tiger has become locally extinct. Most important finding was the sightings of leopard cat (which was

reported to be locally extinct), and new finding of Rusty-spotted cat for the area. The study team also reestablished records of large-brown flying squirrel and held sighting of Dangs Giant squirrel. Both squirrel species seem to be inhabiting Bamboo & moist deciduous forests with large sized trees. Rhesus macaque were restricted to hilly terrain with less human disturbance. This seem to be due to the fact that local tribals kill primates for food. Wildlife seem to be under great pressure, compressed & restricted to few densely wooded pockets. Census of wildlife was carried out in May 1991. Which showed very thin population of most animal species - Best represented was Four-horned Antelope & then Barking Deer. Wild life was present mostly where human disturbance was less or absent. Down stream of river inhabited by small population of Muggar & Otter. Avifaunal diversity was richly represented. 198 species of birds were identified. Out of this there were ten species of birds which were new records for the sanctuary & surrounding forest area. Noteworthy among these were Hodgson's Frogmouth and Streaked Spiderhunter.

Biotic Pressures : The left bank & sanctuary area has lesser human & cattle pressure than the right bank. Sanctuary area on the left bank is honey combed with cultivations & habitations of about 100 forest villages.

Forest tribals depend upon these forests for various resources such as fuel, timber, bamboo, minor forest produce. They maintain cattle which are mostly unproductive & giving

only the social status. About 27000 livestock of sanctuary goes for grazing upto 6 km distance in surrounding forest area. Area thus grazed is experiencing retrogression and unpalatable plant species have covered the forest floor. Water is the main limiting factor for wildlife. Most of the permanent waterholes are under use of cattle and humans.

Local tribals kill wildlife whenever possible for food. Langurs are also eaten. They catch parakeets for sale in nearby markets. Giant & flying squirrels are captured even by burning the tree and are eaten.

Severe forest fires break out during the summer months. Few months before the sowing agricultural crops tribals burn the forest areas for agricultural encroachment, cultivation even done on slopes, causing heavy erosion.

Fires are also lighted for clearing the ground for collection of Mahuwa flowers. Besides this bamboo collection by Forest Dept. for supply to privilege holders also causes great disturbance to rare fauna.

Carrying capacity of wild animals in the sanctuary was estimated taking into consideration variable affecting it.

Management suggestions :

- (i) Restrict unauthorised encroachment & cover them with local tree species.

- (ii) Developing "microcores" initially & then going for central core. Attempts should be made, with people's cooperation, for readjusting some villages from this core area to buffer area, in the sanctuary.
- (iii) Extensive water regime should be developed for wildlife. Separate wildlife & human water holes should be maintained to reduce disturbance to the wildlife.
- (iv) Vaccination of cattle in the sanctuary. This will protect wildlife from getting infected.
- (v) Well planned eco-development to be undertaken in buffer areas for the forest villagers.
- (vi) Encourage agro-forestry in village forest areas.
- (vii) Training facilities for local tribals and their young to earn their livelihood in other professions.
- (viii) Encourage Nature Conservation programmes more.
- (ix) Take up soil conservation works in eroded forest areas.
- (x) Take up desilting of check dams.
- (xi) Stop bamboo working in best wildlife areas like vav, Kalvat & Chopadi.

- (xii) Preserving large sized trees in moist deciduous & riverain areas for Gaint & Flying squirrel, Grey Hornbill & Alexandrine parakeet.
- (xiii) Wherever possible rubble wall should be made between forest & villages. This will reduce changes of encroachment of cultivation.
- (xiv) Setting up meteorological status for recording various climatological parameters.
- (xv) It is not recommended to reintroduce Tiger in the sanctuary, in absence of enough natural prey & large number of villages.
- (xvi) Bird ringing programme should be undertaken in the sanctuary in collaboration with Bombay Nat. Hist. Society.
- (xviii) Training to the staff & officers in wildlife management is required.

"ECO ENVIRONMENTAL AND WILDLIFE MANAGEMENT STUDIES ON THE
SARDAR SAROVAR SUBMERGENCE AREA IN GUJARAT." ALONG WITH
"MANAGEMENT STRATEGIES AND ACTION PLANS FOR THE
ENTIRE STUDY AREA INCLUDING THE SHOOLPANESHWAR
WILDLIFE SANCTUARY"

EXECUTIVE SUMMARY

M.S. UNIVERSITY

1992

-10-

"ECO-ENVIRONMENTAL AND WILDLIFE MANAGEMENT STUDIES
ON THE SARDAR SAROVAR SUBMERGENCE AREA IN GUJARAT"

CONTRIBUTORS:

PROF. S.D.SABNIS, Project Director,
Pro-Vice Chancellor, M.S.University of Baroda.

PROF.J.V.AMIN, Project Consultant,
Dept. of Botany, M.S.U.Baroda.

PROF.R.P.BHATT, Principal Investigator,
Head, Dept. of Botany, M.S.U. Baroda.

PROF.BONNY PILO, Principal Investigator,
Head, Dept.of Zoology, M.S.U. Baroda.

PROF.S.J.BEDI, Principal Investigator,
Prof., Dept. of Botany, M.S.U. Baroda.

DR.Y.M.NAIK, Principal Investigator,
Reader, Dept. of Zoology, M.S.U. Baroda.

DR.N.RADHAKRISHNAN, Principal Investigator,
Reader, Dept. of Zoology, M.S.U.Baroda.

DR.G.PRATHAPASENAN, Principal Investigator,
Reader, Dept. of Botany, M.S.U.Baroda.

RESEARCH ASSISTANTS

MR.PRADEEPKUMAR G.

MR. JAYESH B.BHATT

MS. ISHA V.DESAI

MR.VINOD K.R.

MR. PRADEEP P.K.

CREDITS

1. Prof.S.D.Sabnis is Project Director and Co-ordinator. He is also the Pro-Vice Chancellor of the M.S.University of Baroda. His field of interest are Plant Taxonomy, Chemo-Taxonomy and Ethno Botany.
2. Prof.J.V.Amin is senior project consultant. He has supervised editing of the report and developed Ecosystem classification and Management Strategies section of the report. He has served on the faculty of Texas A & M University and his field of special interest are Plant Physiology, Plant Chemistry and Soils.
3. Prof.Bonny Pilo is Head of the Department of Zoology at M.S.University of Baroda. He has developed the avian fauna inventories of the study area. His other contributions to the report are in the areas of avian food pyramids, ecosystems of Shoolpaneshwar sanctuary, and plant bird interactions prevailing in the study area. His field of special interest are avian physiology. He is also Managing Editor of two scientific journals, PAVO and Journal of Morphology and Physiology.
4. Prof.R.P.Bhatt is Head of the Department of Botany at M.S.University of Baroda. He has helped to develop flora inventories of the study area as well as phenology of the plants in the area in collaboration with Dr.G.Prathapasanen and Dr.S.J.Bedi. His special field of interest is Plant Cytology.
5. Prof.S.J.Bedi is Professor of Botany in the Department of Botany of M.S.University of Baroda. He has contributed sections on Biomass of the Study area, as well as those forage and water availability for wild life, and studies on slope stabilization of the catchment area of the Sardar Sarovar. His field of interest are ecology, air and water pollution in the cities and environment and forests.

6. Dr.Y.M.Naik

is Reader in Department of Zoology at M.S.University of Baroda. he has contributed inventories of vertebate fauna of amphibians, reptiles, and fishes. He also reports on cases of iodine deficiency in the study area. He has served as Dean of Students and is active in student affairs.

7. Dr.N.Radhakrishnan

is Reader in Department of Zoology, M.S.University of Baroda. he has contributed sections on invertbrate fauna of the sanctuary and the right bank. His other contributions include food chains, food webs and food pyramids descriptions as well as those of use of insects to control aquatic weeds in collaboration with Dr.G.Prathapasenan.

8. Dr.G.Prathapasenan

is Reader in the Department of Botany in the M.S.University of Baroda. He has contributed in developing tissue culture techniques for preserving and propagating more rare and interesting plant species found in the study area. He has also developed the section on control of aquatic weeds. His special interest are in the fields of tissue culture and in resistance to salinity and other stress conditions in plants.

Other Contributors:

9. Mr.S.A.Chavan

is an I.F.S. Cadre Officer of the Department of Forest, Gujarat State. He has been on deputation to NPG from the Forest Department and is Principal Investigator of the 'Wild Life Management Studies' a concurrent project working on close cooperation with the environmental group. He has contributed the material on Wild Life section of the report. He has been in wild life field for a large number of years and has served as Conservator Lion Sanctuary of Sasan Gir and Marine Land Sanctuary of Jamnagar. He has also been active in organising nature education and youth activities.

LOCATION OF THE STUDY AREA

The study area lies on both sides of the Narmada River mostly upstream of the Navagam Dam and is restricted to approximately 20 Km on either side of the river in Gujarat. It lies between 73.31'E and 74.5' E and 21.34'N and 22.50 N. The river which flows between the mountain ranges of Vindhya and Satpura enters the alluvial plains of Gujarat at this point. The Vindhya range is on the right bank of the river and the Satpura range makes up the left bank. These ranges run in the east West direction diagonally across the country and separates the Deccan penninsular plateau in the south from the northern Indo-Gangetic plains. The principal geological formation of this area in sequence of deposition are Bag limestones, sandstones, the deccan trap lava flows and alluvial deposits. Of these the trap rocks are impervious to water and exert a considerable influence on the hydrology of the area. The 1600 Sq.Km of the study area can be described as a series of continuous and discontinuous foot hills, intermingled with valleys, streams and forest clearings and bounded at the periphery either by agriculture or by large water bodies. The hills are smaller on the right bank and in the westernly direction.

The area is under the south west monsoon regime; and it rains only June end to September end period. If the rains are tardy the period may be shortened to two months. The rains here are stronger than in the alluvial agriculture area to west; but a large portion of the water is lost in the runoffs due to hilly nature of the area. The streams and rivers of the area begin to dry up by mid January and by February very few of them have any water flow. All of these streams and rivers end up becoming tributories of the Narmada River either up stream or down stream

-2-

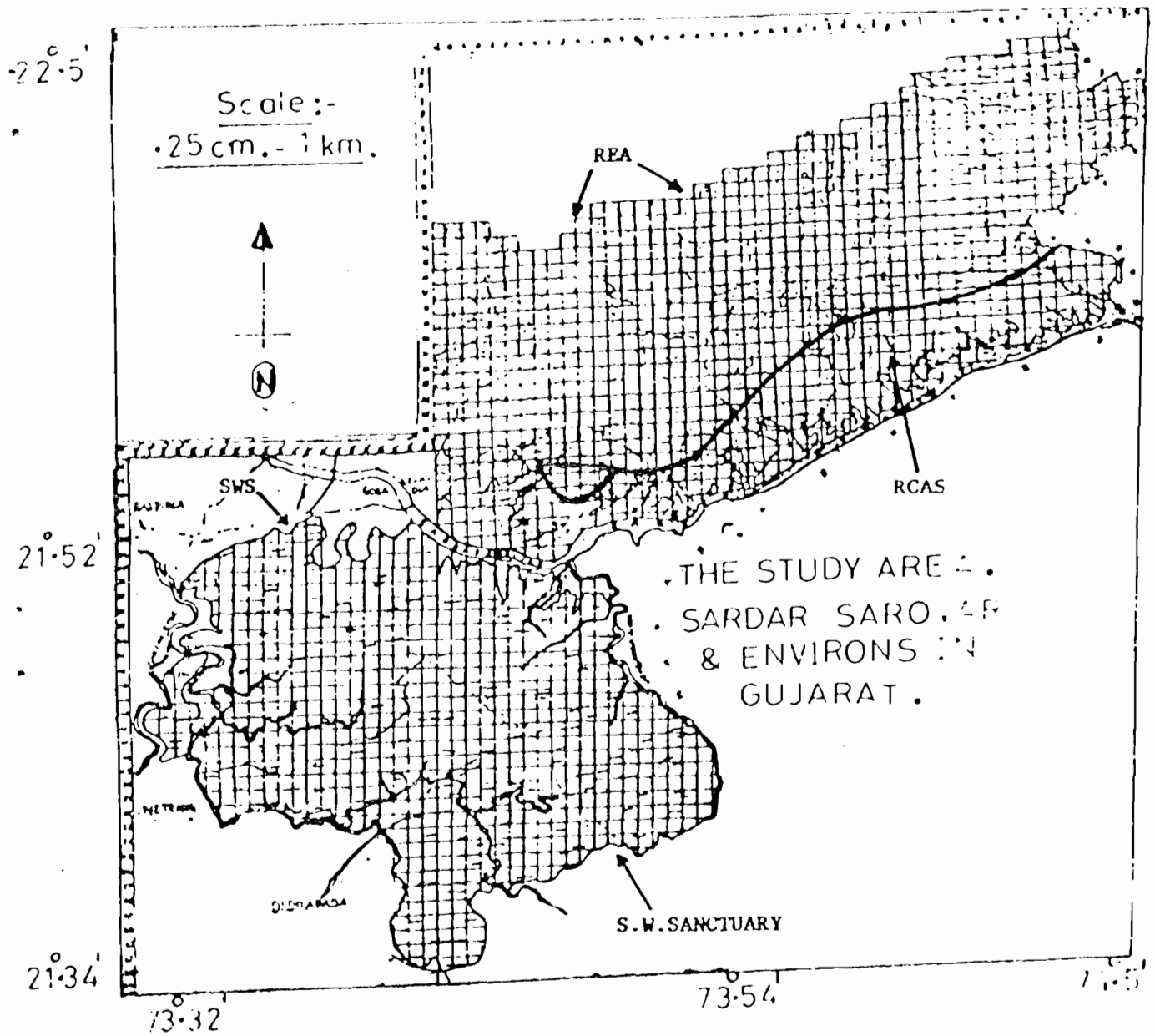
of the Navagam dam. These conditions limit the plant growth in the area to about 100 days and as the dry season proceeds both agriculture and forest areas having increasingly parched look.

Nearly 190,000 people and 85,000 cattle live in this area. 150,000 of the people and 60,000 cattle live in the 924 Sq.Km. of the right bank area and 37,000 people and 26,000 cattle are in 675 Sq.Km. of the left bank area. These areas differ considerably in the lifestyle of the people, nature of vegetation including forests, and domestic and wild life profiles. The left bank area appears better from the environmental point of view and the right bank area appears more close to a better developed life style even though the environment of the area is highly degraded. However, the communication and transport facilities in the interior of both these areas are primitive and many of the locations in the area become un-approachable during monsoon.

The terms of reference of the project required investigators to develop an exhaustive inventory of fauna and flora of the region. If any of the species was found to be endangered or very rare, measures to preserve it or save it from extinction had also to be undertaken. For this purpose it was necessary for the scientists to investigate the area in an intensive manner. It was also necessary to locate areas which had better biomass or had greater capacity to provide habitat to wild life or could be used to support migratory wild life during the course of its travel from the submergence area. Some portions of the work also required random samples to be taken and analysed so that the proper inferences can be made. It was therefore decided to make map of the area that can be used in the field to locate villages, roads ridges and other local features. These maps are prepared in the scale of 1:50,000 from topo sheets of Geological Survey of India. A network of square grids, in which each square had 2 cm sides was drawn on the map

-15-

MAP - I



-3-

and the X and Y co-ordinates were labelled with alphabet and numerical markings. Thus the map was divided into 1600 identifiable squares each representing 1 Sq.Km. and which could be used to locate and mark sites of sample collection, of location of interesting flora and faunal species, for selection of sample areas for biomass studies and a host of other useful activities. Random sampling was required for certain studies involving distribution patterns of flora and fauna. These random sampling sites were selected on the map, using stratified random sampling techniques, and then the actual sites were located in the field during field trips. Map 1 shows a reduced size map of the study area with the grid network. Besides field work, these maps proved highly useful in analysis of ecosystems of the area, development of management strategies and action plans for both the right and the left banks and determination of optimum land use pattern at different locations.

FIELD TRIPS

A word about the organisation of the field trips should help to understand the manner in which the field data was collected. The trips were organised with jeeps as the main transport vehicle. Normally each trip had a minimum of six investigators and two support personnel in a jeep section. Each section had at least one principal investigator from either botany or zoology and at least one experienced research assistant from the supporting counter discipline. The duration of the trip varied from three days to a week; and some times when the work justified it two sections of the jeep were included in the same field trip.

Many times the field trips of the 'Eco-environment project and those of the 'Wild life management project were run

-17-

-4-

concurrently enabling the groups to react with each other in the field and also enabling data collection of bio-inventory, biomass, and ecosystem classification to be gathered along with that of the wild life on the same trip.

Several times, because of the requirements of the Wild Life group, night trips were also organised in which members of the other groups also participated. If an interesting finding or phenomenon was located by some investigators, they reported it to other members of the team either in the field or in the departments and the situation could again be investigated further by going to the same site again with the help of the maps. It was equally possible to investigate and reconfirm or reject doubtful data. In all more than 70 such trips involving 2000 man days were conducted in the study area by the Eco-environmental' group, for the collection of data.

FLORISTICS AND VEGETATIONAL STUDIES ON THE SARDAR SAROVAR SUBMERGENCE AREA AND ITS ENVIRONS IN GUJARAT

A thorough survey of the Sardar Sarovar Submergence area and its environs has been carried out with a view to assessing mainly the present status of vegetation, floristic composition and the presence of any rare or endangered plant species. It has been observed that the submergence area and catchment area on the right bank of the proposed reservoir exhibits a highly degraded ecosystem. Small patches of forest is observed at few places in Right bank Extended Areas (REA). In contrast to this the Left bank area (Shoolpaneshwar Wildlife Sanctuary) exhibits a good forest cover. The main forest types are Moist mixed deciduous and Dry deciduous. A total of 593 plant species belonging to fungi (18), bryophytes (6), pteridophytes (5) and angiosperms (564) are recorded from the entire study area. In addition Phenological and Ethnobotanical data are also collected.

-18-

-5-

A few plants such as Dillenia pentagyna, and Careya arborea, which are the remnants of a good forest in the recent past are observed in small numbers in the Sanctuary area. This clearly indicates that the area still has the potential to support a rich vegetational cover, if properly managed.

The 2½ years extensive survey in the study area did not reveal the presence of any endangered or threatened endemic plant species. A few plant species viz. Butea monosperma (yellow variant) and Radermachera xylocarpa which are rare in distribution in the study area have been introduced into the M.S.University Botanical Garden and they are also been propagated through tissue culture.

ESTIMATION OF FOREST BIOMASS IN THE SARDAR SAROVAR ENVIRONS IN GUJARAT

The forest biomass production in the Narmada Catchment area in the vicinity of Sardar Sarovar in Gujarat State has been estimated. The data on biomass production have shown great variability on both the banks of the river. The reasons being a great variability of interaction of various edaphic, abiotic and biotic factors. On the basis of biomass production of these forests and various interacting factors these systems are classified into 7 ecogrades. They are put in three broad groups.

- I. High biomass production (60 to 80 T/Ha) (E.G. 1 & 2) restricted to core area of the Shoolpaneshwar wild life sanctuary. These areas are characterised by well drained fertile soil, rich with wildlife and low man induced biotic stresses.

-19-

-6-

- II. Medium biomass production areas (30 to 40 T/Ha) (E.G. 3 & 4) on northern and southern side of E.G. 1 & 2 forest areas have medium stresses are well drained and have potential to be improved.
- III. Poor to very poor biomass production (7 to 20 T/Ha) (E.G. 5, 6 & 7) have high biotic and edaphic stresses. Forests are poor and degraded. They cover larger area near Sardar Sarovar and small patches on the E & W parts of SWLS on the left banks and very large area on the right bank. E.G. 1 & 2 covering about 300 Sq.Km. area accounts for about 70% of the forest phytomass produced in the entire area (1599 Sq.Km.) on both the banks. All the system have the capacity to revert back again towards progressive accelerated man induced ecological succession with proper management. Chances of success area very bright with the huge impoundment of water in Sardar Sarovar.

Suggestions are made for the eco-enhancement of the forests in the Narmada Catchment Area in Gujarat State.

FAUNA OF SARDAR SAROVAR SUBMERGENCE AREA AND ITS ENVIRONS IN GUJARAT

The 24 years studies in the area have revealed the presence of a good number of animal species. The diversity of animal species is more in the left bank (Shoolpaneshwar wildlife sanctuary) compared to the highly deteriorated right bank area. The table - 1 shows the number of different animal species located and identified from the study area.

-20-

-7-

Table - 1: Fauna of the study area

<u>Invertebrates</u>		<u>Vertebrates</u>	
Annelids	- 4 spp.	Fishes	- 17 spp.
Crustaceans	- 3 spp.	Amphibians	- 18 spp.
Myriapods	- 3 spp.	Reptiles	- 16 spp.
Arachnids	- 57 spp.	Birds	- 173 spp.
Insects	- 210 spp.	Mammals including	- 18 spp.
Molluscs	- 9 spp.	Wildlife in the	
		Shoolpaneshwar	
		sanctuary	

The presence of some interesting animal species such as Rana keralensis, Kaloula pulchra (Amphibians). Hodgson's Frogmouth, Heartspotted Woodpecker (Birds) and a few wild animals such as Barking deer, Rustyspotted cats makes the Shoolpaneshwar wild life sanctuary a high priority nature conservation area.

During the study period we have not found any rare or endangered animal species in the study area.

WILDLIFE, FOLIAGE AND WATER RESOURCES FOR WILDLIFE IN SHOOLPANESHWAR SANCTUARY

WILDLIFE

The wildlife studies in the study area conducted by the wildlife study group indicates that the number of wildlife is very negligible in the right bank and submergence areas of Sardar Sarovar. In contrast to this the Shoolpaneshwar wildlife sanctuary located on the left bank embodies a good number of wild animals. Table - 2 depicts the different wild animals located and identified during the wildlife census conducted by

TABLE-2

SP. NO. :	NAME OF ANIMAL :	TOTAL ANIMALS SIGHTED :			REMARKS :
:	:	NO.OF ANIMALS SIGHTED IN SUB. AREA :	NO.OF ANIMALS SIGHTED IN CATCHMENT AREA :	NO.OF ANIMALS SIGHTED IN SANCTUARY AREA :	:
1 :	TIGER :	- :	- :	- :	No confirmed reports or signs :
2 :	PANTHER :	- :	1 :	12 :	:
3 :	JUNGLE CAT :	- :	2 :	30 :	:
4 :	LEOPARD CAT :	- :	- :	8 :	:
5 :	RUSTY SPOTTED CAT :	- :	- :	2 :	Seen by Wildlife Study group :
6 :	CIVET CAT :	- :	- :	- :	:
7 :	SAMEER :	- :	- :	1 :	From fresh droppings at Vav. :
8 :	BARKING DEER :	- :	- :	22 :	:
9 :	FOUR-HORNED ANTELOPE :	- :	8 :	180 :	:
10 :	SLOTH BEAR :	- :	- :	18 :	:
11 :	WILD BOAR :	- :	3 :	33 :	:
12 :	WILD DOG :	- :	5 :	35 :	:
13 :	HANUMAN LANGUR :	- :	8 :	99 :	:
14 :	RHESUS MACAQUE :	- :	15 :	150 :	:
15 :	RATEL :	- :	- :	1 :	Seen earlier than census :
16 :	JACKAL :	- :	4 :	59 :	:
17 :	FOX :	- :	- :	2 :	One seen earlier in different :
18 :	PORCUPINE :	- :	- :	5 :	area. :
19 :	MONITOR LIZARD :	- :	2 :	6 :	One seen by Wildlife group :
20 :	PYTHON :	- :	- :	5 :	:
21 :	MONGOOSE :	- :	5 :	15 :	seen by Wildlife group :
22 :	GIANT SQUIRREL :	- :	- :	4 :	confirmed by Wildlife team :
23 :	LARGE BROWN FLYING SQUIRREL :	- :	- :	3 :	confirmed by Wildlife team :
24 :	PEAFOWL :	- :	10 :	298 :	:
25 :	GREY HORNBILL :	- :	- :	7 :	:
26 :	JUNGLE FOWL :	- :	5 :	22 :	:
27 :	ALEXANDRINE PARAKEET :	- :	12 :	51 :	:
28 :	HYACINTH :	- :	- :	18 :	:

-8-

the Forest department jointly with the wildlife study group in the Shoolpaneshwar wild life sanctuary and in the catchment areas of Sardar Sarovar in Gujarat.

FOLIAGE AND WATER RESOURCES FOR WILDLIFE IN SHOOLPANESHWAR SANCTUARY

In general the availability of water in the Shoolpaneshwar Sanctuary is sufficient, especially in the valleys to support the existing wild life. In some good forests in some of the core areas (Vav, Chopadi, Namgir, Waghumar), Scarcity of water exist during summer season and the animals have to move a long distance through thin vegetal cover to reach richer sources of water. Efforts should be made to provide additional perennial sources of water by desilting the existing check dams and deepening the impervious rocky pits in the river beds to increase their water storage capacity during the lean season. Foliage availability in different forest ecogrades and species preference by herbivores is listed.

WEED CONTROL IN AQUATIC SYSTEMS OF SARDAR SAROVAR ENVIRONS IN GUJARAT

The earlier studies on the Ecology and Environment of Sardar Sarovar Narmada Project (1983) give an account of aquatic weeds met with in the present study area and its environs. The two gregarious species with high colonization potential which are likely to infest the reservoir and the canals are waterhyacinth and Pistia. These weeds are not present in the study area. However, their presence has been observed in some areas close to the dam site. Infestation of reservoir and canal by these weeds therefore can take place at any time. Hence it is necessary to have suitable control measures for checking the weed menace as and when required. Among the

-9-

different methods available to control the aquatic weeds the biological control using host specific insect and other organisms is relatively cheap and free from ecological backlashes. Experiments were therefore conducted to evaluate the efficiency of weevils in the control of waterhyacinth under local conditions. The weevils Neochetina eichhorniae and N. bruchi have been found capable of distroying waterhyacinth totally under experimental conditions. Therefore, it is possible to use these insects to control waterhyacinth without fear of any adverse effect.

STABILIZATION OF SARDAR SAROVAR PERIPHERY IN GUJARAT

To maintain and prolong the efficiency and life of Sardar Sarovar, it is absolutely essential to control soil erosion in the catchment area and minimise siltation of the reservoir by stabiliziation of the slopes and eco-enhancement of the ecosystem. Researches and reviews during the past quarter century on the significance of vegetation clearly support the conclusion that vegetation has net stability effect on most slopes. Biological stabilization treatment is inexpensive and more efficient but takes longer time to yield appropriate results. Dense growth of bamboos mixed with perennial grasses, other herbs, shrubs and vegetatively propagating trees provide quicker results. List of such plants are recommended. There is great need to initiate researches for desiltation of large dam reservoirs.

MANAGEMENT STRATEGIES AND ACTION PLANS FOR THE DEVELOPMENT OF SARDAR SAROVAR ENVIRONS IN GUJARAT

The studies has concluded that there is considerable deterioration of environmental systems of the study area and present trend is in the retrograde direction. This retrograde

-10-

trend has the potential to completely cancel the benefits to society of progress on industrial fields; and should be viewed with concern; hence preventive and corrective programme therefore should be undertaken without delay. In order to restore these damaged environmental systems of the study area it is necessary to pay attention to both the internal as well as external factors that influence the performance of these systems.

The initial steps in the restoration of these ecosystems involve elimination of outside system loads on them and determination of the nature of the role to be played by renovated ecosystem i.e. to classify the region by its topographic, hydrological and other characteristics as to whether it is suitable for forests, grass land, farm crops or other uses. Any damaged ecosystem will tend to restore faster or better if it receives - help from other systems from the outside. But however, great the help from outside, it cannot operate an ecosystem in a steady-state equilibrium. That can only be created if the ecosystem in question can generate enough harvests of products, services and goods to exchange with outside systems to serve its varied needs and this has to be done year after year without destroying the system's production potential. Preferably it should also involve cash transactions in which the money earned by the system goes to the system and is used by it.

After this exchange relationship between ecosystem of the study area and those outside is well developed; the residents of the study area should have enough resources to maintain an adequate reseedling programme and to switch over to fuels other than wood. The switch over is necessary to assure sustainable development of these ecosystems.

-25-

-11-

1. The study area and all its parts are energy deficient in terms of both conventional and non conventional energy.
2. The study area's dependance on wood as a source of energy would have to be reduced to a considerable extent if the region is to flourish in ecological terms.
3. Considerably more energy will be needed in this region if it is to be developed in a manner that will integrate nature conservation, economic development and social change. This aspect should be paid attention to when development plans are formulated.
4. Modification of the hydrological cycle and control of the water regime are two principal requirements for the betterment of the ecological system of the area.
5. The management of such an effort should be on watershed basis and water districts should be formed as and when practicable.
6. Both vegetational approach and building of structures should be employed to keep small streams and water courses running for longer periods of time during the year.

Finally the management strategies and action plans outlined in the report here indicate that development and environmental progress are not necessarily against each other. It is the wrong kind of development that creates environmental damage through neglect or through harmful policies.

-26-

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

पर्यावरण उपदल
Environment Sub-Group

सत्रहवीं बैठक की कार्यसूची Agenda for Seventeenth Meeting

स्थान : पर्यावरण भवन, नई दिल्ली
Venue : Paryavaran Bhawan
New Delhi

दिनांक : 16 मार्च, 1993, 11 बजे
Date : 16 March, 1993, 11 A. M.

इन्दौर
मार्च, 1993

INDORE
March, 1993

AGENDA FOR 17TH MEETING OF THE ENVIRONMENT SUB-GROUP
NCA TO BE HELD ON 16TH MARCH, 1993 AT PARYAVARAN BHAWAN
NEW DELHI.

I N D E X

Item Nos.	Contents	Page No.
XVII-1(91)	Confirmation of the Minutes of the Sixteenth meeting of the Environment Sub-Group.	1
XVII-2(92)	Review of Action taken on the decisions of previous meetings.	2 - 7
XVII-3(93)	Present Status of Studies/ Surveys and Environmental Action Plans.	8 - 15
XVII-4(94)	World Bank assistance and performance benchmarks on environmental issues.	16
	Any other Item	17
	Date & Venue of Next meeting.	17

A N N E X U R E S

XVII-1	Status Report on studies and activities on environmental aspects of Sardar Sarovar and Narmada Sagar Projects.	1 - 18
XVII-II	List of studies commissioned by SSNNL.	19
XVII-III	Copy of the VIIIth quarterly report of SFRI for impact assessment of Madhya Pradesh lands to be submerged under SSP and adjoining Eco systems, flora, fauna and other biotic components for the quarter ending September, 1992.	20 - 35
XVII-IV	Preliminary report of School of Environmental Sciences, University of Pune and status of flora and fauna in and around SSP, Maharashtra.	36 - 78
XVII-V	Short note of Govt. of Maharashtra on the health measures for SSP affected persons in the submergence area and at the resettlement sites.	79 - 82

**Item No.XVII(91): CONFIRMATION OF THE MINUTES OF THE 16TH
MEETING**

Minutes of the 16th meeting of the Environment Sub-Group of Narmada Control Authority were circulated to all members and invitees seperately vide letter No. Env-34(16)/93/166 dated 20.1.93. No comments are received.

The minutes may be confirmed.

Item No. XVII-2(92): REVIEW OF ACTION TAKEN ON THE DECISIONS OF THE PREVIOUS MEETING

Consideration of Policy Issues.

1. **Extention of Time for Environmental and Forestry Approval (Item No. XVI-2(83) (b)).**

NCA has already addressed MOE&F on the issue. The revised construction schedule and the schedule for implementation of action plan of environmental safeguard measures will be made available during the meeting for review of the sub-group.

2. **Submission of Catchment Area Treatment Plans for freely draining critically degraded sub watersheds. (Item No. XVI-2(87) (2)).**

During the last Sub-group meeting Govt. of Madhya Pradesh and Govt. of Maharashtra agreed to submit the plans for the critically degraded (High and Very High priority categories) sub water-sheds not covered by directly draining categories within a year time. Progress achieved so far may be reported. With regard to the delineation of critically degraded sub-watersheds within the Narmada Sagar Project, AIS&LUSO has indicated that the report with maps will be available within 6 months time.

3. **Time frame for Environmental Studies . (Item No. XVI-2(83) (b)).**

The School of Environmental Science, Pune University has prepared a preliminary report for the work done upto 15th December, 1992 and submitted the same to the MOE&F and NCA. Govt. of Maharashtra vide their communication dated 6.2.93 indicated that the University of Pune has now completed the survey of Flora and Fauna within RL 61 area. According to the communication received the report has indicated that the area which is likely to be submerged during the ensuing monsoon does not show the presence of extremely rare and endangered species of animal or plants life. GOM further informed that University of Pune's team is engaged in surveying the area other than RL 61 limit and the results of the survey are expected to be available before the end of December, 1993. The University of Pune has also identified the migratory corridors for the wildlife animals in this area and have further suggested the generation of the Neo Eco system based on the species of plants which may be submerged during the monsoon of this year and the forest department is appraised of the recommendations for incorporating the same in the Catchment Area Treatment and Compensatory Afforestation works being undertaken by them.

4. Cost Estimates for preparation of Action Plan and implementation of Environment Safeguard Measures (Item No. XVI-2(83) (4)).

The fragmented information on estimated cost and expenditure incurred by the party states as available in NCA secretariat were compiled and presented during the 15th and 16th Environment Sub-group meeting. Governments of Madhya Pradesh, Maharashtra, Gujarat and Rajasthan were requested again to kindly submit the information in the format presented. The information so far furnished is not complete and a lot of gaps still remain. In pursuance of the direction of the Chairman, a visit of the site of catchment area under treatment was arranged on 9.12.92, however for various reasons most of the members expressed their inability to participate in the programme. However GOMP has indicated that it would welcome any member of the sub-group to the site. GOMP is yet to inform the date for conducting the meeting on catchment area treatment as indicated during 16th meeting of the Sub-group. Intimation of the meeting may be sent to NCA and MOE&F.

CATCHMENT AREA TREATMENT

Studies

	<u>Estimated cost</u>	<u>Cost incurred</u>
(i) Prioritization of catchment by AIS&LUSO, New Delhi.**	-	-
(ii) Prioritization of thematic mapping by ISRO for area in Gujarat.**	-	-

Implementation (Physical target in ha, and Fin. Rs. Crores)

Treatment	<u>Targets</u>		<u>Achievements</u>		<u>Date</u>
	Phy.	Fin.	Phy.	Fin.	
<u>A. Govt. of Gujarat</u>					
a) Non-forest Area	3025	2.41	1171	1.1	Sept '92
b) Forest Area	27204	32.68	15311	8.32	Sept '92
<u>B. Govt. of Madhya Pradesh</u>					
a) Non-Forest Area	91600	25.20	10450*	2.91*	Sept '92
b) Forest Area	23000	18.73	-	-	

** Works carried out under the budget of AIS&LUSO & GOG

* Incomplete works

Treatment	Targets		Achievements		Date
	Phy.	Fin.	Phy.	Fin.	
<u>C. Govt. of Maharashtra</u>					
a) Non-Forest Area	27200	29.41	-	-	
b) Forest Area	4200	2.2	-	-	
Say	145630	107.38	16470	8.43	

II. COMPENSATORY AFFORESTATION (Physical target in ha & Fin. in Rs. Crores)

A. Govt. of Gujarat

a) Non Forest	4650	8.15	3327	3.62	Dec. 92
b) Degraded Forest	9300	9.42	5387	3.23	Sept '92

B. Govt. of Madhya Pradesh

a) Non Forest	21901		10891		
b) Degraded Forest	55471	18.00	37321	4.69	Sept '92

C. Govt. of Maharashtra.

a) Non Forest	90001	37.00	-	-	June, 92
b) Degraded Forests	130001		8383	9.42	

44687	72.57	16138	16.43
-------	-------	-------	-------

III. Flora fauna (including wildlife & fisheries) & Carrying Capacity (FFC) of the areas adjoining submergence.
(In Rs. Crores)

	Estimated Cost	Cost incurred
<u>A. Govt. of Gujarat.</u>		
a) Studies in 1982 by M.S. University.	0.042	0.040
i) Sanctuary improvement works	0.75	0.55
ii) Downstream fisheries by CICFRI**	-	-

** Project under Ministry of Agriculture

	<u>Estimated Cost</u>	<u>Cost incurred</u>
b) Studies on FFC by M.S. University in 1992	0.34	0.20
c) Studies on wildlife management 1992	0.16	0.11
d) People's participation in sanctuary management by VIKSAT***	-	-
e) Fisheries plan for Estuary & Command *	4.00	Nil
B) <u>Govt. of Madhya Pradesh</u>		
a) Studies by State Forest Research Institute on flora, fauna (wildlife)	0.203	0.156 (Sept '92)
b) Limnological studies by three universities (Aquatic fauna & Water quality)	0.19	0.14 (Sept '92)
c) Fisheries plan (SSP)*	0.82	-
C) <u>Govt. of Maharashtra.</u>		
a) Flora, Fauna, Carrying Capacity by School of Environmental Science, Pune University, Pune.	0.38	0.16
b) Fisheries plan (Tank * pond & reservoir fisheries)	1.66	-
D) <u>Narmada Control Authority</u>		
a) Sociological Survey of fishing families.	0.14	0.14
b) A review of studies on fish conservation.	0.127	0.063
* From State Budget		
*** Studies by World Bank's assistance.		

	<u>Estimated Cost</u>	<u>Cost incurred</u>
--	-----------------------	----------------------

IV. COMMAND AREA DEVELOPMENT.Govt. of Gujarat.

a) : Studies	1.58	0.14
b) Implementation	485.00	Nil

(Fig. being reviewed)

Govt. of Rajasthan

a) Studies	-	-
b) Implementation	-	-

V. HEALTH ASPECT.a) Govt. of Gujarat.

i) Hospital	0.47	0.70
ii) Laboratories	2.36	
iii) Infrastructure	1.77	
iv) Anti Malaria	3.44	
v) Insecticidal spray	30.06	
	<u>38.00</u>	

b) Govt. of Madhya Pradesh.

a) Surveillance of malaria	0.11	0.010
b) Implementation for NSP, Omkareshwar, Maheshwar & SSP projects.	7.49	
	<u>7.60</u>	

c) Govt. of Maharashtra.
R&R site.

a) Establishment of PHC & 3 sub-centres at R&R site.	0.2315	
--	--------	--

10 km belt around SSP.

a) 12 new sub-centres	0.3124	
b) Mobile health unit	0.0323	
c) Education health material	0.0200	
	<u>0.5962</u>	

Say Rs. 0.60 Crores

VI. RIM STABILITYStudies:A. Govt. of Gujarat

Rim stability analysis.	-	-
-------------------------	---	---

	<u>Estimated Cost</u>	<u>Cost incurred</u>
B. <u>Govt. of Madhya Pradesh</u>		
(i) Rim Stability analysis.	-	-
(ii) Studies on suspected loss of water from river Narmada.	-	-
C. <u>Govt. of Maharashtra</u>		
Rim Stability analysis.	-	-

VII. SEISMICITY**Govt. of Gujarat (To be reported by the State)**

Installation and commissioning of seismological instruments completed in four observatories and being commissioned in remaining five.

VIII. ARCHAEOLOGICAL/ANTHROPOLOGICAL.

a). <u>Govt. of Gujarat.</u>		
i) Cost of survey	0.013	0.004
ii) Cost of Implementation	To be finalised	0.15
b). <u>Govt. of Madhya Pradesh.</u>		
i) Cost of Survey	-	0.35
ii) Cost of Implementation	-	-
c). <u>Govt. of Maharashtra.</u>		
i) Cost of Survey	-	-
ii) Cost of Implementation	-	-
e) <u>Rashtriya Manav Sandhalya*</u>		
i) Paleontological studies	0.019	0.01
ii) Ethnological studies	0.007	0.007
iii) Tribal Art & culture	0.026	0.026
f) <u>Anthropological Survey of India*</u>		
i) People of India	-	-
ii) Narmada salvage plan	-	-

* From budgets of respective Institutes.

N.B : The missing information may please be furnished by all concerned immediately.

Item No. XVII-3(93): **PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS.**

The latest status report of studies and activities on environmental issues under consideration of the sub-group for the quarter ending December, 1992 is placed at Annexure XVII-I. The progress/present position of the issues under consideration is briefly given below for review by the Sub-group.

1) **Phased Catchment Treatment**

Narmada Sagar Project

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh has already submitted a plan for treating the critically degraded directly draining sub-watersheds spread to 47000 ha of non forest and 6424 ha of the forest areas. However, as directed in the earlier sub-group meetings, GOMP is required to submit additional plan for treating 5086 ha of the catchment area which was earlier identified for afforestation/reforestation works under compensatory afforestation programme. During the last meeting GOMP indicated that out of 5086 ha of the catchment area 2997 ha was already afforested, however this area is now slated for additional treatment measures. Therefore GOMP may like to submit their plans for the works slated in 2997 ha area and a detailed plan for the balance area of 2089 ha. In addition GOMP is also required to submit the plan for afforestation of 2997 ha area.

Upto March, 1992, against the target of 7199 ha, work was completed in 2275 ha and was incomplete in another 5335 ha. Progress during October-December, 1992 has not yet been reported. Hence upto September, 1992, against the target of 11175 ha, work has been completed in 6573 ha and in incomplete stage in 3410 ha. GOMP may indicate the updated position upto December, 1992.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP has submitted the plans for treating 90,000 ha of critically degraded directly draining sub-watersheds during May, 1991.

According to the details of critically degraded sub watersheds contained in the status report annexed, GOMP is required to treat sub watersheds spreads to 1,14,600 ha area. During the 16th meeting of the sub-group Chairman desired that the detailed plan for

treatment of the entire area should be phased out in a realistic manner and has to be implemented ahead of reservoir filling. GOMP indicated that it would be possible to submit the detailed plan by March, 1993 and complete the treatment works in 15000 ha of non forest areas besides taking up engineering works in additional 2000 ha area by the end of 1992-93 against the target of 17000 ha. GOMP may report the upto date progress on submission of plans and progress of treatment works.

Since the phasing of the increased area of 114600 ha, has not yet been received, we have drawn up a phased plan as in the status paper. GOMP may confirm acceptance of the same.

Govt. of Gujarat

Govt. of Gujarat has taken up the entire catchment upstream of SSP for treatment and out of the 30200 ha 15311 ha is treated up till the end of December, 1992 as scheduled. However GOG is yet to report the progress on reconciliation on extent of catchment area upstream of SSP within Gujarat with AIS&LUSG, New Delhi.

Govt. of Maharashtra

Govt. of Maharashtra is required to treat 31000 ha of critically degraded sub watersheds directly draining into the catchment. The detailed plan for treating 25400 ha area was submitted earlier by GDM. During the 11th meeting of the sub-group, GDM has indicated that it will be possible for it to revise the plan by March, 1993. The upto date progress may be reported.

During the last meeting, sub-group recommended that, "if the environmental amelioration works are not accelerated the construction schedule should be readjusted so as not to result in submergence in Maharashtra". It is observed that at RL 61, 3 sub-watersheds (Viz, Na 3(a), Na 3(c) and Na 3(d) comprising a total area of 4937 ha) would be directly draining to the reservoir. GDM has indicated the commencement of works in sub-watersheds in Na 5(g) towards the border with Madhya Pradesh and has proposed further works during the monsoon over 1500 ha of sub-watersheds Na 4(a)& Na 4(c). Thus in all, GDM is to treat 1700 ha of net working area by the monsoon of 1993. However this area may be equal to 50 to 60% of the gross area only as most of the areas are exposed rocks and under development where no conservation works would be necessary. In a recent communication GDM has informed that it has created 4 new Forest Sub-Divisions and indicated that it will be possible for these Sub-Divisions to carry out the works on priority and as per schedule prescribed by MOE&F.

Sub-group may like to review the situation.

ii) **Compensatory Afforestation**

Narmada Sagar Project

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh reported a cumulative progress over 32284 ha of the degraded forest besides afforestation works on 6629 ha of non forest areas till the end of December, 1992, thus achieving the targets as scheduled.

Sardar Sarovar Project

Govt. of Madhya Pradesh

According to the action plan, GOMP was required to plant 1980 ha area during 1992-93. But in accordance with the direction of the sub-group, the deficit of previous year was added up to the targets. Against a target of 2387, GOMP has reported progress over 2400 area completing the targets as scheduled. However, it is observed that all works were carried out in forest areas during 1992-93 where target is exceeded but no work was in non-forest area of 400 ha. Sub-group may like to review the situation.

Govt. of Gujarat

Govt. of Gujarat has reported that the works are going on as scheduled. Out of a total target of 4650 ha of non-forest area scheduled for completion by 1994-95, works are already completed in 3310 ha upto March, 1993. Similarly reforestation in degraded forest works are already completed over 5284 ha against the total targets of 9300 ha, thus achieving the progress as scheduled. Works remaining to be completed in these two categories are 1340 ha and 4016 ha respectively in non-forest and forest areas to be completed in next two working season.

Govt. of Maharashtra

Govt. of Maharashtra reported the progress on 12936 ha of degraded forests against the total targets of 12987 ha, the balance 51 ha is scheduled to be planned during the coming monsoon. However, the progress against 6490 ha of afforestation works in non forest land is reported to be only 84 ha. Identification of land for non-forest afforestation may be speeded up. Further, afforestation over 2200 ha of non forest land against the set target of 2700 ha of forest land released for R&R works at Taloda is completed and the balance of 500 ha is scheduled for coming monsoon.

GOM is required to provide location map of the area being planted alongwith the details of the composition of the species, survival, spacing and other inputs provided to the crop as directed in the last sub-group meeting.

iii) COMMAND AREA DEVELOPMENT

Narmada Sagar Project

Govt. of Madhya Pradesh

During the last sub-group meeting GOMP had informed that a meeting for finalising the technical aspects of the proposed studies on effect of insecticides & pesticides from the run off from the fields was fixed for 15.11.92 and that the basic field data being collected since November, 1991 was compiled. Outcome may be indicated by GOMP.

Sardar Sarovar Project

Govt. of Gujarat

Govt. of Gujarat circulated the detailed terms of reference for the various studies commissioned by Govt. of Gujarat. However, the studies many of which are scheduled to be completed by the end of March, 1993 are progressing well. GOG may give complete details of the studies commissioned with the dates of start as well as the dates of final reports. The list of studies for .pl68 which the TORs were distributed to members during the last 16th meeting for comments is annexed as Annexure- XVII-II.

Govt. of Rajasthan

During the 15th Sub-group meeting Govt. of Rajasthan had indicated that it has entrusted the studies on impact assessment of the command area on the lines that are being taken up by Gujarat. Details are still awaited.

iv) SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES.

Narmada Sagar Project

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh may like to indicate the action taken by it on the reports of Friends of Nature Society, Bhopal.

Sardar Sarovar Project**Govt. of Madhya Pradesh**

A copy of the report for the quarter ending September, 1992 submitted by State Forest Research Institute for the impact assessment studies in Madhya Pradesh is enclosed as Annexure-XVII-III. Govt. of Madhya Pradesh would like to submit the progress report of the State Forest Research Institute, Jabalpur for the quarter ending December, 1992.

Govt. of Gujarat

Govt. of Gujarat may like to submit a detailed action plan based on the recommendations contained in the report of M.S. University, Vadodara. .pl66

Govt. of Maharashtra

School of Environmental Science, Pune University had submitted a preliminary report for the work done upto 15th December, 1992 as already discussed under item No. XVII-2(92)(3), the upto date progress may be reported. A copy of the report is annexed as Annex-XVII-IV.

v) ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY**ARCHAEOLOGY****Narmada Sagar Project****Govt. of Madhya Pradesh**

Progress of preparation of action plan for re-location/protection of central as well as state protected monuments are still awaited from NVDA.

Sardar Sarovar Project**Govt. of Madhya Pradesh**

The action plan giving time frame and cost estimates prepared by State Department of Archaeology and Museum, Madhya Pradesh is yet to be made available to MOE&F and NCA.

Govt. of Gujarat

Latest progress on relocation of Shoolpaneshwar temple giving a firm date for completion of relocation works in view of likely submergence from the coming monsoon may be indicated. The plans finalised by GOG on relocation of Hamfeshwar temple are still awaited.

Govt. of Maharashtra

No works are required in Maharashtra in this regard.

ANTHROPOLOGY

Anthropological Survey of India has earlier indicated that in view of the studies going on, no further studies are required on anthropological aspect. However during the 15th meeting of the sub-group, Director General, Anthropological Survey of India indicated the need for intensive studies in 4 to 5 villages within a short period of 2 to 3 months with the help of NVDA and other project agencies.

Dr. W.S.K. Phillips who is the Principal of Indore School of Social Science and Sociologist consultant to NDA is carrying out a survey of tribal villages in partial fulfillment of the bench marks delineated by the World Bank for continued assistance to the Sardar Sarovar Project. Progress in this regard will be indicated during the meeting.

vi) SEISMICITY AND RIM STABILITY OF RESERVOIR**Narmada Sagar Project****Govt. of Madhya Pradesh**

Govt. of Madhya Pradesh had requested Geological Survey of India to complete the balance studies on rim stability, the outcome of the studies completed may be reported.

Sardar Sarovar Project

Rim stability analysis for the areas in Gujarat was completed in 1982. Similarly 130 sq.km area in Madhya Pradesh was covered up during 1991-92. It was indicated by GSI that the draft report for the balance area is available but before finalising the report confirmation on certain aspects is required. Some studies for the same have been entrusted to CW&PRS, Pune and an amount of Rs. 12.5 lakhs has been placed at their disposal and all necessary facilities have been made available. The joint inspection of the site of the study is proposed for 6-7 th March, 1993. The outcome of the joint inspection may be indicated by NVDA.

vii) HEALTH ASPECT

Govt. of Madhya Pradesh**Narmada Sagar Project and Sardar Sarovar Project**

Govt. of Madhya Pradesh may like to indicate the progress of final report to be submitted by 3 universities on Liminological aspects. The interim report, if any, on surveillance and control by Gandhi Medical College, Shool may also be made available.

Sardar Sarovar Project**Govt. of Gujarat**

Govt. of Gujarat may report the outcome of the review of health plan being undertaken by GOG as reported during 16th meeting of the sub-group and progress of further studies commissioned by Gujarat on health aspects may also be reported.

Govt. of Maharashtra

Govt. of Maharashtra submitted an initial plan in 1987 which was revised in 1991 and is now again revised in 1993 and a short note on this revised plan is enclosed at Annexure-XVII-V. However a copy of the detailed action plan on health indicating the latest revisions may be submitted to the MOE&F and NCA urgently.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

Govt. of Madhya Pradesh

During the last meeting of the sub-group it was emphasised that introduction of carp varieties in the reservoir is not conducive to conservation on aquatic fauna and that careful studies are needed to ascertain the present status and likely impact on the aquatic flora due to impoundment as well as introduction of commercial species. During the earlier meeting of the sub-group Chairman has desired a clear picture on conservation aspect of fisheries. In pursuance a Review of studies already done was commissioned to CICFRI, Barrackpore. These studies also includes the concern of sub-group raised during the 16th meeting and the draft report is now submitted. The final report would be available by the end of March, 1993. Progress will be reported during the meeting.

Govt. of Gujarat

Govt. of Gujarat may like to report on the progress of works on conservation and development of fish fauna in estuary and command.

Govt. of Maharashtra

Govt. of Maharashtra has already submitted a plan for fisheries development in Maharashtra. No comments have been received.

Item No. XVII-4(94): **WORLD BANK ASSISTANCE & PERFORMANCE
BENCH MARK ON ENVIRONMENTAL ISSUES.**
(Item No. XVI-4(89)).

The World Bank has delineated two environmental bench marks as follows:

A. NCA

1. Submission of overview report on SSP.
2. Submission of Terms of Reference for the Environmental management plan for Narmada basin.

Both of these reports were initially prepared by NCA and later got reformatted with the assistance of World Bank consultants taking into consideration the comments till then received from the State Governments and Ministry of Environment & Forests. The upto date progress in this regard will be reported during the meeting.

B. SSNNL - 606

In addition, bench marks delineated, also required (i) the extension of estuary studies (ii) modification of studies on health and (iii) command area.

Govt. of Gujarat is coordinating the above studies and a final report on all the aspect is required to be submitted to NCA by mid March, 1993. A consolidated report on the progress of works on environmental and R&R will be prepared by NCA for submission to the bank by 30th March, 1993. The reports as and when received/finalised will be submitted to the MOE&F. These will also be brought to the notice of the Sub-group in due course.

Any other Item

Date & Venue of next meeting.

ANNEXURES

STATUS REPORT OF STUDIES AND ACTIVITIES
REGARDING THE ENVIRONMENTAL ASPECTS OF
SARDAR SAROVAR PROJECT (SSP)
DECEMBER, 1992

The present status of studies/preparation of action plans and implementation, in respect of suggested Environmental Safeguard Measures is as indicated below:

Suggested Environmental Safeguard Studies/Measures

- 1) Phased Catchment Area Treatment.
- 2) Compensatory Afforestation.
- 3) Command Area Development.
- 4) Flora, Fauna & Carrying Capacity.
- 5) Seismicity.
- 6) Health Aspects.
- 7) Archaeological & Anthropological Studies.
- 8) Fisheries.
- 9) Rim Stability Analysis.

1) **PHASED CATCHMENT AREA TREATMENT**

- All India Soil & Land Use Survey Organization, New Delhi submitted its report on prioritization of watersheds in April, 1991.

- In accordance with the decision of the Govt. of India on the extent of catchment area to be treated at the project cost, the lands identified as of 'high' and 'very high' erodibility categories situated in the Sub-watersheds directly draining into the reservoirs in addition to the areas damaged directly by the project activities are being taken up for treatment by the State Governments.

- The total catchment area of SSP below NSP is 2448973 ha.

	Madhya Pradesh	Gujarat	Maharashtra	Total for the Basin
Total Catchment	2248601	36761*	163611	24,48,973 ha
Very High & High	541825	35412	116354	6,93,591
Directly draining Very High & High	114606	29537	31423	1,75,566
Areas directly damaged by project activities	-	500	-	500

- The total area to be treated at project cost is 1,76,066 ha (say 1,76,000). However the actual area under treatment is 1,76,258 ha (say 1,76,200).

*According to Govt. of Gujarat, the actual catchment area is only 30229 ha and entire area is planned for treatment.

Government of Madhya Pradesh (1,14,600 ha)

In SSP catchment in M.P., 41 sub-watersheds have been identified for treatment. They cover an area of about 1,14,600 ha., 20% of which is estimated to be forest land. Treatment has been planned separately for forest and non forest areas.

The programme and progress is given below:

Programme and Progress of Catchment Area Treatment in M.P.
(1,14,600 ha) (in ha.)

	92-93	93-94	94-95	95-96	96-97
	(Target/Achievement)				
Non-forest area/ha (91,600 ha)	15000 5300	20000	20000	20000	16600
Forest area/ha (23,000ha)	2000@	6000	5000	5000	5000
Total 114600	17000	26000	25000	25000	21600

*10,450 ha. is planted up with Khus plantations during 1992-93. Works are under progress as targetted.

@ All works except afforestation would be completed by the end of 1992-93.

Government of Maharashtra (31,400 ha)

The total catchment area of the SSP in Maharashtra is 163611 ha. Out of this, 31423 ha is proposed to be treated. The treatment plans for the Forest and non-forest areas are being prepared separately.

**Programme and Progress of Catchment Area Treatment (in ha.)
in Maharashtra**

	92-93	93-94	94-95	95-96	96-97
Forest Area , 200 ha Programme being finalised. (27,200ha) Net working Net working area area will be about 15000 ha.					
Non Forest Area Programme being finalised. (4,200) 31423 ha					
Say 31,400 ha					

The catchment area treatment works over 200 ha of forest area are under progress. Efforts are being made to treat net additional 1500 ha area which otherwise means 5000 ha gross by monsoon of 1993.

Government of Gujarat (30,229 ha)

The total catchment area of the SSP in Gujarat is 36,761 ha. of this, a total of 29,537 ha is identified for treatment. However Govt. of Gujarat has planed to treat 30229 ha which includes the areas directly damaged by project activities.

The catchment area treatment measures have been planned separately for forest and non-forest areas covering 27204 ha and 3025 ha respectively. Plan of the work is submitted to MOE&F. The programme and progress is given below:-

a) **Forest Area (27,204 ha)**

Programme and Progress for treatment (Area in ha.)

1990-91	1991-92	1992-93	1993-94	1994-95
		(Target/Achievement)		
4560/4528	4750/4770	6000/6013	6200	5700

b) **Non-Forest Area (3025 ha.)**

Upto 90-91	91-92	92-93	93-94
	(Target/Achievement)		
897	830/274	662/Progress not reported	636

Survey & Planning works is completed over an area of 3025 ha. Programme of Treatment of non forest areas includes contour bunding on 1276 ha, terracing in 980 ha pasture development over 307 ha, afforestation works over 534 ha, in addition, Nala plugging of 100 Nos. Works are completed in 1171 ha upto 1991-92.

2) Compensatory Afforestation

Government of Madhya Pradesh

A total of 6547 ha of degraded forest and 2190 ha of non-forest land located in districts of Jhabua, Dhar and Khargone is identified for afforestation works in lieu of submergence of 2732 ha forest area. The work of compensatory afforestation in the districts of Dhar and Jhabua has been assigned to Madhya Pradesh Van Vikas Nigam (MPVVN). The compensatory afforestation work in non-forest and degraded forest land identified in Khargone district has been entrusted to the Divisional Forest Officer, Kaveri Forest Division.

Programme and Progress of Afforestation (Area in ha.) in Madhya Pradesh

Plantation Year	<u>DEGRADED FOREST</u>		<u>NON FOREST</u>		<u>TOTAL</u>	
	Pro- gramme	Pro- gress	Pro- gramme	Pro- gress	Pro- gramme	Pro- gress
1990-91	132	132	716	716	848	848
1991-92	1580	1200	400	373	1980	1573
1992-93	1580	2400	400	-	1980	2400
1993-94	1580		400	-	1980	
1994-95	1678		274	-	1952	
	6550	3732	2190	1089	8740	4821

Government of Maharashtra

The forest area diverted due to submergence is 6488 ha. The total area to be put under compensatory afforestation is 19205 ha being 6205 ha non-forest area and 13000 ha of degraded forest. A detailed compensatory afforestation scheme has already been submitted by the Government of Maharashtra to the Ministry of Environment & Forests on 14.05.90 for approval. Ministry of Environment & Forests has sought certain clarifications from Govt. of Maharashtra which are still awaited. A plan on compensatory afforestation prepared by Govt. of Maharashtra was submitted to World Bank during Sept. 1991. According to this plan the programme of compensatory afforestation is given below:-

In addition, compensatory afforestation is also required to be undertaken in 2,700 ha of non-forest land in lieu of the forest land in taloda area released for resettlement works. For this, non-forest land to the extent of 2,700 ha has already been identified. The GOM has issued order to transfer these lands to the forest department. Scheme of raising compensatory afforestation in 2,700 ha area is under implementation.

Programme of Compensatory Afforestation

- Programme of Compensatory afforestation under implementation: in Maharashtra

Plantations					
	91-92	92-93	93-94	94-95	95-96
Targets/Achievements (in ha)					
Degraded Forests Area					
(12987 ha)	8383	4596	51.14	-	-
	8383	4552.94			
Non forest Area					
(i) In lieu of submergence (6490 ha)		84	1000	1000	4406
(ii) In lieu of R&R works at Taloda. (2700 ha.)	-	2700	506.80		
		2192.64			

Government of Gujarat

A total of 4165.9 ha of forest area has been diverted for SSP in Gujarat. A work plan for 4650 ha of non-forest land in nine villages of Kutch district and of 9300 ha of degraded forest land outside the basin, in the districts of Surat, Bharuch, Vadodara, Panchmahals and Sabarkantha, is under implementation. Besides 24560 ha of the forest area below density 0.6 in the catchment is also planned for afforestation works.

The programme and progress is as follows:

Target/Progress (Area in ha)			
	Work done till rains of 1992	1993-94	1994-95
Non Forest Area (4650 ha)	3310	800	540
Degraded forest (outside the catch- ment) (9300 ha)	5284	2250	1766
13,950 ha. (Total)			

Plantations along Canal banks:

The total potential of canal bank plantations is estimated as 18000 ha. A project report prepared by forest Deptt. is under scrutiny of SSNNL. A programme of plantation is likely to be launched effectively from the year 1992. However to give start to the work of canal bank plantations, early plantations on 155 ha are already established till the rains of 1992.

Additional Activities

(a) Dam Vicinity Plantation (235 ha)

Planted till rains of 1992 - 240.00 ha

(b) Forest Plantation (500 ha)

Ravine lands on the left bank of the Sabarmati in village Ratanpur (300 ha) and Pirojpur (200 ha). In Pirojpur entire area of 200 ha is planted up by the rains of 1992.

(c) Project area plantations: (255 ha)

Plantations are already completed by rains of 1992.

(d) Additional Plantation in Non-forest Areas (1088 ha)

Non-forest land in Kutch district. Lands have already been released. The plantations will be completed by 1994-95.

3) COMMAND AREA DEVELOPMENT (INCLUDING DRAINAGE STUDIES)

Government of Madhya Pradesh

No command area in Madhya Pradesh.

Government of Maharashtra

No command area in Maharashtra.

Government of Gujarat

Master Plan for surface and sub-surface drainage has been prepared upto Mahi River Crossing. Services of six Consultants have been engaged for carrying out studies beyond Mahi Crossing. These include studies related to ground water, drainage, conjunctive use of surface and ground water, silting aspects of main canal, planning and design of micro-level canal net work etc. Draft reports are available with Govt. of Gujarat. Govt. of Gujarat has commissioned a few more studies. These are to be completed by March - June, 1993.

Government of Rajasthan

The Government of Rajasthan, has submitted a report on Environmental & Ecological aspects and remedial measures for Narmada Canal Project. Copy of the report is submitted to Ministry of Environment and Forests. Govt. of Rajasthan is directed to carry out Impact Assessment Studies on the lines followed by Govt. of Gujarat. Terms of Reference are made available to Govt. of Rajasthan.

4) FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

In depth studies on flora, fauna, wildlife and carrying capacity are in progress for the forest areas coming under sub-mergence of Sardar Sarovar Project spread over 13400 ha area. Studies are already completed in 4500 ha area in Gujarat and are also to be completed for another 2800 ha area in Madhya Pradesh by December, 1992. For the areas in Maharashtra the studies are progressing well, an interim report has already been made available by the project investigators. The studies are likely to be completed by 1993-94. According to the studies completed earlier in the areas falling in Gujarat and Maharashtra and part area of the basin in Madhya Pradesh no endemic rare endangered or threatened species is to be wiped out from the country. In depth studies completed so far have confirmed the above findings. Regarding the carrying capacity of the adjoining areas massive afforestation and greening of the impact area are in progress in Gujarat and Maharashtra to cater to the

needs of the wildlife moving from the submergence areas. Felling plan have been prepared taking care to provide corridors for the wildlife likely to migrate from the submergence areas. Creation of game sanctuaries on either flank of Narmada in Madhya Pradesh as suggested by SFRI is under scrutiny of NVDA.

Government of Madhya Pradesh

Study has been entrusted to the State Forest Research Institute, Jabalpur, in collaboration with H.S.G University, Sagar and Rani Durgavati University, Jabalpur. The study commenced in April, 1990 and is expected to be completed in three years by March, 1993. Action plan will be ready by March, 1994 and implementation will be done by March, 1996. The Institute has submitted quarterly reports. The last report for quarters ending September, 1992 is furnished by the Institute. A felling plan prepared by State Forest Research Institute is also submitted, this will be placed before the Wildlife Committee in the NVDA for consideration.

Government of Gujarat

1) Basic Studies

Studies were conducted by M.S. University, Vadodara in 1983. Fresh study for the SSP submergence area in Gujarat have again been entrusted to M.S. University, Vadodara. An inception report & interim reports I to III have been furnished. Draft final report has also been submitted in May, 1992 and is under scrutiny of SSNNL.

2) Wildlife Conservation Measures

The area of the Shoolpaneshwar Sanctuary has been enlarged from 151 sq.kms. to 448 sq.kms. Habitat improvement measures in the enlarged Shoolpaneshwar Wildlife Sanctuary for the benefit of the flora and fauna of the area are scheduled for completion in five years. Notification, declaring additional area as Shoolpaneshwar sanctuary has already been issued. An expenditure of Rs.5564 lakhs has already been incurred on various developmental works within the sanctuary area. A study report on people's participation in management of wildlife in Shoolpaneshwar Sanctuary by VIKSAT commissioned by World Bank has also been submitted in December, 1991.

3) **Wildlife Management Study for Sardar Sarovar Submergence Area**

The above study has been assigned to a group with a Principal Investigator (of the rank of Conservator of Forest). A workshop on approaches to integrated wild-life management in Gujarat was organised in October, 1990. Report of the workshop has been made available. A report has been submitted by Principal Investigator on Wildlife Management which is under consideration of SSNNL.

4) **Additional Environment Improvement Programme.**

Sardar Sarovar Narmada Nigam Ltd, has decided to undertake the following additional environmental improvement programme in the catchment area and its vicinity.

- i) Creation of a habitat for the great Indian Bustard (highly endangered bird of the country). Improvement of support watering facility at six locations. Providing inspection and transport facilities.

Government of Maharashtra

School of Environmental Science, Pune University were assigned the work. Terms of Reference are finalised. Work is planned for completion in two years i.e. by March, 1994. Vide Govt. of Maharashtra decision No.RPA/3190/93/89/-C-R-61/C-3 dated 20th March, 1992. 40% of the total expenditure (37,98000) i.e. Rs. 1519000 has already been granted to Pune University as first instalment. An interim report was submitted on 15th December, 1992. Further studies are under progress.

5) **SEISMICITY**

Government of Gujarat

The design of the dam allows for a horizontal seismic coefficient of 0.125 g., and it covers additional risk due to reservoir induced seismicity. An eminent Indian Consultant Dr. Jai Krishna, who was the Vice Chancellor of the Roorkee University had been engaged as the Consultant to the Project. The design of the dam had also been referred to the Central Water & Power Research Station, Pune, and Earthquake Engineering School at Roorkee, for dynamic analysis. Advice was also obtained from the World Bank Consultants viz - Dr. Glough and Dr. Bolt, of Burkley University. The design of the dam has also been approved by the Dam Safety Panel comprising eminent engineers.

Establishing Seismological Observatories:

Installation and Commissioning of seismological instruments have been completed in four observatories at Kevadia, Naswadi, Karjan and Kawant. The remaining five observatories viz. Aliraj-pur, Barwani, Sagbara, Kukshi and Shahada are being commissioned. No need for any separate study regarding Seismicity Aspect is felt in Madhya Pradesh and Maharashtra.

6) HEALTH ASPECTS

Government of Madhya Pradesh

The State Director of Health Services, has conducted detailed survey during 1982-83. Health plan regarding immediate service to be provided and continued health services to the population has been prepared. Provision for hospitals, dispensaries, mobile units and evaluation & monitoring cell has been made. The total anticipated expenditure including the cost of strengthening of health institutions has been worked out to be as Rs.748.73 lacs. The agreement for surveillance & control of Malaria has been signed between Gandhi Medical College, Bhopal and NVDA and the surveillance is going on not only for malaria but other diseases also.

Government of Maharashtra

Report has been prepared on the following aspects:

- a) Strengthening of anti malaria programme in the border areas.
- b) Provision of mobile dispensaries.
- c) Providing sub centres.
- d) Construction of primary health services.

The total expenditure anticipated is Rs. 80.31 lakhs.

Government of Gujarat

Two studies relating to schistosomiasis had been carried out in 1985 by the National Institute of Communicable diseases and concluded that there is no threat to the people in the project area. Subsequently, a team led by the Chief of Schistosomiasis Division WHO, Scientist from British Council, London, and Environment Advisor, World Bank carried out investigations and confirmed the above.

The work plan on health aspects has been furnished to the Ministry of Environment & Forests, and World Bank. Total implementation will take about 17 years time. The programme covers the villages on the periphery of the reservoir and the command area.

The work plan submitted would be implemented in a phased manner keeping in view the progressive development of irrigation in the vast command area of the project. A twenty five bed hospital has already been set up and is functioning in the main colony of the project.

7) ARCHAEOLOGICAL SURVEY AND ANTHROPOLOGICAL STUDIES

ARCHAEOLOGICAL SURVEY

Government of Madhya Pradesh

Survey for identification of monuments being carried out by the State Department of Archaeology and Museum has been completed. Inspection for selection of monuments of archaeological significance is going on. Detailed action plans would be available by January, 1993. Excavation at Navadatoli are already completed by Prof. Shankhilya of Pune as per the direction from ASI.

Government of Gujarat

Inventory survey of 19 villages, coming under submergence carried out by the Director of Archaeology, has identified the following two temples for shifting.

- 1) Shoolpaneshwar Mahadev Temple at Surpan, District Bharuch.
- 2) Hamfeshwar Mahadev Temple in Chhota Udaipur Taluk.

Shifting of these monuments is proposed in three phases. Identified monuments are not listed as protected monuments. Sites have been finalised to relocate Shoolpaneshwar and Hamfeshwar temples in consultation with trustees of the temples. Shoolpaneshwar temple is being shifted & reconstructed near Gora, about 15 kms., down-stream on the same bank. Whereas, Hamfeshwar temple will be shifted and reconstructed at a higher elevation near the present location.

Government of Maharashtra

No work is proposed.

ANTHROPOLOGICAL STUDIES**Government of Madhya Pradesh**

Government of Madhya Pradesh has informed that in view of the studies being carried out in connection with Narmada Sagar Project, no separate anthropological studies are required and that the Director General, Anthropological Survey of India has also expressed the same view. M.P. State Adivasi Kala Parishad has submitted its report on Tribal arts & culture. Besides Anthropological Survey of India has informed that Narmada Basin is already covered extensively under the project "people's of India ". However more recently AnSI has suggested a few more ethnographic studies, Director General AnSI is to submit detailed programme for the same.

Government of Maharashtra

No study is proposed.

Government of Gujarat

No study is proposed.

8) FISHERIES**Government of Madhya Pradesh**

Studies of important fish/fauna specially the Mahaaseer has been included in the studies being conducted by the three Universities of the State viz. for the upper Narmada, Rani Durgavati University, Jabalpur, Middle Narmada, Barkatullah University, Bhopal and lower Narmada, Vikram University, Ujjain. All the three Universities have started the studies in their respective areas as per MOU in 1989. The study period was three years, and the work was to be completed by December, 1992.

Government of Maharashtra

Department of Fisheries, Government of Maharashtra, has submitted a draft outline for the fresh water fisheries development in Maharashtra area.

Government of Gujarat

Central Inland Capture Fisheries Research Institute, Barrackpore, Calcutta, (Local office at Vadodara) has undertaken the studies in respect of aquatic life upstream and downstream of Sardar Sarovar in Narmada River in Gujarat State. Report of the first phase of pre-impoundment survey has been received.

The design plans and estimates for a 10 ha., fish farm and fish hatchery complex have been finalised. The plan is to be implemented in 9 years and will include Hydrobiological studies, establishment of fish hatchery and fish farm, training of Fishermen, establishing and assisting primary fishermen's cooperatives, establishing and assisting an Inter-state Fisheries Development Board and a Cell and Directorate for monitoring.

NARMADA CONTROL AUTHORITY

The Narmada Control Authority, has commissioned a socioeconomic study by Central Inland Capture Fisheries Research Institute, Barrackpore, for possible fisheries development in the entire Narmada Basin excluding Bargi reservoir to the confluence of the Narmada with the Arabian sea including estuarine areas. The proposals to establish an Inter-state Apex Body with participation by the States and NCA is under consideration.

Regarding status of studies on fisheries in the reservoir & its downstream a desk review study is entrusted to CICFRI, Barrackpore. Study period will be 3 months from the date of commencement. Report is likely to be available by the 1st week of February, 1993.

9) RIM STABILITY ANALYSIS

Government of Madhya Pradesh & Govt. of Maharashtra

Geological Survey of India, Nagpur Division, was assigned the work by SSNNL Gujarat. Now the work has been transferred from Nagpur Division to Bhopal Division and is in progress. GSI has completed works in 130 sq.km area in Madhya Pradesh and entire area in Gujarat. The work on remaining areas measuring 170 sq.km in Madhya Pradesh and entire area in Maharashtra will now be completed by the GSI during the field work season of 1992-93. A series of studies on suspected loss of water from river Narmada are assigned to CWPRS, Pune by NVDA. Money has been released and work is to commence soon.

Government of Gujarat

Rim Stability analysis has been completed by the Geological Survey of India, Jaipur Branch, in the Gujarat portion of the reservoir. No more work in this respect is required.

STATUS REPORT OF STUDIES & ACTIVITIES
REGARDING THE ENVIRONMENTAL ASPECTS OF
NARMADA SAGAR PROJECT
DECEMBER, 1992

1) PHASED CATCHMENT AREA TREATMENT:

The free draining area of Narmada Sagar Project downstream of Bargi Dam is about 38,952 sq.kms. As per the guidelines of MOWR, directly draining watersheds of 'very high' and 'high' priority categories only are to be treated. This is, however, subject to a final decision on the subject yet to be arrived at. Works on prioritisation of the watershed was entrusted earlier to GSIT&S, Indore. However, the work is now entrusted to "All India Soil & Land Use Survey Organisation, New Delhi, and they are carrying out the prioritisation for the entire catchment of NSP.

AIS&LUSO has divided the catchment area downstream of the Bargi Dam into nine sub-catchments. These sub-catchments are further divided into watersheds and sub-watersheds. Preparation of maps and reports relating to five sub-catchments has been completed and these cover the entire area around the periphery of the Narmada Sagar Reservoir. Out of 638 Sub-watersheds, only 25 sub watersheds of 'high' and 'very high' priority are directly draining into the reservoir. An area of 58,510 ha is proposed to be treated. About 20% of this area i.e. 11,510 ha is estimated to be forest land and the rest 47000 ha non forest land.

Programme and Progress of Works

Programme of Catchment Area Treatment(58510)

	91-92 Target/ Progress	92-93 Target/ Progress	93-94	94-95	95-96	96-97
Non-forest area (47000ha)	<u>6000</u> 1075*	<u>9000</u> 5890*	9000	9000	9000	5000
Forest area (6424ha)**	<u>1199</u> 1200	<u>2175</u> 683	1050	1000	1000	-
53,424 ha						

*Area planted up with khus plantation in 1991-92 spread to 6410 ha and in 92-93 to 9300 ha.

**Against 11510 ha area plan is furnished for treating 6424 ha area only. Balance areas are already identified for compensatory afforestation. However GOMP is directed to substitute the areas & to furnish the plan for the balance areas.

2) COMPENSATORY AFFORESTATION:

A total of 40332 ha forest land would come under submergence and an additional 779.9 ha of forest land has been diverted for the residential colony, power house complex, dam, saddle dam and approach roads. Subsequently, another 308.4 ha of forest land was permitted to be diverted for power house. Thus a total of 41420 ha of forest land has been permitted to be utilised for the construction of ISP.

The Government of Madhya Pradesh, has identified 10143 ha of non-forest and 70802 ha of degraded forest land. Till the end of March, 1992 NVDA has taken over an area of 6512 ha of non-forest land from revenue authorities.

Programme of Compensatory Afforestation

	Commulative progress till 1992-93	93-94	94-95	95-96
Degraded forest area (70,802ha)	32284	12400	12400	13718
Non Forest Area (10,143ha)	6629	1500	1500	514
(80,945) (Say 81,000)	38913	13900	13900	14232

3) COMMAND AREA DEVELOPMENT

The Government of Madhya Pradesh has submitted command area development plan. The project on completion will provide annual irrigation to 1.69 lakh ha of cropped area over a net C.C.A. of 1.23 lakh ha.

The implementation of the plan would be taken up in three phases for completion in 6/2007. Monthly observation of water levels started in November, 1991 for subsequent supply of this data to the consultants, already shortlisted, are likely to be continued for 2 seasons to draw inference for preparation of master plan for drainage. NVDA has addressed J.L. Agricultural University for studies on effect of pesticides, insecticides in the command and a project report is under scrutiny of NVDA/Environment Sub-group.

4) FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

Studies on these aspects were entrusted to Wildlife Institute of India, Dehradun in December, 1989 and are expected to be completed by March 1993. Action plan will be ready by March, 1994. Implementation of the action plan will be completed by March, 1996. Progress report upto June, 1992 has been submitted by Wildlife Institute of India.

Friends of Nature's Society, Bhopal, is entrusted with preparation of Wildlife Retrieval and Conservation Plan. They have submitted the final draft which is under scrutiny of NVDA.

5) SEISMICITY AND RIM STABILITY

The reservoir competency survey has been done by GSI and report is submitted. In the report, GSI has suggested further studies for some patches of narrow water divide. These studies are to be taken up by CWPRS, Pune in consultation with GSI. Joint inspection of problematic area is proposed in February, 1993. An amount of Rs. 12.55 lakhs is sanctioned by Chief Engineer, Lower Narmada Project, Indore to enable CWPRS to undertake studies. GSI is already geared up to help CWPRS to undertake these works during the 92-93 field season itself.

Establishment of Seismic observatories in the Narmada Sagar Complex area is under correspondence with IMD, DGTD and CWC. Meeting of IMD, CWC, DGTD and NVDA Officers for finalising the issue was held on 18.3.91. A list of instruments and broad specifications were agreed. Procurement of the instruments is to be done in consultation with IMD. IMD has been requested by NVDA to supply the instruments (Micro earthquake recorders and wood anderson-2 component seismometers) and for collection of data on pre-impoundment seismic data under Phase-I. Consultants carried out noise survey during March, 1992 to finalise the sites proposed for observatories. Report is received and is under consideration of NVDA.

6) HEALTH ASPECTS

A note on health aspects of NSP prepared by NVDA was examined in the Ministry of E&F and comments were sent for modifying the report. NVDA has submitted the revised plan costing Rs. 748.73 lacs for the preventive and curative aspects of health. Regarding preventive aspects, a MOU is signed with the Department of Preventive and Social Medicine, Gandhi Medical College, Bhopal, whereas, for studies on health aspect in project impact areas of SSP and NSP work is proposed through a cell of monitoring and evaluation under Directorate of Health Services, Bhopal. The approved health plan is being implemented.

Pre-impoundment and post-impoundment Limnological studies being carried out by three Universities will take care of water quality aspect.

7) FISHERIES DEVELOPMENT

The aspect relating to study of the availability of important aquatic fauna/fish, especially the migratory species has been included in the Limnological studies being conducted by the 3 Universities of the State; the Upper Narmada, (Bargi Reservoir) Rani Durgavati University, Jabalpur, Middle Narmada (Tawa, Barna and Kolar Reservoirs) Barkatullah University, Bhopal, Lower Narmada, Vikram University, Ujjain. All the three Universities have initiated the studies in their respective areas as per MOU. Their report for the period 1991 is submitted. Aquatic fauna is also covered under the studies completed by Friends of Nature Society, Bhopal. Studies are Scheduled completion by December, 1992.

8) ARCHAEOLOGICAL AND ANTHROPOLOGICAL SURVEY

A survey of the 254 villages is required for identification of the archaeological monuments falling within the submergence area. State Department of Archaeology and Museum was entrusted with the survey of 87 villages which has been completed. Archaeological Survey of India has also completed the survey for 167 villages assigned for identification of the monuments of significance. Report is submitted to head office and is under scrutiny.

Action plan would be ready by June, 1994. Action will be taken to preserve material of archaeological importance in consultation with experts.

As only lower bastion in north of the Joga Fort is likely to be affected by scour action of water and the Siddeshwar temple is well above the FRL of 860 ft., these two structures are not considered as affected by the project. However, other structures/ monuments will be considered for shifting or protection after their archaeological significance is established through joint inspection of the competent authorities.

ANTHROPOLOGICAL STUDIES

Efforts are being made for retrieval of bio-cultural material from the Narmada Basin. A lot of information is gathered from the field which generates immense data of Socio-Anthropological significance.

Rashtriya Manav Sangrahalaya has constituted a working group for the retrieval of bio-cultural material in Narmada Basin. Survey of tribal art and handicraft entrusted to M.P. Adivasi Kala Parishad is completed and report is available. Besides Anthropological Survey of India has covered these studies under its own project called "peoples of India". The report is in 61 volume out of which 7 volume are under final editing. A Narmada Salvage plan is also launched by Anthropological Survey of India recently and the entire area is scanned and some ancient tools have been found.

**LIST OF TERMS OF REFERENCES OF THE NEW STUDIES
COMMISSIONED BY NPG/SSNNL FOR S.S.P.**

1. Terms of Reference (TOR) for the Expert Multi-disciplinary group on Nal Sarovar Bird Sanctuary.
2. TOR for the Expert Multi Disciplinary Group on Black Buck National Park at Velavadar.
3. TOR for the Expert Multi Disciplinary Group on Wild Ass Sanctuary in Little Rann of Kachhh.
4. TOR for a Multi-disciplinary expert group on Development of Aliabet Island in the Estuary of the Narmada River.
5. TOR for a study on Flora and Fauna of the command area of SSP as a part of EIA studies.
6. TOR For Environmental Impact Assessment (EIA) Study on Water Related Diseases for SSP Command Area.
7. Study on impact of chemical fertilizers & pesticides on quality of runoff waters and ground water in the command area of M.B.C. Project (Command area 2.12 lakh ha).
8. Terms of Reference for EIA of agriculture; runoff (including impacts on quality of ground water) in the command area of SSP.
9. TOR in respect of work to be done by ground water expert (of international repute).
10. Terms of reference for work to be done by international expert on drainage.
11. TOR for integrated review of soil studies for the command area of SSP of Gujarat.
12. Terms of Reference for Environmental Impact Assessment of river valley down stream of Navagam dam upto Gulf of Cambay.
13. Terms of Reference for EIA study on fisheries (inland as well as marine) relevant to the command area of Sardar Sarovar Project (SS) of Gujarat.
14. TOR for preparation of detailed integrated command Area Development Plan for the Sardar Sarovar Project (SSP) of Gujarat.

ANNEX - XVII - (III)

VIIIITH QUARTERLY PROJECT REPORT
(1st July 1992 - 30th September, 1992)

IMPACT ASSESSMENT OF MADHYA PRADESH LANDS TO BE
SUBMERGED UNDER SARDAR SAROVAR PROJECT AND
ADJOINING ECOSYSTEMS ; FLORA, FAUNA AND OTHER
BIOTIC COMPONENTS

Director

State Forest Research Institute, Polipathar,
J A B A L P U R (M.P.)

October, 1992

VIIIITH QUARTERLY REPORT AND REVIEW OF PROGRAMME

PERIOD : 1st July, 1992 to 30th September, 1992

1. TITLE OF THE PROJECT
"Impact assessment of Madhya Pradesh Lands to be submerged under Sardar Sarovar Project and adjoining ecosystem: Flora, fauna and other biotic components."
2. NAME OF THE PRINCIPAL INVESTIGATOR AND INSTITUTION
Director, State Forest Research Institute, Polipathar, Jabalpur-482008.
3. OBJECTIVES
Objectives set for the present investigation have already been discussed in the previous report and therefore these are not being reproduced here.
4. STUDY SITE OR AREA OF WORK
Already given in previous reports.
5. AREA OF INVESTIGATION DURING THE QUARTER UNDER REPORT
During the period from July 1992 to September 1992 various revenue villages and impact villages of Kukshi, Thekri and Manawar tehsils were visited and 22 villages which are coming under submergence were visited (Table 1).
6. PLAN OF WORK FOR THE PERIOD UNDER REFERENCE
 - (a) Collection of plant specimens have been done and mounting, identification etc. continued.
 - (b) Collection of ecological data in laidout quadrats in fields have been done and analysis of data continued.
 - (c) The information regarding the plants which are used for various purposes and their mode of application, type of uses and purpose of uses were listed.
 - (d) Various enquiries regarding the wildlife and birds found in the survey areas were noted in field book.
 - (e) Socio-economic aspect has been considered with special emphasis to livestock, domestic animal population, labour pattern, social

.. 2 ..

status of farmers, agricultural methodology, male, female population, status of various ethnic groups etc. done.

(f) Various forest compartments and revenue submergence villages of SSP were not enumerated during the quarter due to rainy season.

7. METHODOLOGY OF INVESTIGATIONS

Methodology for the collection of the information pertaining to the ecological status, floristic composition, limnological components, enumeration of growing stock, ethnobotanically important plant species, livestock and socio-economic status was same as described in the previous reports.

8. MONTHWISE WORK DONE

July 1992 : VIIth quarterly project of SSP was finalised. The data collected from april '92 to June '92 was compiled and analysed and submitted vide letter No.SFRI/NVAD/92/2541 dated 27.7.92 to financing authority. Leftout areas of Manawar (Dhar) were again visited for present investigation.

August 1992 : Several forest areas having different vegetation types were visited. The visit was also made in Manawar tehsil (Dhar). Some forest villages under impact areas of Barwani tehsil and revenue villages of Kasrawad, Thekri and Dharampuri tehsils (submergence areas) were visited and data regarding the aspect involved in present investigation were collected.

September 1992 : About 22 villages of Barwani, Thekri and Mathwar forest ranges were completed and data collected and analysed.

9. RESULTS OBTAINED AND ANALYSED

9.1 Enumeration

No enumerations were carried out during the quarter (July-Sept. (92).

.. 3 ..

9.2 Ethnobotanical and Ecological Study

The information given by the local villagers and inhabitants were noted down in the field proforma and tabulated according to their multifarious uses (Table 2 to 4).

Regarding the ecological studies several quadrats were laid and data were collected with special reference to ecological status of ground vegetation and flora and their frequency, density, abundance in the surveyed submergence villages. After the analysis of data the results are given in Table 5.

9.3 Fauna

Nothing new was observed in the villages surveyed.

9.4 Socio-Economic Aspects

Extensive survey was conducted in the submergence area of Manawar, Thekri and Barwani tehsils in ^{Dhar and} Khargone districts. 22 villages were surveyed in this quarter. The main idea of socio-economic survey was to find out the per capita annual domestic energy consumption pattern and source of fodder for livestock. During survey it was observed that where forests are not available the popular substitute for firewood is cotton stalks and dung cake (Table 6 to 13).

10. MODIFICATION REQUIRED

Not necessary at this stage.

11. WORK PLAN FOR NEXT QUARTER

1st October 1992 to 31st December 1992

- i. Survey of villages in impact areas of Khargone and Jhabua districts.
- ii. Collection of plant species present in Jhabua district.
- iii. Collection and recording of fauna present in Khargone district.
- iv. Ethnobotanical studies with special reference to collection of information of multipurpose plant species found in Khargone and Jhabua districts.

.. 4 ..

- v. Enumeration of tree species in different girth and quality classes in the impact and submergence areas of Khargone and Dhar districts so as to determine the physical depletion of biomass. Value assessment of standing forests in submergence area.
- vi. Assessment of ecological status of flora particularly the plant density, frequency, abundance and cover of ground vegetation and limnological study in Jhabua district.
- vii. Survey and collection of information in various villages regarding dependance of man and his livestock on various forest products in Jhabua and Dhar districts in submergence and impact areas.
- viii. Preparation of nineth quarterly report of the SSP and synthesis of results obtained.
- ix. Survey of villages within 2 kms and 2 to 5 kms from the submergence area. Collection of information on fuel head loads for bonafide use and for earnings. Also collect information on collection of nonwood forest products.

12. CONSTRAINTS

General openion of the villagers in submergence areas appear to be favourable. However, the activists continue to threaten survey parties.

13. FINANCIAL PROGRESS

Expenditure incurred upto 30.9.92.

S.No.	Item	Amount (Rs.)
1.	Honoraria/Salaries	742,833
2.	Wages for hiring labours to assist	52,419
3.	Contingent field expenses	24,458
4.	T.A./D.A.	44,777
5.	House Rent Allowance	32,012
6.	Organising Seminars	11,529

.. 5 ..

7.	Maintenance , Fuel & Oil	1,01,050
8.	Stationery/Posting/Printing	11,760
9.	Contingent Expenses	57,909
10.	Rent expenses for field office/station	18,264
11.	Contractual services photocopy, drawing	22,862

Grant Total Rs. 11,19,873

Certified that out of total amount of Rs.12.98 lakh an amount of Rs.11,19,873=00 (Rs. Eleven Lakh Nineteen Thousand Eight Hundred Seventythree only) has been incurred on scheme during 1990-91 to 1992-93 i.e. from the starting of the scheme i.e. from 1.9.1990.

Dated:

Dr. P. P. Singh
Project Director

P. P. Singh
Project Director
&
Director
State Forest Research Institute,
Jabalpur, M.P.

/francis/

Y. P. Singh
11/1/90

IX. PHYSICAL WORK DISTRIBUTION

A. OFFICIALS

1. Dr. Ram Prasad,
Director,
SFRI, Jabalpur Scientific supervision, guidance of the project
2. Shri A.S. Parihar
Director SFRI
(from 8.9.92) Overall supervision, guidance, administration of the Project.
3. Shri S.P. Singh
Dy. Director (Research),
SFRI, Jabalpur Work Plan and Work Execution.
4. Dr. Jiten Kumar
Dy. Director (Seed),
SFRI, Jabalpur Organisation of Work Plan.
5. Shri G.P. Shrivastava
ACF, SFRI, Jabalpur Providing guidance for field works, enumerations and overall administration.
6. Shri B.P. Chaurasia
Nodal Officer (ACF)
SFRI, Jabalpur Providing guidance of field camp arrangements, administration, enumeration, supervision, taking care of progress etc.
7. Dr. R.K. Pandey
SFRI, Jabalpur Provide guidance for botanical, wild-life and ecological work.
8. Dr. Pratibha Bhatnagar
SFRI, Jabalpur Provide guidance for socio-economic studies.
9. Shri R.M. Shukla
Dy. Ranger, Indore. Assisting in collection of field data
10. 3 Forest Guards of RRO Nepanagar --- do ---

B. PROJECT ASSISTANTS - FIELD INVESTIGATORS

1. Shri G.P. Date Compilation and analysis of data, writing of report etc.
2. Dr.S.K. Masih Compilation of data on flora, ecological studies and ethnobotanical work.
3. Shri Ashok Goswami Fauna
4. Shri Anil Shrivastava Socio-economic survey.
5. Shri D.K. Ghodke Cartography (Mapping etc.)
Dealing of important files.

Table 1 : Various submergence villages surveyed during this quarter
(July-Sept. '92)- Flora, Fauna Survey (July - Sept. '92)

Manawar Tehsil (Dhar)

1. Barda
2. Akalwara
3. Kaothi
4. Kalyanpur
5. Rajpura
6. Gangli
7. Urdana
8. Mahapura
9. Gopalpura
10. Malangaon
11. Kattawara

11 Villages

Kukshi Tehsil (Dhar)

1. Sisgaon
2. Kheda
3. Babulgaon
4. Malwada

4 Villages

Thikri Tehsil (Khargone)

1. Gawala II
2. Datwada
3. Chichli

3 Villages

Barwani Tehsil (Khargone)

1. Kheda
2. Pipari
3. Utaward
4. Piplod

4 Villages

Table 2 : Medicinal Plants

Botanical Name	Parts Used
<u>Annona squamosa</u>	Fruits
<u>Argemone mexicana</u>	Juice
<u>Kydia calycina</u>	Bark
<u>Sida acuta</u>	Leaves
<u>Bombax ceiba</u>	Bark
<u>Helictres isora</u>	Fruits
<u>Oxalis corniculata</u>	Stem
<u>Aegle marmelos</u>	Fruits, Bark
<u>Ailanthus excelsa</u>	Bark
<u>Azadirachta indica</u>	Whole plant
<u>Boswellia serrata</u>	Bark, Branches
<u>Melia azadirach</u>	Leaves, Stem, Fruits
<u>Launea caromendalica</u>	Stem
<u>Cassia tora</u>	Leaves
<u>C. fistula</u>	Leaves, Seeds
<u>Acacia nilotica</u>	Bark, Fruits
<u>Woodfordia fruticosa</u>	Flowers, Stem
<u>Butea monosperma</u>	Stem, Fruits, Bark
<u>Madhuca indica</u>	Fruits, Flowers
<u>Eclipta prostrata</u>	Leaves, Stem
<u>Xanthium stoumarium</u>	Fruits
<u>Nyctanthes arbortristis</u>	Leaves, Fruits
<u>Solanum nigrum</u>	Fruits
<u>Ocimum americanum</u>	Leaves, Juice

Table 3 : Edible Plants

Botanical Names	Parts Used
<u>A. squamosa</u>	Fruits
<u>A. manihot</u>	Fruits
<u>Gossypium hirsutum</u>	Seeds
<u>Bombax ceiba</u>	Seeds
<u>Oxalis corniculata</u>	Leaves
<u>A. marmelos</u>	Fruits
<u>Feronia lemonia</u>	Fruits
<u>Zizyphus mauritiana</u>	Fruits
<u>Z. oenopia</u>	Fruits
<u>Buchnanania lanzan</u>	Seeds, Fruits
<u>Mengifera indica</u>	Fruits
<u>Tamarindus indica</u>	Fruits
<u>Momordia charantia</u>	Fruits
<u>M. dioica</u>	Fruits
<u>Madhuca indica</u>	Leaves, Flowers
<u>Ocimum americanum</u>	Leaves, Seeds
<u>Amaranthes spinosa</u>	Leaves, Seeds.
<u>A. viridis</u>	Leaves, Seeds
<u>Phoenix sylvestris</u>	Fruits, Juice
<u>Borassus flabellifer</u>	Juice

Table 4 : Fuel Plants

Botanical Names	Parts Used
<u>Gossypium hirsutum</u>	Dry stem
<u>Kydia calycina</u>	Wood
<u>Bombax ceiba</u>	Wood
<u>Helicteres isora</u>	Stem, Branches
<u>Feronia lemonia</u>	Wood
<u>Ailanthus excelsa</u>	Wood
<u>Boswellia serrata</u>	Wood
<u>Zizyphus mauritiana</u>	Stem
<u>Z. oenophlia</u>	Stem
<u>Buchnanania lanzan</u>	Wood
<u>Cassia tora</u>	Whole plant
<u>Cassia fistula</u>	Stem, Branches
<u>Tamarindus indica</u>	Dry branches
<u>Acacia nilotica</u>	Wood
<u>A. catechu</u>	Wood, Branches
<u>Butea monosperma</u>	Wood
<u>Xanthium strumarium</u>	Dry plant
<u>Wrightia tinctoria</u>	Wood

Table 5 : Biomass Productivity in Kukshi, Manawar & Barwani
Tahsila villages surveyed this quarter

Sample Types	Green Biomass	Dry Biomass
Mean Biomass (1m x 1m)	991 gms (Kukshi Tahsil) 817 gms (Manawar Tahsil) 1124.5 gms (Barwani Tahsil)	473.5 gms 426.5 gms 565.5 gms
Mean Biomass t/b	9.89 Kukshi 8.17 Manawar 11.23 Barwani	4.72 4.26 5.65
SD ±	48.57 (K) 226.91 (M) 49.52 (B)	42.88 33.00 31.13
SE ±	4.85 (K) 22.69 (M) 4.95 (B)	4.28 3.3 3.30

Table 6 : Per Capita Annual Domestic Energy Consumption in submergence area of S.S.P. in Khargone District (Thikari Tahsil)

Distance from forest	Name of village	No. of Respondent	Per Capita Annual Energy Consumption in quintals		
			Fuelwood	Agri. Residue	Dung Cake
1. Away from forest	Gamla I	100	1.44	5.98	1.25
2. do	Datwada	350	0.95	5.69	1.49
3. do	Chichali	260	1.20	6.02	1.01

Table 7 : Per Capita Annual Domestic Energy Consumption in submergence area of S.S.P. in Dhar District (Tehsil Kukshi)

S.No.	Distance from forest	Name of village	No. of Respondent	Per Capita Annual Energy Consumption in quintals		
				Fuelwood	Agri. Residue	Dung Cake
1.	Away from Forest	Singgaon	30	1.43	5.87	1.30
2.	do	Kheda	200	1.32	6.01	1.03
3.	do	Babulgaon	325	1.71	5.63	.99
4.	do	Malwada	200	1.13	6.01	1.10

Table 8 : Per Capita Annual Domestic Energy Consumption in submergence area of S.S.P. in Khargone District (Tehsil Barwadi)

S.No.	Distance from forest	Name of village	No. of Respondent	Per Capita Annual Energy Consumption in quintals		
				Fuelwood	Agri. Residue	Dung Cake
1.	Away from Forest	Khedi	80	0.95	6.20	1.22
2.	do	Pipari	105	1.50	6.58	0.96
3.	do	Utawad	25	2.12	5.68	1.10
4.	do	piplod	236	1.01	6.12	0.98

Table 9 : Per Capita Annual Domestic Energy Consumption in submergence area of S.S.P. in Dhar District (Tehsil Munawar)

S.No.	Distance from forest	Name of village	No. of Respondent	Per Capita Annual Energy Consumption in quintals		
				Fuelwood	Agri. Residue	Dung Cake
1.	Away from Forest	Barda	450	1.29	5.24	1.64
2.	-do-	Akalwara	275	.94	6.19	1.68
3.	do	Kavthi	170	1.68	5.75	1.75
4.	-do-	Kalyanpura	109	1.03	66.03	0.89
5.	-do-	Rajpura	50	1.84	5.82	1.20
6.	-do-	Gangli	240	1.13	5.63	1.19
7.	do	Urdana	120	0.93	5.89	1.27
8.	do	Mahapura	130	0.89	6.10	1.41
9.	do	Gopalpura	100	1.32	5.87	1.07
10.	-do-	Malangaon	150	1.62	5.54	1.30
11.	do	Kothada	300	1.53	6.01	0.93

Table 10 Showing percentage of cattle grazing in agriculture and forest areas according to the distance from submergence area in Dhar District (Tehsil Kukshi)

S.No.	Name of village	Limit of cattle grazing	Percentage of cattle grazing		Distance of village from forest	Type of forest
			Agri Area	Forest Area		
1.	Singraon	4 km	100	-	above 20 km	Cultivated area
2.	Kheda	4 km	100	-	do	-do-
3.	Bahulgram	4 km	100	-	do	-do-
4.	Nalwada	2 km	100	-	-do-	-do-
4.	Nalwada	2 km	100	-	do	-do-

Table 11 Showing percentage of cattle grazing in agriculture and forest areas according to the distance from submergence area in Khargone District (Tehsil Thikari)

S.No.	Name of village	Limit of cattle grazing	Percentage of cattle grazing		Distance of village from forest	Type of forest
			Agri Area	Forest Area		
1.	Gamla I	3 km	100		above 25 km	Cultivated area
	-do- II					
2.	Datwada	3 km	100		-do-	-do-
3.	Chichli	4 km	100		do	do

Table 12 Showing percentage of cattle grazing in agriculture and forest areas according to the distance from submergence area in Khargone District (Tehsil Barwani)

S.No.	Name of village	Limit of cattle grazing	Percentage of cattle grazing		Distance of village from forest	Type of forest
			Agri Area	Forest Area		
1.	Khedi	3 km	100	-	Above 20 km	Cultivated Area
2.	Pipari	3 km	100	-	do	do
3.	ulawad	3 km	100	-	do	do
4.	Pipled	3 km	100	-	do	do

Table 13 Showing percentage of cattle grazing in agriculture and forest areas according to the distance from submergence area in Khargone District (Tehsil Munawar)

S.No.	Name of village	Limit of cattle grazing	Percentage of cattle grazing		Distance of village from forest	Type of forest
			Agri Area	Forest Area		
1.	Barda	3 km	100		Above 20 km	Cultivated Area
2.	Akalwara	3 km	100		do	do
3.	Kavthi	2 km	100		do	do

4.	Kalyanpura	4 km	100	-	-do-	-do-
5.	Rajpura	3 km	100	-	-do-	-do-
6.	Gungli	3 km	100	-	-do-	-do-
7.	Urdana	4 km	100	-	-do-	-do-
8.	Mahapura	3 km	100	-	-do-	-do-
9.	Gopalpura	2 km	100	-	-do-	-do-
10.	Mulangaon	4 km	100	-	-do-	-do-
11.	Kothada	3 km	100	-	-do-	-do-

File name : A: NVDA1 (WS)

ANNEX - XVII - (IV)

**STATUS OF FLORA AND FAUNA IN AND AROUND
SARDAR SAROVAR PROJECT, MAHARASHTRA**

PRELIMINARY REPORT

Dr. V.R. GUNALE
Project Director

Principal Investigators

Dr. Vishwas S. Kale
Dr. D.N. Patil
Dr. N.J. Fawar
Dr. (Mrs). A.S. Gadgil
Dr. D.R. Shirke

SCHOOL OF ENVIRONMENTAL SCIENCES
University of Poona, Pune 411 007

Project Director
Dr. V. R. Gunale

Principal Investigators

Remote Sensing & G.I.S :
Prof. Vishwas S. Kale
Dr. D.N. Patil

Biology :
Dr. D.R. Shirke
Dr. V.R. Gunale

Landuse and Climatology :
Dr. Alaka Gadgil
Dr. N.J. Pawar

Consultant :
Prof. S.B. Chaphekar

Research Assistants associated with the Project

Sr No.	Name	Date of joining
01.	Mr. Arote Suresh Karbhari	17th August, 1992
02.	Mrs. Chavan Anupama B.	17th August, 1992
03.	Mr. Ghule Lahanu Damodar	17th August, 1992
04.	Mr. Patil Nitin B.	17th August, 1992
05.	Mr. Patil Ramesh D.	17th August, 1992
06.	Mrs. Patil Bharati D.	18th August, 1992
07.	Mr. Kairnar Sanjay Appaji	19th August, 1992
08.	Mr. Thomas Richie	20th August, 1992
09.	Mr. Lale Manish	21st August, 1992
10.	Ms. Pasupala Jayshree Mohan	24th August, 1992
11.	Mr. Vivek Kulkarni	24th August, 1992
12.	Mr. Hire Pramodkumar S.	24th August, 1992
13.	Mr. Patil Nitinkumar M.	24th August, 1992
14.	Mr. Mahajan D.M.	26th August, 1992
15.	Mr. Patil Ravindrakumar D.	28th August, 1992

STATUS OF FLORA AND FAUNA IN AND AROUND SARDAR SAROVAR PROJECT

FIRST REPORT

Duration of work : May to December 1992

INTRODUCTION:

In the first phase of the work between May and December 1992 preliminary work was carried out. This includes the demarcation of the area as well as preparation of maps representing different aspects of the Physical environment.

In addition to this, first few months were utilized for developing the necessary infra-structural facilities at the SES as well as for the field surveys. This includes the appointment of the Research and Field assistants as well as the supporting staff. Orders for all the essential equipments as well as satellite imageries and maps were placed with the respective organizations. Several difficulties were encountered while procuring maps and satellite imageries. Necessary formalities in the connection have been completed and the forms have been sent to the concerned departments in New Delhi and Dehradun.

INTRODUCTION TO THE AREA :

The area under study includes the belt along the Narmada river and extends for about 20 km from the river, in Maharashtra.

The area extends from 21° 30' to 22° 00' N latitude and from 73° 45' to 74° 45' E longitude. The area is covered by 46 G/13, G/14, J/8, K/1, K/5 and K/9.

During the pre-field work and field work phase the following aspects were studied.

- 1] Preparation of base map of the study area.
- 2] Spatial variation in the physiographic and Vegetation cover on the basis of toposheets and satellite imageries. (see section I).
- 3] Landuse data were collected and spatial analysis of the various parameters was undertaken. (see section II).
- 4] During the field work, faunal and floral surveys were carried out and samples were collected for analysis in the laboratory for identification and classification of the species (see Section III and IV respectively).
- 5] Analysis of aquatic flora and fauna (Section V).

The first field visits were carried out around Dhankhed, Manibell, Daab and Devgavi Ghat in November and December 1992, in spite of numerous difficulties in the field. The details of the work are presented under separate sections.

SECTION - 1

**ANALYSIS BASED ON TOPOSHEETS AND
SATELLITE IMAGERIES.**

Geographical information of the area is taken from toposheets and satellite imageries. The scale of the toposheet is 1:50,000 i.e. 1cm = 0.5km. Area covered by each toposheet e.g. 46K/5 is 15' x 15'. Latitudinal distance is 29.95 km and longitudinal distance is 27.75 km. So total geographical area of each toposheet is 720 sq.km. The latitude as well as longitude is divided into 30 equal divisions. Latitudinal distance of each grid is 0.995 km. and longitudinal distance is 0.920 km. Information is taken from 900 grids (30x30) covering 0.8 sq.km. area.

The information is taken for the following variables from each grid:

1 .Highest Point:

Highest point is considered as highest value of contour in particular grid. Sometimes it is denoted by triangulation station (Δ), triangulation point (.) or bench mark e.g. .264. The contour interval of toposheet is 20m. So values of height are also in meters.

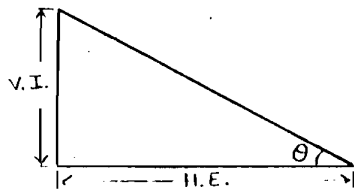
2 .Lowest point:

Lowest contour value of given grid has been considered as lowest point.

3. Slope:

Slope of grid is calculated using the following formula:

$$\text{Tan} = \text{V.I.} / \text{H.E.}$$



V.I. (Vertical Interval) is calculated by subtracting Lowest point from Highest point and H.E.(Horizontal Exaggeration) is calculated by measuring the minimum distance between highest point and lowest point in cms. This distance is multiplied by 500 for converting into meters. Tan value is converted into Tan⁻¹ so the values are in the form of degree decimal e.g. 24.79

4. Drainage Density:

Drainage density is calculated by using the following formula:

$$\text{Drainage density} = \frac{\text{Stream length in respective grid}}{\text{Area of respective grid}}$$

5. Drainage Frequency:

$$\text{Drainage frequency} = \frac{\text{Number of streams in respective grid}}{\text{Area of respective grid}}$$

Other Variables are quantified as follows:

- 6. Perennial streams as 1
- 7. Seasonal streams as 2
- 8. Metalled road as 1
- 9. Unmetalled road as 2
- 10. Cart tract and path as 3
- 11. Large Settlement as 1
- 12. Small settlement as 2
- 13. Barren land as 1
- 14. Agricultural land as 2
- 15. Forest area as 3
- 16. % forest :

% of forest is taken from each grid approximately (visually).

17. % forest from Imagery:

Latest available Imageries (Acquired in November 1985) of same area of same scale is used to determine the area under vegetation and approximate % of area is taken for each grid.

The above variables are then used for GIS studies. GIS (Geographic Information Systems) is basically a powerful set of computer aided tools used for inputting, storing, retrieving, analysing, modelling and displaying spatial data for a particular set of purposes. The spatial maps of varied scales and projections when overlaid and digitally integrated will give an idea of the area under study.

For GIS studies, the package used is known as IDRISI. IDRISI is a raster based information system and hence grids of suitable sizes are used to obtain information from the map or imagery.

Values obtained for a particular variable are used to prepare an image of that feature. The different featured maps are then overlaid to give information on the relief studies, land use studies etc.

For example, landuse studies can be done by overlaying images of barren lands, agricultural lands and forest lands. Information such as the areas under each of these categories can be obtained.

Since satellite imageries give up-to-date information regarding percentage of forests etc., it is better to

determine percentage of forests from imageries. After obtaining the percentage of forests from imageries and toposheets, the discrepancy in information gathered from the toposheets can be determined.

TABLE - I :- Table showing area under Forests, Agriculture & Barren lands (Figures in sq. kms.)

No. of Topo-sheet	Area under study	Area under vegetation		Area under Agricultural and Barren land
		Toposheet	Imagery	
46 K/1	531.20	197.96	190.94	233.24
46 K/5	576.00	448.09	332.58	127.91
46 G/13	237.60	155.48	149.96	82.12
46 G/14	120.80	115.20	-	5.60

From the above table, it can be seen that in the Toposheets No. 46 K/1 and 46 G/13, the difference between area under vegetation from the toposheets and imageries is not much. This is because the agricultural areas in the satellite imageries shows vegetation cover and hence it is classified under forests.

However, in the Toposheet No. 46 K/5, the difference in the forest cover from the Imagery and Toposheet is large. This shows that a large part of the area under forests as shown on the toposheet, do not have thick vegetation cover.

The comparison between the Imagery and Toposheet of 46 G/14 could not be done, due to non-availability of the respective Imagery.

The density of forests in the study area (Toposheets 46 K/1, 46 K/5, 46 G/13, 46 G/14) has also been studied. The forests have been categorized into four groups.

Low Density	-	0-25 %
Medium Density	-	25-49 %
High Density	-	50-74 %
Very High Density	-	75-100 %

Table II shows the area of the forests in square kilometers under the above mentioned categories. A comparison of the forest densities obtained from Imageries and Toposheets can also be seen.

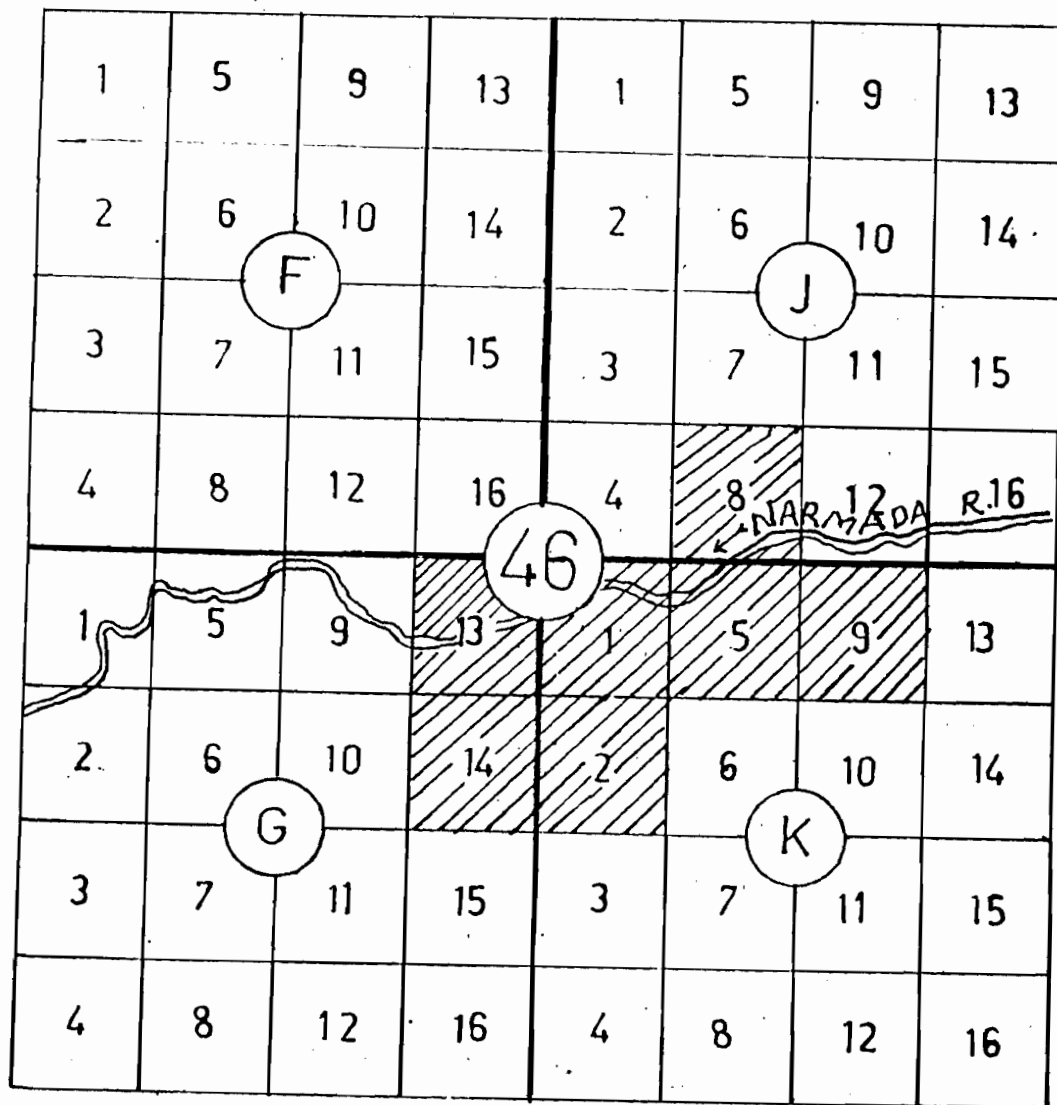
TABLE - II :- Table showing the density of vegetation in Sq. Kms

Topo-sheet No.		Area under vegetation cover				Area under Study
		0-24 %	25-49%	50-74%	75-100%	
46 K/1	Imagery (Nov. 85)	264.0	87.2	76.8	103.2	531.2
	Toposheet	268.8	44.0	66.4	152.0	
46 K/5	Imagery (Nov. 85)	80.0	126.4	140.8	228.8	576.0
	Toposheet	30.4	48.8	101.6	395.2	
46 G/13	Imagery (Nov. 85)	12.0	41.6	97.6	86.4	237.6
	Toposheet	35.2	28.8	49.6	124.0	
46 G/14	Imagery (Nov. 85)	-	-	-	-	120.8
	Toposheet	25.6	20.0	36.8	38.4	

The physiography of the area can be seen in Fig. 1.1.

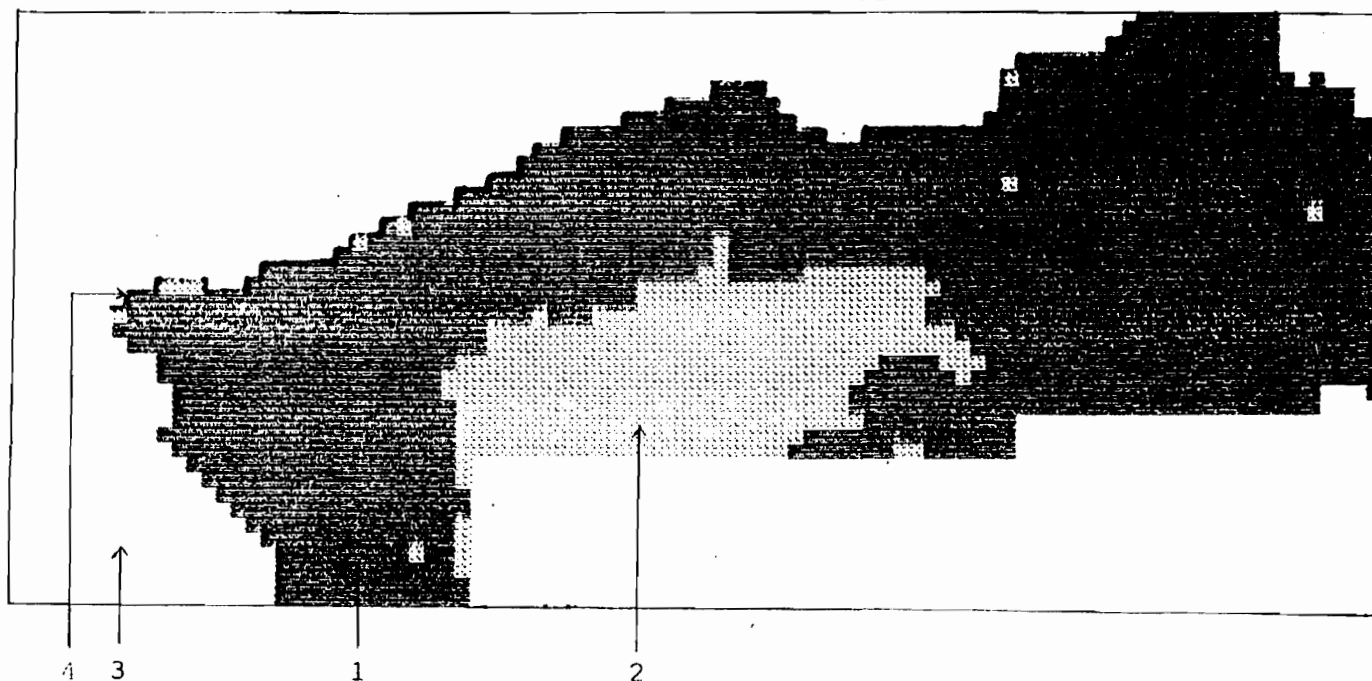
The area includes the study area from toposheet 46 K/1,

INDEX TO TOPOSHEETS



TOPOSHEETS OF STUDY
AREA

Area under Forest and Agriculture



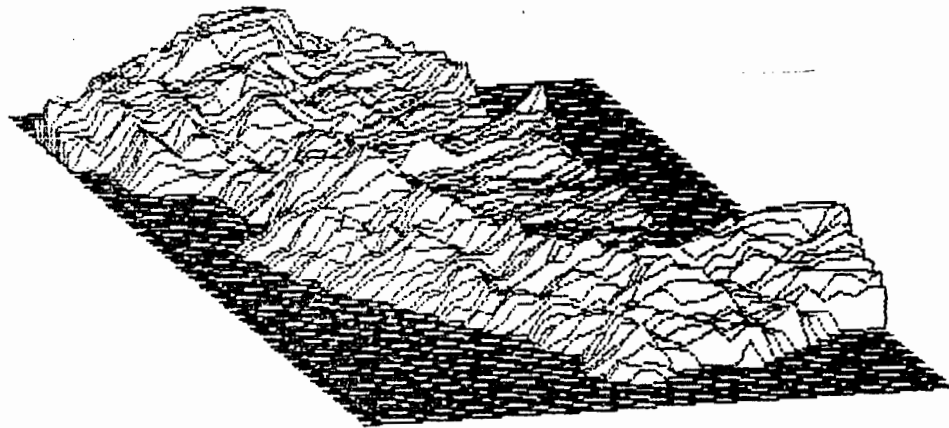


Fig.1.1 Physiography of study area.

46 K/5, 46 G/13 and 46 G/14. It can be seen that a major part of the area from toposheet 46 K/1 is a plain area as compared to the adjacent rugged topography. Agricultural activities are high in this area as shown in Table 1.

From the data gathered from the toposheets & imageries, it is noticed that the density of forests are usually high on higher altitudes as compared to the low lying areas. Also majority of the areas having higher relief are found to have higher forest density.

The occurrence of the high forest density on higher altitudes could be attributed to the following reasons:

1. The higher altitude areas mainly come under the Reserved Forests.
2. There is low accessibility in this area due to the high relief.
3. The area is not suitable for agricultural practises due to steep slopes.

Study of the remaining Toposheets as well as Imageries will be done in the following months.

SECTION - 2

STUDY OF LANDUSE PATTEEN OF THE AREA.

The study area of the research project is the belt of 20 Km. towards South of Narmada river in Maharashtra state. The study area constitutes major parts of Akrani and Akkalkova Tahsils and a small part of Taloda Tahsil. According to the Maharashtra Govt. records, 36 villages of Maharashtra state will be submerged in the S.S.P. Out of these, 9 villages are from Akkalkova Tahsil while 27 are from Akrani Tahsil.

From the total study area, a list of 120 villages is prepared by refering the toposheet of the area. The landuse pattern of these villages is studied for four years, i.e. 1971, 1981, 1985 and 1991. The data for the years 1971 and 1981 is obtained from The District Census Handbook of Dhule district, while the data for the years 1985 and 1991 is collected from the Tahsil offices of the respective Tahsils.

The landuse study includes the study of various elements of each and every village viz., total area of the village in hectares (In 1971 census the total area is measured in Acres which is converted into Hectares and

mentioned here), area under forest in hectares, total agricultural land reported as irrigated and unirrigated land, area as culturable waste (i.e., the area which can be brought under cultivation but presently not under cultivation) and area not available for cultivation (It includes the area under different cultural features like roads, houses, wells etc.).

Then by considering total area of each Tahasil as 100 %, the percentage area under various landuse features as mentioned earlier, of the individual Tahasils is calculated for four different years. From this data, the status of forests, irrigated and unirrigated agricultural land, culturable wastelands and the area not available for cultivation is tabulated as follows.

Table 1

Status of Forests
(Area in Percentage)

TAHASIL	Taloda Akkalkuwa Akrani		
	YEAR		
1971	69.88	66.38	-
1881	71.95	66.78	01.26
1985	69.74	60.43	04.47
1991	69.64	62.76	04.47

The table reveals that forest area in all the three tahasils have increased during 1971 to 1981. In case of Taloda tahasil the forest area has decreased from 1981 to 1991, while in Akrani tahasil, forest area has increased during the subsequent census. Akkalkuwa tahasil shows a considerable decrease in forest in 1985 report and a little increase in forests in 1991 census. Personal discussions with the local Range Forest Officers revealed that, the increase in forest area is the result of plantation activities of the Forest Dept.

Table 2

Status of Unirrigated Agriculture land
(Area in Percentage)

Tahasil	Taloda	Akkalkuwa	Akrani
Year			
1971	23.22	26.40	21.55
1981	22.24	25.65	20.27
1985	15.70	30.56	74.49
1991	17.90	30.67	74.49

The table indicates that in Taloda Tahasil there is a substantial decrease in area under unirrigated agricultural

land upto 1985 with slight increase in 1991. In Akkalkuwa tahasil, after decrease in unirrigated agricultural land in 1981 census, its percentage has increased in 1985 and 1991 census. In Akrani tahasil, there is a major increase in unirrigated agricultural land in 1981 census and then it has decreased substantially in 1985.

The reasons behind the fluctuation in agril. land may be
 1) Due to the practice of shifting cultivation of the local people. The major part of the study area is considered as Tribal area, and shifting cultivation is a common practice in case of tribals.

2) Due to the difference in the perception of the Govt. field workers in identifying the culturable waste land and unirrigated land.

TABLE 3
 STATUS OF IRRIGATED AGRICULTURAL LAND (AREA IN %)

TAHASIL	TALODA	AKKALKUWA	AKRANI
YEAR			
1971	-	-	-
1981	-	0.01	-
1985	7.74	0.03	-
1991	5.62	-	-

The distinguishing feature of the area as observed from this table is that very few irrigation facilities are available. In Taloda Tahsil, irrigation facilities were not available in 1971 and 1981, but after 1985, a small part of it has been brought under irrigation. In Taloda, unirrigated land has increased in 1991, whereas, irrigated land has decreased. This shows the transformation of irrigated land into unirrigated land.

A very small area in Akkalkuwa received irrigation facilities in 1981 and 1985, whereas, Akrani completely lacks irrigation facilities. The irrigation facilities that are available may be coming from wells and local streams, the capacities of which are very low.

TABLE 4
STATUS OF CULTURABLE WASTELAND (AREA IN %)

TAHSIL	TALODA	AKKALKUWA	AKRANI
YEAR			
1971		0.01	77.57
1981	0.71	0.28	1.47
1985	-	-	-
1991	-	-	-

From the table it can be inferred that culturable wasteland is very negligible in Taloda and Akkalkuwa. In Akrani, culturable wasteland was substantial in 1971, which has decreased considerably in 1981 and after that, it has vanished completely. From this, we can conclude that the land which was previously culturable wasteland is now being used for agricultural and other activities.

TABLE 5
STATUS OF AREA WHICH IS NOT AVAILABLE FOR CULTIVATION
(AREA IN %)

TAHSIL-	TALODA	AKKALKUWA	AKRANI
YEAR			
1971	6.90	6.21	0.88
1981	5.10	7.28	7.00
1985	6.82	8.98	21.04
1991	6.84	6.57	21.04

The table depicts that the area not available for cultivation remains more or less constant in Taloda and Akkalkuwa with little deviations. But in Akrani, the area increased at a considerable rate from 1981 to 1991. This may be due to soil deterioration and soil erosion accompanied by shifting cultivation practices of the tribal people.

LANDUSE PATTERN OF THE SUBMERGENCE AREA

The landuse pattern of the submergence area is studied separately. Although there are 36 villages which will be submerged under Sardar Sarovar project, data of only 33 villages has been utilized for these studies as only these are considered as villages.

TABLE 6

LAND USE STATUS OF SUBMERGENCE AREA (AREA IN %)

FEATURE		Forest	Unirrigated	Irrigated	Culturable	Not avail.
Y E A R	1971	74.18	9.22	-	10.04	6.56
	1981	74.86	18.63	-	0.05	6.46
	1985	50.12	23.62	-	-	26.26
	1991	56.55	24.14	-	-	19.31

The table shows that forest land has increased slightly in 1981 census, then decreased considerably in 1985 report with marked increase in area not available for cultivation. This forest land again increased in 1991 census with decrease in area not available for cultivation. On the other hand unirrigated land has increased continuously from 1971 census to 1991 census. From this we can conclude that,

due to human activities forests have depleted markedly in 1985 census and at the same time due to shifting cultivation practises, more and more land has turned into wasteland.

Decrease in culturable wasteland in 1981 census and increase in unirrigated land in 1981 census reveals that culturable wasteland has been brought under cultivation.

The graphic representation of the land use data for the year 1991, for the three Tahasils is given in Figures 1, 2 and 3 which is the existing landuse pattern of the area.

Remarks :

- 1) The data used here is published by the Govt of Maharashtra. As many officers do the work of data collection the perception of each one about various landuse features is different.

e.g., In some Tahsils the culturable waste land is recorded separately, while in some Tahsils it is included in unirrigated land.

Hence, division of data into different landuse features is questionable.

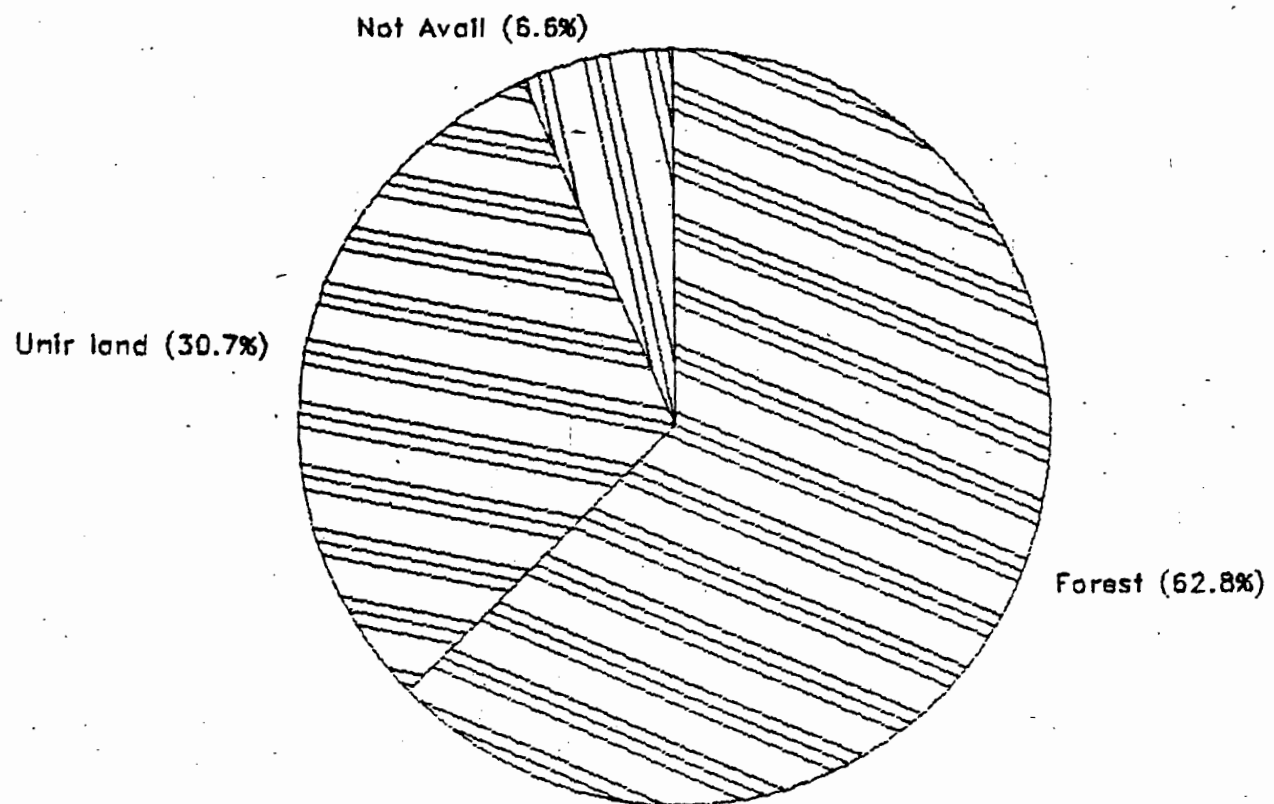


FIG. 1

% Area under various landuse features

Akkalkuwa-1991 census

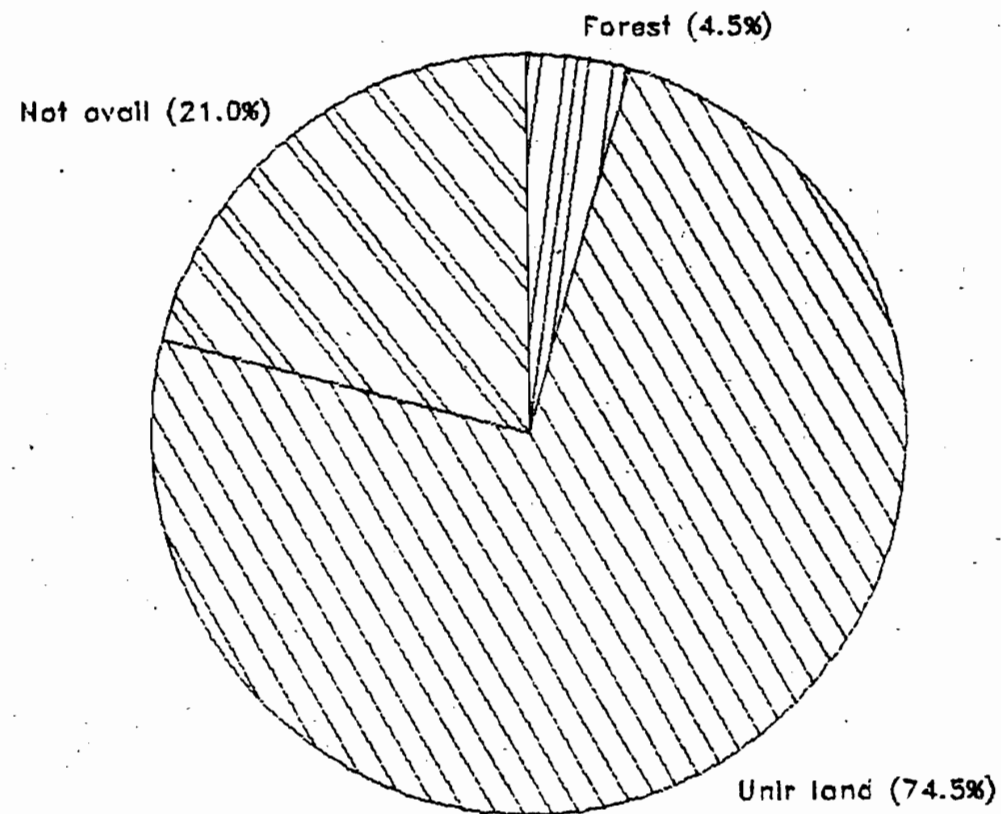


FIG. 2

% Area under various landuse features

Akroni 1991 census

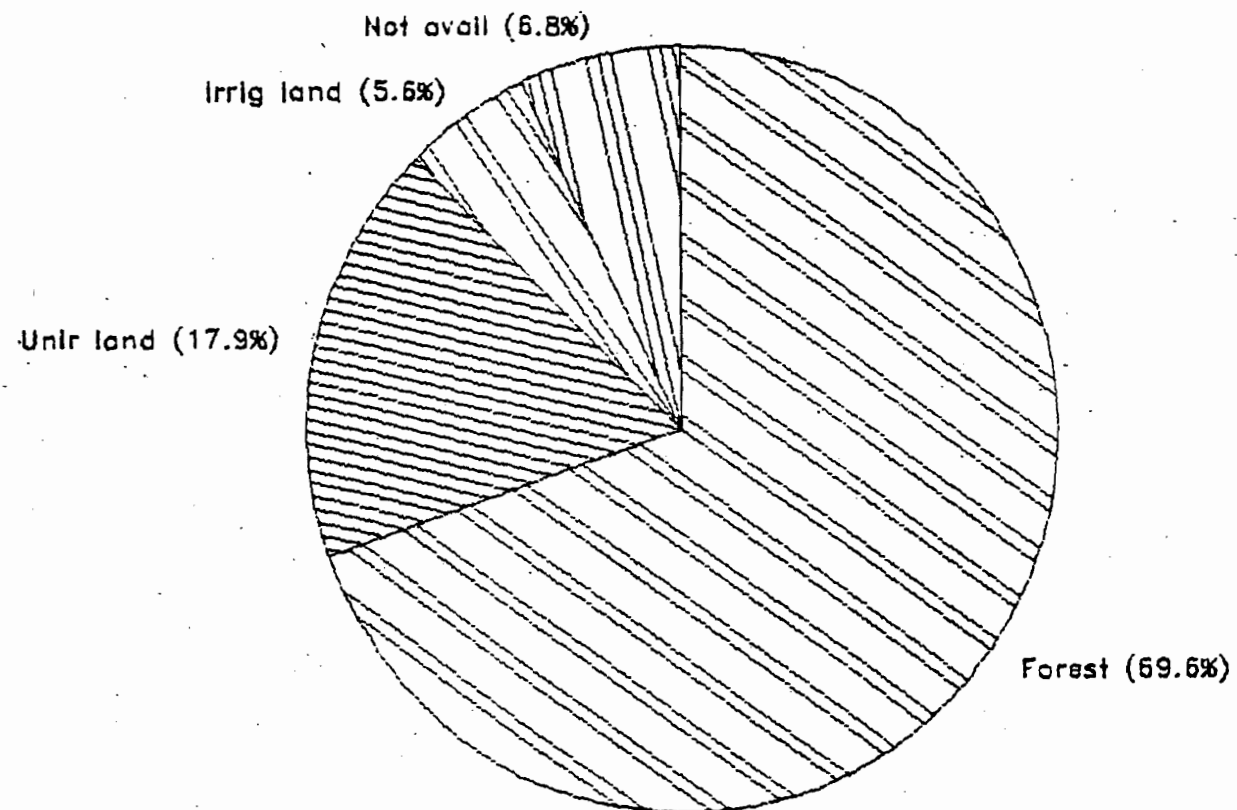


FIG. 3

% Area under various landuse features

Taloda - 1991 census

- 2) The data collected in 1985 and 1991 is different as far as Taloda and Akkalkuwa Tahsils are concerned. But according to officials from Akrani Tahsil, the data published in 1985 and 1991 is the same. The validity of this is questionable.
- 3) The total area of some villages is changing from year to year, e.g., total area of the village Bhadal in 1971 is 72.8 ha while it is 22 ha in 1981. From this we can conclude that there are no permanent boundaries for individual villages. The problem is more prominent in Akrani Tahsil.
- 4) In Akrani Tahsil, some villages are surveyed by Revenue dept while some are surveyed by Forest dept. There may be a difference between the perceptions of the two depts in identifying the various landuse features and reporting the data.

#####

SECTION - 3

FLORA IN AND AROUND SARDAR SAROVAR PROJECT

Field surveys were undertaken in the submergence area of the Sardar Sarovar Project covering the parts of Dhule District in Maharashtra. During the initial surveys covering the parts of Akkalkuwa and Dhadgaon taluka along the southern bank of river Narmada, floristic studies were carried out especially in and around villages Dhankhadi, Chimankhadi, Dab and Molgi. These include listing of plant species and ecological aspects such as species Abundance, Density and Frequency etc. The ecological studies were carried out by following quadrat method. The quadrats of 10m X 10m were studied for species abundance, density and frequency. In addition to these studies social surveys were carried out to understand the food habits of tribal population as well as to note the wild plants they use as their food.

The floristic exploration resulted in the enumeration of 112 plant species belonging to 99 genera of 51 families. A brief description of vegetation type encountered in the study area is given below :

A. Generally the forest is of Dry & Deciduous Type and having a common vegetation of :

Tectona grandis, Linn. . Lannea coromandelica, Merr.

Butea monosperma, (Lamk)Taubert. Madhuca indica, Gmel.

Diospyros melanoxylon, Roxb.

Mitragyna parviflora, Korth.

Wrightia tinctoria, Br.

Borassus flabellifer, Linn.

The following economically important plant species have been recorded in these forests. :

a. Plants used as Timber :

Tectona grandis, Linn.

Lannea coromandelica, Merr.

Madhuca indica, Gmel.

Diospyros melanoxylon, Roxb.

Mitragyna parviflora, Korth.

Acacia catechu, Willd.

b. Plants used as Fuel :

Butea monosperma, (Lamk) Teubert.

Wrightia tinctoria, Br.

Nyctanthus arbor-tristis, Linn.

Ficus hispida, L.

Pongamia pinnata, (Linn) Pierre.

Zizyphus rugosa, Lamk.

c. Edible fruit plants :

Mangifera indica, Linn.

Zizyphus jujuba, Lamk.

Aegle marmelos, Corre.

Emblica officinalis, Gaert.

Tamarindus indica, Linn.

Ficus glomerata, Rox.

Madhuca indica, Gmel.

d. Medicinally important plants :

Wrightia tinctoria, Br.

Vangueria spinosa, Roxb.

Asparagus racemosus, Willd.

Aegle marmelos, Corre.

Terminalia arjuna, Bedd.

Terminalia bellerica, Roxb.

Holarrhena antidysenterica, (Linn) Wall.

e. Commercially important plants :

<i>Acacia concinna</i> , DC.	<i>Madhuca indica</i> , Gmel.
<i>Diospyros melanoxylon</i> , Roxb.	<i>Pongamia pinnata</i> , Linn.
<i>Terminalia chebula</i> , Retz.	<i>Dendrocalamus strictus</i> , Nees.

f. Following grass species are found :

<i>Apluda aristata</i> , Linn.	<i>Heteropogon contortus</i> , Roem.
<i>Bambusa arundinacea</i> , (Retz)Willd.	<i>Cynodon dactylon</i> , Linn.
<i>Chloris barbata</i> , Sw.	<i>Lophopogon tridentatus</i> , Hack.
<i>Themeda triandra</i> , Forst.	

B. The areas under cultivation constituting hill slopes and valleys show predominance of following crops :

<i>Culcas sativa</i> , Spreng
<i>Andropogon sorghum</i> , Bert. Fl.Luist.
<i>Zizania mays</i> , L.
<i>Hibiscus monabimus</i> , L.
<i>Pharolus munge</i> , L.
<i>Cleome arbutifolia</i> , L.

The following plant communities were recognized in study area. It is seen that the different plant communities are mixed and/or overlapped with each other.

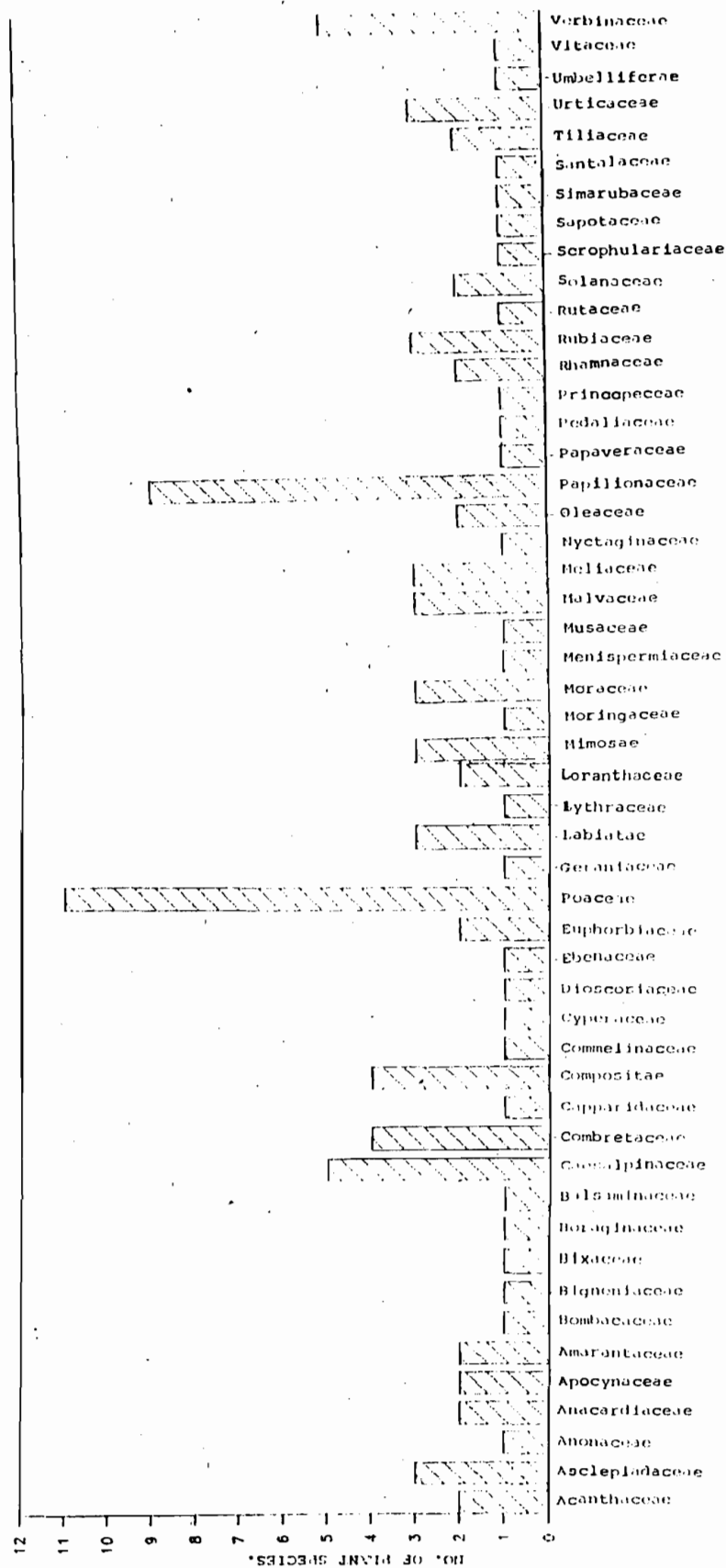
1. *Tectona-Lannea-Butea* community.
2. *Madhuca-Diospyros-Nyctanthes* community.
3. *Mitragyna-Wrightia-Anogeissus* community.

The following plant species are observed in the above mentioned villages :

<i>Argemone mexicana</i> , L.	<i>Anogeissus latifolia</i> , Wall.
<i>Ammannia tenuis</i> , Clke.	<i>Andropogon sorghum</i> , Brot.
<i>Acacia catechu</i> , Willd.	<i>Acacia farnesiana</i> , Willd.
<i>Acacia concinna</i> , DC.	<i>Asparagus racemosus</i> , Willd.
<i>Aegle marmelos</i> , Corre.	<i>Azadirachta indica</i> , Juss.
<i>Ailanthus excelsa</i> , Roxb.	<i>Abrus precatorius</i> , L.
<i>Albizia lebbek</i> , Benth.	<i>Artemisia parviflora</i> , B-Ham.
<i>Alysicarpus monilifer</i> , DC.	<i>Achyranthus aspera</i> , L.
<i>Anona squamosa</i> , L.	<i>Borassus flabellifer</i> , L.
<i>Bauhinia racemosa</i> , Lam.	<i>Eutea monosperma</i> , Taubert.
<i>Eutea suprema</i> , Roxb.	<i>Biophytum sensitivum</i> , DC.
<i>Rombax malabaricum</i> , DC.	<i>Eridelia retusa</i> , Spr.
<i>Boerhaavia diffusa</i> , L.	<i>Kyllinga triceps</i> , Rottb.
<i>Cassia tora</i> , L.	<i>Cassia fistula</i> , L.
<i>Cassia occidentalis</i> , L.	<i>Celosia argentea</i> , L.
<i>Canscora diffusa</i> , E.Br.	<i>Combretum ovalifolium</i> , Roxb.
<i>Cochlospermum religiosum</i> , Linn.	<i>Cissus quadrangularis</i> , L.
<i>Cynodon dactylon</i> , Pers.	<i>Commelina bengalensis</i> , L.
<i>Chloris barbata</i> , Sw.	<i>Cryptolepis buechanani</i> , R&S
<i>Cicer arietinum</i> , L.	<i>Calotropis procera</i> , Br.

<u>Desmodium auriculatum</u> , DC.	<u>Diospyros melanoxylon</u> , Roxb.
<u>Dioscorea bulbifera</u> , L.	<u>Dendrocalamus strictus</u> , Nees.
<u>Emblica officinalis</u> , Gaert.	<u>Ficus retusa</u> , L.
<u>Ficus glomerata</u> , Roxb.	<u>Ficus hispida</u> , L.
<u>Ficus bengalensis</u> , L.	<u>Gmelina arborea</u> , Roxb.
<u>Gynandropsis pentaphylla</u> , DC.	<u>Girardiana zeylanica</u> , Dene.
<u>Grewia asiatica</u> , L.	<u>Hibiscus cannabifera</u> , L.
<u>Holarrhena antidysenterica</u> , Wall.	<u>Hibiscus esculantus</u> , L.
<u>Heterophragma Roxburghii</u> , A. DC.	<u>Hemidesmus indicus</u> , Br.
<u>Hibiscus cyriacus</u> , L.	<u>Holoptelia integrifolia</u> , Planch.
<u>Indigofera pulchella</u> , Roxb.	<u>Impatiens balsamina</u> , L.
<u>Ipomoea</u> spp.	<u>Leucas aspera</u> , Spr.
<u>Lannea coromandelica</u> , Merr.	<u>Lavandula bipinnata</u> , O. Kuntze.
<u>Loranthus longiflorus</u> , Desr.	<u>Lepidagathis cristata</u> , Willd.
<u>Madhuca indica</u> , Gmel.	<u>Mangifera indica</u> , L.
<u>Morinda citrifolia</u> , L.	<u>Martynia diandra</u> , Glox.
<u>Mitrasacme parviflora</u> , Korth.	<u>Melia composita</u> , Willd.
<u>Moringa pterygosperma</u> , Gaert.	<u>Melilotus philippinensis</u> , Muell.
<u>Musa ensata</u> , Gmel.	<u>Nyctanthes arbor-tristis</u> , L.
<u>Olea dipica</u> , Roxb.	<u>Ocimum sanctum</u> , L.
<u>Pongamia pinnata</u> , (Linn) Pierré.	<u>Phaseolus mungo</u> , L.
<u>Physalis minima</u> , L.	<u>Pimpinella adscendens</u> , Dalz.

FIGURE 1
FAMILIAR OCCURRENCE OF PLANT SPECIES



<u>Eupalia atropurpurea</u> , Moq.	<u>Phaseolus aconitifolius</u> , Jacq.
<u>Euphorbia delphinifolia</u> , Don.	<u>Sida cordifolia</u> , L.
<u>Setaria glauca</u> , Beauv.	<u>Santalum album</u> , L.
<u>Tectona grandis</u> , L.	<u>Triumfetta pilosa</u> , Roth.
<u>Themada cymbaria</u> , Hack.	<u>Terminalia bellerica</u> , Roxb.
<u>Terminalia arjuna</u> , W. & A.	<u>Tinospora cordifolia</u> , Miers.
<u>Trema orientalis</u> , Bl.	<u>Trichodesma indicum</u> , Br.
<u>Tamarix dioica</u> , Roxb.	<u>Urena lobata</u> , L.
<u>Vitex negundo</u> , Linn.	<u>Viccia indica</u> , DC.
<u>Vangueria spinosa</u> , Roxb.	<u>Vernonia divergens</u> , Edgw.
<u>Viscum angulatum</u> , Heyne.	<u>Wrightia tinctoria</u> , Br.
<u>Xanthium strumarium</u> , L.	<u>Zizyphus rugosa</u> , Lam.
<u>Zizyphus trinervia</u> , Roxb.	

The preliminary observations indicate that the vegetation is disturbed due to human interference particularly by chopping of trees for domestic purposes and grazing.

#####

SECTION - 4

REPORT ON THE FAUNAL STUDIES

A field visit was made to the Dam site for the survey of vegetation and the fauna of the area. The aim of the visit was for initial survey of the area.

From the Gujarat side we reached the village Dhankhedi. We crossed the river by a small dug-out-canoe called "Doongi". Here for the first time everyone of us sighted river Narmada. The area is well endowed with greenery. A good amount of forest could be seen on the ranges of both the Satpuda and the Vindhya. The area seems to be rich in wildlife. Here the river seems to be quite silted on both the banks.

About 4 km area around Dhankhedi was scanned. The villagers of Dhankhedi provided valuable information about the ecology and the life-style of the area. Following information was provided by the "Patil" of the village named Mr. Monga Mukhia Vesave, Mr. Krishan Ramsingh, Mr. Bhamta and the villagers of Dhankhedi.

"The area is very well-supported by the adjoining forest. The locals collect minor forest produce like gums, Tendu leaves, Palash leaves, Mahua, honey etc. Animal life is in abundance. Amongst the animals following are noted: Sambar, spotted deers, Wild boars, Sloth Bears, Leopards, Tigers, Pangolins, Giant

squirrels, Mongoose, Porcupines, Black Naped Hare, Hanuman Langours, Rhesus Macaques, Bonnet Macaques, Indian Fox, Jackals, Wolves, Hyenas etc.

Amongst the birds, Peacocks, Jungle Fowls, Eagles, Hawks, Vultures are noteworthy.

In addition to this plenty of snakes, crocodiles, turtles, frogs, lizards, fish and countless insects are present."

From the preliminary survey there is definite room to believe that the forest is quite capable of supporting a diverse wildlife. The information was further confirmed by the collection of droppings of leopards, civets and the pug marks of hare, some small cats and the tail and claw marks of crocodile. However, the presence of the tiger is doubtful.

A list of animals sited at Dhankhedi is as follows :

BIRDS

COMMON NAME	ZOOLOGICAL NAME
01. Black Drongo or King Crow	<u>Dicrurus adsimilis</u> Bechstein
02. Blue Rock Pigeon	<u>Columba livia</u> Gmelin
03. Cattle Egret	<u>Egulus ibis</u> Linnaeus
04. Common Sandpiper	<u>Tringa hypoleucos</u> Linnaeus
05. Common Swallow	<u>Hirundo rustica</u> Linnaeus
06. Dusky Craig Martin	<u>Hirundo concolor</u> Sykes
07. House Crow	<u>Corvus splendens</u>
08. House Sparrow	<u>Passer domesticus</u> Linnaeus

09. House Swift
10. Indian Robin
11. Indian White Backed Vulture
or Bengal Vulture
12. Lesser Pied Kingfisher
13. Little Egret
14. Little Green Bee Eater
15. Rufous Tailed Finchlark
16. Red Vented Bulbul
17. Red Wattled Lapwing
18. Red Whiskered Bulbul
19. Roller
or Blue Jay
20. Rose Ringed Parakeet
21. Shikra

- Arus affinis
Saxicolodius fulicata Linnaeus
Gyps bengalensis Gmelin

Ceryle rudis Linnaeus
Egretta garzetta Linnaeus
Merops orientalis Latham
Ammodramus phoenicurus
Pycnonotus cafer Linnaeus
Vanellus indicus Boddaert
Pycnonotus jocosus Linnaeus
Coracias benghalensis Linnaeus

Psittacula krameri Scopoli
Accipiter badius Gmelin

MAMMALS

Evidences of the presence of wild animals were found from their droppings and pugmarks.

- Possible Droppings of Black Leopard
- Possible Droppings of Civet
- Possible Pugmarks of Hare
- Pugmarks of Small Cats (species unidentified)

These evidences will be confirmed in the further surveys.

REPTILES

- Garden Lizards
- Rock Gecko
- Possible Tail and Claw marks of Marsh Crocodile

The next morning we visited the Dam site, after which we visited the first village in the submergence area MANIBELI. The village appeared to be similar to Dhankhedi in the forest and

agricultural types. However, we could not study the area because the villagers refused to allow us to enter the village. This problem will occur everywhere in the submergence area due to the sour relationships between the Government and the agitating people. Unless this problem is solved any kind of survey in the submergence area will be impossible.

Since any kind of survey was not possible in the submergence area we retreated to Akkalkuwa. Here we visited one more village named Molgi. Though there is not much forest around the village Molgi, a good amount of forest was present on the way from Akkalkuwa to Molgi. According to the Talathi of Molgi, though wildlife was once very abundant, it is now suffering heavy losses due to the shrinkage of the habitat. Mammals like Sloth Bear, Leopard, Sambar, Wild Bear, Pangolin are still present in the lower valleys.

The list of birds sighted at Molgi is as follows :

COMMON NAME	ZOOLOGICAL NAME
01. Black Drongo or King Crow	<u>Dicrurus adsimilis</u> Bechstein
02. Common Iora	<u>Aegithina tiphia</u> Linnaeus
03. Red Whiskered Bulbul	<u>Eycnonotus jocosus</u> Linnaeus
04. Shikra	<u>Accipiter badius</u> Gmelin
05. Sparrow Hawk	<u>Accipiter niscus nisosimilis</u>
06. Spotted Dove	<u>Streptopelia chinensis</u> Scopoli
07. White Browed Fantail Flycatcher	<u>Rhipidura aureola</u>

Future plan includes detailed survey qualitatively and quantitatively of flora and fauna using standard methods.

SECTION - 5

PHYTOPLANKTONS AND ZOOPLANKTONS

The submergence area of the Sardar Sarovar Project coverings parts of Dhule Dist. were surveyed for aquatic flora and fauna.

Samples were collected from the Dhankhedi, Manibelli, Daab & Devi Ghat villages covering parts of Dhule Dist. in Maharashtra. These samples were preserved with 4% formalin and then identified in the laboratory using standard monographs.

The results of zooplanktonic and phytoplanktonic analysis are given below :

A] Sampling Site : Dhankhedi

Plankton Net Samples

PHYTOPLANKTONS

- 01. Peridium
- 02. Fragilaria
- 03. Pleurococcus
- 04. Gomphonema
- 05. Navicula
- 06. Staurostrum
- 07. Nitzschia

ZOOPLANKTONS

- 01. Cysts of ciliata
- 02. Paramecium sp.

Manually Collected Samples

PHYTOPLANKTONS

01. Spirogyra
02. Synedra
03. Oscillatoria
04. Nitzschia
05. Fragilaria
06. Cymbella
07. Microsterias sp.
08. Anabaena
09. Gomphonema
10. Navicula
11. Pediastrum
12. Carteria
13. Scenedesmus
14. Fungal spores - Alternaria

ZOOPLANKTONS

01. Paramecium sp.
02. Cyst of ciliates.
03. Chattonella sp.
04. Rotifera
 - a. Licane sp.
 - b. Monostyla sp.
 - c. Lepadella sp.
05. Nematoda
 - a. Rhabdolaimus aquaticus

B1 Sampling Site : Manibeli

Plankton Net Samples

PHYTOPLANKTONS

01. Fragilaria

ZOOPLANKTONS

C] Sampling site : Daab

Plankton Net Samples

PHYTOPLANKTONS

- 01. Peridium
- 02. Melosira
- 03. Oedogonium
- 04. Pediastrum
- 05. Eotryococcus

ZOOPLANKTONS

- 01. Protozoa
 - a. Astasia comma
 - b. Phacus longicaudum
 - c. Euglena gracilis
- 02. Rotifera
 - a. Karatella tropica
 - b. Nothelca sp.

D] Sampling site : Devgavi Ghat

Manually collected Samples

PHYTOPLANKTONS

- 01. Oscillatoria
- 02. Spirogyra
- 03. Fragilaria
- 04. Coscinium
- 05. Microsterias
- 06. Gomphonema
- 07. Cymbella
- 08. Chlorococcum
- 09. Anabaena

ZOOPLANKTONS

- 01. Protozoa
 - a. Euglena sp.
 - b. Euplates sp.
- 02. Rotifera
 - a. Mytilina sp.
- 03. Nematoda
 - a. R. aquaticus

10. Navicula

11. Nitzschia

12. Stauroneis

13. Closterium

Even though the results of the phytoplanktonic and zooplanktonic analysis indicate that the water quality is good, it supports very little aquatic life.

ANNEX - XVII - (V)**Note on the Health measures for Sardar Sarovar Project Affected Persons in the submergence area and at the resettlement sites.**

Sardar Sarovar a Mega Irrigation and Power Project has been taken up for construction on the Narmada River at Kevadia in Gujarat State. The project is a combined effort of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan States. Because of the backwaters of the dam, 33 villages of Akkalkuwa and Dhadgaon Tahsil will under go submergence. It is estimated that more than 15000 persons from about 3500 families will be displaced because of the submergence. About 15000 people are proposed to be rehabilitated at sites near Valeri village in Taloda Tahsil of Dhule District, Maharashtra. It would be necessary to provide adequate health cover to these oustee families being resettled in Taloda. The submergence water would affect an area admeasuring 10 km x 40 km. This submergence would indirectly affect about 80 villages in this belt. Although it would not be necessary to relocate these villages, proper health cover would be necessary as the ponded water may cause several waterborne diseases like malaria, fialaria, diarrhoea etc.

2. According to the norms adopted by the State Government, one primary health centre is admissible for 30,000 population in non-tribal area while the norm for tribal area is 20,000 population. Similarly for population of 5,000 in non-tribal and population of 3,000 in the tribal area, one public health unit is admissible. One public health centre normally controls 5 public health units. Based on these norms, 2 cottage hospitals, 8 primary health centres and 55 primary health units have already been

sanctioned for Dhadgaon and Akkalkuwa Tahsils in Dhule.

As most parts of these two Tahsils are hilly and inaccessible the State Government has adopted a special health programme for these talukas and has sanctioned an additional 8 public health units. It has also been decided that pending the establishments of the centres, 10 mobile health units would be sanctioned for these areas. These mobile units have been put into service about 2 years ago.

3. Of the 8 new primary health centres (refer para 2) sanctioned for these talukas, one of the centres was to be located at Bamni village. As this village would under go submergence, it has been decided to shift this public health centre, to Valeri in order to take care of the project affected persons who would be concentrated around this village. It is proposed to establish three resettlement sites to accommodate the displaced persons during the year 1993-94 and 1994-95. It has been decided to sanction one primary health unit for each of these villages. Thus in a radius of about 5 kms, one primary health centre and three primary health units will be established, with none of the units being more than 2 kms from each other.

4. While the health measures are being strengthened at the resettlement sites, it has been decided to establish 8 primary health units and provide one floating dispensary for the villages falling in the 10 Km belt of the submergence area

5. The following will be the staff structure in the primary health centre, floating dispensary and primary health unit.

Sr.No.	Designation	No. of post	Pay scale
1.	Medical Officer Class II	2	Rs.2200 4000
2.	Nurse Mid wife	1	Rs.1400-2600
3.	Compounder	1	Rs.1350-2200
4.	Health Assistant (Male)	1	Rs.1200-2040
5.	Auxiliary Nurse Mid wife	1	Rs.1200-2040
6.	Junior Clerk	1	Rs. 950-1500
7.	Driver	1	Rs. 950-1500
8.	Peons Class IV	5	Rs. 750-940
Total		13	

Primary Health Unit

1.	Auxiliary Nurse Mid wife	1	Rs.1200 1800
2.	Multi-purpose worker (Male)	1	Rs. 950-1500
3.	Part-time Attendant	1	Rs.50/-
Total		3	

Floating Dispensary

1.	Auxiliary Nurse Mid wife	1	Rs.1200 1800
2.	Compounder	1	Rs.1350 2200
3.	Launch Driver	1	Rs. 950-1500
4.	Peon	2	Rs. 750-940
Total		5	

The requirement of funds for capital expenditure maintenance grants and recurring expenditure is estimated to be Rs.80.31 lakhs.

Recurring Cost (Rs. in lakh)	Non-Recurring Cost (Rs. in lakh)	Capital Cost (Rs. in lakh)	Total Cost (Rs. in lakh)
14.76	09.05	53.50	80.31

The expenditure will be charged to the Sardar Sarovar Project.

6. These measures when adopted would take sufficient care of the health needs of both the areas, i.e. the resettlement site and the submergence area. This would be substantial improvement over the existing health arrangement in the submergence area. It needs to be mentioned that except for the proposed primary health centre at Bahni, there is no proper medical arrangement in the 33 villages undergoing submergence. People are required to walk for several Kms before they come across any dispensary or medical establishment. The large number of medical units proposed to be opened would serve multi purpose needs. While they would take care of waterborne diseases and sicknesses prevalent in the area, they would also impart in the people consciousness about population control, the ill effects of traditional practices and help remove superstitious beliefs. They would also provide major relief for mother and child care.

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

**पर्यावरण उपदल
Environment Sub-Group**

सत्राहवीं बैठक का कार्यवृत्त Minutes of the Seventeenth Meeting

**16 मार्च, 1993
को
पर्यावरण भवन, नई दिल्ली में हुई**

**Held at Paryavaran Bhawan New Delhi
16th March, 1993**

**इन्दौर
अप्रैल, 1993**

**INDORE
APRIL, 1993**

MINUTES OF THE 17TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 16TH MARCH, 1993 AT 12 NOON
IN PARYAVARAN BHAWAN, NEW DELHI.

I N D E X

Item No.	Contents	Page No.
	Introduction	1
XVII-1(91)	Conformation of the Minutes of the 16th meeting.	2
XVII-2(92)	Review of Action taken on the decisions of the previous meeting.	3 - 5
XVII-3(93)	Present Status of studies/Surveys and Environment Action Plans.	6 - 12
XVII-4(94)	World Bank Assistance and Performance Benchmarks on Environmental Issues [Item No.XVI-4(89)].	13
XVII-5(95)	Any Other Item	14
	Date & Venue of Next Meeting.	15

A N N E X U R E

XVII.Min.1	List of Participants of XVII meeting.
------------	---------------------------------------

MINUTES OF THE 17TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 16TH MARCH, 1993 AT 12 NOON
IN PARYAVARAN BHAVAN, NEW DELHI.

Shri R. Rajamani, Union Secretary, Ministry of Environment & Forests and Chairman of the Environment Sub-group of NCA welcomed the Members and Invitees to the 17th meeting of the Environment Sub-group. The list of participants is enclosed at Annex.XVII.Min-1.

Discussion on the agenda items was taken up thereafter.

Item No.XVII-1(91): CONFIRMATION OF THE MINUTES OF THE 16TH MEETING

Minutes of the 16th meeting of the Environment Sub-Group of Narmada Control Authority were circulated to all members and invitees separately vide letter No.34(16)/93/166 dated 20.1.93.

The minutes were confirmed with the following modifications:

Under Item XVI-1(86), the following was added :

1. Dr. Shekar Singh stated that his view point is that, the bar charts showing progress of implementation of Environmental Safeguard Measures in relation to construction of civil works on SSP, should also show the yearwise submergence and the resulting works required on yearly basis. It was, however, noted that even though, his view point is not reflected in the minutes but the NCA had made arrangements for accommodating the views expressed and a copy of the map indicating the yearly submergence as per RIS 1989 was made available.
2. Dr. Shekar Singh referring to compensatory afforestation works being done by Govt. of Gujarat in Kuchchh Distt. expressed that afforestation works normally should be taken up within the same ecological zone. Chairman, desired that, if sufficient non-forest areas are available for plantation within the impact areas, such areas should be taken up for compensatory afforestation, not only for the SSP but for all projects.

**Item No.XVII-2(92): REVIEW OF ACTION TAKEN ON THE DECISIONS
OF THE PREVIOUS MEETING**

Consideration of Policy Issues.

**1. Extention of Time for Environmental and Forestry
Approval [Item No.XVI-2(83) (b)].**

Chairman observed that there are slippages, in the areas to be impounded within the territories of Maharashtra particularly in the areas of catchment treatment. Besides keeping in view, the progress of the various works, he felt that Sub-group should recommend to the SSCAC and NCA that there cannot be any impoundment this year.

Mr. M.K. Jiwrajika, DIG(FC), MOE&F stated that there is no serious attempt for taking up the catchment area treatment works either in Maharashtra or in Madhya Pradesh and real Soil Conservation works are yet to commence. Dr. A.K. Malhotra, Member (E&R), NCA stated that in Maharashtra, even though posting of the staff in the field is yet to take place he has some information that nursery seedlings are raised, so that as soon as the staff assumes the charge, works can be taken up in the coming monsoon.

It was also informed that as per RIS 1989 at RL 61 mt, only 49 ha of land is coming under submergence in Maharashtra and in Gujarat also only few villages are coming under submergence and that in M.P., there would be no submergence till 1994-95. The situation was further explained by E.M., NCA by showing on a map, the extent of submergence and chainage of submergence on a map to the Chairman.

Chairman expressed that MOE&F is yet to take a view on the request made by NCA for seeking extension of time for certain studies. He desired that a clear pictorial view should be given by NCA showing the original schedule of construction in relation to the studies promised and the preparedness of the studies in relation to the Revised Implementation Schedule of 1989.

2. **Submission of Catchment Area Treatment Plans for freely draining critically degraded sub-watersheds. [Item No. XVI-2(87) (2)].**

Mr. Lowlekar, CCF, NVDA informed that they are delineating the forest areas and non forest areas in topo sheets of the Survey of India. To complete this work they need to take up 180 topo sheets out of which they have completed 19 topo sheets upto date. Chairman told them to expedite this work and submit the work plan within three months.

Chairman wanted to have similar information from GOM; however, as none was present, he desired that GOM may be conveyed that if, adequate attention is not paid for preparing the plans for the areas under reference and it is allowed to spill over to the next year, it may infringe Pari-Passu clause.

He further desired that GOM and GOMP may like to speed up the works and submit these plans as early as possible.

3. **Time Frame for Environmental Studies [Item No. XVI-2(83) (b)].**

Sub-group noted the content of the preliminary report of Pune University annexed with agenda papers. However, Chairman desired to know, what will happen if the Pune University comes out with the different recommendations in their final report? Further, it was pointed out by Prof. Ramaseshan that the report under reference, as it is apparent, has analysed the works within the submergence area and in future, interim reports may concentrate on other areas. Therefore, the recommendation may not vary much. However, he desired that the methodology adopted while preparing the report, may be clearly indicated in the beginning. Chairman desired that the discussion on the quality of the report, may be done under separate agenda to follow later under flora & fauna.

4. **Cost Estimates for preparation of Action Plan and implementation of Environment Safeguard Measures [Item No. XVI-2(83) (4)].**

Sub-group reviewed the cost estimate presented and expressed concern over delay in filling up the gaps. The

Chairman observed that, despite the fact that the issue is being raised for the last 2 meetings the gaps still persist, he therefore directed that all concerned should be approached immediately to furnish the information urgently. He desired that the cost estimates may be presented itemwise in a manner to give a feeling as to how much amount is planned to be spent on a particular item. This information will also be useful for finding the total spending for environmental safeguards for SSP. Chairman also expressed that even though the cost estimates can vary from State to State due to variation in topography, terrain, daily wages etc. yet there is a need for detailed analysis of the data as to establish that the various elements of the Action Plan are in place and adequate. He further desired that since the Environment Wing of the NCA is now fully staffed, this work should be done by them and a clear picture presented to the Sub-group. Site verifications, if necessary, may also be planned.

Dr. Shekar Singh desired that Health Aspect of the Command Area should be separated out from the General Health Aspects.

Chairman reviewed the situation and observed that against Rs.2000 crores of the estimated cost of the SSP Dam and Reservoir approximately Rs.200 crores is planned to be spent on Environmental works, which is roughly 10% of the total cost. It was further observed that against Rs.4000 crores, which is required to be spent on development of the canal and distributaries, an amount of Rs.700 crores on Environmental works within the Command Area is also proposed. He wanted a comprehensive picture to be presented in the next meeting.

Item No.XVII-3(93): PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS.

i) Phased Catchment Treatment

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP stated that the plan for treating 2997 ha of the catchment area, which was earlier taken up for compensatory afforestation works, is already slated for additional works like gully plugging, check dams, diversion of channels etc. The estimated cost of these minor works is stated to be Rs.500-800 rupees per ha. GOMP further reported that the CAT plan for the balance area of 2089 ha was already covered in the plan submitted earlier in June, 1991. However, this needs to be confirmed.

GOMP reported a progress of 11200 ha of treating non-forest area till the end of February, 1992. DIG (FC), MOE&F pointed out that during the last meetings, GOMP had indicated that only 8000 ha area is available for plantations and it is a first reporting that an area of 11200 ha has been completed in all respect. Chairman desired that the figures may be verified before these are accepted as progress during the year.

Sardar Sarovar Project.

Govt. of Madhya Pradesh

GOMP reiterated its stand to submit the micro watershed plans for the directly draining, critically degraded areas by the end of March, 1993. It was further indicated that the annual target shown in the status report, may also undergo revision.

GOMP reported, completion of treatment works over 8000 ha of non-forest areas and further progress of works in 1000 ha of the forest areas by the end of February, 1993 and indicated that NVDA is negotiating with M.P. Forest Development Corporation to give further impetus to the CAT works in forest areas.

Govt. of Gujarat

Chairman observed that even though GOG is ahead of its target on treatment works in forest areas, yet there is a slippage in the non-forest areas and desired that this should be made good as early as possible. In addition, he also observed that reconciliation of the figures is also pending for a very long-time and should be expedited by GOG.

Govt. of Maharashtra

Chairman observed that may be due to other pressing problems, no one has come to attend the meeting from GOM. But in order to ensure that the works on the SSP are not neglected he desired that it should be indicated to GOM clearly that any further delay may amount to violation of the Pari-Passu clause as indicated in the earlier meetings.

(ii) Compensatory AfforestationNarmada Sagar ProjectGovt. of Madhya Pradesh

DIG (FC), MOE&F pointed out that the areas afforested earlier have not been deleted from the achievements under compensatory afforestation. GOMP indicated that these are being revised.

GOMP reported completion of works over 34697 ha of degraded forest and 6629 ha of non-forest areas. The net cumulative progress after deleting 2997 ha of area transferred to catchment area treatment, stands at 31977 ha.

Sardar Sarovar ProjectGovt. of Gujarat

Sub-group noted the progress achieved by GOG.

Govt. of Maharashtra

No one attended the meeting from GOM, therefore, the progress could not be discussed.

(iii) Command Area Development**Narmada Sagar Project****Govt. of Madhya Pradesh**

GOMP informed that it has received modified proposal from Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur on 12th March, 1993, which is under scrutiny of NVDA. GOMP further reported that the command area survey report on ground water, is under completion and it is expected to be available shortly.

Sardar Sarovar Project**Govt. of Gujarat**

Dr. Mahesh Pathak, Executive Member of the Narmada Planning Group (NPG) informed the progress of various studies commissioned recently by the GOG and stated that as all these studies were forming a part of the Performance Benchmarks delineated by the World Bank, the interim drafts of these studies would be available by the end of March. He further informed that many of these studies are being examined with the help of the international experts, with a view to incorporate all possible suggestions.

Chairman emphasised the need for including studies on growth centres, development and maintenances of roads, integrated pest management, common property resources, studies on household, water table etc. He pointed out that the development of the growth centre should be decentralised as not to choke already crowded areas in Gujarat. He expressed that all these points should also be adequately addressed. He further emphasised the need for proper land use planning and expressed apprehension that in the absence of enforcement of directive on cropping pattern, some farmers may start cultivating the crops like sugarcane, which may result in shortage of water for irrigation to tailender farmers. He quoted instances from Rajasthan Canal where in some pockets farmers are now cultivating the sugarcane on the ground of availability of water. He stressed upon the need for enforcing the cropping pattern may be through some legislative measures, if the need be. Executive Member, NPG pointed out that in Gujarat, water is planned to be provided on volumetric basis, which would be insufficient for the crop like sugarcane. Yet, in view of the ability of the rich

farmers to supplement resources by exploiting ground water, he agreed to examine the issue. However, Mr. M.B. Mehta, CCF, SSP informed that Irrigation Act is on the anvil and the problem can be addressed to, to safeguard the interest of poor farmers. Chairman desired that to the extent possible, cropping pattern may be tailored to the proper land use. The Executive Member, NPG, however, pointed out that the cropping pattern is the function of Agro-Climatic zoning and hence optimum cropping pattern in the command area suiting to each zone is already recommended.

Chairman expressed this is a golden opportunity to make the SSP a model project by integrating various developmental programmes in the command area like fisheries, hydro generation etc. through community/local participatory approach.

Govt. of Rajasthan

Dr. Nalini Bhatt, Joint Director, MOE&F indicated that the report submitted by GOR was found to be inadequate and Govt. of Rajasthan was directed to take up the studies on the lines being taken up by GOG. GOR informed that they have entered into a dialogue with WAPCOS for taking up the studies and the matter is under negotiation.

(iv) Survey of Flora, Fauna and Carrying Capacity Studies.

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP indicated that due to inability of the officials of Zoological Survey of India, Botanical Survey of India and Wildlife Institute of India organisations, to attend the meetings called by NVDA to discuss the report produced by Friends of Nature Society, Bhopal, it was not possible to develop action plans. However, now these officials have been sent a copy each and their comments are invited on the same. Response from these officials is yet awaited.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP indicated that due to transfer of the Director, SFRI, the quarterly report ending December, 1992 is yet awaited. Dr. Shekar Singh desired a copy of the felling plan prepared by the SFRI from GOMP.

Govt. of Maharashtra

Chairman invited the comments of Prof. Ramaseshan and Prof. Katty on the observations made by them on the reports of School of Environmental Science, Pune University annexed with the agenda papers. Prof. Ramaseshan desired that the technology adopted for delineation of the slopes is very crude and the GIS package has the capability for measuring the slope and aspect in a cohesive way. He further stated that it is mentioned in the report that all vegetation indicated through the satellite imageries is taken as forest, which is not correct. However, Specialist (Env.), NCA explained that the Pune University has requested Survey of India for furnishing of the aerial photographs available with them. He further informed that a project proposal for interpreting the data on the forest quality, quantity and density etc. framed by Indian Institute of Remote Sensing, is also under consideration of the Pune University. In addition, the ground verification is also being taken up by them. Prof. Katty desired that the methodology adopted by the Pune University, should be prefixed to the final report. Chairman desired that the observations of the members may be communicated in writing to the Project Director and if possible, a meeting can also be arranged.

(v) Archaeological & Anthropological SurveyArchaeology

GOMP informed that the State Department of Archaeology has submitted the action plan for salvaging/relocation/exploring the monuments, sculptures, mounds of archaeological importance in the month of February, 1993. A copy of the same is being sent to NCA and MOE&F. GOMP further informed that as per the said Action Plan the total expenditure on documentation will be 60.375 lakhs (Rs.20.125 for SSP and 40.25 lakhs for NSP/Omkarashwar/Maheshwar Project) and the expenditure on shifting monuments/sculptures, setting up of museum is estimated to be 212.84 lakh. The Action Plan is being examined in NVDA.

Anthropology

NVDA has initiated exploratory studies in all the 17 villages coming under submergence in the first phase by a team comprising (i) Director, Tribal Welfare of NVDA (ii) JD (Research) of Tribal Research Institute and

(iii) Sociologist/Research Officer of NVDA under the guidance of Dr. N.K.Gauraha of Sagar University (Sociologist) and an eminent anthropologist Dr. K.C. Dube, IAS (Retd.). This team was assisted by trained and experienced Research Assistants and Field Investigators from Tribal Research Institute and the State Tribal Welfare Deptt. The team visited most of the villages coming under submergence and a number of relocation sites in Gujarat in the months of January and February, 1993 and have completed the field studies. The report is being drafted by Dr. K.C. Dubey and is expected to be received by 20th March, 1993.

Executive Member, NCA briefed the members about the studies being conducted by Dr. W.S.K. Phillips, which is forming a part of the Performance Benchmarks delineated by the World Bank. Sub-group noted the progress.

(vi) Seismicity and Rim Stability of Reservoir

Narmada Sagar Project and Sardar Sarovar Project

In order to confirm the findings of the GSI, CWPRS, Pune has been assigned the work. Preliminary field investigations are scheduled for 16 & 17 of March, 1993. The progress will be reported during the next sub-group meeting.

(vii) Health Aspect

Narmada Sagar Project and Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP indicated that the report on Liminological aspect has been received from Rani Durgavati University Jabalpur and that the other 2 Universities are compiling the report.

Interim report of the Gandhi Medical College has also been received.

Govt. of Gujarat

GOG reported that the review on health aspect as delineated in Performance Benchmark is under progress. A draft report will be available by the end of March, 1993.

Govt. of Maharashtra

No representative attended from BDM and the progress could not be ascertained.

(viii) Fisheries Development of SSP and NSP Reservoirs.

Govt. of Madhya Pradesh

Executive Member, NCA informed the Sub-Group that the CICFRI have submitted draft report, which is being finalised. Copy of the report, when finalised will be made available.

Govt. of Gujarat

GOG reported that it has commissioned studies on fisheries development in the estuary and command. Dr. Shekar Singh desired to know whether the report will also cover the ecological aspect. Executive Member, NPG informed that all the aspects have been covered in greater details in the estuary reports being prepared by NPG with the help of international consultants.

Govt. of Maharashtra

No one was available for discussions from Maharashtra State.

**Item No.XVII-4(94): WORLD BANK ASSISTANCE AND PERFORMANCE
BENCHMARKS ON ENVIRONMENTAL ISSUES
[ITEM NO.XVI-4(89)]**

Sub-group noted the progress of the works being carried out to meet the Performance Benchmarks by NCA, SSNNL and GOG.

Item No.XVII-3(95) : ANY OTHER ITEM

Dr. Shekar Singh raised the issue of the additional forest land requested by GOM for rehabilitation purpose and desired to know the status of the same. Chairman informed that the MOE&F had not agreed to this decision. Ministry of Water Resources has been informed accordingly. GOM has been directed to examine the proposal again with a view to purchase the private land for the purpose of R&R.

DATE & VENUE OF NEXT MEETING

The next meeting of the Environment Sub-group of NCA is proposed to be held on 29th May, 1993 at 10.00 A.M. in the Committee Room of Narmada Control Authority, Vishal Tower, Indira Complex, Navlakha, INDORE-452001. The meeting will be followed by field visits, where catchment treatment works are going on.

Annex.Min-XVII-1.

**LIST OF PARTICIPANTS ATTENDED THE 17TH MEETING OF
ENVIRONMENT SUB-GROUP OF NCA HELD ON 16.3.93 AT 12 NOON
AT PARYAVARAN BHAWAN, CBO COMPLEX, NEW DELHI.**

S.No.	Name & Designation	Office/Deptt.
1.	Shri R. Rajamani	Secretary, Ministry of Env. & Forests - CHAIRMAN
2.	Shri D.C. Debnath	Executive Member, NCA.
3.	Shri A. Bhattachara	Addl. Secretary, Ministry of Env. & Forests.
4.	Shri N. Suryanarayanan	Commissioner (PP), Ministry of Water Resources.
5.	Dr. A.K. Malhotra	Member (E&R), NCA.
6.	Shri N.V.V. Char	Secretary, SSCAC.
7.	Dr. Mahesh Pathak	Executive Member, NPG.
8.	Shri S.B. Lowlekar	Member (E&F), NVDA.
9.	Shri T.N. Chaudhary	A.D.G., ICAR.
10.	Dr. Shekar Singh	Project Director, IIPA.
11.	Dr. S. Ramaseshan	Prof. C.E., IIT, Kanpur.
12.	Prof. R.K. Katty	Director & Consultant Uneecs Pvt. Ltd., New Bombay.
13.	Shri M.B. Mehta	C.C.F., SSP, Vadodara.
14.	Shri A.V. Gururaja Rao	Chief Engineer, SSNNL.
15.	Shri M.K. Jiwarajika	Ministry of Env. & Forests.
16.	Smt. Nalini Bhat	Jt. Director, Ministry of Env. & Forests.
17.	Dr. Pawan Kumar	Specialist (Env.), NCA.
18.	Dr. Afroz Ahmad	Director (R), NCA.
19.	Shri C. Margabandhu	Director (CE), ASI.
20.	Shri R.K. Behre	Specialist (Hydrology & Sedimentation), NVDA.
21.	Shri D.K. Kaushik	D.D. (Env.), CWC.
22.	Shri K.P. Gupta	Technical Officer, Deptt. of Environment, Rajasthan.

-----+-----

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण
NARMADA CONTROL AUTHORITY

पर्यावरण उपदल
Environment Sub-Group

अठारहवीं बैठक की कार्यसूची
Agenda for Eighteenth Meeting

स्थान : पर्यावरण भवन, नई दिल्ली
Venue : Paryavaran Bhawan
New Delhi

दिनांक : 28 मई, 1993, 10 बजे
Date : 28 May, 1993, 10A.M.

इन्दौर
मई, 1993

INDORE
May, 1993

**AGENDA FOR 18TH MEETING OF THE ENVIRONMENT SUB-GROUP
NCA TO BE HELD ON 28TH MAY, 1993 AT PARYAVARAN
BHAWAN CGO COMPLEX, NEW DELHI.**

I N D E X

Item Nos.	Contents	Page No.
XVIII-1(96)	Confirmation of the Minutes of the Seventeenth meeting of the Environment Sub-Group.	1
XVIII-2(97)	Review of Action taken on the decisions of previous meeting.	2 - 4
XVIII-3(98)	Present Status of Studies/ Surveys and Environmental Action Plans.	5 - 11
XVIII-4(99)	World Bank assistance and performance benchmarks on environmental issues.	12
	Any other Item } Date & Venue of Next meeting. }	13

A N N E X U R E S

XVIII-1	Details of Environmental cost of SSP.	1 - 9
XVIII-2	Status Report on studies and activities on environmental aspects of Sardar Sarovar and Narmada Sagar Projects.	10 - 36
XVIII-3	Modified research proposal.	37 - 52
XVIII-4	Copy of the IXth quarterly report of SFRI for impact assessment of Madhya Pradesh lands to be submerged under SSP and adjoining Eco systems, flora, fauna and other biotic components for the quarter ending December, 1992.	53 - 71
XVIII-5	Report of Gandhi Medical College.	72 - 123

**Item No.XVIII-1(96): CONFIRMATION OF MINUTES OF THE 17TH
MEETING**

Minutes of the 17th meeting of Environment Sub-Group of Narmada Control Authority were circulated to all members and invitees seperately vide letter No. Env-34(17)/93/973 dated 27.4.93. No comments are received.

The minutes may be confirmed.

**Item No. XVIII-2(97): REVIEW OF ACTION TAKEN ON THE DECISIONS
OF THE PREVIOUS MEETING**

Consideration of Policy Issues.

- 1. Extention of Time for Environmental and Forestry Approval (Item No. XVII-2(92) 1).**

As directed by the Chairman during 17th meeting of the Sub-Group, a pictorial view, of original & revised schedules of construction in relation to preparedness of the studies, will be presented during the meeting.

- 2. Submission of Catchment Area Treatment Plans for freely draining critically degraded sub watersheds. (Item No. XVII-2(92) (2)).**

During the last Sub-group meeting held on 16th March, 1993, Chairman directed Govt. of Madhya Pradesh and Govt. of Maharashtra to submit the plans for the critically degraded (High and Very High priority categories) sub water-sheds not covered by directly draining categories within 3 months time. Progress achieved so far may be reported.

- 3. Cost Estimates for preparation of Action Plan and implementation of Environment Safeguard Measures (Item No. XVII-2(92) (4)).**

The fragmented information on estimated cost and expenditure incurred by the party states as available in NCA secretariat was compiled and presented during the 15th to 17th Environment Sub-group meeting. A brief summary of the cost estimates for survey/studies/Action plans & their implementation as desired by the sub-group during its 17th meeting is presented below and details are placed at Annex-XVIII-1. Work on detailed analysis is going on & will be presented to the sub-group as soon as it is completed.

ENVIRONMENTAL COST OF SSPRELATED TO UNIT I & II DAM & POWER HOUSE :A) Expenditure by project authorities:i) Cost of Survey & Studies (in lacs.)

S.No.	Component	<u>Estimate/Actual Expenditure</u>				Total
		GOG	GOM	GOMP	NCA	
1.	Compensatory Afforestation	NA	NA	NA		-
2.	Catchment Area Treatment.	NA	NA	NA		-
3.	Flora & Fauna	<u>129.2</u> 100.3	<u>38</u> 16	<u>39.3</u> 33.5	<u>15.27</u> 14.63	<u>221.77</u> 164.43
4.	Health	NA	NA	NA		-
5.	Archaeology/Anthropology.	<u>1.3</u> 0.40	NA	<u>59</u> 40		<u>60.3</u> 40.40
6.	Seismicity & Rim Stability.	NA	NA			-

ii) Cost of Implementation (in lacs)

1.	Compensatory Afforestation.	<u>1407</u> 540.447	<u>2116</u> 822.98	<u>1310.252</u> 626		<u>4833.252</u> 1989.427
2.	Catchment Area Treatment.	<u>3509</u> 1061.94	<u>2254.97</u> NA	<u>8880</u> 447		<u>14643.97</u> 1508.94
3.	Flora & Fauna including Shoolpaneshwar	<u>75</u> 55	NA	NA		<u>75</u> 55
4.	Health (incremental expenditure) for 10 yrs.	<u>5999.5</u> 70	<u>210.15</u>	<u>437</u> 1.0		<u>6646.65</u> 71
5.	Archaeology/Anthropology.	NA	NA	<u>213</u> NIL		<u>213</u> NIL
6.	Seismicity & Rim Stability.	NA				-

Total: 24618.942
3829.197

* In addition several State/Central agencies have also incurred expenditure on various Environmental studies & implementation aspects. Full details are not yet available.

NA : Not available.

ENVIRONMENTAL COST OF SSPRELATED TO UNIT - III CANAL & DISTRIBUTION SYSTEM

	<u>Command Area Development</u>		<u>Total</u>
	<u>GOG</u>	<u>GOR</u>	
1) Cost of studies (in lacs.)	<u>1257.15</u>	NA	<u>1257.15</u>
Estimated/ incurred	153.62*		153.62*
11) Cost of Implementation	68500/NA	NA	68500/NA
Estimated/incurred			

* Expenditure for studies completed up to 1992.

Dtd:-29/11/1991.

To:
Mr. SM.Pai,
Secretary,
Environment Sub-Group of N.C.A.,
INDORE.

Sub:-Item No.XII-4(70): Setting up of an
environmental development cell -
Minutes of the 12th meeting.

Dear Sir,

Regarding the above item I have the following
points to be brought to the kind notice of the
Sub-Group.

- 1) It is mentioned in the minutes that it is the intention of Ministry of Env. & Forests to develop EDC into an autonomous centre of Excellence. This point was not made clear to the sub-group, when the first draft was prepared some of us prepared the draft with above intention. However, it was disappointing to see that such a centre of Excellence which is similar to TIFR etc. was to be executed through the auspices of a CSIR laboratory as a part of a sub-section. Similar exercises to set up such centres of excellence jointly taken up by the Ministry of Science and Technology and Ministry of Education in the past in already existing educational Institutions have failed. In view of this, deviation started taking place on this matter.
- 2) The above subject was discussed in the advisory committee of Ministry of Water Resources and the members including me felt that the emerging technology would not applied to a major project immediately if the cell is set up under the auspices of NCA. Once it grows the cell can be reshaped.
- 3) If it is still the intention of Min. of Environment & Forest to set up an autonomous Institute of excellence with an intention to take up the problem of NCA in the first instance by the Institute, I would like to endorse the concept fully in the principle. There is a need to work out a viable management structure.

Please put it up before the Sub-group.

Yours Sincerely,

(R.K.Kitti)
Member, Env. Sub-Group of NCA.

Item No. XVIII-3(98): **PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS.**

The latest status report of studies and activities on environmental issues under consideration of the sub-group for the quarter ending March, 1993 is placed at Annexure XVIII-2. The progress/present position of the issues under consideration is briefly given below for review by the Sub-group.

i) **Phased Catchment Treatment**

Narmada Sagar Project

Govt. of Madhya Pradesh

As per the report received from NVDA, AIS&LUSO has now submitted report for another 4 sub-catchments. Now the reports are available for 8 sub-catchments, and only 1 subcatchment remains to be surveyed.

According to these reports the total catchment area of NSP below Bargi dam is 38,95,200 ha out of which 32 subwatershed covering an area of 81427 ha are identified to be directly draining. The forest area is estimated to be 15516 & non forest area 65911 ha. As non-forest area of 6591 ha is not available for treatment. Therefore, GOMP is required to submit detail plans for 59320 ha of non forest besides 15516 ha of forest area. GOMP may like to report the progress on Updating of the plan submitted in June, 91.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP has submitted the plan for treating 90,000 ha. of critically degraded directly draining sub-watersheds during May, 1991

During the last meeting GOMP indicated that it planned to treat 1,11,795 hectares area spread to 42 sub-watersheds excluding 13,019 ha of area which is undergoing submergence. GOMP has now informed that detailed plan for treating the entire area would be submitted by 15th May, 1993.

According to the information supplied by GOMP an area of 8800 has been treated up against a target of 15000 ha of non forest area. Whereas progress is reported over 1000 ha of forest area by erection of engineering structures only, against a target of 2000 hectare for 92-93.

Govt. of Gujarat

Govt. of Gujarat has taken up the entire catchment upstream of SSP for treatment. Out of the 27,200 ha an area of 15311 ha has been treated upto 1992-93 as scheduled. However progress on treatment of non-forest area is not reported. Besides GOG is yet to report the progress on reconciliation with AIS&LUSO, New Delhi on extent of catchment area upstream of SSP within Gujarat.

Govt. of Maharashtra

Govt. of Maharashtra is required to treat 31000 ha of critically degraded sub watersheds directly draining into the reservoirs. The detailed plan for treating 25400 ha of area was submitted earlier by GOM. During the 17th meeting of the sub-group, progress could not be reviewed as no one attended the meeting from Maharashtra. Latest progress may be reported.

Sub-group may like to review the situation.

ii) Compensatory Afforestation**Narmada Sagar Project****Govt. of Madhya Pradesh**

During the last meeting GOMP reported a cumulative progress over 34697 ha & after deleting 2997 ha area transferred for CAT works, net progress of 31977 ha is reported. In view of more area identified for CAT works GOMP has revised the targets as contained in the status report annexed.

Sardar Sarovar Project**Govt. of Madhya Pradesh**

According to the action plan, GOMP was required to plant 1980 ha area during 1992-93. But in accordance with the direction of the sub-group, the deficit of previous year was added up to the targets. Against a target of 2387, GOMP has reported progress over 2400 area completing the overall targets. However, it is observed that all works were carried out in forest areas during 1992-93 where target is exceeded but no work was done in non-forest area of 400 ha. GOMP may report the progress of advance works on non-forest area during the coming monsoon.

Govt. of Gujarat

Govt. of Gujarat has reported that the works are going on as scheduled. Out of a total target of 4650 ha

of non-forest area scheduled for completion by 1994-95, works are already completed in 3310 ha upto March, 1993. Similarly reforestation in degraded forest are already completed over 5284 ha against the total targets of 9300 ha, thus achieving the progress as scheduled. GOG may report progress of advance works for plantations during the coming monsoon.

Govt. of Maharashtra

Govt. of Maharashtra reported a progress on 12,936 ha in degraded forests against the total targets of 12987 ha, the balance 51 ha is scheduled to be planted during the coming monsoon. However, the progress against 6490 ha of afforestation works in non forest land is reported to be only 84 ha. Further, afforestation over 2200 ha of non forest land against the set target of 2700 ha of forest land released for R&R works at Taloda is completed and the balance of 500 ha is scheduled for planting in coming monsoon. Sub-group may like to review the situation.

GOM is required to provide location map of the area being planted alongwith the details of the composition of the species, survival, spacing and other inputs provided to the crop as directed during the 16th meeting of the Sub-Group.

iii) COMMAND AREA DEVELOPMENT

Narmada Sagar Project

Govt. of Madhya Pradesh

During the last sub-group meeting GOMP had informed that a meeting for finalising the technical aspects of the proposed studies on effect of insecticides & pesticides from the run off from the fields was fixed for 15.11.92, a copy of the modified research proposal is annexed at XVIII-3 for consideration of the sub-group. Comments received from WALMI, PCB, MFCOST etc. may be placed before the sub-group by GOMP during the meeting. Progress on data compilation by NVDA for supplying to the consultants for preparation of detailed plan may be reported.

Sardar Sarovar Project

Govt. of Gujarat

The detailed terms of reference for various studies commissioned by GOG were circulated during 16th meeting of the sub-group. GOG may give progress reports of these studies.

Govt. of Rajasthan

During 17th meeting GOR reported that it is negotiating with WAPCOS for entrusting the studies on command area development on the lines taken up by GOG. Outcome of the negotiation may be reported.

iv) SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES**Narmada Sagar Project****Govt. of Madhya Pradesh**

GOMP may report the progress of studies being done by WLI India and make available a copy of this final report produced. Govt. of Madhya Pradesh may also like to indicate the action taken by it on the comments received from members of the committee on the report of Friends of Nature Society, Bhopal & the actions proposed to be taken for conservation of Wildlife.

Sardar Sarovar Project**Govt. of Madhya Pradesh**

A copy of the report for the quarter ending December, 1992 submitted by State Forest Research Institute for the impact assessment studies in Madhya Pradesh is enclosed at Annexure-XVIII-4. Govt. of Madhya Pradesh would like to submit the report for the quarter ending March, 93 of the State Forest Research Institute, Jabalpur and summary of the actions proposed.

Govt. of Gujarat

Govt. of Gujarat may like to submit a detailed action plan based on the recommendations contained in the report of M.S. University, Vadodara.

Govt. of Maharashtra

School of Environmental Science, Pune University had submitted a preliminary report for the work done upto 15th December, 1992 upto date progress may be reported by GOM.

y) ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY**ARCHAEOLOGY****Narmada Sagar Project****Govt. of Madhya Pradesh**

A detailed action plan for relocation/protection of central as well as state protected monuments are still awaited from NVDA.

Sardar Sarovar Project

Govt. of Madhya Pradesh

The action plan giving time frame and cost estimates prepared by State Department of Archaeology and Museum, Madhya Pradesh is yet to be made available to MOEF and NCA.

Govt. of Gujarat

Latest progress on relocation of Shoolpaneshwar temple giving a firm date for completion of relocation works in view of likely submergence from the coming monsoon may be indicated. The plans finalised by GOG on relocation of Hamfeshwar temple are still awaited.

Govt. of Maharashtra

No works are required to be done in Maharashtra in this regard.

ANTHROPOLOGY

Govt. of Madhya Pradesh

GOMP is to report the progress of the works based on the studies completed by Dr. K.G. Dubey.

vi) SEISMICITY AND RIM STABILITY OF RESERVOIR

Narmada Sagar Project

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh had requested Geological Survey of India to complete the balance studies on rim stability, the outcome of the studies completed may be reported.

GOMP is also to report the progress on procurement of Seismometers from IMD needed for obtaining preimpoundment data.

Sardar Sarovar Project

Rim stability analysis for the areas in Gujarat was completed in 1982. Similarly 130 sq. km area in Madhya Pradesh was covered up during 1991-92. It was indicated by GSI that the draft report for the balance area is available but before finalising the report confirmation on certain aspects is required. Some studies for the same have been entrusted to CW&PRS, Pune and an amount of Rs. 12.5 lakhs has been placed at their

disposal. All necessary facilities have been made available. The joint inspection of the site was undertaken on 16th March, 1993 & it was found that some more data is needed. GOMP has been requested to collect and furnish the data to GSI & CWPRS at an early date.

vii) HEALTH ASPECT

Govt. of Madhya Pradesh

Narmada Sagar Project and Sardar Sarovar Project

The interim report, on surveillance and control by Gandhi Medical College, Bhopal received from NVDA is placed at Annex XVIII-5 for review by the sub-group.

Sardar Sarovar Project

Govt. of Gujarat

Govt. of Gujarat may report the outcome of the review of health plan being undertaken by GOG through SCHMS & a copy may be made available.

Govt. of Maharashtra

Govt. of Maharashtra submitted an initial plan in 1987 which was revised in 1991 and it was again revised in 1993 and a short note on this revised plan was submitted during 17th meeting. However, a copy of the detailed action plan on health indicating the latest revisions may be submitted to the MOE&F and NCA urgently.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

During the last meeting of the sub-group it was emphasised that introduction of carp varieties in the reservoir is not conducive to conservation of aquatic fauna and that careful studies are needed to ascertain the present status and likely impact on the aquatic flora due to impoundment as well as introduction of commercial species. During the earlier meeting of the sub-group, Chairman has desired a clear picture on conservation aspect of fisheries. In pursuance a review of studies already done, was commissioned to CICFRI, Barrackpore. These studies also address to the concern of the sub-group raised during the 16th meeting and the draft report is now submitted. The report is under finalisation by the CICFRI.

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh may like to indicate the progress of final report to be submitted by 3 universities on Liminological aspects.

Govt. of Gujarat

Govt. of Gujarat may like to report on the progress of studies on conservation and development of fish fauna in estuary and command undertaken with the help of H.R. Wallingford Institute, London.

Govt. of Maharashtra

Govt. of Maharashtra has already submitted a plan for fisheries development in Maharashtra in 1988.

Item No. XVIII-4(99):WORLD BANK ASSISTANCE & PERFORMANCE
BENCH MARK ON ENVIRONMENTAL ISSUES.
(Item No.XVI-4(89)).

In view of the decision taken by Govt. of India not to seek any further reimbursement from the World Bank for Narmada Projects. This agenda item is proposed to be dropped.

Any other Item

Date & Venue of next meeting.

ANNEXURES

ANNEX - XVIII-1DETAILS OF THE ENVIRONMENTAL COST OF SSP(A). COMPENSATORY AFFORESTATION :

State	Total Area Dive- rted for Pro- ject	Category of land identi- fied for plantation	Target			Achievement		
			Phy.in in Hac.	Financial		Phy.in Hac.	Financial	
				Total in	Per hac		Total in	Per ha.
				lacs.	in lacs		lacs.	in lacs.
GOG	4523	NFA	4650	465	0.10000	1995	152.997	0.07669
		DFA	9300	942	0.10129	5387	387.45	0.07192
GOM	6486	NFA	6490	676.00	0.10419	84	6.0	0.07143
		DFA	12977	1440.00	0.11096	12977	816.98	0.06296
GOMF	2732	NFA	2190	328.50	0.15	1089	626.00	0.12990
		DFA	6547	982.02	0.15	3727		
TOTAL: 13743			42154	4833.52	0.11466	25255	1989.427	0.07877

Note: 1) Cost of overhead charges included in GOMP plan @ Rs.5000/ ha. may be adopted uniformly for total area 44800. Thus total overhead cost would be = Rs.2240 lacs.

2) Cost per hac. under expenditure incurred excluded the cost of maintenance. Therefore at the end of work, the cost per hac. may go up further.

DFA : Degraded Forest Area.

NFA : Non Forest Area.

ENVIRONMENTAL COST OF SSPB. CATCHMENT AREA TREATMENT

State	Category	Target			Achievement			AGENCY
		Phy.in	Financial		Phy.in	Financial		
		in Hac.	Total in	Per hac	Hac.	Total in	Per ha.	
			lacs.	in lacs		lacs.	in lacs.	
GOG	NFA	3000	241	0.08033	1171	110.00	0.09393	Gujarat land Development Corporation.
	FA	27200	3268	0.12014	15311	951.94	0.06217	State Forest Department.
GOM	NFA	4170	220	0.05275	-	N.A.	N.A.	State Agricultural Deptt.
	FA	27230	2034.97	0.15385	-	N.A.	N.A.	Forest Deptt.
GOMP	NFA	91800	5550	0.07521	10450	446	0.04268	N.V.D.A.
	FA	22800	3330	0.09048	1000	1	0.001	N.V.D.A.
TOTAL:		176200	1464397	0.08311				

NA : Not available.

ENVIRONMENTAL COST OF SSP(C) HEALTH

[Estimate in Rs. lacs]

Particular	GOG	GOMP	GOM	Remarks
(A) <u>For 1st year</u>				
i) Non recurring Exp.	38.50	247.0	62.55	
ii) Recurring Expenditure	596.10*	19.0	14.76	
	634.60	266.0	77.31	
(B) <u>Extra for remaining years.</u>				
For 9 years health plan and recurring expenditure.	596.10 x 9 = 5364.9*	19x9 = 171	14.76x9 = 132.84	
Total cost for 10 years health plan.	5999.5	437	210.15	
[G.Total= 6646.65 lacs.]				

Cost/PAP

- * Entire expenditure is to be incurred on phase I of the command area which includes the project site also.

LIST OF STUDIES ON COMMAND AREA DEVELOPMENT

Sl. No.	Name of Study	Name of Agency	Year of Completion	Expenditure Incurred Rs. in lacs.	Note if Any
1	2	3	4	5	6
1.	Mathematical Modelling of Ground Water for Baroda & Bharuch Area.	Operation Research Group, Baroda.	1981	0.88	
2.	Pre-Feasibility study for Low Level Canal.	Jyoti Consultants Ltd. Baroda.	1981	0.39	
3.	Pre-Feasibility level Drainage study of Narmada Mahi Doab of SSP Command.	Core Consultants Ltd. Ahmedabad.	1982	6.25	
4.	Some Aspects of Role of Panchyats and Institutional Arrangements for canal irrigation in Two Talukas of Ahmedabad District.	Institute of Cultural and Urban Anthropology, Ahmedabad.	1982	0.15	
5.	A study of settlement Pattern (6 Talukas sub Districts in the Narmada Command Area of Mahesana District of Gujarat).	Department of Geography, Gujarat University, Ahmedabad.	1982	1.25	
6.	Regionalisation of Narmada Command.	Operations Research Group, Baroda.	1982		
7.	Marginal cost study of two Typical Distributerries and Two Typical Branches.	Dr. C.R.Shah, Baroda	1983	0.84	
8.	Population Projection and Migration study for Narmada Command Area.	Operations Research Group, Baroda.	1983	2.28	
9.	Cropping Pattern and Water Demand Study in Narmada Command Area.	Operations Research Group, Baroda.	1983	8.21	
10.	Study on Water Demand for Non-Agricultural use from Narmada Project.	Gujarat Water Supply and Sewerage Board, Gandhinagar.	1983	2.00	

1	2	3	4	5	6
				22.23	
11.	Consumer Expenditure, Assets and Indebtedness of Rural Households of the Command Areas of Sardar Sarovar (Narmada) Project, 1982.	Directorate of Economics & Statistics, Gandhinagar.	1983	2.39	
12.	Methodological frame work for Economic Appraisal of Narmada Project.	Tata Economic Consultancy Services, Bombay.	1983	0.20	
13.	Wasteland Development Project for command Area of Narmada Canal (Region 11 and 12).	Gujarat State Rural Development Corporation Ltd., Gandhinagar.	1984	0.70	
14.	Studies for Optimisation of Hydro Power Installation and pumping Units along Saurashtra Branch Canal.	Premier Consultants, Bombay.	1985	4.41	
15.	Additional work on Mathematical Modelling of Ground Water System-Single Layer Model Narmada Mahi Doab.	Operations Research Group, Baroda.	1985	0.78	
16.	Socio-Economic Bench Mark survey of 62 Talukas (Sub-districts) of Narmada Command Area.	Fourteen Different Agencies including Universities, Research Institutions, Private Institutions.	1985	43.05	
17.	Land Use and Cropping Pattern Survey and Mapping of Narmada Command Area Zone 4A & 4B.	Department of Geography, M.S. University, Baroda.	1986	0.81	
18.	Inter-Regional Water allocation and Determination of Branch Canal capacity.	Operations Research Group, Baroda.	1989	0.86	
19.	Extended study on Inter Regional Water Allocation and determination of Branch Canal Capacity.	Operations Research Group, Baroda.	1989	0.22	

1	2	3	4	5	6
				75.67	
20.	Rate of Adoption of Improved Technology in Narmada Command and Rest of Gujarat State (Based on Analysis of Crop cutting Experiments Data).	Operations Research Group, Baroda.	1989	0.76	
21.	Computer aided Planning of conveyance and distributory Network.	Indian Institute of Management, Ahmedabad.	1990	7.06	
22.	Growth of Agro-Processing Industries in Phase-I of the Sardar Sarovar Project.	Gujarat Industrial & Technical Consultancy Organisation Ltd. Ahmedabad.	1990	2.61	
23.	Consultancy work for Control, Telemetry and Communication Net Work on Narmada Canal System for SSP.	Gujarat Communication & Electronics Ltd., Baroda.	1991	10.09	
24.	Mathematical Modelling of Ground Water System Single Layer Model Narmada Mahi Doab.	Operations Research Group, Baroda.	1982	1.62	
25.	Techno-Economic Study for utilising Village Tanks as Borrow Area for Construction of Canal Net Work.	Operations Research Group, Baroda.	1992	4.48	
26.	Area Development Strategies for selected Regions Adjacent to Narmada Main Canal.	Operations Research Group, Baroda	1992	7.56	
27.	Water Rates Policy in 3 parts.				
	i) Pricing of a public Utility Survey of Literature	Department of Economics, South Gujarat University, Surat.	1992	0/26	
	ii) Financial working of Irrigation Projects - A case of four projects in Gujarat.	Department of Economics, Sardar Patel University, Vallabh Vidyanagar.	1992	0.39	
	iii) Some policy issue for Canal Water Rates in Gujarat.	Department of Economics, Sardar Patel University, Vallabh Vidyanagar.	1992	1.74	

1	2	3	4	5	6
28.	Mathematical Modelling of Ground Water System for SSP Command between Rivers Shedhi and Sabarmati.	Consultancy Engineering Services, New Delhi.	1992	7.50	
29.	Mathematical Modelling of Ground Water System for SSP Command between Rivers Sabarmati and Banas.	Operation Research Group, Baroda.	1992	11.73	
30.	Mathematical Modelling of Groundwater System for SSP Command beyond Banas upto Rajasthan Border.	Datal Consultants, Ahmedabad.	1992	8.0	
31.	Prefeasibility level Drainage study for SSP Command beyond Mahi.	Consultancy Engineering Service, New Delhi.	1992	14.15	
32.	Action Research on People's Participation in Water Management in SSP.	Gandhi Labour Institute, Ahmedabad.	1993	2.68	
33.	Extension of 4th reservoir Modelling Study.	Operations Research Group, Vadodara.	1993	5.00	
34.	Action Research in Peoples Involvement in Water Management.	Gandhi Labour Institute	1993	2.0	
35.	Development and Management Plan for Black Buck Sanctuary at Velavadar.	Expert Multi-Disciplinary Group.	1993	5.0	
36.	Development and Management Plan for Wild Ass Sanctuary in Little Rann of Kachchh.	Expert Multi-Disciplinary Group.	1993	20.00	
37.	Integrated Command Area Development Plan for SSP.	Wamana Consultants Hyderabad and through GOG.	1993	25.00	
38.	Impact study on water Borne/ Water related Diseases in Command Area including area down stream of SSP Dam.	Commissionerate of Health Medical Services & Medical Education.	1993	100.00	
39.	EIA studies of Fisheries (Inland as well as marine) relevant to command area of SSP.	M.S. University.	1993	20.00	

1	2	3	4	5	6
40.	Impact on Monuments of Historical Archaeological Importance in SSP Command.	Status note to be provided by (i) Director of Archaeology GOG (ii) Archaeological Survey of India, G.O.I.	1993	5.00	
41.	Review of Ground Water Studies and problems.	International Consultant.	1993	5.0	
42.	Review of studies and Problems on Drainage.	International Consultant.	1993	5.0	
43.	Review of Soil Studies	National Expert	1993	5.0	
44.	Survey and Investigation work of Ground Water Resources beyond River Mahi in SSP Command.	Gujarat Water Resources Development Corporation Ltd. Gandhinagar.	1994	117.85	
45.	Survey and Investigation of Ground Water Resources beyond River Mahi in SSP Command.	Gujarat Water Resources Development Co., Limited.	1994	100.0	
46.	Research in Irrigated Agriculture	Gujarat Agriculture University.	Long-term study	200.00	
47.	Pre irrigation and institutional training for functionaries of Nigam and farmers in the command area of SSP. field visit etc.	Department of Agriculture GOG	1994	25.0	
48.	Flora and Fauna studies of Command area of SSP.	M.S. University	1994	25.0	
49.	Operational level drainage studies for the command area of SSP (on appropriate packages).	To be identified	1994	50.0	
50.	Impact of Agriculture Run-off on Quality of Ground-water in SSP.	Indian Agriculture Research Institute	1994	20.0	
51.	Socio-economic Survey in Command Area updating earlier Bench Mark Studies.	To be identified	1994	100.0	

1	2	3	4	5	6
52.	Field Level Studies on farmers participation including pilot VSA Studies.	To be identified	1994	50.00	
53.	Agricultural Research Studies.	Gujarat Agricultural University, Ahmedabad.	1998	216.00	

ANNEX-XVIII-2

STATUS REPORT
SARDAR SAROVAR PROJECT (SSP) ENVIRONMENTAL ASPECTS
MARCH - 1993

The action plans and status of studies and implementation of Environmental Safeguard Measures is as indicated below:

Environmental Safeguard Studies/Measures

- 1) Phased Catchment Area Treatment.
- 2) Compensatory Afforestation.
- 3) Command Area Development.
- 4) Flora, Fauna & Carrying Capacity.
- 5) Seismicity.
- 6) Health Aspects.
- 7) Archaeological & Anthropological, Studies.
- 8) Fisheries.
- 9) Rim Stability Analysis.

I. CATCHMENT AREA TREATMENT

The MOEF clearance granted in 1987 contained two conditions pertaining to CAT, as follows:

- more detailed surveys for prioritisation of the sub-catchments in the SSP area should be undertaken;
- a phased CAT programme should be prepared and implemented ahead of reservoir filling.

GOI issued a Directive in June 1992 that, for the SSP, the project would bear the costs of the treatment of all critically-degraded sub-watersheds draining directly into the reservoir. These watersheds were identified amongst those classified as either very high or high-priority categories by the All India Soil and Land Use Survey (AISLUS). The project would also be responsible for the treatment of those areas of the catchment which are directly damaged by the project activities.

In addition, plans are required to be prepared for the treatment of the balance of the critically-degraded watersheds but the cost of this will be met from other ongoing schemes and in a timeframe to be determined.

Studies

Surveys and studies have been undertaken to aid the development of a management plan for CAT in the SSP catchment.

- Report of Inter-Departmental Committee on Soil Conservation and Afforestation, (the Dewan Committee Report), 1985.
- Report on Prioritisation of Sub-watersheds in sub-catchments of Narmada Catchment, 1991.

Table 1.1 Summary of Status of CAT Planning

	GOG	GOM	GOMP
Preliminary Surveys) : : : : : : :)	"Complete" for all item in all States.	
Prioritisation of sub-watersheds			
Development of Management Options			
Annual Action Plan			
Effective monitoring			
Phased Programme	Complete	Under finali- sation	Under finali- sation

Table 1.2 Principal Elements of Action Plans for CAT

Elements of Action Plans	GOG	GOM	GOMP
Survey work	) : :	"Complete" for all item & all States.	
Preparation of detailed map			
Micro-watershed development map	Complete	Partly done & partly under pre- paration.	Partly done & partly under pre- paration.
Assignment of responsibility for conducting the work	) : :	"Yes" for all item for all States	
Timetable	:		
Budget	:		
Menu of treatment	:		
Proposals for monitoring)		

Table 1.3 The total catchment area of SSP below NSP is 2448973 ha.

	GOMP	GOG	GOM	Total for the Basin
Total Catchment	2248601	36761*	163611	2448973 ha
Very High & High	541825	35412	116354	693591
Directly draining Very High & High	114606	29537	31423	175566
Areas directly damaged by project activities.	-	500	-	500
				Planned to treat 176200*

* According to Govt. of Gujarat, the actual catchment area is only 30229 ha and entire area is planned for treatment.

Table 1.4 Implementation of CAT

	Gujarat		Maharashtra		Madhya Pradesh	
<hr/>						
<u>Area to be treated in ha.</u>						
(Area in brackets indicate actual progress)						
<hr/>						
	Forest	Non-Forest	Forest	Non-Forest	Forest	Non-Forest
<hr/>						
<u>Monsoon year</u>						
1990-91	<u>4560</u> (4528)	<u>897</u> (897)	-	-	-	-
1991-92	<u>4750</u> (4770)	<u>830</u> (274)	-	-	-	-
1992-93	<u>6000</u> (6013)	<u>662</u> (NA)	<u>425</u> Under finalisation	-	<u>2000</u> (1000*)	<u>15000</u> (8800)*
1993-94	6200	636	-do-		6000	20000
1994-95	5700	-	-do-		5000	20000
1995-96	-	-	-do-		5000	20000
1997-98	-	-	-do-		5000	16600
<hr/>						
TOTAL :	<u>27200</u> (15311)	<u>3000</u> (1171)	<u>27200**</u> (-)	<u>4200</u> (-)	<u>23000</u> (-)	<u>91600</u> (8800)

	<u>Gujarat</u>	<u>Maharashtra</u>	<u>Madhya Pradesh</u>
Implementation	55% complete work scheduled to finish 1995	work recently commenced scheduled to finish 1996	7% completed work scheduled to finish 1997

* Incomplete works on 1000 ha of forest areas are completed by erection of Engineering structures only.

** Net working area may be 50 to 60% of the targets indicated.

II. COMPENSATORY AFFORESTATION

Approval for the diversion of forest land for the SSP was granted by the MOEF in 1987 and in 1990 (for R&R works) but several conditions were attached relating to the planning and conduct of CAF. Principal amongst these were the following stipulations.

- For every hectare of forest land submerged or diverted for construction of the project there should be Compensatory Afforestation on one hectare of non-forest land plus reforestation on two hectares of degraded forest. This represents a two fold increase of the usual requirement.
- For the 2,700 hectares of forest land in Maharashtra which is to be used for R&R, an equal area of non-forest land or double the area of degraded forest should be planted.
- The governments of the three states involved should prepare plans detailing their proposals for Compensatory Afforestation and submit these to the MOEF before work in the forest area is due to commence.
- The project should supply firewood to its construction workers, at its own cost, to prevent them from having to meet their fuel needs from the surrounding forests.

Studies

These have been a number of studies in three states aimed at assessing the extent and significance of the loss of forest land attributable to the SSP.

- Sardar Sarovar (Narmada) Project Development Plan, Volume-II prepared by the Narmada Planning Group (NPG) in 1983.
- Studies on Ecology and Environment by M.S. University of Baroda (MSU) in 1983.
- Sardar Sarovar Project: Preparation of Environmental Work Plan by the Forest Department of Maharashtra in 1988.

- Eco-Environmental and Wildlife Management Studies on the Sardar Sarovar Submergence Area in Gujarat 1992 by MSU.
- Impact Assessment of Madhya Pradesh Land to be Submerged Under Sardar Sarovar Project and Adjoining Ecosystems by State Forest Research Institute, Jabalpur (1989-92).
- Status of Flora and Fauna in and Around Sardar Sarovar Project, Maharashtra is a preliminary report of an ongoing study by the University of Pune which began in 1992 and is due to run for two years.

The Action Plans

In compliance with the conditions set by the MOEF, each state has prepared an action plan for the CAF of areas within its boundaries. The relevant documents are:

- Government of Gujarat Work Plan for Management of Environmental Effects, Section on Forests and Wildlife: The Compensatory Afforestation Plan for the Rann of Kutch, 1986.
- Project for Afforestation in Sardar Sarovar Project Impact Areas due to Diversion of Forest Lands for Sardar Sarovar Project (GOG), 1991.
- Compensatory Afforestation Scheme in Lieu of Sardar Sarovar Project in Dhule District, Maharashtra State (1989).
- Government of Madhya Pradesh Forest Department Action Plan of Compensatory Afforestation for Sardar Sarovar multi-purpose river-valley project (1989).

These plans were submitted in varying stages of completeness but each has now been revised and updated to take account of the comments of the MOEF and the NCA. Action plans of 3 State Govts. contained following components:

1. Identification of areas for CAF;
2. Description of selected areas,
3. Justification of Selection of Areas,
4. Identification of responsible agency,
5. Description of staffing requirements,
6. Description of material requirements,
7. Estimate of costs,
8. Identification of tree species,
9. Description of preparatory work needed,
10. Description of planting techniques,
11. Provision for aftercare,
12. Yearly planting target,
13. Yearly budget,
14. Provision made for monitoring implementation

These action plans spell out a programme of tree planting in the three states on both non-forest and degraded forest areas as shown in Table 2.1 & 2.2.

Table 2.1 Areas for Compensatory Afforestation

	Area of Forest divert for SSP	Area of Degraded forest to be Replanted	Area of Non-Forest Land to be Afforested	Total Area for CAF
Gujarat	4,523	9,300	4,650	13,950
Maharashtra	9,188*	12,980	9,190	22,170
Madhya Pradesh	2,732	6,547	2,190	8,737
TOTAL	16,443	28,827	16,030	44,857

* This includes 2700 ha released for R&R works in Maharashtra in 1990 for which only equal non forest area is being raised as stipulated.

Table 2.2 Schedules for Implementation of CAF

	Gujarat		Maharashtra		Madhya Pradesh	
	Area to be Afforested in ha (Area in brackets indicates actual progress)					
	Degraded Forest	Non- Forest	Degraded Forest	Non- Forest	Degraded Forest	Non- Forest
Monsoon year						
1990		2,150 (2150)			132 (132)	716 (716)
1991	2,835 (2,835)	270 (276)	8,383 (8383)		1580 (1200)	400 (373)
1992	2,555 (2555)	880 (880)	4,552 (4552)	2,276 (2276)	1580 (2400)	400 (-)
1993	2,250	800	45	1,506	1580	400
1994	1,660	550		1,000	1675	274
1995				4,408		
Total:	9,300	4,650	12,980	9,190	6547	2190
Achievement in ha.	(5390)	(3300)	(12935)	(2276)	(2732)	(1089)
Total Task Comp- letion in %	58%	71%	99.65%	24.75%	41.7%	49.7%

Other Additional Afforestation Activities:**Plantation along Canal Banks:**

The total potential of canal bank plantations is estimated as 18000 ha. A project report prepared by forest Deptt. is under scrutiny of SSNNL. A programme of plantation is likely to be launched effectively from the year 1992. However to give start to the work of canal bank plantations, early plantations on 155 ha are already established till the rains of 1992.

Additional Activities**(a) Dam Vicinity Plantation (235 ha)**

Planted till rains of 1992 - 240.00 ha

(b) Forest Plantation (500 ha)

Ravine lands on the left bank of the Sabarmati in village Ratanpur (300 ha) and Pirojpur (200 ha). In Pirojpur entire area of 200 ha is planted up by the rains of 1992.

(c) Project area plantations: (255 ha)

Plantations are already completed by rains of 1992.

(d) Additional Plantation in Non-forest Areas (1088 ha)

Non-forest land in Kutch district. Lands have already been released. The plantations will be completed by 1994-95.

III. COMMAND AREA DEVELOPMENT (INCLUDING DRAINAGE STUDIES)

(A) **Government of Gujarat:** Govt. of Gujarat has undertaken several studies related to the Command area development which included the following:

Sl. No.	Name of Study	Name of Agency	Year of Completion
1.	Mathematical Modelling of Ground Water for Baroda & Bharuch Area.	Operation Research Group, Baroda.	1981
2.	Pre-Feasibility study for Low Level Canal.	Jyoti Consultants Ltd. Baroda.	1981
3.	Pre-Feasibility level Drainage study of Narmada Mahi Doab of SSP Command.	Core Consultants Ltd. Ahmedabad.	1982

- | | | | |
|-----|---|--|------|
| 4. | Some Aspects of Role of Panchyats and Institutional Arrangements for canal irrigation in Two Talukas of Ahmedabad District. | Institute of Cultural and Urban Anthropology, Ahmedabad. | 1982 |
| 5. | A study of settlement Pattern (6 Talukhas sub Districts in the Narmada Command Area of Mahesana District of Gujarat). | Department of Geography, Gujarat University, Ahmedabad. | 1982 |
| 6. | Regionalisation of Narmada Command. | Operations Research Group, Baroda. | 1982 |
| 7. | Marginal cost study of two Typical Distributerries and Two Typical Branches. | Dr. C.R.Shah, Baroda | 1983 |
| 8. | Population Projection and Migration study for Narmada Command Area. | Operations Research Group, Baroda. | 1983 |
| 9. | Cropping Pattern and Water Demand Study in Narmada Command Area. | Operations Research Group, Baroda. | 1983 |
| 10. | Study on Water Demand for Non-Agricultural use from Narmada Project. | Gujarat Water Supply and Sewerage Board, Gandhinagar. | 1983 |
| 11. | Consumer Expenditure, Assets and Indebtedness of Rural Households of the Command Areas of Sardar Sarovar (Narmada) Project, 1982. | Directorate of Economics & Statistics, Gandhinagar. | 1983 |
| 12. | Methodological frame work for Economic Appraisal of Narmada Project. | Tata Economic Consultancy Services, Bombay. | 1983 |
| 13. | Wasteland Development Project for command Area of Narmada Canal (Region 11 and 12). | Gujarat State Rural Development Corporation Ltd., Gandhinagar. | 1984 |
| 14. | Studies for Optimisation of Hydro Power Installation and pumping Units along Saurashtra Branch Canal. | Premier Consultants, Bombay. | 1985 |

- | | | | |
|-----|--|--|------|
| 15. | Additional work on Mathematical Modelling of Ground Water System-Single Layer Model Narmada Mahi Doab. | Operations Research Group, Baroda. | 1985 |
| 16. | Socio-Economic Bench Mark survey of 62 Talukas (Sub-districts) of Narmada Command Area. | Fourteen Different Agencies Including Universities, Research Institutions, Private Institutions. | 1985 |
| 17. | Land Use and Cropping Pattern Survey and Mapping of Narmada Command Area Zone 4A & 4B. | Department of Geography, M.S. University, Baroda. | 1986 |
| 18. | Inter-Regional Water allocation and Determination of Branch Canal capacity. | Operations Research Group, Baroda. | 1989 |
| 19. | Extended study on Inter Regional Water Allocation and determination of Branch Canal Capacity. | Operations Research Group, Baroda. | 1989 |
| 20. | Rate of Adoption of Improved Technology in Narmada Command and Rest of Gujarat State (Based on Analysis of Crop cutting Experiments Data). | Operations Research Group, Baroda. | 1989 |
| 21. | Computer aided Planning of conveyance and distributory Network. | Indian Institute of Management, Ahmedabad. | 1990 |
| 22. | Growth of Agro-Processing Industries in Phase-I of the Sardar Sarovar Project. | Gujarat Industrial & Technical Consultancy Organisation Ltd. Ahmedabad. | 1990 |
| 23. | Consultancy work for Control, Telemetry and Communication Net Work on Narmada Canal System for SSP. | Gujarat Communication & Electronics Ltd., Baroda. | 1991 |
| 24. | Mathematical Modelling of Ground Water System Single Layer Model Narmada Mahi Doab. | Operations Research Group, Baroda. | 1982 |

- | | | | |
|-----|--|---|------|
| 25. | Techno-Economic Study for utilising Village Tanks as Borrow Area for Construction of Canal Net Work. | Operations Research Group, Baroda. | 1992 |
| 26. | Area Development Strategies for selected Regions Adjacent to Narmada Main Canal. | Operations Research Group, Baroda | 1992 |
| 27. | Water Rates Policy in 3 parts. | | |
| | i) Pricing of a public Utility Survey of Literature | Department of Economics, South Gujarat University, Surat. | 1992 |
| | ii) Financial working of Irrigation Projects - A case of four projects in Gujarat. | Department of Economics, Sardar Patel University, Vallabh Vidyanagar. | 1992 |
| | iii) Some policy issue for Canal Water Rates in Gujarat. | Department of Economics, Sardar Patel University, Vallabh Vidyanagar. | 1992 |
| 28. | Mathematical Modelling of Ground Water System for SSP Command between Rivers Shedhi and Sabarmati. | Consultancy Engineering Services, New Delhi. | 1992 |
| 29. | Mathematical Modelling of Ground Water System for SSP Command between Rivers Sabarmati and Banas. | Operation Research Group, Baroda. | 1992 |
| 30. | Mathematical Modelling of Groundwater System for SSP Command beyond Banas upto Rajasthan Border. | Dalal Consultants, Ahmedabad. | 1992 |
| 31. | Prefeasibility level Drainage study for SSP Command beyond Mahi. | Consultancy Engineering Service, New Delhi. | 1992 |
| 32. | Action Research on People's Participation in Water Management in SSP. | Gandhi Labour Institute, Ahmedabad. | 1993 |
| 33. | Extension of 4th reservoir Modelling Study. | Operations Research Group, Vadodara. | 1993 |
| 34. | Action Research in Peoples Involvement in Water Management. | Gandhi Labour Institute | 1993 |

35.	Development and Management Plan for Black Buck Sanctuary at Velavadar.	Expert Multi-Disciplinary Group.	1993
36.	Development and Management Plan for Wild Ass Sanctuary in Little Rann of Kachchh.	Expert Multi-Disciplinary Group.	1993
37.	Integrated Command Area Development Plan for SSP.	Wamana Consultants Hyderabad and through GOG.	1993
38.	Impact study on water Borne/ Water related Diseases in Command Area including area down stream of SSP Dam.	Commissionerate of Health Medical Services & Medical Education.	1993
39.	EIA studies of Fisheries (Inland as well as marine) relevant to command area of SSP.	M.S. University.	1993
40.	Impact on Monuments of Historical Archaeological Importance in SSP Command.	Status note to be provided by (i) Director of Archaeology GOG (ii) Archaeological Survey of India, GOI.	1993
41.	Review of Ground Water Studies and problems.	International Consultant.	1993
42.	Review of studies and Problems on Drainage.	International Consultant.	1993
43.	Review of Soil Studies	National Expert	1993
44.	Survey and Investigation work of Ground Water Resources beyond River Mahi in SSP Command.	Gujarat Water Resources Development Corporation Ltd. Gandhi-Nagar.	1994
45.	Survey and Investigation of Ground Water Resources beyond River Mahi in SSP Command.	Gujarat Water Resources Development Co., Limited.	1994
46.	Research in Irrigated Agriculture	Gujarat Agriculture University.	Long-term study

47.	Pre irrigation and institutional training for functionaries of Nigam and farmers in the command area of SSP, field visit etc.	Department of Agriculture	1994
48.	Flora and Fauna studies of Command area of SSP.	M.S.University	1994
49.	Operational level drainage studies for the command area of SSP (on appropriate packages).	To be identified	1994
50.	Impact of Agriculture Run-off on Quality of Ground-water in SSP.	Indian Agriculture Research Institute	1994
51.	Socio-economic Survey in Command Area updating earlier Bench Mark Studies.	To be identified	1994
52.	Field Level Studies on farmers participation including pilot VSA Studies.	To be identified	1994
53.	Agricultural Research Studies.	Gujarat Agricultural University, Ahmedabad.	1998 pn12

Synthesis of Ongoing Work

Topic	Date of Award	Duration	Agency
1. Flora and Fauna of Command Area (3 part)	January 1993	18 months	Sardar Patel University, Gujarat and Saurashtra University
2. Wildlife Sanctuaries (4 nos.)	Started Sept. 1992	6 months	Experts coordinated by SSNNL.
6. Fisheries	January 1993	12 months	MSU, CICFRI, and Commissariat of Fisheries, GOG.
7. Public Health	December 1992	4 months	SCHMS GOG

8.	Impacts of Agricultural Chemicals on runoff and Groundwater	Due to start March 1993	12 months	Indian Agricultural Institute, Delhi.
9.	Command Area Development	Started in December 1992	12 months	WAMANA Consultant, Hyderabad.
10.	Integrated Review of Soil Studies	Due to start in March, 1993	6 months	Dr. Agarwal, consultant
11.	Groundwater & Drainage	Start date to be determined	4 months	HR Wallingford
12.				
13.	Revision of 4th Reservoir Model Study	December 1992	4 months	Operations Research Group, Baroda.
14.	SSP downstream study.)	
15.	Impact on monuments of historical/Archaeological importance in SSP command.		)	Details awaited.
16.	Saurashtra and Kutch Water Supply Distribution system	Start date to be determined	6 months	Commissioning agency to be determined.

(B) Government of Rajasthan

The Government of Rajasthan has submitted a report on Environmental & Ecological aspects and remedial measures for Narmada Canal Project. Copy of the report is submitted to Ministry of Environment and Forests. Govt. of Rajasthan has been directed to carry out Impact Assessment Studies on the lines followed by Govt. of Gujarat. Terms of Reference are made available to Govt. of Rajasthan. Govt. of Rajasthan has approached WAPCOS for the same & matter is under negotiation.

IV. FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

The guidelines of the MOEF require that while seeking environmental clearance for the hydropower projects, surveys should be conducted so that the status of the flora and fauna present can be assessed, listed (rare and endangered) species can be detected, if present, and appropriate conservation measures devised.

On the basis of relevant details supplied, MOEF issued clearance for the SSP in 1987. A condition of this clearance, as far as it related specifically to the Flora & Fauna, was that

Narmada Control Authority would ensure indepth studies on flora & fauna needed for implementation of Environmental Safeguard measures.

Studies/Surveys :

Important survey work has included the following:

- The Environmental Impact Study of 1983 prepared by (MSU).
- Preliminary Report on First Botanical Exploration and Plant Collection from Narmada Valley by the Botanical Survey of India in 1986.
- Report on the Survey of the Narmada Sagar Area by Zoological Survey of India, 1988.
- Note on Sardar Sarovar Project - Preparation of Environmental Work Plan for Forest and Wildlife by the State Forest Department, GOM, 1988.
- Status of Flora and Fauna in and Around Sardar Sarovar Project, Maharashtra is an ongoing study by the University of Pune (1992-94).
- Eco-Environmental and Wildlife Management Studies in the Sardar Sarovar Area in Gujarat, 1992, by MSU.
- Impact Assessment of Madhya Pradesh Land to be Submerged Under Sardar Sarovar Project and Adjoining Ecosystems is an ongoing study which began in September 1990 and for which quarterly reports and two interim reports (1990-1991) and 1991-92) are available. The study is being conducted by the State Forest Research Institute (SFRI) in Jabalpur and financed by the NVDA.
- Workshop on Approaches to Integrated Wildlife Management in Gujarat: A Report by the SSNNL, October 1990.
- People's Involvement in Wildlife Management, by VIKSAT in 1991.
- Wildlife Management Studies in the Submergence and Catchment Area of Narmada Project: With Special Reference to Shoolpaneshwar Wildlife Sanctuary, by the SSNNL, 1992.
- Narmada Basin Water Development Plan: Development of Fisheries, 1984, was prepared by the Narmada Planning Agency, GOMP.
- Rapid Reconnaissance Survey of Limnological Aspects Part I, II and III, 1987, were undertaken by the Universities of Bhopal, Vikram and Rani Durgavati for GOMP.

- Water quality data has been collected by the Central Pollution Control Board, Central Water Commission, the State Pollution Control Boards and the National Institute of Oceanography.
- Narmada River Basin Development Project: Fisheries Component, 1991 by the German Consultants to the World Bank, GOPA.
- Sociological Survey of the Fishing Families of the Narmada River by CICFRI, 1991.
- Aquatic Fauna (Fish) Studies in Indira Sagar Submergence Area, prepared by the Friends of Nature Society in 1991 on behalf of the NVDA reported on the fish fauna of the Narmada.
- Pre-and Post-impoundment Limnological Studies of Narmada Basin, involves the same three universities coordinated by Barkatullah University for the NVDA. (1989-92)
- Studies on Fish Conservation in Narmada Sagar, Sardar Sarovar and its Downstream is a desk review sponsored by the NCA and undertaken by CICFRI, 1993.
- Ecology and Fisheries of the Narmada Estuarine System with Special Reference to Proposed Impoundment (Sardar Sarovar Dam), is an ongoing study begun in 1988 by CICFRI.

The Action Plans

To ensure that the wildlife conservation measures are implemented effectively, action plans for the three states were prepared as follows:

- felling plans for the forest area coming under submergence in Maharashtra and Madhya Pradesh which will avoid the possibility of animals being trapped in the submergence area;
- plans for improvement works in the wildlife sanctuaries of Gujarat;

Fisheries Component:

Three state Govts. submitted the fisheries development plans as follows:

- The Narmada Basin Water Development Plan: The Development of Fisheries, 1984. This comprehensive plan for GOMP addressed the development of fisheries in the NSP, Omkareshwar, Maheshwar and SSP areas. Phasing and programming with respect to pre and post-impoundment, clearance of the forests, training of fishermen, cooperative societies and post-impoundment management were proposed.

- Environmental Work Plan: Sector Fish and Fisheries, GOG, 1986. This work plan, prepared in compliance with the agreement with the World Bank included the establishment of fish hatcheries and fish farms, training of fishermen, establishing primary cooperatives, and establishing an Inter State Fisheries Board. In addition, it included proposals for conducting hydrobiological studies, studies on the morphology of the river, investigations into the physical and chemical characteristic of the water and soil, and studies on flora, fauna, fish yield, plankton, and productivity in the reservoir.
- A Note on SSP: Preparation of Environmental Work Plan for Fisheries Development in Maharashtra, 1987. This plan included proposals for the felling in the reservoir submergence zone, fish seed, hatcheries, stocking, fishing, manpower requirements, and training and management through the Inter-State Board.

Subsequently, the state governments revised their plans to address further issues as they arose. The revised plan for GOM included proposals for the fishing population to be resettled on the periphery of the reservoir or in R&R sites in Maharashtra. In addition, the establishment of low-cost hatcheries and irrigation tanks, the development of pen cage culture fisheries, and intensive fish farming were proposed.

Table 4.1 Summary of Status of Environmental Planning:

A) Wildlife

	Gujarat	Maharashtra	Madhya Pradesh
Preliminary Surveys	Complete	Complete	Complete
In-Depth Studies	Complete	Underway (Poona Univ.)	Complete
Development of Management Options	Complete for Shoolpaneshwar	Some work completed but awaiting results of study and deliberations of the expert group	Some work completed but awaiting results of study and deliberations of the expert group

Action Plan

Migratory corridors	Not needed	Completed	Complete
---------------------	------------	-----------	----------

Sanctuary development	Complete for Shoolpaneshwar development.	Plans for establishment of wildlife sanctuaries await study results and expert group	Plans for establishment of wildlife sanctuaries await study result and expert group
Wildlife conservation	Massive afforestation in entire catchment of SSP	It depends on deliberations of expert group	May not be required. Await final outcome of study
Implementation	Shoolpaneshwar development almost complete, CAT work (increasing carrying capacity) nearing completion	Awaiting outcome of the study. CAF nearly completion, CAT work recently accelerated	Arrangements complete, awaiting final outcome of study

Progress in Shoolpaneshwar Sanctuary Development

	Target	Achieved to	% Complete
Fencing	100km	107	100
Firelines	60km	60	100
Barricades	2km	2km	100
Check Dams	14	14	100
Construction of Quarters	21	21	100
Construction of Rest House	1	1	100
Improvement of Communications	Not fixed	15km	100

The SSP will also provide an opportunity to enhance nature conservation outside the immediate catchment area of the Narmada. In particular three wildlife sanctuaries located in the command area of the project will benefit from the increased freshwater availability resulting from the project and there are plans by the GOG to expand these. They comprise:

- Nal Sarovar, a freshwater lake;
- A Wild Ass Sanctuary in the Rann of Kutch.
- A Black Buck Sanctuary at Veladar.

Summary of Status of Environmental Planning:**B) Fisheries**

	GOG	GOM	GOMP
Preliminary surveys	} : : : : : : : }		
Detailed surveys/ studies of fish fauna			
Action plans		"Complete" for all item in all States.	
Monitoring and evaluation cell			
Plan for training of fishermen	Yes	Yes	Yes
Implementation			
1. Plan for clear felling	Under imple- mentation	Yes to synchronise with submer- gence	Yes to synchronise with submer- gence
2. development of fish farms	Under imple- mentation	Yes, awaits submergence	Yes, awaits submergence
3. establishment of IFDB for future R&D management	Agreed	Agreed	Yet to agree

Progress of Implementation

CICFRI have already established one hatchery in Gujarat for augmenting the numbers of the Hilsa fish in the reservoir. This currently produce around 250,00 spawn per year. CICFRI have also been commissioned to monitor the whole of the estuary and their study has been extended to examine pollution and to undertake modelling studies in the downstream environment.

A draft plan for the creation of an Interstate Fisheries Development Board (IFDB) has been prepared by the NCA and agreed, in principle, by the governments of Gujarat and Maharashtra. The organisation is expected to be set up and fully functioning prior to reservoir filling. the IFDB will be an autonomous organisation with the NCA represented on the Board.

GOG has already provided 16 hectares of land to the project for the development of fish farms. In addition, the State Fisheries Department is exploring the development of riverine fisheries and the development of the reservoir for commercial and game fisheries.

Execution of felling as per felling plans prepared will await the commencement of impounding.

V. SEISMICITY:

Studies

Studies of reservoir-induced seismicity (RIS) and rim stability have been carried out by the Geological Survey of India (GSI), Central Water and Power Research Station (CWPRS), University of Roorkee and World Bank Consultants. The principal studies are described below:

- University of Roorkee. 1980. Geological and Seismological Investigations of the Environs of Narmada Valley around Navagam Dam site in Gujarat.
- GSI. 1981-82 and 1982-83. A Geotechnical Report on the Reservoir Competency Investigations in Parts of Sardar Sarovar Area, Bharuch & Vadodara Districts. Volumes I&II.
- Shenoi et al. 1982. Shenoi et al presented at the New Delhi conference on the significance of seismotectonic aspects on reservoir development.
- Balasundaram, M.S. 1982 Sardar Sarovar Project: A Geotechnical Report Compiled and Edited for the Government of Gujarat.
- MSU. 1983. The Sardar Sarovar Narmada Project Studies on Ecology and Environment.
- NVDA published a Position Paper on Seismic Studies in January 1986.
- Krishna, Dr. J. 1989. Dams and Seismicity.
- GSI. 1990. Study of the Rim Stability of the SSP.
- GOI. 1993. Sardar Sarovar Project Seismicity and Sardar Sarovar Dam.

Progress of Implementation

The various recommendations for modification of the dam design have all been carried out and are summarised as:

- adoption of horizontal design coefficient of 0.125g on the recommendation of the Dam Review Panel;
- installation of stress monitors in the main body of the dam;
- increase of the depth of the foundation to 18m below the lowest river bed.

The Government of Gujarat has identified 9 locations for the installation of seismic monitoring stations, 4 each on either side of the Sardar Sarovar reservoir in Madhya Pradesh and Maharashtra and 1 at Kevadia in Gujarat. By mid 1992, 4 stations had been installed. A further 5 stations are under construction and completion expected by the end of 1993. Selection of the initial sites was carried out by the SSNNL.

The progress of implementation is illustrated in Table below:

Implementation of Actions

Action	Status
Dam design modifications	Complete
Installation of monitoring stations	4 stations installed by end 1991, 5 more awaited
GSI (Nagpur Division) rim stability studies	Completed in Gujarat, work in progress in M.P. and Maharashtra

VI. HEALTH ASPECTS

Studies

A large number of studies have been carried out on the health profile of villages in the three affected states. The key studies are summarised below:

- Narmada Programme - Schistosomiasis - Back-to-Office Report, 1986 assessment was carried out by Goodland, consultant to the World Bank, the National Institute of Communicable Diseases (NICD) and the World Health Organisation (WHO).
- Proceedings and Recommendations of the Meeting on Schistosomiasis Research and Surveillance held at NICD on 22nd November 1985.
- Disease Profile of Command Area by the State Commissariat of Health, Medical Services and Medical Education (SCHMS), 1986.
- Health Statistics, GOM, 1987. The state department of health produced a report on the health profile of 33 project-affected villages in Dhule District, Maharashtra.
- Health Statistic 1982-84, GOMP. This study, published by GOMP in 1985.
- The Sardar Sarovar Narmada Project Studies on Ecology and Environment by MSU in 1983 considered public health in Chapter-3.

- Numerous studies have been conducted on the incident of malaria in India by, amongst others, the Malaria Research Centre (MRC) and Dr. Kalra.

Status of Implementation of Actions for Public Health

Action	Gujarat	Maharashtra	Madhya Pradesh
Baseline studies	SCHMS works on command area due March 1993	Complete	Complete
Preparation of state action plan	Submitted and modified in 1986; Urban Malaria Scheme proposed	Original submitted in 1987, revised in 1991 and 1992; modified version with MO&EF	Original submitted in 1986, revised in 1988 and final plan submitted in 1991
Survey of existing facilities	Complete	Complete	Sufficient facilities
Establishment of new facilities	Hospital at Kevadia for workers; laboratory and mobile unit complete, drug dispensaries	Somawal village hospital; functional, health centres and health units sanctioned	Hospital, mobile unit and civil dispensaries for labour; detailed scheme for resettled population
Vector control measures in place	NMEP; SSNNL workshop on malaria control; laboratory established; entomological studies underway	NMEP; adoption malaria control guidelines of irrigation Department	NMEP; state malaria control organisations strengthened
Appointment of specialist staff	Complete	Complete at one R&R site at Somawal village	Needs identified
Disease Monitoring and responsibility	SCHMS plan in progress; SSNNL created Health Organisation at Kevadia	Entrusted to regular health department	Evaluation cell established

VII. ARCHAEOLOGICAL SURVEY AND ANTHROPOLOGICAL STUDIES/ **ARCHAEOLOGICAL SURVEY**

In the case of SSP, where some sites may be submerged the NWDT award stipulated that, the entire cost of relocation and protection should be chargeable to GOG. Relocation work is to be supervised by the Department of Archaeology under the provisions of the 1958 Act.

Studies:

Survey conducted for identification of various sites & monuments of significance has included the following:

- Gujarat: Archaeological Survey of Nineteen Villages Submerged by Sardar Sarovar Reservoir, 1989.
- Maharashtra : Survey of Department of Archaeology. A survey was carried out by the Department of Archaeology of cultural sites in 24 villages of Akkrani Taluk and nine village from Akkalkuwa Taluk, Dhule District.
- Madhya Pradesh : Survey of State Department of Archaeology and Museum (1992).
- Anthropological Survey of India: Narmada Salvage Plan.
- Anthropological Survey of India: Peoples of India.
- Parishad, A.K. Survey of Material Cultural in the Narmada Valley.
- Rashtriya Manav Sanghralaya : Narmada Salvage Plan.

Cultural Heritage in SSP Area

	Gujarat	Madhya Pradesh	Maharashtra
Temples	8(2)*	16(6)*	-
Mounds	-	3	-
Gateway	-	1	-
Rock shelters,	-	6	-
cave paintings	-	2	-
Tombs	-	-	-

* Figures in brackets indicate number of sites designated for relocation.

Summary of Current Situation and Progress

	GOG	GOMP	GOM
Survey of Villages in Submergence Zone.)		
Identification of Cultural Sites	)	"Complete" for all item in all States.	
Collection of Data and Documentation of Sites)		
Selection of appropriate sites.	Complete	In process	Not required
Action plan	Complete	Not finalised, expected March, 1993	Not required

ANTHROPOLOGICAL STUDIES

Government of Madhya Pradesh has informed that in view of the studies being carried out in connection with Narmada Sagar Project, no separate anthropological studies are required and that the Director General, Anthropological Survey of India has also expressed the same view. M.P. State Adivasi Kala Parishad has submitted its report on Tribal arts & culture. Besides Anthropological Survey of India has informed that Narmada Basin is already covered extensively under the project "people's of India". Besides Rashtriya Manav Sanghralaya has conducted needed studies in the past as follows. Further studies are covered under R&R plan of the state Governments.

- a study of the palaeo-ecology of quaternary fossils in the central Narmada Valley;
- excavation of upper palaeolithic site of Mehtakhaeda and further exploration of Nimar;
- collection of tribal artifacts in Madhya Pradesh.

Institutional responsibility for these actions was specified in the action plan whereby the first two elements were completed by Deccan College, Puna and the third by Adivasi Kala Parishad, for the Rashtriya Manav Sanghralaya, Bhopal.

STATUS REPORT
NARMADA SAGAR PROJECT (NSP) ENVIRONMENTAL ASPECTS
MARCH - 1993

1) Phased Catchment Area Treatment :

The free draining area of Narmada Sagar project down stream of Bargi Dam is about 38,952 sq.kms. As per the guidelines of MOWR, directly draining watersheds of very high and high priority categories only are to be treated. Prioritisation survey of the watersheds was entrusted earlier to GSIT&S, Indore. However, the survey is now entrusted to the All India Soil & Land Use Survey Organisation, New Delhi, and they are carrying out the prioritisation survey of the entire catchment of NSP.

AISLUS has divided the middle Narmada Basin (from Bargi dam to NSP dam) into 9 subcatchments. AISLUS has completed prioritisation survey of 8 subcatchments and has submitted its report. The details related to the progress of survey in remaining 1 subcatchment as well as the survey report is awaited from AISLUS. On the basis of the reports submitted by the AISLUS, 32 sub-watersheds belonging to the very high and high priority categories and directly draining into the reservoir have been identified for treatment. These 32 sub-watersheds cover an area of about 81427 ha. On the basis of planimetry exercise conducted by the NVDA, these 32 sub-watersheds comprise an estimated 15516 ha forest area and 65911 ha non-forest area. As for the non-forest area, it has been estimated that 59320 ha non-forest area will be available for treatment.

Programme and Progress of Works:

	Upto 92-93	93-94	94-95	95-96	96-97
	Cumulative Progress		Target		
Non-Forest area/ ha. (59,320 ha)	13075	12000	12000	11500	10745
Forest area/ (15,516 ha)	1883	3000	4000	4000	2633
Total Area: (74,836 ha)	14958	15000	16000	16500	12378

2) Compensatory Afforestation :

A total of 40332 ha forest land would come under submergence and an additional 779.9 ha of forest land has been diverted for the residential colony, power house complex, dam, saddle dam and approach roads. Subsequently, another 308.4 ha of forest land was permitted to be diverted for power house. Thus a total of 41,420

ha of forest land has been permitted to be utilised for the construction of ISP. To compensate for this loss of forest, 10,143 ha of non-forest and 70,802 ha of degraded forest land has been identified for compensatory afforestation.

Programme of Compensatory Afforestation:

	Commulative Progress till 91-92	92-93 Target/ Progress	93-94	94-95	95-96
Degraded Forest area (70,802 ha)	23048	<u>12528</u> 11919	12400	12400	12370
Non-Forest area (10,143 ha)	5239	<u>1534</u> 1390	1500	1500	1037
(80,945) (say 81,000 ha)	28287	<u>14062</u> 13309	13900	13900	13407

3) Command Area Development :

The Government of Madhya Pradesh has submitted command area development plan. The project on completion will provide annual irrigation to 1.69 lakh ha.

The implementation of the plan would be taken up in three phases for completion in 6/2007. Monthly observation of water levels started in November, 1991 for subsequent supply of this data to the consultants, already shortlisted, are likely to be continued for 2 seasons to draw inference for preparation of master plan for drainage. NVDA has addressed J.L. Agricultural University for studies on effect of pesticides, insecticides in the command area. The study proposal received from the University has been scrutinized in NVDA by a team of experts in light of suggestions/observations received from WALMI, Bhopal, WALMI Aurangabad, M.P. State Pollution Control Board, Bhopal, and MAPCOST Bhopal. Accordingly, the University has now modified its study proposal. This modified proposal has been sent to NCA for their observation. Meanwhile the study proposal is under active consideration of NVDA.

4) Flora, Fauna, Wildlife and Carrying Capacity :

Studies on these aspects were entrusted to the Wildlife Institute of India, Dehradun in December, 1989 and were expected to be completed by March, 1993. Action plan will be ready by March, 1994. Implementation of the action plan will be completed by March, 1996. Progress report upto June, 1992 has been submitted by the Wildlife Institute of India.

Friends of Nature's Society, Bhopal, were entrusted with preparation of Wildlife Retrieval and Conservation Plan. They have submitted the final draft which is under scrutiny of NVDA.

5) Seismicity and Rim Stability

The reservoir competency survey has been done by GSI and report is submitted. In the report, GSI has suggested further studies for some patches of narrow water divide. As such they were requested to carry out the study in the required area. GSI is further reviewing the need to survey the area identified earlier.

Establishment of seismic observatories in the Narmada Sagar Complex area is under correspondence with IMD and CWC. The specification have been finalised and procurement of imported instruments as suggested by IMD is under finalisation with CWC. Meanwhile action for procurement of indigenous wood Anderson Seismometers from IMD has already been taken so as to obtain pre-impoundment data.

6) Health Aspect:

A note on health aspects of NSF prepared by NVDA was examined in the Ministry of E&F and comments were sent for modifying the report. NVDA has submitted the revised plan costing Rs.748.73 lacs for the preventive and curative aspects of health. Regarding preventive aspects, a MOU has been signed with the Department of Preventive and Social Medicine, Gandhi Medical College, Bhopal, whereas, for studies on health aspect in project impact areas of SSP and NEP, work is proposed through a cell of monitoring and evaluation under the Directorate of Health Services, Bhopal. The approved plan is being implemented.

Pre-impoundment and post-impoundment Limnological studies being carried out by three Universities will take care of water quality aspect.

7) Fisheries Development:

The studies of certain aspects of fisheries have been included in the Limnological studies being conducted by the three Universities of the State; studies in the Upper Narmada, (Bargi Reservoir) by Rani Durgawati University, Jabalpur, studies in the Middle Narmada (Tawa, Barna and Kolar Reservoirs) by Barkatullah University, Bhopal, studies in the Lower Narmada by Vikram University, Ujjain. All the three Universities have initiated the studies in their respective areas as per MOU. Aquatic fauna has also been covered under the studies completed by Friends of Nature Society, Bhopal.

8) Archaeological and Anthropological Surveys:

A survey of the 254 villages is required for identification of the archaeological monuments falling within the submergence area. The State Department of Archaeology and Museum, Bhopal was entrusted with the survey of 87 villages which has been completed. Archaeological Survey of India has also completed the

survey for 167 villages assigned for identification of the monuments of significance. Report is submitted to head office and is under scrutiny.

Action plan would be ready by June, 1994. Action will be taken to preserve material of archaeological importance in consultation with experts.

As only lower bastion in north of the Joga Fort is likely to be affected by scour action of water and the Siddeshwar temple is well above the FRL of 860 ft., these two structures are not considered as affected by the project. However, other structures/monuments will be considered for shifting or protection after their archaeological significance is established through joint inspection of the competent authorities.

Anthropological Studies:

Efforts are being made for retrieval of bio-cultural material from the Narmada Basin. A lot of information is gathered from the field which generates immense data of Socio-Anthropological significance.

Rashtriya Manav Sanghralaya has constituted a working group for the retrieval of bio-cultural material in Narmada Basin. Survey of tribal art and handicraft entrusted to M.P. Adivasi Kala Parishad is completed and report is available. Besides Anthropological Survey of India has covered these studies under its own project called "people of India". The report is in 61 volume out of which 7 volume are under final editing. A Narmada Salvage plan is also launched by Anthropological Survey of India recently and the entire area is scanned and some ancient tools have been found.

**MODIFIED RESEARCH PROJECT PROPOSAL
ON**

**"Impact of Agrochemicals Runoff from Fields on
Surface & Ground Water Quality in Command Areas".
March. 1993**

**FOR CONSIDERATION OF NVDA
NARMADA BHAVAN : BHOPAL (M.P.)**

**Principal Investigator : Dr. D.L.Kauraw
Senior Scientist
(Soil Science)**

**JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA
COLLEGE OF AGRICULTURE
KHANDWA (M.P.)**

RESEARCH PROJECT FOR CONSIDERATION OF NARMADA CONTROL AUTHORITY

1. Title of the project :

"Impact of Agrochemicals run-off from fields on Surface & Ground Water quality in command areas".

2. Location:

- | | |
|--|---|
| a) Name and address of Instt./University. | Jawaharlal Nehru Krishi Vishwa Vidyalaya. Jabalpur. |
| b) Name and address of Head of the Deptt./ | Dr. V.S.Tomar
Department of Soil Science & Agricultural Chemistry. |
| c) Actual location where the research work will be carried out : | College of Agriculture. Khandwa Campus. Khandwa (M.P.) -450 001. |
| d) Head of the Campus | Dr. C.B.Singh, DEAN College. |
| e) Associate Director Research | Dr. P.L.Bhalla. |

3. Duration : : Three years or more.

4. About Principal Investigator:

- | | |
|---|---|
| a) Name & Designation: | Dr. D.L.Kauraw,
Senior Scientist (Soil Science). |
| b) Brief biodata indicating his specialised interest particularly in relation to the proposed research work : | <p>1) Academic qualification :
M.Sc.(Ag) Soli Sci.& Agri Chem.
Ph.D.-Soil Science (Soil Physics)</p> <p>2) Experience - 23 years.
experience in research & teaching in the related fields. Conducted the research work on soil and water management. water and nutrients movements within the soil profiles of the cropped fields. About 12 years work in the AICRP on "Improvement of Soil Physical Conditions for better crop production".</p> <p>Guided postgraduate Research and Ph.D. Research work for about 15 years.</p> <p>Working as Scientist Incharge/ Nodal Scientist. NARP-Subproject Khandwa. since July 1988.</p> |

5. Objectives :

- a) To determine the nature and levels of the residues of toxic agricultural chemicals run-off from fields in the ground water and surface water in command areas of the "Narmada valley".
- b) To study the ecological effects of the residues in irrigation water. and their physiological effects on aquatic and terrestrial vegetation, crops, animal lives and thus the agro-ecosystem as a whole.
- c) To determine the rate of dissipation of the agrochemicals and significant degradation products under fallow and cropped field conditions.
- d) To find out the suitable measures for reducing the ill effects of the residues of toxic agricultural chemicals, if any and thus to predict their safe consumption in the study area.
- e) To evaluate/determine suitable "mathematical model/functional relationships" amongst the various dominating parameters for per capita pesticide distribution & potential pesticide load of study area, so as to predict the future possibilities of toxic residues under the diversified farming & ecological situations.
- f) To evaluate the suitable preventive and remedial measures, thus to advise for the promotion for the use of environment friendly pesticide in the study area, so that it may not become a serious problem in future.

6. Practical and Scientific Utility :

In modern agriculture, a number of pesticides viz., insecticides, fungicides, rodenticides, herbicides etc. are being used to control insect-pests, diseases, rats and weeds for successful crop production. The high yielding crop varieties also need higher amount of NPK fertilizers and trace elements too, for their optimum production. These fertilizers and pesticides when used in the fields, are subjected to leaching losses and there by mix with ground water current, which reach to the wells and thus the drinking water is polluted. These chemicals also transferred from field to the water bodies by surface run-off. Hence, in the form of solution these chemicals reach to the near by Nallas, Rivers, Tanks and Dams, and pollute their water intended for crop, animals and human consumption.

The quantity of the chemicals leached through the soil profile to the ground water or get discharged along with run-off water depends on the method of application, soil type, soil organic matter (humus), water retentive capacity of the soil, on farm management, soil slope, methods of irrigation, rainfall (distribution and magnitudes), catchment design, cropping systems and floristic composition of the command area.

Hence, the knowledge on the effects of these parameters on residue built up of toxic chemicals in the under ground and surface water of the command area is essential to prevent and/or reduce the pollution hazards in future.

The investigations on impact of agrochemicals on run-off water will provide data on the nature and level of the residues in ground water, residue in still water and its disposal in flowing water, the residue absorbed on bottom sediments and its rate of dissipation, the nature and amount of residues in fishes, the

amount in water used for irrigation, the amount of residue transferred to representative irrigated crops and the possible transfer of residues from water or irrigated crops to meat, milk and egg.

The study will also provide the suitable remedial/control measures to modify or reduce the residual effects of agricultural chemicals in the command areas of Narmada Valley. This information will not only help to prevent pollution of water-consequently the whole environment of command area of "Narmada Sagar and Omkareshwar Command" but other command areas also viz: Tawa Command, or Bargi Command areas and other areas in the country.

7. Review of Research Work Conducted/ being conducted on the subject in India and Abroad.

(a) At sponsoring institution:

Preliminary studies on herbicidal residues in fields through bioassay method is being conducted. But the studies on herbicidal and pesticidal residues in water have not been taken so far. Some studies in insecticide residues in food crops are in progress. However, no emphasis has been given to soil water and/or surface water residues.

(b) Research work done and in progress in India:

The studies on residues in food stuff, and soils have been conducted at different Agricultural Universities viz PAU, HAU, TNAU and IARI and Bhabha Atomic Research Centre-Trombay, Bombay. However, the research work on residues built-up in underground water or surface water in command areas, are totally lacking in India.

(c) Research work done and in progress in abroad.

The studies relating to the residues of toxic organic chemicals found in ground water are extensively conducted in USA (Rao et al. 1985). Some of the toxic chemicals viz. Alachlor, Atrazine, BHC, Benzene, Bromacil, Carbofuron, Chloroform, Cyclohexane, Bibromochloropropane, Dinitroob, Ethyle-benzene, Parathion and Simazine have been reported in under ground water. Many organic chlorinated compounds are reported in the ground and surface waters. The heavy metal residues have also been found in water creating the residue problems.

The use of activated charcoal to remove mercury from drinking water has been reported by various investigators (Logsdon and Symon, 1973, Sony, 1979).

Nitrate predominates in surface and ground water and the levels of nitrate can be increased through contamination by nitrogen containing fertilizers or human and animal wastes. The levels normally do not exceed 1 to 2 mg/l for nitrate and 0.1 mg/l for nitrite. Currently 40 surface water supplies and 568 ground water supplies are known to exceed the nitrate maximum contaminant level (MCL) of 10 mg/l, as a result of the use of fertilizers or from animal wastes, or septic system (Review of Environ contamination and Toxicology Vol. 107 pp. 117-130).

The studies revealed that in water of Maumee and Sandusky rivers contained the Alachlor residues to the extent of 10-14 ug/l during 1984. In water of Mississippi river near Wikswarg 0.26 to 0.76 ug/l of Metoluchlor, and 0.28 to 0.64 ug/l of Alachlor residues were noted.

A survey conducted at USA, revealed that Alachlor and Metolachlor polluted the water of many rivers, tanks and tube wells. Several samples contained the residues ranging from 1.0-270 ug/l of water (Reviews of Environmental contamination and Toxicology vol 110).

Acrolin a herbicide used for controlling the aquatic weeds remain active upto 6 days in water. The residue of this chemical at 1 ppm is toxic to the fishes.

Several other agrochemical residues are reported at the toxic levels in ground and surface waters. Hence, this study is most important to reduce the water pollution of command area and the resultant long term hazards.

8. Technical programme :

First year

1. Establishment of Lab and equipments for specific residue analytical purpose.
2. Survey of the command areas and catchment topography and other edaphic, biological and infrastructure of the ecosystem.
3. Collection and analysis of water samples :
ground water : tube well, open wells, hand pumps etc.
and surface water : Nallas, Streams, Rivers, Tanks & Dams.
of the command areas.
4. Cataloging of the Agrochemicals being commonly used in different crops & Farming situations of the region.

Second and Third year :

1. Water and soil solution samples from farmers fields with different farming situations will be taken for analysis and will be used to evaluate and develop general models for the residues contents under specific farming situations.
2. The specific field experiments using different agrochemicals will be conducted on farmers' fields.
3. The water samples will be collected for residues analysis from underground and run off water, and its' analysis will be continued.
4. The experiments to develop preventive and remedial measures will be under taken.
5. Residues will be estimated under different methodology normally used for various agrochemicals under field conditions.
6. Report preparation and recommendation on generalized basis.

Fourth and Fifth year if continued:

1. Considering the results of the previous years. the field experiments of the proven technology, on the cultivators' fields would be taken for reducing the residue problems.
2. Collection and analysis of ground water and surface water samples will continue.
3. To evaluate the effect of the residues on the Eco-microbial Environment in the Pedosphere. and it's impact on crops.
4. To evaluate the nature of most commonly used pesticides in relation to the cropping situations, soil types and the prevailing environmental conditions of the zone.
5. Final Report Writing and Recommendations for different Farming Situations will be prepared.

Experimentations :

- " For designing and recommending the suitable remedial measurers for residue control under differnt situations."

To reduce the herbicidal residues in soil and water. the information will be collected and/or. studies will be conducted to find out the correct formulations, method of application, structure of the chemicals which many decompose easily by light or volitilization in the form of gas, prevention of toxicity by use of antidotes. enhancement of degradation by changing soil pH, organic matter, moisture level, cultivation or innoculation of soil microbes. plant enzymes treatment. and/or by use of muck or peat soils. by growing "trap crops " trap plant species which can metabolize the chemicals into nontoxic forms. and also the measures for checking the leaching as well as surface run off.

9. Facilities :

A. Facilities already available

- i) Land for experiments is available. However. some fields in catchment area will be selected for runoff water studies.
- ii) Office facilities are available. however additional laboratory facilities have to be arranged for this specific work.

B. Additional facilities required:

1.	Equipments	App. Cost in Rs.
a)	GLC. with essential accessories (laboratory estimations of constituents).	3.75.000/-
b)	Integrator	1.50.000/-
c)	Vacuum evaporator (sample preparation)	15.000/-
d)	Water Bath (2) (sample preparation)	15.000/-
e)	Water analyser kit (field estimations)	15.000/-
f)	Spectrophotometer (UV) (laboratory estimations of constituents)	1.10.000/-
g)	Tensiometer & pizometers (sampling etc.)	20.000/-
h)	Portable conductivity meter & pH meter (field estimations)	10.000/-
i)	Infrared Thermometer with data logger (field estimations at large scale)	1.25.000/-
j)	Servo voltage stabilizer 5KV (accessories)	25.000/-
k)	Ion-Meter with electrodes etc. (laboratory estimations of ions. i.e. NO ₃).	2.25.000/-
l)	Oxygen-Meter (Microbiological environment estimations)	80.000/-
m)	High speed cooling centrifuge (separation & analysis of constituents)	60.000/-

	SUBTOTAL	Rs. 12.25.000/-
2.	Implement for sampling & experimentation. (different types of samplers, augars, sprayers, tools for fabrication, maintainance & installation of tensiometers and piezometers etc.).	75.000/-
3.	Equipments & accessories for preparation of project report and it's presentation. (i.e. photographs, slides, charts, maps etc., and other audio-visible aids. needed.)	1.00.000/-
4.	Miscellaneous equipments as per research needs.	1.00.000/-
5.	<u>Vehicles</u> (Jeep with trolly & One Motor cycle)	3.50.000/-

TOTAL AMOUNT REQUIRED ** is		Rs. 18,50,000/-

NOTE

Except No. (d) & (f), other equipments demanded are not available at the campus. One water bath is available yet it is not sufficient in view of the work load & it's small life spane (not more than 4 years of use). Further, the spectrophotometer unit available with us is not as per the project requirement (not covering the range of estimation), and also not working satisfactorily.

**** Add about 30% increase to the cost of equipments proposed.**

10. Staff Requirement:

S.No.	Designation	No. of posts	Scale of posts	Qualification prescribed for technical staff
*1.	Senior Scientist	1	4500-7300	M.Sc.(Ag.) and Ph.D. Soil Science with 15 years experience in soil science.
*2.	Scientist	1	3700-5700	M.Sc.(Ag.) with 10 years experience &/or Ph.D. in Soil Sci./Analytical Chem.
*3.	Jr. Scientist	3	2200-4000	M.Sc.(Ag.) in Soil Science/ Crop Physiology / Agronomy/ Analytical Chemistry/Food Science
*4.	Tech. Asstt.	3	1600-2800	M.Sc.(Ag.) with appropriate experience in respective
*5.	Jr. Stenographer cum clerk.	1	1400-2340	English & Hindi Typing & short-hand (english).
**6.	Research Fellows	2	1800/-	Ph.D. Scholars for the research project periods only.
**7.	Lab Tech.	1	1200-2040	B.Sc.(Ag.)/B.Sc.
**8.	Field/Lab Asstt.	4	1150-1800	Higher Sec./Preferably B.Sc.(Ag.)/B.Sc.
**9.	Driver	1	950-1530	Higher Secondary

NOTE :

- * These positions will be provided by the Vishwa Vidyalaya.
 ** These positions are emanded in the project.

The positions of Research Fellows are optional. These positions has been demanded considering the suggestion of Director Agriculture (NVDA- Bhopal), for an early & timely completion of the Research work with reliable precision.

The positions of Field Asstt. have been raise from one to four, as per suggestions proposed for the estimations of soil hydraulic properties thus water flux with in the fields. These estimations have to be performed at the field sites, with supplements from laboratory data (water retention & transmission rates).

11. Estimates of Cost :

S.No.	Items of the expenditure	1st yr	2nd yr	3rd yr	4th yr	5th yr	Totals
LAKH RUPEES							
1.	Pay of Officers	2.28	2.35	2.42	2.49	2.56	12.10
2.	Pay of Estt.	1.40	1.44	1.48	1.52	1.56	7.40
3.	Allowances :						
a)	DA	2.78	2.85	2.92	2.99	3.06	14.60
b)	HRA	0.35	0.37	0.39	0.42	0.45	1.98
c)	CCA	0.04	0.04	0.04	0.04	0.04	0.20
d)	Medical	0.20	0.20	0.20	0.20	0.20	1.00
e)	Leave Encashment	0.20	0.22	0.24	0.26	0.28	1.20
f)	CPF Contribution	0.35	0.37	0.39	0.42	0.45	1.98
TOTALS		7.60	7.84	8.08	8.34	8.60	40.46
4.	Contingencies :						
A)	Recurring						
i)	Glassware and Chemicals	2.50	2.50	2.00	1.50	1.50	10.00
ii)	POL etc.	0.30	0.30	0.30	0.30	0.30	1.50
iii)	Inputs Expt.	0.30	0.40	0.40	0.30	0.30	1.70
iv)	Lab. electricity maintainance etc.	0.20	0.20	0.20	0.20	0.20	1.00
v)	Scientific Books Literature etc.	0.10	0.10	0.10	0.10	0.10	0.50
vi)	Travelling Allow	0.30	0.30	0.30	0.30	0.30	1.50
vii)	Sym./Conf./Semin Training R.Course etc.	0.05	0.05	0.05	0.05	0.05	0.25
B)	Non-Recurring	17.50	0.00	1.00	As per Res. need		18.50+
Total Contingency		21.25	3.85	4.35	2.75+	2.75+	34.95+
GRAND TOTALS		28.85	11.69	12.43	11.09	11.35	75.41+

NOTE :

1. The additional expenditure in pay and allowances of the staff demanded, has to be sanctioned extra.
2. If staff positions No. 4 to 6 are not provided then the proportional additional funds be included in the recurring contingency funds.
3. About 30% increase in the cost of equipment from the first proposal is included. If there is further substantial increase in the prizes, be sanctioned extra.
4. The amount in chemicals and glassware contingencies has been enhanced considering the current rise in the prize of these items (about 40%) and additional analysis proposed.

CLASSIFIED STATEMENT OF PROJECT COST ESTIMATES TO BE GIVEN BY NVDA

Tentative Expenditures in various heads yearly and totals.

<u>A. Staff</u> :	Positions	Monthly (Expenditures : Rs.)	Annual
	Research Fallow	- 3600/-	43.200/-
	Field Assistant	- 16000/-	1.92.000/-
	Lab. Technician	- 4000/-	48.000/-
	Jeep Driver	- 3500/-	42.000/-
TOTALS		Rs. 27.100/-	3.25.200/-

Yearly Expenditure in Lakhs

Expenditure Head	1st	2nd	3rd	Total of Three Years	4th	5th	Total of Five Years
A. Staff Salary	3.25	3.30	3.35	9.90	3.40	3.45	16.75
B. Contingency	3.75	3.85	3.35	10.95	2.75	2.75	16.45
C. Equipments	17.50	0.00.	1.00	18.50	(As per research need)		
TOTALS	24.50	7.15	7.70	39.35	6.15+	6.20+	51.70+

Total project cost is Rs. 39.35* lakhs in three years.

Total project cost is Rs. 51.70* lakhs in five years.

* Some additional cost may be needed for :

- (a) Increased expenditures in pay & allowances.
- (b) Increased cost of Equipments .Chemicals & Glassware needed.
- (c) Additional Equipments if absolutely needed for the research work.

DETAILED PROGRAMME OF WORK

"Proposed Research Programme to Study the Impact of Agrochemicals Run-off from Fields on Surface & Ground Water Quality in Command Areas".

The study is proposed to take up at the sites where irrigation facilities are being availed since five to ten years period or more. Based on the preliminary information, such situations are aspected to be available in the Command areas at :

1. Kunda Command.
2. Satak Command.
3. Intensive well irrigated area adjoining to Dhangoan/Kalmukhi villages of Khandwa Distt. (Near Sanawat on Indore-Road).

A. Selection of the Area :

Field locations in the above mentioned zones of the command will be selected for study. To select the appropriate sites, we have to consider that there must be an intensive cultivation since five to ten years period and the agrochemicals (Fertilizers, Pesticides, etc.) are in use at least as per the recommendations or more.

To identify such locations in the command area, a preliminary survey of the area will be done. Also, the basic information pertaining to the important relevant aspects will be collected from the other sources available.

B. Survey of the Area :

A reconnaissance survey of the above three zones will be conducted to collect the information on :

1. Rainfall.
2. Soil types and their characteristics.
3. Topographical features in the areas.
4. Cropping pattern and cropping intensity, in the areas.
5. Irrigation frequency and period.
6. Intensity of Fertilizer/Pesticide/Fungicides/Herbicides and other Agrochemicals being used in different crops and season.
7. Nature/sources of agrochemicals, being commonly used.
8. Ground water conditions in the areas.
9. Nature of run-off out lets etc.
10. Any other special information of interest.

C. Site Selection :

Considering the available information, the study at the initial stage of investigation will be concentrated to the field sites where the following cropping sequences are common (Any seven only) :

- | | | | |
|----------------------|---|-------------------------|-----------|
| 1. Hybrid cotton | - | Hybrid cotton. | |
| 2. Groundnut | - | Cotton HYV/Sorghum.HYV. | |
| 3. Maize/Sorghum HYV | - | Wheat/Gram. | |
| 4. Banana | - | wheat/Gram | - Cotton. |
| 5. Sugarcane | - | Wheat/Gram. | |
| 6. Vegetable | - | Chillies. | |
| 7. Chillies | - | Cotton HYV. | |
| 8. Soybean | - | Wheat/Gram. | |
| 9. Cotton | - | Moong. | |
| 10. Soybean | - | Wheat | - Moong. |

NOTE :- In each cropping sequence the fields representing the desired situation will be selected on randomization basis.

Replications :

The proposed study and sampling will be confined to three locations in each cropping sequence available in the zone. Thus :

Benchmark Study :

$$3 \times 1 \times 3 = 09$$

Sample Study :

$$\begin{array}{ccccccc} 3 & \times & 7 & \times & 3 & = & 63 \\ \text{sites} & & \text{crop sequences} & & \text{replications} & & \text{sampling sites} \end{array}$$

D. Monitoring :

To monitor the probability of water contamination by the agrochemicals, water samples (runoff & seepage) during rainy season will be collected from the predecided field sites. Also, the water samples from the wells (irrigation wells & drinking water wells), water bodies and water ways will be collected for analysis.

Benchmark Studies on pesticides in the rainfed areas of the monitoring sites will also be taken-up.

The information on Hydro-Geological aspects will be used from Ground Water Hydrology Board.

Water sampling :

Fields : Runoff and seepage water samples (about 200 to 500 ml as per the method of estimations & constituents) from 53 field sites will be collected at 15 days interval in rainy season. It may give 60 samples of runoff & 100 profile water samples at each sampling. In rabi season, water profile samples will be obtained through tensiometers/piezometers, as per irrigation schedule, and in summer season through tensiometers only.

Wells : Water samples from selected wells (5 wells per zone) will be collected at the monthly interval in the post rainy season. The samples will be collected at (i) Static water level (equilibrium condition) & (ii) At middle water level conditions after during/after output.

(a) Command areas - Kunda and Satak.

(b) Outside command area - Dhangoan/Kalmukhi and benchmark sites.

----- WATER SAMPLING PROGRAMME -----	
	! --Rainy--Runoff & seepage--15 days interval ! Season
Field water sampling	! --Rabi--Profile water by tensiometers/piezometers ! Season as per irrigation schedules.
	! --Summer--Profile water by tensiometers. ! Season
Well water sampling	! --Monthly interval 5 wells per zone.
& Water table	
Canal water quality	! --Two months interval.

Canal : Samples of canal water for analysis will be taken at the interval of 2 months (Oct. - Dec. - Feb. - Apr.).

Water table : Monthly and/or as feasible.

Methods of water sampling :- To collect the runoff water samples from the selected fields, the water ways will be modified/modulated to have common drain from where the samples could be obtained just at the outlet of the field. The subsurface drainage water will be collected through the piezometers/tensiometers or auger holes previously located for this purpose.

E. Analysis of Water Samples, Soil & Plant samples :

On the basis of preliminary information, the following constituents are proposed for analysis in a sample. Though, the actual constituents to be estimated in a sample will be decided on the nature of agrochemicals in actual use.

1. Nutrients - Nitrate, Phosphate and Sulphate.
- Zinc, Boron or Mercury :optional.

2. Insecticides-

Organochlorides : BHC, Aldrin, Endosulfan etc.

Organophosphates: Dichlorvos (Novan), Dimethoate (Rogar),
Oxydemeton-Methyl (Metasystox),
Phosphomidon (Dimecron),
Monocrotophos (Novacron), Phorate,
Quinalphos (Ekalux), Malathion etc.

Carbamates : Carbaryl (Sevin).

Synthetic Pyrethroids : Cypermethrin,
Decamethrin & Fenvalerate.

3. Fungicides - Bordeaux mixture, Sulphur, Thiram, Ziram, Zineb
Maneb (M-45), Agrosan, Ceresan etc.

4. Herbicide - 2,4-D, Agromax, Diuron, Fluchloralin (Basalin) etc.

5. Quality test - Potable water at some locations if necessary.

6. Drainage water samples - Through seepage where available.

These constituents will be estimated in different water samples. However, the constituents to be analyse in a given sample will be decided considering the information on the nature of agrochemicals being used by the farmers.

Soil Sampling : Surface (15 cm) & Subsoil (30 cm) samples from the selected fields (i) In the command areas.

- (ii) Outside command area (Rainfed).
(before and after every crop).
- (iii) Basic properties will also be evaluated.

Plant analysis : (i) Foliage.
(ii) Seeds
(iii) Fruits & vegetables.

The constituents to be analysed in the soil or plant parts will be according to the nature of agrochemicals and conditions and/or frequency of it's applications.

Micro-organisms : Biospheral analysis (Laboratory studies)

- (i) Population.
- (ii) Activity.

F. Control Measures :

Field and Laboratory studies will be conducted to evaluate suitable preventive & control measures. The actual plan of work will be formulated after studying the results of first year and the preliminary information of the area under investigation.

G. Methods of Data Analysis :

Factorial Randomized Block Design method of analysis will be used to isolate the variations from various sources. The Toxicity limits will be according to :

- (i) Human consumption.
- (ii) Fisheries, and
- (iii) Plant growth/soil health. point of views.

H. Progress Reports & Plan of Work:

1. Annual report & plan of work - In September month - 5 copies.
2. Three Years Final Report - In September month of fourth year.
3. Five Years Final Report - In September month of sixth year.

Note : No. of copies of report : after three years - 15 copies &
after five years - 40 copies).

The recommendations on control measures are aspected and possible if the project work continued for five years period.

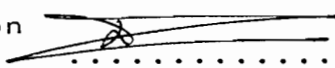
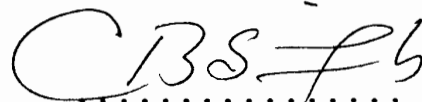
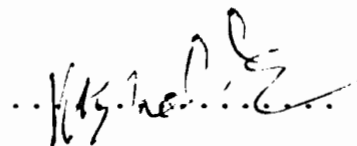

* * *

Annexure - I
MRL values of some pesticides
(FAO/WHO)

Pesticides		Actual Daily Intake (ADI) (mg/kg body weight)	Commodities	MRL (ppm)
1.	Acephate	0.02	Cotton seed	2.0
2.	BHC	NO ADI	-	-
3.	Captan	0.10	Apple	25.0
			Citrus fruits	15.0
			Vegetables	10.0
4.	Carbaryl	0.01	Leafy vegetables	10.0
			Apple, Banana, Beans.	5.0
			Grapes, Pepper, Tomatoes	
			Root crops	2.0
			Cotton seed	2.0
			Poultry	1.0
5.	Cypermethrin	0.006	Cotton seed	0.1
			Tomatoes	0.5
			Potatoes	0.05
6.	2,4-D	0.3	Raw grains, Potatoes	0.2
			Citrus fruits	2.0
7.	Diazinon	0.002	Vegetables and fruits	2.0
			Cotton seed	0.7
			Rice, Wheat	0.1
8.	DDT	0.005	Apple, Pwaches, Vegetables (except root vegetables)	7.0
			Citrus fruit, Mango, Root vegetables.	3.5
			Milk, milk product, eggs	1.0
9.	Dimethioate	0.02	Tree fruit, Vegetable (except pepper & tomatoes), Grapes	2.0
			Pepper, Tomatoes	1.0
10.	Dithio- carbarnates	0.005	Apples, Tomatoes, Peaches,	3.0
			Grapes	5.0
			Beans, Carrots, Cucumbers	0.5
			Wheat	
			Potatoes	0.1
11.	Endosulfan	0.0075	Treat (Manufactured)	30.0
			Fruits and Vegetables	2.0
			Cotton seed	1.0
			Carrots, Tomatoes, Onion	0.2
			Milk, milk products	0.1
12.	Malathion	0.02	Wheat	20.0
			Cabbage, dry fruits, Grapes	8.0
			Pulses, raw cereals	
			Tomatoes and Turnip	3.0
13.	Parathion	0.005	Vegetables, Fruits	1.0
			Tomatoes, Tea	0.2
14.	Fenuvalerate	0.02	Cotton seed	0.2
			Cabbage, Cauliflower	2.0
			Tomatoes, Beans	1.0
			Potatoes, Radishes	0.05
15.	Lindane	0.1	Vegetables	0.5
			Milk and milk products	0.2

CERTIFIED THAT

The research work proposed in the scheme dose not in any way duplicate the research work already done and being carried out elsewhere on the subject.

Name	Designation	Signature
1. Dr. D.L. KAURAW,	Principal Investigation	
2. Dr. C.B. Singh,	Dean Campus	
3. Dr. P.L. Bhalla,	ADR (Nimar Zone)	
4. Dr. D.P. Nema,	Director Research Services	

IX QUARTERLY PROJECT REPORT
(1.10.92 to 31.12.92)

IMPACT ASSESSMENT OF MADHYA PRADESH LANDS TO BE SUBMERGED
UNDER SARDAR SAROVAR PROJECT AND ADJOINING ECOSYSTEMS :
FLORA, FAUNA AND OTHER BIOTIC COMPONENTS

Director
State Forest Research Institute, Polipathar,
J A B A L P U R (M.P.)
January, 1993

IX QUARTERLY PROGRESS REPORT AND REVIEW OF PROGRAMME

PERIOD : 1st October 1992 to 31st December 1992

1 TITLE OF THE PROJECT

"Impact assessment of Madhya Pradesh lands to be submerged under Sardar Sarovar Project and adjoining ecosystem : Flora, fauna and other biotic components".

2 NAME OF THE PRINCIPAL INVESTIGATOR AND INSTITUTION

Director, State Forest Research Institute, Polipathar, Jabalpur - 482008.

3 OBJECTIVES

Objectives set for the present investigation have already been discussed in the previous reports and have not been reproduced here.

4 STUDY SITE OR AREA OF WORK

Already mentioned in previous reports.

5 AREA OF INVESTIGATION DURING THE QUARTER UNDER REPORT

During the period from 1st October 1992 to 31st December 1992, revenue villages and impact villages of Kukshi, Barwani and Manawar tahsils were visited and about 37 villages (27 submergence villages and 10 impact villages) coming under submergence and impact parameters were surveyed (Table 1).

6 PLAN OF WORK FOR THE PERIOD UNDER REFERENCE

- (i) Collection of about 120 plant specimens have been done. The above mentioned plant species are not additional species, their collection had been done previously. Mounting, identification etc.

.. 2 ..

is in progress.

- (ii) Collection of ecological data in identified quadrats in fields has been done and the analysed of data is in progress.
- (iii) The information regarding the plants used for various purposes and mode of their application was compiled.
- (iv) information on wildlife and birds found in the survey areas was collected and listed.
- (v) Socio-economic study has been conducted with special emphasis to livestock, labourer, social status of farmers, agricultural technology, male & female population, status of various ethnic groups etc.
- (vi) Twentyfour revenue villages under submergence of SSP were enumerated during the quarter.

7. METHODOLOGY FOR INVESTIGATION

Methodology followed for the collection of the information pertaining to ecological status, floristic composition, limnological components, enumeration of growing stock, ethnobotanically important plant species, livestock and socio-economic status was the same as described in the previous reports.

8. MONTHWISE WORK DONE

October 1992 : VIII quarterly report of the project was finalised. The data collected from July '92 to Sept '92 was compiled and analysed and submitted to financing authority vide letter No.SFRI/NVDA/126/2541

.. 3 ..

dated 11.3.93. Remaining areas of Barwani and Khargone were visited again for investigation.

November 1992 : Forest areas having different vegetation types were visited in Barwani tahsil (Khargone) Forest villages under impact areas of Kukshi, Barwani, Manawar tahsils and revenue villages of submergence areas were visited. ^(Table-1) Data involved in present investigation methodology were collected.

December 1992 : The survey work has been badly affected due to violence during Ram Janma Bhumi issue tragedy and very little field survey work was done. The work of data compilation and analysis was completed in the Head Quarter at S.F.R.I., Jabalpur.

9. ANALYSIS AND RESULTS

The enumeration work is - > badly affected due to the noncooperation of local villagers and Narmada Bachao participants. The forest staff of survey team was also highly terrorized by the local inhabitants. The enumeration work during the quarter is partially done.

9.2 Ethnobotanical and Ecological Study

The information given by the local villagers and inhabitants was recorded in the field proforma and was tabulated according to their multifarious uses.

In the ecological studies, about 35 quadrats were laid and data were collected with special reference to ecological status of ground vegetation and its frequency, density, abundance were calculated (Table 2 to 7).

9.3 Fauna

Nothing new was observed in the villages surveyed.

.. 4 ..

9.4 Socio-Economic Aspect

Extensive survey was conducted in the submergence area and impact areas of SSP. About 37 villages were surveyed. The main idea of socio-economic survey was to find out per capita annual domestic energy consumption pattern and source of fodder for livestock. During survey it was observed that the popular substitute for firewood was cotton stalks and dung cake (Table 8 to 13).

10. MODIFICATION REQUIRED

Not necessary at this stage.

11. WORK PLAN FOR NEXT QUARTER ENDING ON 31ST MARCH 1993

- i. Survey of villages in impact areas and submergence villages of Dhar, Jhabua and Khargone districts.
- ii. Collection of plant species present in all districts.
- iii. Collection and recording of fauna present in all districts.
- iv. Ethnobotanical studies with special reference to collection of information on multipurpose plant species found in all districts of SSP areas.
- v. Enumeration of tree species in different girth and quality classes in the impact and submergence areas of Khargone and Dhar districts so as to determine the physical depletion of biomass. Value assessment of standing forests in submergence area will be done.
- vi. Assessment of ecological status of flora particularly the plant density, frequency, abundance and cover of ground vegetation and limnological study in remaining villages of SSP areas.

.. 5 ..

- vii. Survey and collection of information in villages regarding dependance of man and his livestock on various forest products in all districts in submergence and impact areas.
- viii. Preparation of X quarterly report of SSP and synthesis of results obtained.
- ix. Survey of villages within 2 kms and 2 to 5 kms from the submergence area. Collection of information on fuel headloads for bonafide use and for earnings. To collect information on forest products.

12 CONSTRAINTS

General opinion of the villagers in submergence areas is not favourable. The activists continue to threaten survey parties and forest staff involved in enumeration work and field survey.

13. FINANCIAL POSITION


Expenditure incurred upto 31.12.92


S.No.	Item	Amount (Rs.)
1.	Honoraria/Salaries	7,84,995
2.	Wages to labourers for assisting field staff	63,274
3.	Contingent field expenses	31,358
4.	T.A./D.A.	60,237
5.	House Rent Allowance	34,367
6.	Seminar, Meetings	31,645
7.	Maintenance of vehicle, P.O.L.	1,06,402
8.	Stationery/Postage/Printing	19,018
9.	Contingent expenses	71,913
10.	Rent for field office/station	38,890
11.	Contractual services - photocopy, drawings, typing	24,628
Grand Total Rs. 12,66,727		

.. 6 ..

Certified that out of total amount Rs.12.98 lakhs an amount of Rs.12,66,727 (Twelve lakhs sixtysix thousand seven hundred twentyseven only) has been incurred on scheme during 1990-91 to 1992-93 i.e. from the starting of the scheme i.e. from 1.9.1990.

Jabalpur,
Dated:


Project Director
&
Director
State Forest Research Institute,
Jabalpur, M.P.


/francis/

.. 7 ..

IX. PHYSICAL WORK DISTRIBUTION**A. OFFICIALS**

- | | | |
|----|--|---|
| 1. | Dr. Ram Prasad,
Addl. CCF, Wildlife,
Bhopal | Scientific supervision,
guidance of the project
and technical guidance
in analysis of data. |
| 2. | Shri A.S. Parihar
Director, SFRI
(from 8/9/92) | Overall supervision, guid-
ance, administration of
the project. |
| 3. | Shri S.P. Singh
Dy. Director (Research)
SFRI, Jabalpur | Workplan and work execution |
| 4. | Dr. Jiten Kumar
Dy. Director (Seed)
SFRI, Jabalpur | Organisation of Work Plan. |
| 5. | Shri B.P. Chaurasia
Nodal Officer (ACF)
SFRI, Jabalpur | Providing guidance and
field camp arrangements,
administration, enumeration
supervision, taking care
of progress. |
| 6. | Dr. R.K. Pandey
SFRI, Jabalpur | Provide guidance for botani-
cal wildlife and ecological
work. |
| 7. | Dr. Pratibha Bhatnagar
SFRI, Jabalpur | Provide guidance for socio-
economic studies. |
| 8. | Shri R.M. Shukla
Dy. Ranger, Indore | Assisting in collection
of field data. |
| 9. | 3 Forest Guards of
RRO Nepanagar | -- " -- |

B. PROJECT ASSISTANTS - FIELD INVESTIGATORS

- | | | |
|----|--------------------|---|
| 1. | Shri G.P. Date | Compilation and analysis
of data, writing of report
etc. |
| 2. | Dr. S.K. Masih | Compilation of data on flora,
ecological studies and
ethnobotanical work. |
| 3. | Shri Ashok Goswami | Fauna and Ecological Studies |

.. 8 ..

4. Shri Anil Shrivastava Socio-economic Survey.
5. Shri D.K. Ghodke Cartography (Mapping etc.)
Dealing of important files.

Table 1. Survey of villages effected due to the Sardar Sarovar Project in this quarter

S.No.	Name of village	Status of village Submergence/Impact
A. Tahsil Kukshi		
1.	Bodhwara	S
2.	Khaperkeda	S
3.	Malagaon	S
4.	Karondia	S
5.	Amla Bardi	S
6.	Batgaon	S
7.	Kadmal	S
8.	Badli	S
9.	Kaswa	S
10.	Rekati	S
11.	Kolgaon	S
12.	Bhawaria	S
13.	Molkhed	S
14.	Malwada	S
15.	Nawdabadi	S
16.	Chandankedi	S
17.	Dhana	I
18.	Susari	I
19.	Nanonda	I
20.	Pipripura	I
21.	Deshwalia	I
22.	Kikarwas	S
B. Tahsil Barwani		
23.	Babultale	S
24.	Awalda	S
25.	Eklara	S
26.	Kukra	S
27.	Pichodi	S
28.	Bhamta	S
29.	Kathora	S
30.	Jangarwa	S
31.	Kalyanpur	S
32.	Nandgaon	S
C. Tahsil Manawar		
33.	Devgarh	I
34.	Sorsi	I
35.	Mandvi	I
36.	Pipaly	I
37.	Loni	I

Table : 2 Green biomass on grounds in Tahsil Barwani

No. of sample land	Biomass g/m ²	Biomass t/ha.
1.	1000	10.00
2.	950	9.5
3.	900	9.0
4.	1050	10.5
5.	910	9.1
6.	800	8.0
7.	870	8.7
8.	620	6.2
9.	710	7.1
10.	940	9.4
11.	810	8.10
12.	720	7.2
13.	600	6.0
14.	790	7.9
15.	1020	10.2
16.	1100	11.0
17.	2250	12.5
18.	1010	10.10
19.	800	8.0
20.	780	7.8
21.	630	6.3
22.	750	7.5
23.	1070	10.7
24.	890	8.9
25.	785	7.85
G.T.	21755	
Mean	870.2	
S.D. \pm	162.47	
S.E. \pm	0.030	

Table 3 Dry biomass on grounds of Barwani Tahsil

No. of samples laid	Biomass g/m ²	Biomass t/ha
1.	295	2.95
2.	280	2.8
3.	265	2.6
4.	290	2.9
5.	270	2.7
6.	240	2.4
7.	235	2.3
8.	190	1.9
9.	200	2.00
10.	230	2.8
11.	255	2.5
12.	225	2.2
13.	195	1.9
14.	240	2.4
15.	295	2.9
16.	230	2.8
17.	300	3.00
18.	235	2.3
19.	230	2.3
20.	200	2.00
21.	225	2.2
22.	275	2.7
23.	245	2.4
24.	215	2.1
25.	200	2.0

G.T. 6160

Mean 246.4

S.D. \pm 35.04S.E. \pm -

Table 4 Green biomass on grounds in Tahsil Manawar

No. of sample laid	Biomass g/m ²	Biomass t/ha
1.	680	6.8
2.	590	5.9
3.	700	7.0
4.	775	7.7
5.	665	6.6
6.	1150	11.5
7.	600	6.0
8.	680	6.8
9.	810	8.10
10.	900	9.0
11.	650	6.5
12.	630	6.3
13.	575	5.7
14.	1050	10.5
15.	880	8.8
16.	680	6.8
17.	785	7.85
18.	825	8.2
19.	920	9.2
20.	640	6.4
21.	725	7.2
22.	1000	10.0
23.	1025	10.2
24.	1050	10.5
25.	1100	11.00

G.T. 20035

Mean 303.4

S.D. \pm 176.65S.E. \pm -

Table : 5 Dry biomass on grounds, Manawar Tahsil

No. of sample laid	Biomass g/m ²	Biomass t/ha.
1.	195	1.95
2.	180	1.8
3.	220	2.2
4.	235	2.35
5.	210	2.10
6.	300	3.00
7.	200	2.0
8.	240	2.4
9.	265	2.65
10.	270	2.7
11.	180	1.8
12.	200	2.0
13.	195	1.9
14.	290	2.9
15.	235	2.3
16.	200	2.0
17.	265	2.6
18.	240	2.4
19.	250	2.5
20.	180	1.8
21.	195	1.95
22.	260	2.6
23.	295	2.95
24.	275	2.75
25.	230	2.8

G.T. 5365

Mean 234.6

S.D. \pm 038.83S.E. \pm 8

Table : 6 Green biomass on ground on Tahsil Kukshi

No. of samples laid	Biomass g/m ²	Biomass t/ha.
1.	750	7.5
2.	1100	11.0
3.	650	6.5
4.	600	6.00
5.	735	7.35
6.	800	8.00
7.	875	8.7
8.	625	6.2
9.	775	7.7
10.	500	5.00
11.	525	5.2
12.	600	6.00
13.	700	7.00
14.	880	8.8
15.	700	7.00
16.	750	7.5
17.	750	7.5
18.	1000	10.0
19.	950	9.5
20.	950	9.5
21.	900	9.0
22.	600	6.0
23.	650	6.5
24.	680	6.8
25.	910	9.10

G.T. 18955
 Mean 758.2
 S.D. \pm 154.57
 S.E. \pm -

Table 7 Dry Biomass on grounds of Kukshi Tahsil

No. of sample laid	Biomass g/m ²	Biomass t/ha.
1.	200	2.0
2.	230	2.3
3.	195	1.9
4.	130	1.3
5.	200	2.0
6.	210	2.1
7.	220	2.2
8.	240	2.4
9.	260	2.6
10.	190	1.9
11.	225	2.2
12.	190	1.9
13.	240	2.4
14.	250	2.5
15.	200	2.0
16.	280	2.8
17.	225	2.2
18.	260	2.6
19.	295	2.9
20.	275	2.7
21.	200	2.0
22.	215	2.1
23.	210	2.1
24.	195	1.9
25.	270	2.7

G.T.	5675
Mean	227
S.D. \pm	32.81
S.E. \pm	-

Table 8 Showing Percentage of cattle grazing in agriculture and forest areas according to the distance from submergence area in

S.No.	Name of village	Limit of cattle grazing	Percentage of cattle grazing		Distance of village from forest	Type of Forest
			Agri area	Forest area		
1.	Bodhwada	3 km	100	-	20 km	cultivated area
2.	Khaparkheda	2 km	100	-	12 km	-do-
3.	Gaihalgaon	2 km	100	-	15 km	-do-
4.	Karondiya	2 km	80	20	8 km	-do-
5.	Rekti	4 km	100	-	18 km	-do-
6.	Batgaon	3 km	100	-	18 km	-do-
7.	Kadmal	3 km	100	-	14 km	-do-
8.	Bajdi	3 km	80	20	10 km	-do-
9.	Raswa	4 km	100	-	20 km	-do-
10.	Kalgaon	3 km	100	-	20 km	-do-
11.	Bhawariya	4 km	100	-	10 km	-do-
12.	Molkhad	3 km	100	-	16 km	-do-
13.	Malwada	4 km	100	-	18 km	-do-
14.	Navadpura	3 km	100	-	15 km	-do-
15.	Chandankhedi	5 km	67	33	5 km	-do-
16.	Kikarwas	5 km	60	40	5 km	-do-

Table 8 Showing percentage of cattle grazing in agriculture and Forest areas according to the distance from Impact area in Dhar District (Kukshi Tahsil)

S.No.	Name of village	Limit of cattle grazing	Percentage of cattle grazing		Distance of village from forest	Type of Forest
			Agri area	Forest area		
1.	Ghana	5 km	60	40	10 km	cultivated area
2.	Susari	3 km	100	-	20 km	-do-
3.	Nanoda	4 km	100	-	20 km	-do-
4.	Pipaly	4 km	100	-	22 km	-do-
5.	Deshwaliya	4 km	100	-	20 km	-do-
6.	Lani	3 km	100	-	22 km	-do-

Table 10 Per Capita Annual Domestic Energy consumption
in submergence area of S.S.P. in Khargone
District (Barwani Tahsil)

Distance from forest	Name of Village	No. of Respon- dent	Per Capita Annual Energy consumption in quintals		
			Fuelwood	Agri Resi due	Cake Dung
1. Near Forest	Awalda	50	3.23	3.69	1.23
2. Near Forest	Pichhodi	83	3.36	3.69	1.27
3. -do-	Bhamta	23	4.02	2.97	0.79
4. -do-	Kathora	45	3.51	3.98	1.32
5. -do-	Jagarwa	51	4.49	2.39	1.40
6. -do-	Kalyanpura	35	3.76	3.89	0.96
1. Away from Forest	Nandgaon	38	3.23	3.59	1.31
2. -do-	Eklara	20	1.01	6.29	0.85
3. -do-	Kukra	40	1.23	6.54	0.94

Table 11 Showing percentage of cattle grazing in agriculture
and forest areas according to the distance from
submergence area in Khargone District (Barwani Tahsil)

S.No.	Name of village	Limit of cattle grazing	Percentage of Cattle grazing		Distance of village from forest	Type of Forest
			Agri Area	Forest Area		
1.	Awalda	5 km	11	89	5 km	cultivated area
2.	Pichhodi	5 km	9	91	5 km	-do-
3.	Bhamta	4 km	15	85	4 km	-do-
4.	Kathora	5 km	16	84	5 km	-do-
5.	Jangarwa	3 km	10	90	3 km	-do-
6.	Kalyanpura	5 km	17	83	5 km	-do-
7.	Nandgone	3 km	86	14	15 km	-do-
8.	Eklara	2 km	90	10	20 km	-do-
9.	Kukra	3 km	91	9	16 km	-do-

Table 12 Per Capita Annual Domestic Energy Consumption
in submergence of S.S.P. in Dhar District
(Kukshi Tahsil)

Distance from forest	Name of village	No. of Respondent	Per capita Annual Energy consumption in quintals		
			Fuel wood	Agri Resi due	Cake Dung
1. Away from forest	Bhodhwada	35	.68	6.29	1.22
2. -do-	Khaparkhedi	50	.89	5.97	0.98
3. -do-	Gainalgene	20	.75	6.45	4.34
4. -do-	Karondiya	35	.90	5.88	1.24
5. -do-	Revti	20	1.10	4.93	2.03
6. -do-	Batgaon	10	.82	6.03	0.93
7. -do-	Kadmal	50	.75	6.36	0.75
8. -do-	Bajdi	30	.93	5.78	1.45
9. -do-	Raswa	30	.98	6.21	0.89
10. -do-	Kalgone	48	.85	5.90	1.35
11. -do-	Bhawariya	100	.94	5.78	1.68
12. -do-	Malkhad	15	.102	5.86	1.03
13. -do-	Malwada	40	.79	6.02	0.94
14. -do-	Navadpura	30	1.50	5.36	1.45
15. -do-	Chandankhedi	52	2.02	3.98	1.78
16. -do-	Kikarwas	60	1.98	3.86	1.91

Table 13 Per Capita Annual Domestic Energy Consumption in
Impact area of S.S.P. in Dhar District (Kukshi Tahsil)

S.No.	Distance from Forest	Name of village	No. of Respon dent	Per Capita Annual Energy consumption in quintal		
				Fuel wood	Agri Resi due	Dung cake
1.	Near Forest	Ghana	30	3.89	2.39	1.80
2.	Away from Forest	Susari	200	2.54	4.02	1.69
3.	-do-	Nanoda	69	.89	5.69	0.98
4.	-do-	Pipalya	125	.81	6.92	0.83
5.	-do-	Deshwaliya	30	.93	6.35	0.96
6.	-do-	Loni	100	.95	5.04	1.24

FIRST SIX MONTHLY REPORT

(1 st JULY to 31 st DECEMBER 1992)

ON

**" STUDY ON HEALTH ASPECTS IN PROJECT
AREA OF NARMADA SAGAR THROUGH EPIDEMIOLOGICAL SURVEILLANCE ".**

BY

DEPARTMENT OF PREV.&SOCIAL MEDICINE

GANDHI MEDICAL COLLEGE, BHOPAL

**STUDY OF HEALTH ASPECTS IN PROJECT IMPACT AREA
OF NARMADA SAGAR THROUGH EPIDEMIOLOGICAL SURVILLANCE**

SUMMARY

Morbidity survey was undertaken in 32 Villages of Punasa area which are to be submerged in near future. Total 500 families were covered consisting of 3111 persons. 18.19 percent of them had at least one spell of sickness during preceeding six months. Out of these sick persons 'time lost sickness' was only in 8.3 percent, with approximately 9 days being lost on an average by each person in each spell i.e. 5 percent of time was lost.

In post impoundment area, that is Tawa area, 26 villages were seen and 500 families surveyed for morbidity consisting of 2871 persons. 20.65 percent of persons had complaint of one or more spells of sickness during previous six months. However time lost sickness was reported by only 470 persons i.e. 16 percent. Each of them on an average lost about 9.5 days due to sickness in six months.

Average Family size was 6.2 in pre impoundment area while it was 5.7 in Post impoundment area. Family formation pattern is nearly the same with slight difference which is not significant. More than two third of people are illiterate in both the areas.

77 percent of males in pre impoundment area and 85 percent of them in post impoundment area are engaged in Agriculture as occupation. 88 percent and 90 percent of families belonged to

...2

-2-

middle income group in pre and post impoundment areas respectively.

Demographic changes in population appear to have been increased. Birth rate in pre-impoundment area is nearly 39 per thousand, while it has been observed to be nearly 60 per 1000 population in post impoundment area. Similarly death rates are 8.4 and 12.5 per 1000 population in pre and post impoundment areas respectively. This observation had to be watched carefully in next survey.

Majority of population in both areas prefer allopathy system of treatment, but they go to private practitioners (92 and 81 percent). More than 95 percent of them by untrained dai. 48 percent of children below 6 years of age have been found to be unimmunized and on an average 30 percent of them were partially immunized.

20.3 percent of children below 6 years were malnourished to the grade III and IV in pre impoundment area, while this percentage was 26.7 for post impoundment area. 75 and 68 percent of these children reported sickness in pre and post impoundment are respectively.

Future plan of survey will be to consolidate the baseline data in punasa area of submergible villages. 1000 families in group of villages will be the subjects for intensive study for water related and water borne diseases. Observations of birth and deaths will be verified. Complete medical check up will be

...3

-3-

undertaken in sample. Similarly 1000 families in post impoundment area will be studied in detail with factors affecting morbidity and mortality rates.

RECOMMENDATIONS

The team entered the field only in Sept. '92 and period is too short to recommend any long term programme. However looking to Literacy in adults and immunization and Nutritional status in children, extensive health education for utilization of available health services is must. This will assure psycho-social rehabilitation also. Alongwith Health education for utilization of services the Govt. Health agency should be available to population at such a distance, that their routine work is not disturbed. For this Mobile Clinics can be suggested with an Educator and Laboratory Technician alongwith a physician. The need is to reduce the period of Radical treatment of Malaria after taking Blood slide. If Technician is available in Van, Radical treatment can be stated the same day. Under such conditions the case will not get time to transmit the infection to others for long time, i.e. existing situation at present. A.P.I. in Pubasa area is 5.0 per 1000 population and for Tawa is post impoundment area it is 0.23 per 1000 population.

....4

-4-

INTRODUCTION

Marmada project involves construction of 29 major dams, 135 medium size and approximately 3000 small irrigation schemes in Madhya Pradesh. Construction of dams is mainly utilized in irrigation of land and hydroelectric power generation. Thus irrigation systems have become an important economic component of agricultural development in many developing countries.

Major benefits of successful irrigation schemes include increased food production and income, thus increasing the potential for better nutrition and health. There many also be better access to safe drinking water and sanitation. But the negative aspect is that irrigation systems are often associated with an increased incidence of disease (Tiffen 1989, Yoder 1983).

Especially in the tropics, irrigation schemes carrying a highrisk of vector born and water related diseases. More than 30 diseases have been linked to irrigation (Hunter 82 Music, 87 Tiffen, 89). Vector born disease transmission is aggravated by man-made environmental changes that favour proliferation of vector. Main vector borne diseases in these areas are Malaria and Palaria. Effects of water resources development on health are reviewed by Hunter et at (1982) in many countries, viz-Brazil, Egypt, Kenya, Malayasia, Mali, Nigeria etc. He has come to the conclusion that water resource development projects always lead to a higher incidence of vector born diseases.

.....5

-5-

For example the implementation of a large irrigation scheme on the Cukurova plain of Turkey in 1970 resulted in a resurgence of endemic malaria. Wijesundra (1988) has also reported rise in malaria incidence in Sri Lanka after development of irrigation scheme of the Mahaweli River basin.

Although there have been many studies on irrigation and health, only in a limited studies it has been possible to base conclusions on a comparison of pre and post implementation surveys. The present study too in its initial stage shall compare health and morbidity in pre impoundment area with that of a place where already the dam has been constructed but in the later stages when base-line data is available for pre-impoundment area, it will be compared with health and morbidity data after completion of the water reservoir.

SAMPLE As per MCU, 1000 families each from pre and post impoundment area were to be surveyed. Due to some loss of time in recruitment etc only 1000 families in all could be surveyed.

A list of affected villages was obtained for both pre and post impoundment areas and the villages (Affected & to be affected were classified as follows.

(TABLE - 1)

....6

-6-

TABLE - 1 DISTRIBUTION OF FAMILIES AS PER SIZE OF
VILLAGE POPULATION

TYPE OF VILLAGE ACCORDING TO POPULATION	TOTAL NO. OF VILLAGE	VILLAGE COVERED	TOTAL POPUL	FAMILY COVERED	POPULATION COVERED
---	-------------------------	--------------------	----------------	-------------------	-----------------------

(A) PRE IMPOUNDMENT AREA - PUNASA

1. POPULATION 1-200	44	3	53094	21	143
2. POPULATION 201-500	85	13	30202	154	1021
3. POPULATION ABOVE 501	87	16	75491	325	1947
TOTAL (A)	216	32	110922	500	3111

(B) POST IMPOUNDMENT AREA - TAWA

1. POPULATION 1-200	21	16	1974	235	1365
			35.09%	(97.0)	
2. POPULATION 201-500	7	9	1999	173	982
			35.5%	(34.6)	
3. POPULATION ABOVE 501	3	3	1651	92	524
TOTAL (B)	44	28	5624	500	2871

In the pre impoundment area to be partially submerged and to be fully submerged both type of villages were covered keeping in view that the morbidity study is to be done for 3 consecutive years, villages of phase III and IV were selected for

.....7

-7-

the study. In the post impoundment area of Tawa Dam morbidity survey was undertaken in the partially submerged villages and in the villages where total population was shifted because of construction of dam.

WORK under this study was initiated from 1st July 92. It took nearly two months for advertisement, interviews and appointments for the following posts.

SRG -1	MSW (M) 1
ARC -1	MSW (F) 1
Stat.Asst-1	Attendant - 1
Lab Tech-1	

A questionnaire/proforma was developed for the study which included Demographic and socio-economic factors, Environmental factors, morbidity both recent and chronic, immunization & nutritional status of preschool children and births and deaths in the community. Pretesting of the proforma was done in approximate 100 families at pre impoundment areas of Indira Sagar project. It took nearly one month for complete designing of proforma and its field testing. Relevant modifications were made in the proforma after pretesting. Thus from Oct.92 actual survey work in pre and post impoundment areas could be started.

Total 1000 families were surveyed in pre and post impoundment areas of Indira Sagar project and Tawa Dam areas respectively. At the time of survey in villages, they were distributed medicines free of cost. Relevant laboratory investigations were carried out. Weight and height measurement was done

-8-

for children in 0-6 yrs age group. Slides for malaria and Filaria were prepared and examined in small samples.

Completed proformas were checked, edited and manual analysis was done.

RESULTS are being described below under following heads:-

1. General profile.
 - 1.1 Religion & Caste
 - 1.2 Family Size
 - 1.3 Socioeconomic status
 - 1.4 Demographic features.
 - 1.5 Addition.
2. Environmental sanitation
 - 2.1 Housing
 - 2.2 Ventilation & Overcrowding
 - 2.3 Waste disposal
 - 2.4 Water supply
3. Morbidity
 - 3.1 prevalence of Diseases in previous six months
 - 3.2 Incidence of Diseases in a fortnight.
 - 3.3 Age & Sex specific morbidity
 - 3.4 Factors affecting morbidity.
 - 3.5 prevalence of Chronic Diseases.
 - 3.6 Duration of restricted working.
 - 3.7 Disability.

....9

-9-

- 4. Mortality
 - 4.1 Age, Sex and cause specific
- 5. Utilization of Health services
 - 5.1 place of treatment
 - 5.2 place of Delivery.
 - 5.3 Immunization status

1. GENERAL PROFILE

The present study was carried out in 500 families each in pre and post impoundment areas. At pre impoundment site 500 families surveyed, 409 (81.8%) are from the villages likely to be partially submerged and remaining 91 families are from the villages which shall be fully submerged after construction of dam. At post impoundment site 333 families surveyed belonged to villages which were partially submerged and 167 families belonged to villages which were fully submerged after construction of dam.

1.1 RELIGION & CASTE :

In post impoundment area 100% population surveyed belonged to Hindu religion, whereas it constituted, 94.6% (473 families) of surveyed population in preimpoundment areas. Percentage of scheduled tribes was much higher (76.8%) in post-impoundment area. In all Scheduled Caste and Scheduled Tribes constituted 54.2% and 89.4% in pre & post impoundment areas respectively.

(Table 3 & 4)

....10

-10-

1.2 FAMILY SIZE :

Proportion of joint families was little higher 268 (53.6%) in pre impoundment area while that of nuclear families was little higher 263 (52.6%) in post impoundment area. Average family size in pre impoundment area was 6.22 and 5.74 in post impoundment area. (Table 5 & 6)

1.3 Socio economic status :

In both the areas major part of population was illiterate i.e. 1864 (69.2%) in pre impoundment area and 1756 (84.71) in post impoundment area. Female literacy was 15.6% and 8.02% respectively.

Main Occupation in both the areas was farming. Agriculture labour and unskilled labour. 88.8% families in preimpoundment areas and 90.4% families in post impoundment area belonged to socio-economic class III & IV of modified Prasad's classification. (Table 7, 8 & 9).

1.4 DEMOGRAPHIC PROFILE

Below 15 yrs. population was 42.4% and 44.2% in pre and post impoundment area respectively. Which is similar to the proportion of population in the said age group in other parts of the country. 16-65 Yrs age group comprised 54.4% in pre impoundment & 54.1% in post impoundment area, while elderly above 65 yrs were 3.03% & 1.39% respectively. (Table 10)

In all 120 births were recorded from preimpoundment area, giving rise a birth rate of 38.5 (x) per 1000 popul.

....11

-11-

while 173 births were recorded in post impoundment area. Thus birth rate in post impoundment area (60/1000 popul) was much higher as compared to pre impoundment area..

A total of 26 deaths were recorded in pre impoundment area as compared to 36 deaths in post impoundment area.

1.5

ADDICTION

Addiction was more common in males than females and more in post impoundment area than preimpoundment area whereas 44.75% males and 14.2% females were addicted to Tobacco or Alcohol in postimpoundment area, 37.2% males and 6.22% females were addict to these things in preimpoundment area, males in the age group 36-45 years were maximum addicts in both the areas; while maximum no. of females were addict in 46-55 year age group in both the areas. (Table 11)

2.

ENVIRONMENTAL SANITATION

2.1

HOUSING

In both the areas majority of houses were Kuccha i.e. 431 (86.2%) and 456 (91.2%) in pre and post impoundment areas respectively. 64 (12.8%) houses in punasa and 40 (8.0%) houses in Tawa area were semipakka. (Table 16)

2.2

VENTILATION AND OVERCROWDING

Ventilation was adequate in 241 (48.2%) houses in pre impoundment area as compared to 245 (49.0%) in post

....12

-12-

impoundment area. In 316 (62.2%) houses overcrowding was present at punasa site while in Tawa area 276 (55.2%) houses were identified with overcrowding. (Table 17, 18)

2.3 WASTE DISPOSAL

In both the areas mostly people dispose off their refuse by indiscriminate throwing only 37.8% families in preimpoundment area and 24.8% families in post impoundment area using dumping method for refuse disposal. Similarly for disposal of waste water there is practically no system. In both the areas majority of families have open drainage soakage pits are non existing. (Table 19)

98.6% families in pre impoundment area and 99.4% families in post impoundment area are practising open field defecation.

2.4 WATER SUPPLY

In both the areas the main source of drinking was hand pump i.e. in 266 (53.2%) and 375 (75.0%) surveyed families in punasa and Tawa area respectively. This was followed by well in 130 (26.0% houses in punasa area and 84 (16.8) houses in Tawa area respectively. (Table 20)

3.0 MORBIDITY:

3.1 PREVALENCE OF DISEASES IN PREVIOUS 6 MONTHS:

Over all prevalence of morbidity in post impoundment area (i.e. 20.65%) was slightly higher than that in the

-13-

preimpoundment area (18.19%) in last six months. The main cause of illness in both the area was fever. As per symptoms mentioned by respondents majority of these seem to be malaria cases. Next in order of frequency were Respiratory infections (1.25%) and diarrhoeas (0.98%) in preimpoundment area, while they were Diarrhoea (1.65%) & Resp inf (0.48%) in post impoundment area.

(Table 12)

3.2 INCIDENCE OF DISEASES IN A FORTNIGHT:

Overall incidence of morbidity in all ages at the time of survey was 17.87% and 15.18% in pre & post impoundment area respectively. Fever and Respiratory infection were the two most common causes of illness at the time of survey.

(Table 13)

3.3 AGE & SEX SPECIFIC MORBIDITY

In preimpoundment area maximum morbidity in males was in 1-4 yr age group (39.7%) followed by 0-1 yr age (30.0%) and above 56 yr. age group (18.4%). In females also highest morbidity rate was observed in 1-4 year age group (30.3%) followed by 0-1 year age group (20.0%).

In the post impoundment area also infants and 1-4 yr age children had highest morbidity rates. while 20.0% male infants and 19.8% male children were diseased at the time of survey, corresponding figures for females were 35.8% and 31.0% respectively. (Table 14)

3.4 FACTORS AFFECTING MORBIDITY:

3.4.1 Socio Economic class :

Morbidity in different socio economic caused was similar. Both recent (within a fort night) as well as past

-14-

(last 6 months) morbidity was compared with socioeconomic class. It can be concluded that no significant difference was observed in incidence and prevalence of morbidity in relation to socioeconomic class. (Table 15)

3.4.2 HOUSING

Morbidity in Kuchha and semipucca houses in both the areas was similar in nature. Proportion of pucca houses in these areas was too small (1&4 in pre and post impoundment area respectively) to draw any conclusion. (Table 16)

3.4.3 VENTILATION & OVERCROWDING :

In pre impoundment area frequency of disease 218(90.97%) was slightly less in adequately ventilated houses. But no such difference was observed in relation to overcrowding,

In post impoundment area prevalence of morbidity (last 6 months) was less in adequately ventilated houses. But not much difference was observed in relation to overcrowding. (Table 17,18).

3.4.4 SOURCE OF WATER SUPPLY

Main source of water supply in both the areas were handpumps followed by well. No significant difference was observed between morbidity and source of water supply in these areas. (Table 20)

....15

15.

3.4.5 WASTE WATER DISPOSAL

In both the study areas majority of houses had open drain for disposal of waste water. Morbidity in these areas was proportionate to house ~~to~~ surveyed and no clear cut difference was observed between morbidity and method of waste water disposal. (Table 19)

3.4.6 NUTRITIONAL STATUS & MORBIDITY

Nutritional Status of 0-6 Yr. children was classified as per I.A.P. classification of malnutrition. Only 16.4% children in preimpoundment area and 26.4% children in post impoundment area were well nourished. Morbidity rates were much higher (i.e. 75.76% and 68.60%) in severely malnourished children as compared to well nourished children. (Table 21)

3.5 CHRONIC ILLNESS

Prevalence of Chronic diseases was maximum in above 65 yr age group in both the areas. (18.08% and 35.0% in Punasa & Tawa area respectively) followed by in the age group. 46-65 year Cataract was the most common chronic disease. Other diseases responsible for chronic illness were T.B., Anaemia, Amoebiasis Asthma & Chronic bronchitis etc. (Table 22)

3.6 DURATION OF RESTRICTED WORKING

Duration of restricted working / work loss days was calculated for both the areas. In pre impoundment area a

.....16

-16-

total of 2205.5 man days were lost due to morbidity. Maximum days were lost due to Malaria (1711.9 days) and fever (105.6 days), followed by diarrhoea (86.3 days).

In post impoundment area the total days of work loss were much more (4519.6 days). The mean duration of work loss was maximum for Malaria (9.73 days) followed by ~~the~~ Diarrhoea (9.35 days). (Table 23)

3.7 DISABILITY

19 and 28 persons were found disabled in pre & post impoundment area respectively. Giving rise to a prevalence rate of & respectively. (Table 24)

4.0 MORTALITY

4.1 Age, Sex & Cause Specific

A total of 26 deaths in preimpoundment area ~~xx~~ and 36 deaths in post impoundment were recorded. Thus crude death rate in these areas was 9.35 and 12.53 per 1000 population respectively.

Infant mortality rate was 83.3 and 92.5 per 1000 live births in pre and post impoundment area respectively.

No significant difference was observed in sex distribution of deaths.

....17

-18-

immunized. proportion of non immunized children was almost similar in both the areas (i.e. 47.92% and 48.28% respectively). Thus immunization services are also poorly utilized in these areas.

(Table 30)

....

NARMADA GHATI PROJECT UNDER P.S.M. DEPT.

Expenditure Statement With Effect From :-

July 1992 TO DEC. 1992

AlLOTment	EXPENDITURE
Rs:- 184000 = 00	Bank exchange charges & P&F charges Rs:- 562 = 00
Interest Rs:- 1018 = 90	Exp. in Pay head up to Dec. 1992 Rs. 80934 = 00
	Electronic Typeewriter Rs. 30022 = 00
	P.O.-L, Repair of Vehicle etc. (11531) Rs.- 14591 = 00
	Stationary Rs. 1823 = 00
Rpts:- 185,018 = 90	Total Exp. Rs:- 1,27,932 = 00
CP Bal. NIL	CL Bal Rs. 57056 = 90
Total 1,85,018 = 90	G Total Rs. 1,85,018 = 90

NR:-

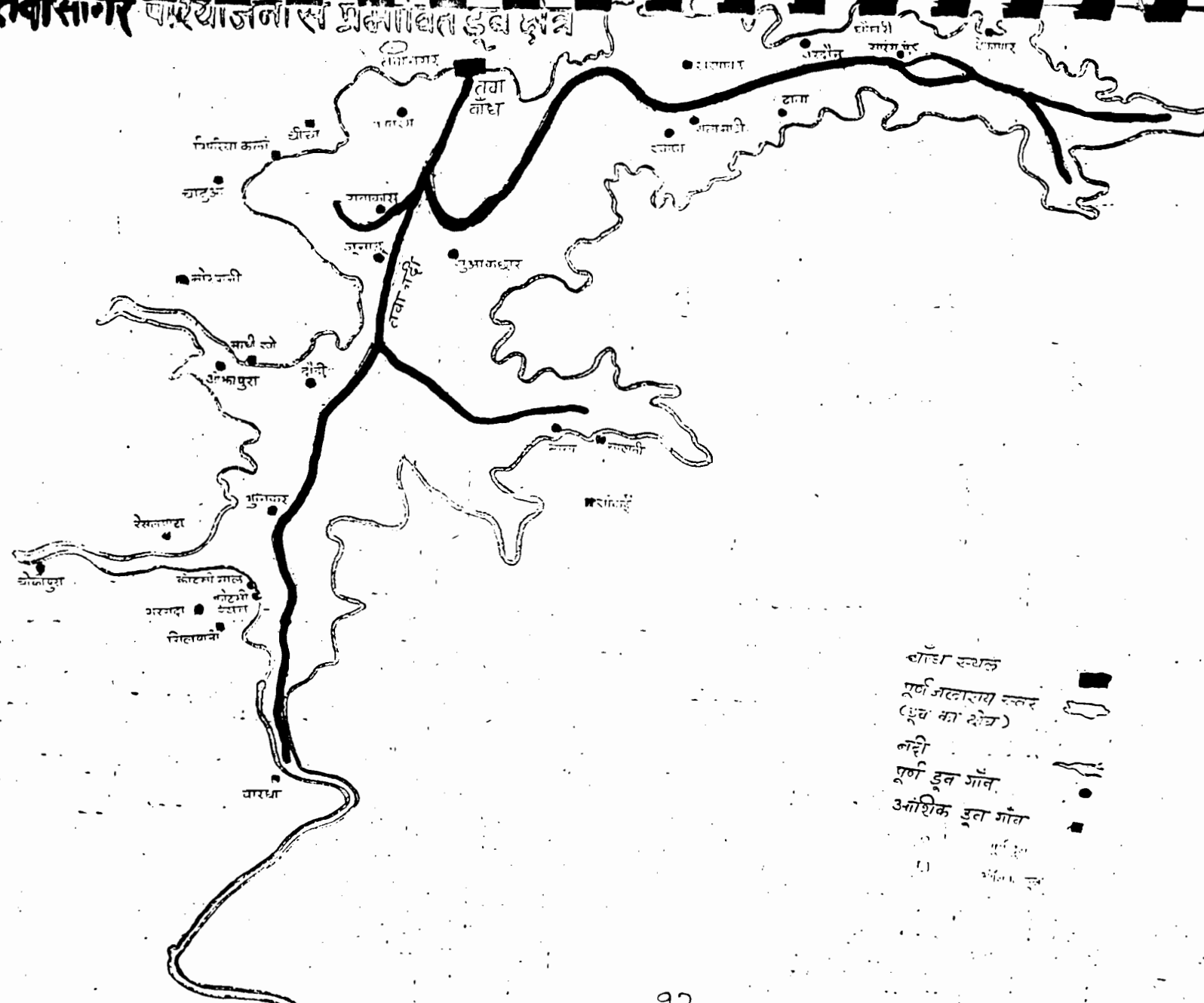
चूंकि जेन का भुगतान दिनांक 28 8 92
 किया गया है और मात्र 57056 का भुगतान शेष
 है से शेष 57056 = 90 अंकित है।

Signature
 19/11/93

an-

पुस्तकालय रत्नसंग्रहालय





DISTRUBUTION OF TYPE OF VILLAGES
COVERED UNDER STUDY

	FULLY SUBMERGED					PARTIALLY SUBMERGED					
	TOTAL	VILLAGE	TOTAL	NO.OF	POPN.	TOTAL	VILLAGE	TOTAL	FAMILY	POP.	TOTAL F
	VILLAG	COVERED	POPN.	FAMIL.	COV.	VILLAG	COVERED	POPN.	COVER	COVER	COVERED
PRE IMPOUNDMENT	38	04	16667	91	528	178	28	94385	409	2583	500
POST IMPOUNDMENT	14	12	*	167	950	30	14	*	333	1921	500

NOTES:-

- * Population of villages in post impoundment area according to submergence not known .

Above table shows how many families were taken from fully submerged & Partially submerged villages in each area their population is also shown.

TABLE NO. - 3

**DISTRIBUTION FAMILIES ACCORDING
TO RELIGION**

PRE- PRE IMPOUNDMENT AREA				POST IMPOUNDMENT AREA		
RELIGION	NO OF FAMILY	%	PCPN.	NO OF FAMILIES	%	POPULATION
1/ HINDU	473	94.6	2898	500	100.0	2871
2/ MUSLIM	27	5.4	213	0	0.0	-
3/ CHRISTIAN	00	00	00	0	0.0	-
4/ OTHERS	00	00	00	0	0.0	-
TOTAL	500	100	3111	500	100.0	2871

In both the areas Hindus formed major portion of the surveyed Population.

TABLE NO:- 4

DISTRIBUTION OF FAMILIES ACCORDING
TO CASTE

PRE IMPOUNDMENT AREA				POST IMPOUNDMENT AREA		
CASTE	NO.	%	POPULATION	NO.	%	POPULATION
1 - S.C.	144	28.8	927	63	12.6	326
2 - S.T.	127	25.4	738	384	76.8	2243
3 - OTHERS	229	45.8	1446	53	10.6	302
TOTAL	500	100	3111	500	100	2871

Scheduled tribes are the main caste in post impoundment area of Tawa Dam. Where it constituted 76.8 % of the surveyed population . In all scheduled caste and shceduled tribes constituted 89.4 % of surveyed Families in post impoundment area as compared to 54.2 % in pre impoundment area.

TABLE No.:- 5

TABLE SHOWING TYPE OF FAMILIES
IN THE STUDY AREA

TYPE OF FAMILY	PRE IMPOUNDMENT AREA			POST IMPOUNDMENT AREA		
	NO.	%	POPULATION	NO.	%	POPULATION
1/ NUCLEAR	232	46.4	1102	263	52.6	1286
2/ JOINT	268	53.6	2009	237	47.4	1585
TOTAL	500	100.0	3111	500	100.0	2971

In pre impoundment area, proportion of joint families was little higher (53.6%) while in post impoundment area nuclear families were more in number (52.6 %) .

TABLE No. 5-6

DISTRIBUTION ACCORDING TO FAMILY SIZE

PRE IMPOUNDMENT AREA			POST IMPOUNDMENT AREA	
FAMILY SIZE	NO.	%	NO.	%
UP TO 4 MEMBERS	136	27.2	148	29.6
5-6 MEMBERS	175	35	190	38
7-8 MEMBERS	105	21	109	21.8
8-10 MEMBERS	40	8	38	7.6
10 + MEMBERS	44	8.8	15	3
TOTAL	500	100	500	100
AVERAGE FAMILY SIZE	6.22		5.74	

OBS:- In pre impoundment area 83.2% families had family size of up to 8 members while in post impoundment area 89.4 % families were in this category Average family size was 6.22 and 5.7 in pre and postimpoundment area respectively.

TABLE NO:- 7

TABLE SHOWING EDUCATIONAL QUALIFICATION

EDUCATIONAL QUALIFICATION	PRE IMPOUNDMENT AREA						POST IMPOUNDMENT AREA					
	MALE	%	FEMALE	%	TOTAL	%	MALE	%	FEMALE	%	TOTAL	%
1. ILLITERATE	809	56.06	1055	84.4	1864	69.22	702	75.88	1048	91.92	1756	84.7
2. JUST LITERATE	46	3.19	39	3.12	85	3.16	37	3.96	12	1.05	49	2.3
3. PRIMARY	388	26.89	125	10	513	19.05	71	7.66	62	5.43	133	6.4
4. MIDDLE	137	9.49	27	2.16	164	6.09	93	9.96	15	1.13	108	5.2
5. HIGHER SEC.	33	2.28	03	0.24	36	1.34	19	2.03	02	1.17	21	1.0
6. GRADUATE	25	1.73	00		25	0.93	03	0.32	00	0.0	03	0.1
7. POST GRADUATE	05	0.34	01	0.08	06	0.22	02	0.21	01	0.087	03	0.1
TOTAL	1443		1250		2693 *		933		1140		2073 *	

*;- Does not include population of 0-6 yr. children.

Above table shows the educational Qualification, in pre Impoundment area 56.0% Male were illiterate, and those educated in which majority 26.8% were up to primary level, while 84.4% female were illiterate and mostly those educated 10% up to primary level. In Tawa 75.88 % Male were illiterate, and in literate 9.9% were educate up to Middle. While female were 91.9% illiterate, and 5.4% were educated up to primary In study area female literacy rate is very low. Which inturre leads to poor care, ignorance regarding disease and needs more motivation to use health facilities.

TABLE NO:- 8

SHOWING OCCUPATION OF PERSONS
ABOVE 18 YR.

	PRE IMPOUNDMENT AREA						POST IMPOUNDMENT AREA					
	MALE	%	FEMALE	%	TOTAL	%	MALE	%	FEMALE	%	TOTAL	%
1. FARMER	545	64.8	64	8.31	609	37.80	482	64.44	127	15.29	599	40.68
2. AGRICULTURAL LABOUR	104	12.37	75	9.74	179	11.11	155	20.72	104	14.86	259	17.89
3. SKILLED WORKER	52	6.18	03	0.39	55	3.41	21	2.81	06	0.96	27	1.85
4. UNSKILLED WORKER	101	12.01	22	2.86	123	7.64	78	10.43	28	4.00	106	7.32
5. VENDER	08	0.95	00	00	08	0.5	00	0.0	00	0.0	00	00
6. SERVICE CLASS	22	2.62	01	0.13	23	1.43	10	1.34	07	1.00	17	1.17
7. SHOPKEEPER	08	0.95	00	00	08	0.5	02	0.27	04	0.57	06	0.41
8. HOUSEWIFE	00	0.0	605	79.57	605	37.55	00	0.0	444	63.42	444	30.66
9. PROFESSIONAL WORKER	01	0.12	00	00	01	0.06	00	0.0	00	0.0	00	0.0
TOTAL	841	100.0	770	1000	1611	100.0	748	100.0	700	100.0	1448	100 %

Major occupation of villages in both the areas was farmer (37.8% & 40.68%) , Agriculture labour (11.1 % & 17.89 %) and unskilled labour (7.64% & 7.32 %). 79.5 % females in preimpoundment area and 63.4 % females in postimpoundment area were working as house wife.

TABLE No- 9

DISTRIBUTION OF FAMILIES AS PER
SOCIO ECONOMIC CLASSIFICATION

S.E. CLASS	PREIMPOUNDMENT			POST IMPOUNDMENT		
	FAMILIES		POPULATION	FAMILIES		POPULATION
	No.	%		No.	%	
I	04	0.8	19	1	0.2	02
II	30	6.0	147	17	3.4	69
III	195	39.0	1132	159	31.8	793
IV	249	49.8	1538	298	59.6	1640
V	22	31.0	165	25	5.0	210
TOTAL	500	100.0	3001	500	100.0	2714

Maximum population in both the areas was from socio economic class IV.

100

TABLE NO:- 10

AGE & SEX DISTRIBUTION OF THE
SURVEYED POPULATION

AGE	PRE IMPOUNDMENT AREA						POST IMPOUNDMENT AREA						GRAND TOTAL	
	MALE	%	FEMALE	%	TOTAL	%	MALE	%	FEMALE	%	TOTAL	%	NO.	%
0-1	60	3.64	50	3.41	110	3.53	90	6.18	67	4.72	157	5.46	267	4.44
1-4	176	10.69	145	9.89	321	10.32	156	10.72	174	12.27	330	11.49	651	10.81
5-15	474	28.81	418	23.56	892	28.67	413	28.40	370	26.11	783	27.27	1675	28.01
16-25	287	17.44	275	18.75	562	18.06	249	17.12	268	18.91	517	17.83	1079	18.01
26-35	166	10.09	132	9.0	298	9.58	147	10.11	127	8.96	274	9.54	572	9.54
36-45	92	5.59	101	6.88	193	6.2	111	7.63	114	8.04	225	7.84	415	6.91
46-55	75	4.55	69	4.7	144	4.62	55	3.78	38	2.68	93	3.24	237	3.91
56-65	50	3.03	44	3.0	94	3.02	23	1.58	17	1.19	40	1.39	134	2.21
TOTAL	1645		1466		3111		1454		1417		2871		5982	

The table depicts majority of people of both sexes belong to age group 5-15 years (28.6 %, 28%), followed by 16-25 group (18.%, 18 %) and 26-35 years (15.% 15%) The trend is similar in both areas.

TABLE NO:- 11

DISTRIBUTION ACCORDING TO TYPE OF ADDICTION

TYPE OF ADDICTION	PRE IMPOUNDMENT AREA						POST IMPOUNDMENT AREA					
	MALE	%	FEMALE	%	TOTAL	%	MALE	%	FEMALE	%	TOTAL	%
1. NIL	886	62.88	1192	93.78	2078	77.54	684	55.25	984	86.01	1668	72.03
2. SMOKER	244	17.32	09	0.71	253	9.44	136	10.99	07	0.61	143	6.00
3. ALCOHOLIC	123	8.73	57	4.49	180	6.72	70	5.65	25	2.19	95	3.99
4. TOBACCO CHEWING	104	7.38	13	1.02	117	4.37	159	12.84	127	11.10	286	12.01
5. (2 + 3)	26	1.85	00	0.0	26	0.97	115	9.29	00	0.0	115	4.93
6. (2 + 4)	03	0.21	00	0.0	03	0.11	30	2.42	00	0.0	30	1.26
7. (2 + 3 + 4)	22	1.56	00	0.0	22	0.82	39	3.15	01	0.09	40	1.68
8. (2 + 3 + 4)	01	0.07	00	0.0	01	0.04	05	0.40	00	0.0	05	0.21
	1409	100 %	1271	100%	2680	100%	1238	100%	1146	100%	2382	100%

OBS:-

Prevalence of addiction was more in males as compared to females in both areas, smoking, alcohol and tobacco chewing were main types of addiction.

TABLE No. 12

PREVALENCE OF MORBIDITY IN
LAST 6 MONTHS

AGE GROUP	TOTAL POPUL	PRE IMPOUNDMENT						POST IMPOUNDMENT							
		NO. OF CASES		DIARR HOEA	OTHERS	TOTAL	% SICK	AGE GROUP	TOTAL POP.	NO. OF CASES		DIARR HOEA	OTHER	TOTAL	% SICK
		MALARIA	RESP INF.							MAL ARIA	RESP INF				
0-1	110	11	03	02	01	17	15.45	0-1	157	15	4	3	5	27	17.20
1-4	321	40	19	05	14	78	24.30	1-4	330	54	8	7	10	79	23.94
5-15	892	123	11	01	21	150	17.49	5-15	783	148	4	8	15	175	22.35
16-25	562	54	03	00	11	68	12.10	16-25	517	89	5	3	6	103	19.92
26-35	497	72	02	02	22	98	19.72	26-35	452	617	5	5	12	89	19.69
36-45	298	34	06	02	14	56	18.79	36-45	274	41	2	0	11	54	19.71
46-55	193	30	03	00	11	44	27.80	46-55	225	23	7	2	12	44	19.56
56+	238	32	04	03	10	49	20.59	56+	133	20	1	0	1	22	16.54
3111		398	51	15	104	568	18.15	2	2871	459	36	28	72	593	20.65
		69.9%	9.0%	2.65%	18.37	100%				77.4	6.07	4.72	12.14	100%	

Above table shows age wise distribution of morbidity in last six months. Fever cases/Malaria was the most prevalent disease in all age groups.

Adults

TABLE No. 1- 13

INCIDENCE OF MORBIDITY WITHIN
A FORTNIGHT OF SURVEY

PRE IMPOUNDMENT AREA									POST IMPOUNDMENT AREA							
NO. OF CASES									NO. OF CASES							
AGE GROUP	TOTAL POP.	MAL- RIA	RESP INF.	DIARR HOEA	OTHER	TOTAL	% SICK	AGE GROUP	TOTAL POP.	MAL- RIA	RESP INF.	DIARR HOEA	OTHER	TOTAL	% SICK	
0-1	110	28	15	09	01	03	28	25.45	0-1	157	10	12	01	19	42	26.75
1-4	321		26	51	02	24	104	32.40	1-4	330	35	26	02	22	85	25.76
5-15	892		86	32	02	27	147	16.48	5-15	783	74	31	02	15	122	15.58
16-25	562		43	07	00	21	71	12.63	16-25	517	35	04	-	10	49	9.48
26-35	497		46	09	01	26	82	16.50	26-35	452	40	10	01	11	62	13.72
36-45	298		22	03	01	18	44	14.76	36-45	274	24	04	-	03	31	13.31
46-55	193		13	05	02	15	35	18.14	46-55	225	14	08	-	08	30	13.33
56+	238		24	08	02	11	45	18.91	56+	133	09	02	-	04	15	11.28
	3111		275	124	12	145	556	17.87		2871	241	97	06	92	436	15.18

Incidence of morbidity was high in infants and preschool children in both the areas.
Maximum incidence was recorded for fever and respiratory infections.

TABLE - 14 A. AGE & SEX SPECIFIC MORBIDITY IN PRE IMPOUNDMENT AREA

AGE GROUP	FEVER				RESP.INFECTION				DIARRHCEA				OTHERS			TOTAL		TOTAL MORB- SICK IDITY (%)	
	M	F	TOTAL	%	M	F	TOTAL	%	M	F	TOTAL	%	M	F	TOTAL	% POP.			
Infants (0-1)	9	6	15	5.26	01	00	01	8.33	07	02	09	7.26	01	02	03	2.22	110	28	25.46
Preschool(1-4)	21	15	36	12.6	01	02	03	24.9	31	20	51	41.2	17	07	24	17.7	321	114	35.51
School Age(5.15)	51	35	86	30.1	01	01	02	16.6	17	15	32	25.8	15	12	27	19.9	892	147	16.48
Adults(16-55)	61	63	124	43.5	01	03	04	33.3	15	09	24	19.3	30	40	70	51.8	1550	222	14.32
Elderly(56+)	13	11	24	8.42	00	02	02	16.6	05	03	08	6.95	05	06	11	8.15	238	45	18.91
TOTAL	155	130	285	100	04	08	12	100	75	49	124	100	68	67	135	100	3111	556	

TABLE -14-B AGE & SEX SPECIFIC MORBIDITY IN POST IMPOUNDMENT AREA

AGE GROUP	FEVER				RESP. INFECTION				DIARRHOEA			OTHERS			TOTAL POP. %		TOTAL MOR SICK DEATH (%)		
	M	F	TOTAL	%	M	F	TOTAL	%	M	F	TOTAL	%	M	F	TOTAL	%			
Infants (0-1)	1	9	10	4.17	01	00	01	16.6	06	06	12	12.3	10	09	19	20.8	157	42	26.75
Preschool (1-4)	13	21	24	14.1	00	02	02	33.3	09	17	26	26.8	09	13	22	24.1	330	84	25.46
School age (5-15)	41	33	74	30.8	00	02	02	33.3	17	14	31	31.9	06	09	15	16.5	783	122	15.58
Adults (16-55)	57	57	113	47.0	01	00	01	16.6	14	12	26	26.8	10	22	32	35.1	1468	172	11.7
Elderly (56+)	04	05	09	3.75	00	00	00	00	00	02	02	2.0	02	01	03	3.30	133	14	10.53
TOTAL	116	124	240	100	02	04	06	100	46	51	97	100	37	54	91	100	2871	438	

The two age groups with maximum morbidity were infants and preschool children in both the areas.

TABLE No:- 15

TABLE SHOWING SOCIO- ECONOMIC CLASS

PRE IMPOUNDMENT AREA											POST IMPUNDMENT AREA							
E CLASS	TOTAL POP	FAMIL. NO	FAMIL. %	MORBIDITY						TOTAL POP	MORBIDITY							
				0-2 WK No.	0-2 WK %	2WK-6M NO	2WK-6M %	CHR ILLNESS NO	CHR ILLNESS %		FAMIL No.	FAMIL %	0-2WK NO	0-2WK %	2WK -6M NO	2WK -6M %	CHR NO	CHR ILLNES: %
I	19	04	0.8	03	0.56	05	0.92	03	4.34	02	1	0.2	-	-	1	0.16	-	-
II	147	30	6.0	27	5.07	33	6.1	07	10.14	69	17	3.4	11	2.5	21	3.42	1	2.2
III	1132	195	39.0	202	37.9	209	38.85	30	43.4	793	159	31.8	130	29.8	135	22.0	16	36.
IV	1538	249	49.8	269	50.5	262	49.6	27	39.1	1460	298	59.6	270	61.9	387	63.1	27	61.
V	165	22	4.4	31	5.8	29	5.3	2	2.8	210	25	5.0	25	5.7	69	11.2	-	-
	3001	500	100	532	100	538	100	69	100		500	100	436	100	613	100	44	100

Proportion of population was maximum in socioeconomic class III & IV .

Morbidity was also maximum in these classes.

TABLE NO:- 16

TABLE SHOWING TYPE OF HOUSES
VS MORBIDITY

TYPE		PRE IMPOUNDMENT AREA MORBIDITY						POST IMPOUNDMENT AREA MORBIDITY					
		0-2 WEEK		2 WEEK - 6 MONTH				0-2 WEEK		2 WEEK - 6 MONTH			
HOUSE	NUMBER OF FAMILI NO. %	NO.	%	NO.	%	NO. OF FAMILIES NO. %		NO.	%	NO.	%		
CCA	05	1	03	.563		02	.37	4	0.8	2	.45	7	1.14
CHHA	431	86.2	442	83.08		446	82.9	456	91.2	393	90.14	548	89.4
MI PUGCA	64	12.8	87	16.35		90	16.73	40	8	41	9.4	58x2	9.46
TOTAL	500		532	100.0		538	100.0	500		436	100	613	100

Above table shows the types of houses most of people live in "Kuchha " houses 86.2% in Punasa, 91.2% in Tawa, as Pucca houses were very few 1 % in Punasa, 0.8% in Tawa, so no clear act conclusion can be drawn regarding morbidity.

TABLE No:- 17

TABLE SHOWING VENTILATION
VS MORBIDITY

VENTILATION	NO OF FAMILIES		PRE IMPOUNDMENT AREA MORBIDITY				NO. OF FAMILIES		POST IMPOUNDMENT AREA MORBIDITY				
	NO.	%	2 WKS NO.	%	2 WKS NO	6M %	NO.	%	2 WKS NO.	%	2 WKS NO.	6 MONTHS %	
ADEQUATE	241	48.2	218	40.97	257	47.76	245	49.0	206	47.2	244	39.8	244
IN ADEQUATE	259	51.8	314	59.03	281	52.24	255	51.0	280	52.8	369	60.4	363
TOTAL	500	100.0	532	100.0	538	100.0	500	100.0	486	100.0	613	100.0	

Above table shows the effect of ventilation on morbidity. Slightly more than half popn. in both the areas had in adequate ventilation and they have slightly more morbidity both up to 2 weeks duration and 2 weeks to 6 months duration.

TABLE No. 1- 18

SHOWING RELATION OF OVER CROWDING
AND MORBIDITY

OVER CROWDING	NO. OF FAMILIES	PRE IMPOUNDMENT AREA MORBIDITY				POST IMPOUNDMENT AREA MORBIDITY				NO. OF FAMI NO.	2 WKS NO.	2-6 MONTHS NO.	%
		2 WKS NO.	%	2-6 MONTHS NO.	%	2 WKS NO.	%	2-6 MONTHS NO.	%				
YES	316	63.2	200	56.2	319	59.29	276	55.2	243	56.19	374	61.01	
NO	184	36.8	233	43.8	219	40.71	224	44.8	191	43.81	239	39.90	
	500	532	100	539	100	500	100	436	100	613	100		

Above table shows the relationship between overcrowding with morbidity.

In both the areas morbidity was high in overcrowded houses.

TABLE No:- 19

TABLE SHOWING METHODS OF WASTE
WATER DISPOSAL VS MORBIDITY

MEANS OF DISPOSAL	PRE IMPOUNDMENT AREA MORBIDITY						POST IMPOUNDMENT AREA MORBIDITY					
	NO. OF FAMILIES NO.	%	0-2 WK NO.	%	2 WK 6-MONTH NO.	%	NO. OF FAMILIES NO.	%	2WKS NO.	%	2 WK NO.	6 MONTH %
OPEN DRAIN.	479	95.8	507	95.30	211	94.98	466	93.2	407	93.34	572	93.31
UNDER GROUND	21	4.2	25	4.7	27	5.02	34	6.8	29	6.66	41	6.69
POAKAGE PIT	-						-	-			-	
TOTAL	500	100	532	100	538	100	500	100	436	100	613	100

Table depicts the method of waste water disposal mostly opendrainage seen (95.8 %, 93.2 %) which is associated with more morbidity as open drainage leads to breeding places for insects.

TABLE NO. :- 20

TABLE SHOWING SOURCE OF DRINKING
WATER SUPPLY

SOURCE	PRE IMPOUNDMENT AREA						POST IMPOUNDMENT AREA					
	MORBIDITY						MORBIDITY					
	NO. OF FAMILIES NO.	%	0-2 WKS NO.	%	2 WKS NO.	6 MONTH %	NO. OF FAMILIES NO.	%	0-2 WKS NO.	%	2 WKS NO.	6 MONTHS %
TAP.	54	10.8	51	9.59	60	11.15	03	0.6	03	0.69	05	0.82
WELL	130	26	133	25	150	27.88	84	16.8	69	15.82	89	14.52
TUBWELL	00	-	00		00		01	0.2	01	0.23	07	1.14
POND.	02	0.4	08	1.5	10	1.85	19	3.8	13	2.98	15	2.45
RIVER	48	9.6	55	10.33	60	11.15	18	3.6	29	6.65	26	4.25
HANDPUMP	266	53.2	285	53.51	258	47.95	375	75	321	73.63	471	76.83

Above table shows the source of drinking of water main source was hand pump in both the area 53.2% in Punasa, 75% in Tawa next source was well no significant difference seen in both the areas associated with morbidity.

TABLE NO. 21

NUTRITIONAL STATUS OF CHILDREN
0-6 YRS OF AGE

STATUS	PRE IMPOUNDMENT AREA				POST IMPOUNDMENT AREA			
	NO. OF CHILDREN NO.	%	MORBIDITY NO.	%	NO. OF CHILDREN NO.	%	MORBIDITY NO.	%
WELL NOURISHED	80	16.4%	37	46.25	120	26.4	55	45.83
MALNOURISHED (Gr. I & 2)	309	63.3	146	47.24	213	46.9	100	46.95
MALNOURISHED Grade III & IV	99	20.3	75	75.76	121	26.7	83	68.60
TOTAL	488	100.0	258		454	100.0	238	

Above table shows Nutritional status of children (0-6 yrs) and relation with morbidity. It is clear that malnourished children grade III & IV have highest morbidity 75.76 % in Punasa & 68.6 % in Tawa while well-nourished having least morbidity 46% in Punasa and 45% in Tawa. Therefore this table concludes that malnourished children are more prone to get infection.

TABLE 1.1-2

PRE-EXISTING AREA

POST-EXISTING AREA

DISEASE

POP.	5 - 15 Yrs. (888)	16 - 45 YRS (1357)	46 - 65 (337)	65+ (94)	TOTAL (2676)	5-15 (783)	16 -45 (1243)	46 -65 (318)	65+ (40)	TOTAL (2384)
------	----------------------	-----------------------	------------------	-------------	-----------------	---------------	------------------	-----------------	-------------	-----------------

T.B.

01	04	02	-	07	-	03	01	-	04
----	----	----	---	----	---	----	----	---	----

174

TABLE NO:- 23 A

TABLE SHOWING DAYS OF RESTRICTED WORKING

PRE IMPOUNDMENT AREA
DURATION OF RESTRICTED WORKING

DISEASE	1 - 3 DAYS		TOT	4-5 DAYS		TOT	6-7 DAYS		TOT	ABOVE/ONE WEEK			MEAN DURATION RESTRICTED WORKING	TOTAL DAYS LOST
	M	F		M	F		M	F		M	F	TOTAL		
MALARIA	29	08	29	34	18	52	14	8	22	115	82	197	8.69 days	1711.9
FEVER(POP)	7	3	10	10	1	11	2	1	3	11	5	16	6.62 days	103.6
DIARRHOEA	1	0	1	2	0	2	0	0	0	0	5	5	8.29days	41.4
RESP INFECTION	2	0	2	0	2	2	0	1	1	6	4	10	8.63 days	86.3
CONJUNCTIVITIES	0	0	0	0	0	0	0	0	0	2	1	3	8.75 days	26.25
TYPHOID	0	0	0	0	0	0	0	0	0	02	12	28	11 days	33
OTHERS	4	1	5	6	2	8	0	0	0	12	12	24	8.38 days	201.1
TOTAL	36	12	48	52	23	75	16	10	26	148	110	258		2205.5

TABLE NO:- 23 B

TABLE SHOWING DAYS OF RESTRICTED WORKING
POST IMPOUNDMENT AREA
DURATION OF RESTRICTED WORKING

DISEASE	1-3 DAYS			4-5 DAYS			6-7 DAYS			ABOVE/ONE WEEKS			MEAN DURATION OF RESTRICTED WORKING	TOTAL DAYS LOST
	M	F	TOT	M	F	TOT	M	F	TOT	M	F	TOT		
MALARIA	18	6	24	25	14	39	12	9	21	190	171	361	9.73 days	3542.5
FEVER (POP)	1	2	3	4	7	11	5	2	7	28	21	49	9.14 days	447.8
DIARRHOEA	2	0	2	0	2	2	1	1	2	2	8	10	8.5 days	85
RES INFECTION	2	3	6	1	1	2	0	1	1	9	12	21	9.35 days	196.35
CONJUNCTIVITIES	0	0	0	0	0	0	0	0	0	3	3	6	11 days	66
TYPHOID	0	0	0	0	0	0	0	0	0	0	0	0	-	-
OTHERS	3	1	4	1	1	2	1	0	1	9	14	23	9.22 days	212.6
TOTAL	27	12	39	31	25	56	19	13	32	282	289	570		4519.

TABLE - 24

TABLE SHOWING DISABILITY

NATURE	PRE IMPOUNDMENT			POST IMPOUNDMENT		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
1/ PARTIAL	4 33.33	5 71.4	09-49.3	05 35.6	06 44.4	11
2/ PERMANENT	8 66.66	2 28.6	10-50.7	09 64.4	08 55.6	17
TOTAL	12 100	7 100	19-100.0	14 100	14 100	28

Above table shows Disability in both areas permanent disable persons were more as compared to partial disable persons no significant difference were seen in both areas,

TABLE- 25

AGE & SEX DISTRIBUTION OF DEATHS.

AGE GROUP	PREIMPOUNDMENT			POSTIMPOUNDMENT		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
0-1 yr	5	5	10	10	6	16
1-5 yr	4	1	5	2	4	6
6-15 yr	3	-	3	1	2	3
16-60 yr	4	3	7	4	2	6
60+	-	1	1	4	1	5
Total	16	10	26	21	15	36

A total of 26 deaths occurred in pre-impoundment area and 36 deaths in post impoundment area. Maximum no. of deaths were in 0-1 yr age group in both the areas.

TABLE-26

DISTRIBUTION OF TYPE OF TREATMENT

TYPE	PRE IMPOUNDMENT		POST IMPOUNDMENT	
	NO.	%	NO.	%
1/ ALLOPATHY	776	98.6%	644	88.7
2/ HOMEOPATHY	2	0.44% 26	00	
3/ AYURVEDIC	9	1.14%	80	11.3
4/ UNANI	-		00	
5/ OTHERS	-		02	
	787		726	

This Table clearly indicates that for treatment people usually go for Allopathy 98.6% , 88.7% very few Opt for Ayurvedic, or Homeopathy treatment.

TABLE- 27

TABLE SHOWING SOURCE OF TREATMENT

SOURCE OF TREATMENT	PRE NO.	IMP %	POST NO.	IMP %
1/ Govt. Institution	57	7.2%	132	18.18
2/ Private Practitioner	730	92.75%	592	81.54
3/ Others	—	—	02	0.32
TOTAL	787		726	

Table reflects that mostly people go to private practitioner for treatment (92.5% , 81.5%) very few percentage of people go to Govt. institution (7.2%,18.1%) This indicate need to expend and strengthen the health facility available at Govt. institution so that patients get easily, proper and complete treatment at these places. Unqualified private practitioner should face legal action.

120

TABLE- 28

TABLE SHOWING PLACE OF DELIVERY

SITE	PRE IMPOUNDMENT AREA		POST IMPOUNDMENT AREA	
	NO.	%	NO.	%
1/ HOME	110	96.4	154	98.09
2/ P.H.C.	4	3.6	3	1.91
3/ DISTT.HOSPITAL	-	-	-	-
4/ OTHERS	-	-	-	-
	114		157	

Above table reveal that maximum deliveries were taken place at home (96.4% & 98.09%) least at P.H.C. level, which is common phenomenon of villages of our Country.

TABLE- 29

TABLE SHOWING WHO ASSISTED DELIVERY

ASSISTED BY	PRE IMPOUNDMENT		POST IMPOUNDMENT AREA	
	NO.	%	NO.	%
1. TRAINED DAI	12	10.5	26	16.56
2. UNTRAINED DAI	76	66.6	126	80.26
3. ANM	23	20.1	4	2.55
4. DOCTOR	2	1.7	1	0.63
5. RELATIVE	1	0.8	-	-
6. OTHERS	-	-	-	-
TOTAL	114		157	

Above table illustrate who assisted delivery, majority deliveries (66.6% & 82.9%) in both areas conducted by untrained Dais, followed by trained Dais who conducted 10.5% & 14.0% deliveries. The picture is similar to other rural areas of India.

TABLE- 30

TABLE SHOWING IMMUNIZATION STATUS OF 0-6 YEARS OF CHILDREN

STATUS	PRE IMPOUNDMENT AREA		POST IMPOUNDMENT AREA	
	NO.	%	NO.	%
1/ FULLY IMMUNIZED	53	8.81	131	22.50
2/ PARTIALLY IMMUNIZED	260	43.26	170	29.20
3/ UNIMMUNIZED	288	47.92	281	48.28
TOTAL	601	100.0	582	100.0

Above table reveal the Immunization status of children up to 6 years of age, fully immunized children were more (22.50%) in Tawa as compared to Punasa (8.81%) while un-immunized were 47.9% in Punasa and 48.2% in Tawa. Morbidity is less in fully immunized children.

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण
NARMADA CONTROL AUTHORITY

पर्यावरण उपदल
Environment Sub-Group

अठारहवीं बैठक का कार्यवृत्त
Minutes of the Eighteenth Meeting

28 मई, 1993
को
पर्यावरण भवन नई दिल्ली में हुई

Held at Paryavaran Bhawan New Delhi
28th May, 1993

इन्दौर
जुलाई, 1993

INDORE
July, 1993

MINUTES OF THE 18TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 29TH MAY, 1993 AT 10.00 AM
IN PARYAVARAN BHAWAN, NEW DELHI

I N D E X

Item No.	Contents	Page No.
	Introduction	1
XVIII-1(96)	Confirmation of the Minutes of the 17th meeting.	2
XVIII-2(97)	Review of Action taken on the decisions of the previous meeting.	3 - 8
XVIII-3(98)	Present Status of Studies/Surveys and Environment Action Plans.	9 - 13
XVIII-4(99)	World Bank Assistance and Performance Benchmarks on Environmental Issues.	14
	Any Other Item	15
	Date & Venue of Next Meeting	15

A N N E X U R E

XVIII.Min-1	List of participants of XVIII th meeting.	1
XVIII.Min-2	Comments of concerned organisations on modified research proposal from JNKVV and replies thereupon.	2 - 15
XVIII.Min-3	Environmental Impact Assessment Preliminary report on water related diseases SSP command area.	16- 54

MINUTES OF THE 18TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 28TH MAY, 1993 AT 10.00 A.M.,
IN PARYAVARAN BHAWAN, NEW DELHI.

Shri R. Rajamani, Secretary, Ministry of Environment & Forests and Chairman of the Environment Sub-Group of NCA welcomed the Members and Invitees to the 18th meeting of the Environment Sub-Group. The list of participants is enclosed at Annex.XVIII.Min.I.

Discussion on the agenda items was taken up thereafter.

**Item No.XVIII-1(96): CONFIRMATION OF THE MINUTES OF THE
17TH MEETING**

Minutes of the 17th meeting of the Environment Sub-Group of Narmada Control Authority were circulated to all members and invitees separately vide letter No.Env-34(17)/93/973 dated 27.4.93. Government of Gujarat vide their letter No. SSPA/ENV/NCA/MEET/230-31 dated 15.5.93 offered the clarifications on the minutes. These were circulated to the members. However, Chairman observed that as the issue raised is only a clarification, therefore, no change in the minutes is required. Therefore, the minutes were confirmed as circulated.

ITEM NO.XVIII-2(97): REVIEW OF ACTION TAKEN ON THE DECISIONS OF THE PREVIOUS MEETING.

Consideration of Policy Issues.

1. Extension of Time for Environmental and Forestry Approval (Item No.XVII-2(97)1).

Chairman while reviewing preparedness of the environmental studies in relation to the construction works on project, reiterated that the pari-passu clause is to be so operated as to complete all works in the areas commensurate with submergence which is an indicator of the progress of construction works. In order to get a clear view, Chairman desired that the progress of works on each component should be synchronised with submergence and shown in the form of a chart accompanied by an explanatory statement. He further desired that this statement should be made available to the members atleast one week before the next meeting. In reply to a question from Chairman, Shri N.S. Parasnis, CCF Govt. of Maharashtra, informed that flora and fauna studies in the areas likely to be affected by the submergence are completed and that felling plans have been prepared by the School of Environmental Science, Pune University, Pune for safe migration of whatever little wildlife is present in the submergence area. He further informed that the felling is going on in the areas likely to be affected but also stated that demarcation of "corridors" for safe transit of wildlife has not yet been done. Executive Member, NCA informed the sub-group that in view of the decision taken by the SSCAC, construction sluices will not be closed till December, 1993, therefore, there will not be any permanent submergence, despite the back water effect, in any areas in the coming monsoon. However, chairman pointed out that since neither Chairman of the Sub-group nor his nominee is represented on the Board of the SSCAC therefore it is necessary that the SSCAC should take a decision on closing of the sluices only in consultation with the sub-group and that the Environment sub-group on the issues as they relate to Environment should have a say on the decisions to be taken by the SSCAC. In order to recommend the measures needed for avoiding any infringement of the pari-passu clause he suggested formation of a team for taking up the field investigations. Prof. Ramaseshan stated that the Geographic Information System (GIS) is a powerful tool which could be utilised gainfully to study the present and projected land uses with related implications for the management of natural resources. A critical issue, however, is the collection of reliable data without which this tool would be ineffective.

Chairman desired that a committee may be constituted of the members who are willing to spare time to visit the area(s) which are likely to be affected in the coming monsoons.

Executive Member pointed out areas, on a map, which are likely to be affected by the submergence after closing of the sluices during the monsoon of 1994. These maps would be made available to the Ministry. Chairman, however, directed that closing of the sluices shall be deferred atleast by another 3 months. He further desired that the clear felling in the submergence area should be carried out in a manner that migratory corridors are left out to provide for the safe migration of the wildlife. He also recommended that Pune University should be asked to submit their final recommendations on affected areas by September, 1993. After detailed discussion on related aspects following recommendations were made by the Sub-Group:-

1. A committee was formed with Dr. S. Maudgal, Advisor, MOE&F, Mr. Chengappa, CF in the office of Regional CCF, Bhopal as representatives of MOE&F and three non official members of the sub-group Dr. Shekhar Singh, Prof. Ramaseshan and Prof. Katty alongwith Member (E&R) and Specialist (Env) of NCA. The team is required to focus on the following issues.

- (i) Likely impoundment area by March, 1994.
- (ii) Progress of catchment area treatment and compensatory afforestation works.
- (iii) Provision of wildlife migratory corridors in Maharashtra
- (iv) Evaluating the progress of these works with impoundment for ensuring pari-passu clause.

Team members were advised to visit the areas between 18th to 21st June, 1993. A detailed programme will be issued by NCA in confirmation of the above. The team will discuss the issues on 21.6.93 at Narmada Guest House, Kevadia/Vadodara and its findings in brief will be presented to the sub-group during its 19th meeting which is scheduled to be held on 28th July, 1993 at Paryavaran Bhawan, New Delhi at 12.00 Noon.

2. Member (E&R) of the NCA and Govt. of Maharashtra officials should discuss all relevant issues with team members of the School of Environmental Science, Pune University, Pune to verify the studies being done by them on carrying capacity and migratory corridors and request Pune University to submit their final report by September, 1993.

3. Schedule of closing of sluices by December, 1993 is considered to be too tight and therefore Sub-group recommended that the date should be shifted to March, 1994.
2. Submission of Catchment Area Treatment Plans for freely draining critically degraded sub-watersheds. (Item No. XVII-2(97) (2)).

While reviewing the problems faced by State Governments regarding the funds for treating extensive areas of catchment, Dr. Abrol of ICAR suggested that Ministry of Agriculture may be requested to take up on priority the SSP areas in the state of Maharashtra and Madhya Pradesh as part of their watershed development schemes. Chairman pointed out that in some states there is legislation to compel the farmers to take up the catchment area treatment works on private farms and that in the National Watershed Development plan there is a provision for a subsidy which could be utilised for treatment of this area. He reiterated the urgent need for submission of these plans which should include possible funding arrangements and time schedule also. The Govt. of Maharashtra and Govt. of Madhya Pradesh indicated that the Watershed development plans for the balance of the critically degraded areas will be available by October, 1993. Chairman directed that the team which will visit the areas in Gujarat and Maharashtra may also later on go into details of these plans and consult the concerned Collector(s) and other revenue authorities and may put up their recommendations before the Sub-Group.

3. Cost Estimates for preparation of Action Plan and implementation of Environment Safeguard Measures (Item No.XVII-2(97) (3)).

While reviewing the environmental cost of the SSP it was observed that for many of the survey/studies eventhough some cost must have been incurred by the State Governments, this has not been reflected in the notes submitted. State Governments, however, agreed to submit this information within a month. Some of the cost estimates/expenditure presented in the agenda papers were updated and the emerging picture is presented below.

ENVIRONMENTAL COST OF SSP**RELATED TO UNIT I & II DAM & POWER HOUSE :****A) Expenditure by project authorities:****1) Cost of Survey & Studies (in lacs.)**

S.No.	Component	<u>Estimate/Actual Expenditure</u>			NCA	Total
		GOG	GOM	GOMP		
1.	Compensatory Afforestation	NA	NA	2.43		-
2.	Catchment Area Treatment.	NA	NA	3.28		-
3.	Flora & Fauna	<u>129.2</u> 100.3	<u>38</u> 16	<u>20.334</u> 15.64	<u>15.27</u> 14.63	<u>221.77</u> 164.43
4.	Health	NA	NA	<u>30.00</u> 18.89		-
5.	Archaeology/Anthropology.	<u>1.3</u> 0.40	NA	<u>59</u> 35.73		<u>60.3</u> 40.40
6.	Seismicity & Rim Stability.	<u>1.3</u> 0.4	NA	<u>23.00</u> 12.55		<u>24.3</u> 12.95

11) Cost of Implementation (in lacs)

1.	Compensatory Afforestation.	<u>1757</u> 865	<u>2116</u> 822.98	<u>1800.000</u> 533.27		<u>5673</u> 1970.137
2.	Catchment Area Treatment.	<u>3509</u> 1291	<u>2254.97</u> NA	<u>8835.05</u> 447		<u>14643.97</u> 1738
3.	Flora & Fauna	<u>75</u> 62	NA	NA		<u>75</u> 62
4.	Health (incremental expenditure) for 10 yrs.	<u>3800.0</u> 91	<u>210.15</u>	<u>748.73</u> 1.0		<u>4758</u> 92
5.	Archaeology/Anthropology.	<u>156</u> 18	NA	<u>213</u> NIL		<u>369</u> 18
6.	Seismicity & Rim Stability.	<u>129</u> 271				<u>129</u> 271

Total: 25879.34
4368.917

* In addition several State/Central agencies have also incurred expenditure various Environmental studies & Implementation aspects. Full details are not available.

NA : Not available.

ENVIRONMENTAL COST OF SSPRELATED TO UNIT - III. CANAL & DISTRIBUTION SYSTEM

	<u>Command Area Development</u>		
	GOG	GOR	Total
i) Cost of studies (in lacs.)	<u>1257.15</u>	NA	<u>1257.15</u>
Estimated/ incurred	NA		NA
ii) Cost of Implementation	<u>68500</u>	NA	<u>68500</u>
Estimated/incurred	NA		NA

While reviewing the cost estimates for the works related to canal and distribution system Chairman desired that 53 studies should be looked into closely and grouped subjectwise and the shortcomings pointed out. He requested Dr. Abrol to look into the studies and to relate these to the need for suitable cropping pattern, irrigation intensity etc. Chairman desired that issues regarding the industrial area planning, land use survey, road development, conjunctive use of surface and ground water, integrated forestry, agro forestry may also be included for sustainable development of the command area. He further desired that Dr. Abrol may also like to look into the studies on cropping pattern in the command area as per ICAR norms. He also emphasised that the farmer should be educated and persuaded to accept the recommended packages being developed by the project authorities. Dr. S. Maudgal, Adviser, MOE&F suggested that the command may be harbouring genetic stock of some high yielding/hardy species of cereals/fruits/vegetables which need to be identified and protected, for saving our bio-diversity, by taking adequate measures in time.

Dr. Abrol pointed out that a number of studies have been conducted on the agriculture aspects but these still remains a need to synthesise the work done through proper coordination and to avoid duplication. Dr. Pathak agreed to coordinate all such studies with the help of Dr. Abrol and Member (E&R) of the NCA. Dr. Mahesh Pathak informed the sub-group that the EIA on the integrated development of the command area which synthesised all the studies till date is now compiled and a copy of the interim report was submitted during the meeting to the Ministry of Environment & Forests and the NCA. He requested that these reports may be examined and improvements may be suggested.

Chairman took a serious view of the absence of representatives of the Govt. of Rajasthan and desired that this should be communicated to the Chief Secretary of the Govt. of Rajasthan. Referring to the reported negotiations of Government of Rajasthan with WAPCOS for entrusting the studies for the areas in Rajasthan sub-group felt that WAPCOS may not be an appropriate organisation to undertake extensive studies on the lines being taken by Govt. of Gujarat. Chairman, therefore directed that Govt. of Rajasthan should get in touch with Govt. of Gujarat who could advise them suitably.

Item No. XVIII-3(98): PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLAN.

1) Phased Catchment Treatment

Narmada Sagar Project

Govt. of Madhya Pradesh

According to the information supplied, All India Soil & Land Use Survey Organisation, New Delhi has submitted reports for all 9 sub catchments and these reports are being scrutinised by the experts in NVDA. Result of analysis will be available by 30th June, 1993.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP reported a progress of 13075 ha of non forest area by the end of March, 1993. GOMP has submitted a revised plan for the directly draining, high and very high critically degraded areas in the sub-watersheds. According to this plan a total of 73795 ha of non forest area is to be treated at a cost of Rs. 55.35 crores including the cost of establishment. The forest area proposed to be treated is 59572 ha. Out of this 7642 ha area is not workable and another 13930 ha area being fully stocked, would require only engineering works. In the balance area of 38,000 ha full treatment works comprising engineering as well as vegetative and afforestation works will be taken up at an estimated cost of Rs. 33 crores.

Catchment Area Treatment work on 361 ha of non forest area has been completed upto April, 1993 and another 1000 ha of non forest area is expected to be treated during May 1993. In addition engineering works are under progress on 1000 ha forest area which is proposed to be planted up during the coming monsoon.

Govt. of Gujarat

Besides completing the target of 15311 ha of degraded forests Govt. of Gujarat has reported a progress of 363 ha and cumulative progress of 1534 ha on non forest area also.

Govt. of Gujarat has expressed the view that because the catchment area within the Gujarat state is extensively studied and the entire area is planned for treatment there

is no need for further reconciliation of area figures with any other organisation.

Govt. of Maharashtra

Upto date progress was not made available to the Sub-Group.

ii) Compensatory Afforestation

Narmada Sagar Project

Govt. of Madhya Pradesh

Sub-group noted the progress.

Sardar Sarovar Project

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh expressed its inability in obtaining suitable non forest areas and therefore has proposed that the afforestation in non forest areas will be taken up from 1994 monsoon. However, 2300 ha area of degraded forests will be afforested during 1993-94 in the coming monsoon.

Govt. of Gujarat

Govt. of Gujarat has reported the progress of 3347 ha of non forest areas and 5284 ha on degraded forest areas by the end of March, 1993.

Govt. of Maharashtra

Sub-group noted the progress of works. However, the location map of the area being planted alongwith the composition of the species, survival, spacing and other inputs provided are not yet furnished.

iii) Command Area Development

Narmada Sagar Project

Govt. of Madhya Pradesh

Comments of WALMI, Aurangabad/Bhopal, Pollution Control Board, Bhopal, Madhya Pradesh Council of Science and Technology, Bhopal and the replies/considerations thereupon have been enclosed at Annex-XVIII-Min-II. It was reported by the NVDA that the collection of the data is to be

continued for atleast another season to be able to draw inferences for preparation of master plan for drainage.

Sardar Sarovar Project

Govt. of Gujarat

Already discussed under Item XVIII-2(101)1.

Govt. of Rajasthan

Already discussed under item XVIII-2(101)1.

iv) SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES

Narmada Sagar Project

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh informed that steps have been taken to obtain the comments of members of Wildlife Expert Committee and the report could only be finalised after receiving all comments. GOMP requested MOE&F to help them to expedite comments from the members of the committee.

Sardar Sarovar Project

Govt. of Madhya Pradesh

In response to a question raised by Prof. Ramaseshan it was explained that the report produced by SFRI only pertains to the collection of data during the period under report and the detailed analysis of this report will be presented by the investigators in the final report and that the TOR for the same was circulated to the members during the 9th meeting of the sub-group. Chairman, however, desired that the study report submitted by various agencies should be critically analysed both by expert members and the specialised staff of NCA and shortcomings presented to the sub-group from time to time. GOMP reported that the felling plan prepared by the SFRI, Jabalpur has been handed over to Dr. Sekhar Singh.

Govt. of Maharashtra

Discussed already under item XVIII-2(101)1.

Govt. of Gujarat

Govt. of Gujarat informed that the final report of the M.S. University, Vadodara has recently been submitted and the action plans have been developed and will be made available shortly. However, chairman desired that the team

visiting the site may also look into the needs of the areas in relation to scheduled submergence.

v) ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY

ARCHAEOLOGY

Narmada Sagar & Sardar Sarovar Projects

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh informed that the revised action plan is expected by the 2nd week of June, 1993.

Govt. of Gujarat

Govt. of Gujarat informed that there will not be any permanent submergence during the coming monsoon and that the temple has been erected 15 Km downstream and only the idol remains to be shifted.

Govt. of Maharashtra

No work is required.

ANTHROPOLOGY

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh submitted a copy of the studies completed by Dr. K.G. Dubey during the meeting to NCA.

vi) SEISMICITY AND RIM STABILITY OF RESERVOIR

Govt. of Madhya Pradesh

Narmada Sagar Project

GOMP had requested Geological Survey of India to conduct detailed field studies in some patches, which were identified by GSI during geological mapping of the reservoir area. Aerial photographs of the area were also provided as required by GSI with a view to assess the need for field work. Director, GSI, Bhopal Division has opined that further field work may not be necessary. However, final report in this regard is being obtained from G.S.I.

A reference has been made to India Meteorology Deptt. for supply of 12 Nos of Wood Anderson Seismometer and 6 Nos of photographs recorders to be installed to obtain pre-impoundment data. IMD has been furnished with the cost estimates and terms and conditions for supply of these instruments. The case is under finalisation and the seismic

instruments are expected to be procured shortly and these will be installed to obtain pre-impoundment seismic data. Similarly tenders for supply of Micro-Earthquake recorders were invited and price bids have been received, which are under consideration of the GOMP.

Sardar Sarovar Project

After making preliminary field investigations of the suspected sites on 16th March, 1993, the team finalised the type of experiments to be conducted and field data to be collected for which the equipments and personnel would be made available by CWPRS, Pune and GSI, Nagpur Division. This field work is likely to continue for a couple of months. Sources for the data, as required from GOMP, are being identified.

vi) HEALTH ASPECT

Narmada Sagar and Sardar Sarovar Projects

Govt. of Madhya Pradesh

Final report on liminological aspects is being drafted by the Barkatullah University, Bhopal and will be made available by the end of July, 1993.

Sardar Sarovar Project

Govt. of Gujarat

Govt. of Gujarat submitted the health plan revised by SCHMS and the copy is annexed here as XVIII-Min-3.

Govt. of Maharashtra

Copy of the detailed health plan is yet to be received.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

Communication has been received from CICFRI that the final report on desk review studies on conservation of fish fauna is under printing and would be available shortly.

Regarding report on Environmental Impact of downstream of SSP Govt. of Gujarat informed that the final report is awaited from HR Wallingford Institute, London.

Chairman suggested that the fishermen families living downstream may be settled in the command area in the growth centres and that the conservation aspects of the Mahaseer and other fisheries should be studied.

**Item No. XVIII-4(99) : WORLD BANK ASSISTANCE & PERFORMANCE
BENCH MARK ON ENVIRONMENTAL ISSUES (Item No. XVIII-4(99).**

Executive Member, NCA informed the Sub-group that all bench marks have been completed except the issues relating to the release of additional 1500 ha forest land at Taloda for R&R works and cost sharing of the R&R. He further clarified that even though it has been decided not to seek any further reimbursement from World Bank, it is proposed to prepare all the reports as laid down in the bench marks. He also agreed to supply a copy of each report when these are completed.

Dr. Maudgal stated that two issues connected with World Bank funding needed follow-up action:

***Formulation & Implementation of Narmada Basin Plan:**

This plan is to ensure integrated and sustainable development of the basin and needs to be taken up irrespective of World Bank funding. Executive Member, NCA assured that this plan will be formulated.

Additional Funding to offset cutting of World Bank support:

The Union Government has promised to offset loss of World Bank funding only to the extent of \$ 170 million which will be used towards the cost of construction, but no funding is pledged for any source to meet the cost of Narmada Basin Plan and also the Command Area Development. Unless funds are mobilised for these aspects, they are likely to get ignored.

Chairman suggested that the issues could be taken up by MEF at the Ministry's level.

Chairman suggested that the place of dropping the agenda item altogether it may be replaced by another agenda item through which progress of identified works could be monitored.

Any Other Item

Date & Venue of the next meeting.

28th July, 1993 at Paryavaran Bhawan, New Delhi
at 12 Noon.

ANNEXURES

Annex.Min-XVIII-1**LIST OF PARTICIPANTS ATTENDED THE 18TH ENVIRONMENT SUB-GROUP MEETING HELD ON 28TH MAY, 1993 AT 10.00 AM IN PARYAVARAN BHAVAN, NEW DELHI.**

S.No.	Name	Designation, Office/Deptt.
1.	Shri R. Rajamani	Secretary, MOE&F - CHAIRMAN
2.	Shri D.C. Debnath	Executive Member, NCA, Indore.
3.	Shri S.K. Mishra	Vice Chairman, NVDA, Bhopal
4.	Shri N. Suryanarayanan	Commissioner(PF), MOWR.
5.	Shri D. Kaudgal	Advisor, MOEF
6.	Shri I.P. Abrol	Dy. Director General (Soil Agro- nomy & Engg.), ICAR, New Delhi.
7.	Dr. Mahesh Pathak	Executive Member, NPG
8.	Shri H.A. Vaishnav	PCCF, GOG.
9.	Dr. A.K. Malhotra	Member (E&R), NCA
10.	Shri M.B. Mehta	CCF, SSP, GOG.
11.	Shri M.S. Parasnis	CCF, Govt. of Maharashtra
12.	Mr. Verma	Member (E&F), NVDA, Bhopal.
13.	Shri B.K. Chengappa	CF, MOEF, Bhopal
14.	Shri M.K. Jiwrajika	Dy. Inspector General, MOE&F
15.	Dr. Shekhar Singh	Faculty Member, IIPA
16.	Dr. S. Ramaseshan	Professor, IIT, Kanpur
17.	Prof. R.K. Katti	Director & Consultant, UNEECs Pvt. Ltd. New Bombay
18.	Shri A.V. Gururaja Rao	C.E. (Env), SSNNL.
19.	Smt. Nalini Bhatt	Joint Director, MOE&F
20.	Shri R.V. Rao	Director (Env), CWC.
21.	Dr. Pawan Kumar	Specialist (Env.), NCA
22.	Dr. Afroz Ahmed	Impact Assessment Officer, NCA
23.	Shri R.K. Behre	Spl. Hydrology & Sedimentation NVDA, Bhopal
24.	Ms. Asha Rajwanshi	Scientist, Wildlife Institute of India, Dehradun.

Annex.Min-XVIII-2.

COMMENTS OF CONCERNED ORGANISATIONS ON MODIFIED RESEARCH
PROPOSAL FROM JNKVV AND REPLIES THERE UPON MADE
BY THE SCIENTIST UNDERTAKING THE STUDY



NARMA VALLEY DEVELOPMENT AUTHORITY

**KERCHERWADI, Post Box No. 304 AURANGABAD-431002.
(MAHARASHTRA) INDIA,**

GRAM WALMI

**26239, 25836
27430 to 27434**

Ref: WALMI/JD(T)/

Date :

To,

**Member (Envt. & Forest),
Narmada Valley Development Authority,
Narmada Bhavan, Tulsi Nagar,
B H O P A L**

**Sub: Review of research proposal titled
"Impact of Agro-chemicals run-off from
fields on ground water and surface
water in command areas of Narmada Sagar
complex project.**

**Ref: Your Letter No.NVDA/AGRI/463/92/2052
Dated 23-10-1992.**

=====

Sir,

**Please find enclosed herewith my comments on
research proposal for your use.**

Thanking you,

Yours faithfully,

**(Dr.S.B.VARADE)
JOINT DIRECTOR (TRG)**

Encl: As above.

...

RAM/-

COMMITTEE ON RESEARCH PROPOSAL
TITLED "IMPACT OF AGROCHEMICALS RUN OFF
FROM FIELDS ON SURFACE & GROUND WATER
QUALITY IN COMMAND AREAS".

I reviewed the research proposal, The proposal is well drawn, However there are certain observations on some points as given below :

- 1.0 It is not clear that what will be sample size.
This means at how many locations water will be collected.
- 2.0 How the locations will be decided is not also made clear. Will the randomization be used?
- 3.0 The parameters used for quality of water are not clear.
- 4.0 Drainage water analysis should be included. ✓
- 5.0 There is no suggestion regarding natural pesticides or insecticides that could be used to control the pests and diseases, yet we will not leave the residues. This needs to be studied.
- 6.0 The proposal should make it very clear whether water quality is going to be determined for potable water or irrigation or both.
- 7.0 The proposal does not show procedure in handling the data as affected by spatial variability.
This may also be made clear, so that the inferences could be useful.

OFFICE OF THE DIRECTOR
WATER AND LAND MANAGEMENT INSTITUTE
NEAR KALIASOTE DAM, P.B. No.38
R.S. NEGAR, BHOPAL (M.P.).

No. 1546312/WALMI

Dated 18th Sept. 92.

To

Shri S.B. Lowlekar
Member (Env. & Forest) NVDA
Narmada Bhavan
BHOPAL.

Sub: Impact of Agro-Chemicals run-off from fields on
ground water and surface water in command areas on
Narmada Sagar Complex Projects.

Ref: No.NVDA/Agri/63/92/1564 Dated 10.9.1992.

.....

I am in receipt of your reference above.

I have gone through the proposal in general terms. I am
giving few points on the same for consideration by you.

(i) The importance of the study proposed is very well
established already. In this connection limited studies in
local areas have been done under Research Programmes of CBI&P.
If considered appropriate, you may also get in touch with them.,

(ii) This study proposed now can at best, be considered
as an initial bench mark study. Further the conditions now existing
in proposed areas like Kunda and Satak cannot be considered repre-
sentative as the original bench mark studies are not available and
also cultivation practices and chemical inputs will be much different
in the new project.

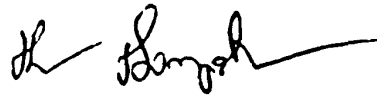
(iii) The Central Ground Water Board regularly conducts
qualitatives analysis of ground water in different parts of the
country and this is available for fairly long period. There is a
unit of the Central Ground Water Board at Bhopal who may also be
consulted in the above available date, which will be of great impor-
tance in finding out the current status. The equipment list given
has been gone through by me. It is not clear whether this equipment
will be available indigenously and also there are certain improved
equipment like the Atomic Absorption Spectrometer now available. I
would suggest that you may consult Director (Research) J.N.K.V.V.,
Jabalpur Dr. Nema who may be of help you in examining the equipments,
regarding adequacy and appropriateness.

- 2 -

In such studies, there should be a definite indication of the exact methods by which post project monitoring will be done. This requires elaboration. It is suggested that few representative locations may be indentified in the command and bench mark status established now to be compared with post project operation data.

(iv) The study should also be linked with programme of ground water monitoring both in respect of studies of the quality, water levels and any other significant change in the command area. This can only be done after making an appropriate appreciation of the hydro-geological aspects. In view of it, consultation should also be held for framing such study when only a total picture will be got.

I hope the above comments will be of help as desired by you.



(P. SAMPATH)
DIRECTOR
WALMI → BHOPAL

- 6 -

DR. G P TIWARI
PROJECT DIRECTOR

M.P.COUNCIL OF SCIENCE & TECHNOLOGY
159 Zone-I, Maharana Pratap Nagar, Bhopal

Telephone: 553224 (O)
566371 (R)

D O No. 657-5 /CST/92/PD(T)

Bhopal, dated 23/10.1992

Sub:- Impact of Agrochemicals run-off from fields on
ground water and surface water in command areas
of Narmada Sagar Complex projects.

Ref:- Your No. NVDA/Agri/63/92/1563 dated 10.9.1992

Dear Shri Lowlekar,

In reference to your above referred letter it is
informed that Dr. Mishra has retired since 5th September,
1992.

Comments on project submitted by Dr. D K Kauraw of
Agriculture College, Khandwa are enclosed.

With regards,

Yours sincerely,

(G.P. TIWARI)

Shri S B Lowlekar
Member (Env. & Forests)
Narmada Valley Development
Authority
Narmada Bhawan
Bhopal

23/10

MADHYA PRADESH COUNCIL OF SCIENCE & TECHNOLOGY
159 Zone-I Maharana Pratap Nagar, Bhopal-462011

Comments on Project on "Impact of Agro-Chemicals Runoff from Fields on surface and Ground Water Quality in Command areas"

1. Dr. D L Kauraw, Principal Investigator has requisite academic qualifications and experience to oversee & guide investigations mentioned in the proposed project.
2. The detailed programme of work is well drawn out. Study area has been identified in the command of Satak and Kunda dams which are constructed on tributaries of river Narmada. Choice of Dhangaon and Kal mukhi villages of Khandwa district where principal source of Irrigation are wells, will provide a comparative picture indicating variation in impact of agro-chemicals run off.
- 3.(a) In case of water sampling of wells, it is suggested that apart from quantitative aspects, size, depth and its recharging capability be also recorded.

It is also suggested that physical & chemical parameters of soil be also recorded in the command areas of fields where water run off and seepages studies are proposed to be undertaken.
4. Project is for three years with provision for two years extension.
5. Projected cost for three years is Rs.27.12 lakh of which 51% is on equipment which include one jeep with trolley and Motorcycle.

It is also seen from report that Agriculture College, Khandwa's existing laboratory facilities are inadequate. That is why Rs.9.70 lakh has been earmarked in the project for purchase of equipment. The list of equipment include costly items

11 2 11

like G L C with accessories (Rs. 3.0 lakh) and smaller items like water bath (Rs. 5,000/-)

General Recommendation

1. Project is good. It is liable to generate valuable information which will no doubt lead to development of suitable measures for the benefit of Farmers. It will also help in maintaining quality of soil and water.
2. Estimated expenditure on equipment to the tune of Rs. 9.70 lakh though much but if approved will provide Agriculture College an essential infrastructure for continuing similar studies.
3. Expenditure on jeep, trolley and Motor cycle does not appear to be critical for the project.
4. It is recommended that project may be considered for approval subject to suggestions made in para 2 and 3 (a), (b).

Signature
11/11/11

उत्तरा पालोना भोपाल

क्रमांक 15672 मु.प्रानवो/अर.शा.१२ भोपाल, दिनांक 31-10-१२.

प्राप्त,

✓ श्री एल.बी.लखोकर,
सदस्य उपनिर्वाहण एवं वन,
नर्मदा घाटी विकास प्राधिकरण,
नर्मदा भवन, भोपाल ।

विषय :- वृक्ष कार्य में प्रयुक्त होने वाले रसायनों की भूमिगत जल एवं
जल स्रोतों में उपस्थिति ।

संदर्भ :- आपका पत्र क्र. एन.व्ही.डी.ए./वृष/63/१२/1565,
भोपाल, दिनांक 10-9-१२.

संदर्भित पत्र द्वारा, आपके द्वारा प्रेषित प्रोजेक्ट समयापूर्व सम्पादन
प्राप्त हो चुका है । प्रोजेक्ट के उद्देश्य में संलग्न दस्तावेज संस्तु हो लो शामिल

नम्र प्रार्थना है कि,
31/10

निस
31/10/१२

ANNEXURE-I

Objective:

- (g) To evaluate suitable mathematical model for per capita pesticide distribution and potential pesticide load of study area.
- (h) To predict the future consumption of pesticides in the study area.
- (i) To advice for the promotion for the use of environment friendly pesticide in the study area.


Reply to the "COMMENTS" recieved

Dr. S.B Varade : Joint Director (TRG), WALMI : Aurangabad (M.S.).

"Research Project Proposal on Impact of Agrochemicals Runoff from Fields on Surface & Ground Water Quality in Command Areas".

1. The information on water sample size is not actually mentioned in the detailed project programme, as it will depend on the procedures used. However, the water sample size will generally range between 200 to 500 ml per sample, per site. The locations are tentatively mentioned in the programme and will be finalized after the preliminary survey.
2. The selection of location in the programme is done on the basis of the preliminary information available about the area. Further, the site selection in each cropping sequence of the representative Farming Situation will be done on the basis of randomization. However, the Farming Situations will be considered first.
3. The parameters to be used for quality of water will be according to the nature of its use, and the limits previously reported in the literature. The list of parameters are given in part 'E' of the Detailed Programme. A copy of the relevant literature is enclosed for reference.
4. The drainage water sampling and analysis has been included in the proposal, submitted (last para, page-11 of programme).
5. The study suggested in para # 5 i.e. use of natural pesticides, is beyond the scope of proposed study.
6. The suggestion is well taken care of. The limits of pollutant concentrations will guide us regarding the suitability of water for various purposes (i.e. potable or irrigation).
7. Since this is the preliminary study and inclusion of study on spatial variability will require more data and resources. If data suggest it necessary, it will be considered in the subsequent detailed studies.

I wish, most of the suggestions have been considered.



(D.L. Kauraw)
Senior Scientist (Soils)
College of Agriculture,
KHANDWA (M.P.)

Reply to the "COMMENTS" recieved

Er. Shri P. Sampath : Director WALMI . Bhopal.

1. As suggested. the CBI&P is being approached for the purpose.
2. The proposed study has been suggested to be under taken at three different locations i.e. Kunda command. Satak command and in a well irrigated area of Dhangoan/Kalaunkhi. The two commands are availing irrigation facilities since last 8 to 10 years or more and also the cropping intensity/input rates have to be higher than any other areas of the region. The study sites in these commands will be taken at head reach which would simulate the likely situation in the commands of Marsada Sagar Complex. Second well known area of Dhangoan/ Kalaunkhi. though have well irrigation facilities. yet the rates of applications of fertilizers as well as pesticides or fungicides are quite higher than other farming situations of the region. therefore, selected.
3. The preliminary survey proposed in the programme, and the results of the first year will also guide us for the monitoring or selection of more representative fields.
4. The data from rainfed sites adjoining to the study areas will be taken as bench mark for the studies. and the results will be interpreted accordingly. The present study areas will be useful as the bench mark sites for future studies.
5. Most of the equipments proposed are indegenious. except GLC Infrared Thermometer. etc. The equipment like Atomic Absorption Spectrophotometer will certainly of greater use. as well as essential for the similar studies. Yet. the same could not be demanded due to (i) high cost. and (ii) also there was a proposal to procure the same for us by your organisation. as intisated in one of our seminars personally. An early procurement of the same by your organisation would be of greater use. certainly.
6. As mentioned in the suggestion No. 3. the Bench mark location wells have to be marked and established. However, that could be possible only after preliminary survey. The period of monitoring will be decided after knowing the magnitude of contaminations encounter in this basic study.
7. The suggestion NO. 4 widens the scope of the study and the main objective will become the secondary. More over inclusion of such aspect will require longer period and substantial higher cost. In view of this no primary data will be collected in the study. However, all available data will be used in interpreting the results.

I wish most of the suggestions have been considered.


 (D.L.Kaurav)
 Senior Scientist (Soils)
 College of Agriculture. KHANDWA (M.P.)

Reply to the "COMMENTS" recieved

Dr. G.P.Tiwari: Project Director MPCOST, Bhopal.

"Research Project Proposal on Impact of Agrochemicals Runoff from Fields on Surface & Ground Water Quality in Command Areas."

1. Recommendations No. 1 & 2 require no comments:
2. Recommendation No. 3 : The expenditure on Jeep with trolly and a motor cycle is absolutely essential as the selected study sites are faraway from the campus as well as amongst themselves (i.e. in the radius of about 100 to 150 km). Further, the locations are at the remote sites and are not connected by the local conveniences. Also the samples would be voluminous and heavy, difficult to carry. Hence there must be provided.
3. The comments on recommendation No. 4 : are as under :
 - (a) The information/data suggested on the wells, of the study areas is worth considering, and has incorporated in the detailed project programme. As regards the estimations related to the recharging capacity of wells, the information available with Central/State Ground Water Board, will be use.
 - (b) The essential soil parameters of the study locations will be estimated, being an essential part to evaluate/correlate the results of the investigations, and for their applicability in other areas.
 - (c) The information on soil survey of the study area is available and will be used/ incorporated for the interpretation of data. The necessary soil analysis will be performed as necessary.

(D.L.Kauraw)
Senior Scientist (Soils)
College of Agriculture,
KHANDWA (M.P.)

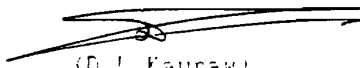
Reply to the "COMMENTS" recieved

Dr. S.P. Patil : Member Secretary, M.P. EPCB . Bhopal. (M.P.).

"Research Project Proposal on Impact of Agrochemicals Runoff from Fields on Surface & Ground Water Quality in Command Areas"

The suggestions are duly incorporated in the proposal. The objectives were included in the proposal as (e) & (f). However, the objective (h) could not be included in the programme as the proposed study is for a short duration only. As such the prediction of future consumption of pesticides in the study area and their extrapolation to likely contaminations of water may not be appropriate.

I wish, most of the suggestions given by you have been considered. Further suggestion as well as comments will always be given due respect.


(D.L. Kaure)
Senior Scientist (E.P.)
College of Agriculture
Khandwa

Annex-Min-XVIII-3

**ENVIRONMENTAL IMPACT ASSESSMENT
PRELIMINARY REPORT ON WATER RELATED DISEASES
SSP COMMAND AREA**

MARCH - 1993

**COMMISSIONERATE OF HEALTH, MEDICAL SERVICES
AND MEDICAL EDUCATION [HEALTH]
5, DR. JIVRAJ MAHETA BHAVAN
GANDHINAGAR - 382 010.**

C O N T E N T S

<u>Sr. No.</u>		<u>Page No.</u>
1.1	INTRODUCTION	1
1.2	COMMAND AREA COVERAGE AND IT'S MAIN FEATURES	1
1.3	MAIN FEATURES OF NARMADA COMMAND AREA.	1
1.4	HEALTH PROBLEMS ASSOCIATED WITH WATER RELATED DEVELOPMENT PROJECTS.	2
1.5	OBJECTIVES OF EIA.	3
1.6	HEALTH INFRASTRUCTURE IN THE COMMAND AREA.	3
2.0	PRESENT PROFILE OF WATER BORNE/RELATED DISEASES IN GUJARAT AND IN 12 DISTRICTS OF S.S.P.COMMAND AREA	3
2.1	STATE POSITION	4
2.2	S.S.P.COMMAND AREA POSITION	4
3.	MALARIA AND ITS MANAGEMENT	5
3.1	EPIDEMIOLOGY	5
3.2	ENTOMOLOGY	6
3.3	MANAGEMENT(Present control strategies)	7
3.4	EXPERIENCE IN IRRIGATION AREA (MAHI PROJECT COMMAND AREA - KHEDA DIST.)	9
3.5	IMPACT OF SSP ON MALARIA AND PROPOSED MEASURES.	12
4.	FILARIA	14
5.	GASTRO-ENTRITIS, TYPHOID AND CHOLERA	16
6.	JAPANESE ENCEPHALITIS	17
7.	INFECTIVE HEPATITIS	17
8.	SCABIES/SKIN RELATED DISEASES.	18
9.0	OTHER RELEVANT WATER RELATED DISEASES.	18
10.0	INTEGRATION	19
	RECOMMENDATIONS	20
	REFERENCES	21
	STATEMENT No. I to XI.	

ENVIRONMENTAL IMPACT ASSESSMENT PRELIMINARY REPORT ON WATER RELATED DISEASES FOR SSP COMMAND AREA

1.1 INTRODUCTION

The Sardar Sarovar project is an Inter-state multipurpose joint venture of four States, Gujarat, Madhyapradesh, Maharashtra and Rajasthan with a terminal dam on Narmada river at Navagam in Nandod taluka of Bharuch district. It is the largest water resources development project in India and possibly in the world. The main features of the project are many, few among them are ;-(1)

- 1) 18 lakhs hectares of land spread over 12 districts, 62 talukas and 3393 villages in Gujarat State will be covered under irrigation, which will increase agricultural production.
- 2) Drinking water facilities to 4720 villages and 131 urban centres, both with in and outside command area will get drinking water facilities.
- 3) Water supply requirement of several industries will also be met from the project giving a boost to around production.

The other benefits from this project to Gujarat State will be increased power generation, employment potential, protection against advancement of desert by afforestation, flood protection and development of fisheries.

Analysing the main features of the project, it is very clear that S.S.P. will induce all round development in all spheres of Gujarat and hence the life line of Gujarat.

1.2 COMMAND AREA COVERAGE AND IT'S MAIN FEATURES

The area, number of talukas and villages falling in the SSP command area by district is shown in attached STATEMENT NO.I

1.3 MAIN FEATURES OF NARMADA COMMAND AREA

Districts covered under the Narmada command area are having varying climatic conditions, topography and geographical features, Socio-economic conditions are also not similar in all the 12 districts.

The attached STATEMENT NO.II shows the different features of the districts under S.S.P command area..

The variation in features of the districts are clearly visible. The rainfall in Bharuch, Baroda

2^c

and Panchmahals districts is around 1000 mm. The two districts viz; Bharuch and Panchmahals are characterised as tribal districts, having tribal population more than 40%, while Baroda has also more than 25% tribal population. Kutch, Rajkot, Bhavnagar, Surendranagar and Banaskantha districts receives an average rainfall around 500 mm. Most of these districts are draught prone. But the districts in central Gujarat viz; Gandhinagar, Kheda and Ahmedabad receives moderate rainfall between 600 - 700 mm. Density of population in these three districts are also very high as compared to the remaining districts in the command area. The general literacy rate in Panchmahals(35.3) and Banaskantha(31.4) districts is far below the state literacy rate of 51.17.

The topography of the districts covered under command area is hilly, plain, plain sandy and plain coastal.

The present health infrastructure existing in the 12 districts of the command area will cater to the various health needs of community residing in these areas. This existing health infrastructure can be further augmented if need arises in the command area.

1.4 HEALTH PROBLEMS ASSOCIATED WITH WATER RELATED DEVELOPMENT PROJECTS.

Any water related project would involve:-

- i) Immigration of people as construction work force for construction of dam, reservoirs and canals.
- ii) Out migration due to evacuation of people from Dam and reservoir site and submerged areas.
- iii) Flow of water through main canal subsidiary canals and field channels in the command area for irrigation purpose.
- iv) Immigration of people viz; farmers, fisherman and traders due to irrigated agricultural development.

The above mentioned factors may have effect on environmental health problems particularly water related diseases. Further the movement of people in and out may have related health hazards, both through introduction of new diseases into an area and through increased transmission of existing disease amongst immigrants who have no immunity.

35

1.5 OBJECTIVES OF EIA.

The main objectives of EIA study are :-

- i) Identifying potential impacts of sardar sarovar project on public health.
- ii) Assessment of existing health infrastructure.
- iii) Assessment of monitoring and evaluation system.
- iv) proposing adequate preventive and control measures.

1.6 HEALTH INFRASTRUCTURE IN THE COMMAND AREA

In order to tackle the health problems a wide network of health infrastructure in the form of community health centres, hospitals, primary health centres and sub centres have been functioning, under various health and family welfare programmes in the State.

A team of multi-purpose health worker (Male & Female) at the sub-centre level is responsible for regular surveillance of communicable diseases in the area ranging from 5000 to 7000 population. There is one multi-purpose health supervisor for each of the 6 multi-purpose health worker (Male & Female). They are working under the control of Medical Officer in-charge of the primary health centre.

The criteria for having a P.H.C. is 20,000 population in tribal and 30,000 population in other areas. The criteria for having a community health centre is 1,00,000 population. The activities under all national health and family welfare programme are carried out by a net work of health workers and supervisors of the primary health centre under the control of District Health Organisation. Community health centres, district and sub-divisional hospitals are responsible for providing referral and specialised services which are working under the control of of Regional heads.

The implementation of modified plan of operation under National Malaria Eradication Programme is also carried out by such infrastructure through primary health care delivery system working under Regional/District Health Organisation. The present health infrastructure existing in 12 districts of the command area as shown in STATEMENT NO.III. will cater to the various health needs of the community residing in these areas. This existing health infrastructure can be further augmented if need arises in the command area.

2.0 PRESENT PROFILE OF WATER BORNE /RELATED DISEASES IN GUJARAT AND IN 12 DISTRICTS OF S.S.P COMMAND AREA

2.1 STATE POSITION

In Gujarat State one of the main water related disease is Malaria. Malaria is prevalent in almost all parts of Gujarat. Districtwise Average Annual Parasite Incidence (API) for last 5 years is given in STATEMENT NO.IV. The average API is above 2.0 in all the districts of Gujarat except Bhavnagar (1.9). According to GOI guidelines Malaria is considered to be under control if API is below 2 and insecticidal spraying activities should be undertaken in the areas having API 2 and above (2). Thus Malaria parasite load in most of the districts are more than the expected level, and if supported by other causative factors like increase in density of vector mosquito, heavy rainfall, water logging, humidity, temperature, migration of population etc, malaria parasites in the community will multiply and there is every possibility of an increase in the number of malaria cases.

Filaria in Gujarat State is confined to a few districts viz; Surat, Valsad, Jamnagar, Junagadh and Amreli. However Micro Filariae rate which was above 5 a few years ago has come down to 0.30 in 1992.

The other water borne diseases prevalent in Gujarat State are cholera, gastro-entritis, Infective hepatitis and Typhoid etc.

Number of cases and deaths due to the above mentioned important water related/borne diseases for the last 5 years in Gujarat State is given in STATEMENT NO.V.

2.2 S.S.P. COMMAND AREA POSITION

Malaria is prevalent in all districts of the S.S.P. command area. The S.S.P. area also showed increase in malaria cases in the year 1988-89, as per the general trend of disease noticed in almost all the districts. In all the 12 districts under the command area except Bhavnagar the average Annual Parasitic Incidence (API) is above 2. Districts like Baroda, Panchmahals and Bharuch have shown average API above 15. These districts can be considered as problem districts, so far as malaria is concerned.

The malaria risk in 12 districts can be distinguished as under :

API Range	Name of district	Malaria risk
I. 10 - 19	Bharuch, Baroda, Panchmahals, Surendranagar, Kutch	Hyper endemic High malariogenic potential Moderate to high incidence

Ahd,

II. 2 - 9	Gandhinagar, Kheda, Mehsana Baroda Rajkot	Meso-endemic Moderate malariogenic potential, Moderate to high incidence, Moderate epidemic potential.
III. Less than 2	Bhavnagar	Hypo endemic Low malariogenic potential, Low incidence and low epidemic potential.

The number of malaria positive cases, P.falciparum cases and deaths due to malaria in 12 districts under SSP command area for the last 10 years is given in STATEMENT NO.VI. All districts except Kutch has shown decreasing trend in both malaria and P.falciparum cases in the year 1992 as compared to 1991. Kutch district has shown an increase of 11 and 324.4 percent in reporting of malaria and P.falciparum cases respectively.

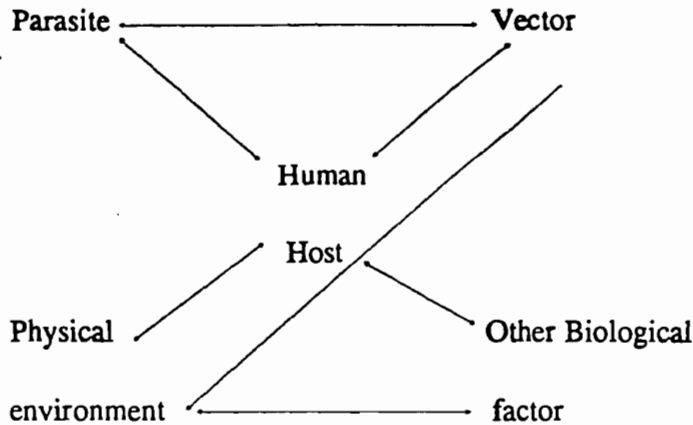
Not a single case of Schistosomiasis has been reported so far in any district under SSP command area. Filaria is also absent in the districts under SSP command area. Hence there is no threat of Schistosomiasis and Filariasis in the command area of SSP. Further a study on Schistosomiasis carried out in 1986 by National Institute of communicable diseases (NICD) and followed by investigating team of World Bank and WHO which reveal that the disease of Schistosomiasis posed no threat in the area of the SSP project.(3).

Looking to the information regarding other water related/borne diseases like gastro-entritis, cholera etc. for the last 5 years in these 12 districts under Narmada command area, at present it is not a special threat in the command area but is a usual phenomenon taking place elsewhere also.

3. MALARIA AND ITS MANAGEMENT

3.1 EPIDEMIOLOGY

In spite of intensive governmental efforts towards eradication of malaria it still continue to persist. Malaria is a potential threat to any warm region with available mosquito breeding habitats. The occurrence and perpetuation of malaria as a disease in a community in endemic form or it's periodic spurt in certain situations in epidemic form is governed by mutually interacting factors namely the parasite (a protozoon of the genus plasmodium) the vector (certain species of mosquitoes of the genus Anophelis) and the human host. These factors in turn react with their environment and present a complex system as under (4) :



3.2 ENTOMOLOGY.

In India the anopheline fauna comprises of 53 species out of which only 9 are malaria vectors. Out of 9 malaria vectors found in India, only the following three species have been established as a vector of malaria in Gujarat.

(a) Anopheles Culicifacies.

This is the most important rural malaria vector in Gujarat. The species is known for its ability to breed in a great variety of waters. Preferential breeding places are rain water, pools, irrigation channels, sluggish streams with sandy margins and little vegetation pools in river beds, borrow pits, freshly laid rice fields and wet fallows. Its flight range is 0.8 km but may extend to 2.8 Kms. under favourable circumstances.

(b) Anopheles Stephensi.

This is the wellknown vector of urban malaria in Gujarat. In urban areas the species breeds in well, cisterns, fountains, ornamental tanks and artificial containers. It is known to tolerate heavy pollution. In rural areas it breeds in pools, stream beds and at the margins of the stream, in seepages and marshy areas, irrigation channels, reservoirs etc. In urban areas the flight range is 0.8 kms. while in rural areas it is upto 4.8 kms..

(c) Anopheles fluviatilis.

This is a vector of considerable importance in hills and foothills regions. It is clear water breeders, normally breeding in irrigation channels, in grassy margins of slow moving streams, in seepages from irrigation and its channels during monsoon. Its flight range is 0.8 kms.

All these three vectors are prevalent in the command area of the S.S.P also. Looking to the

various breeding habitates of three main vectors of Malaria in Gujarat and its flight range, anti-malarial measures must be intensified upto an area of 3 kms. away from the canal system (main, tributaries and field channels) on both sides in particular and the command area in general.

3.3 MANAGEMENT (Present Control Strategies).

National Malaria Eradication Programme under modified plan of operation for Malaria is being implemented in all 19 districts of Gujarat State as per the guidelines of NMEP/GOI. The main objectives of modified plan of operation are :

- 1) To prevent deaths due to malaria.
- 2) To keep the Malaria morbidity under check,
- 3) To prevent adverse effect of Malaria on agriculture and industry.

The main features of surveillance and control measures under modified plan of operation, National Malaria Eradication Programme which are undertaken by the department of Health in Gujarat can be summarised as follows :

- 1) ; Active surveillance by MPHW
- 2) Passive surveillance through PHC's and hospitals and other non government organisations.
- 3) Treatment to suspected malaria cases (fever cases) through active and passive surveillance and malaria clinics functioning in each health centre and hospitals.
- 4) Radical treatment to all Malaria positive cases.
- 5) Selective residual insecticidal spray (depending on availability of insecticides).
- 6) Bio-environmental measures.

The above activities are carried out through following health infrastructure under Health and Family Welfare Programmes.

1. P.H.C.	921
2. C.H.CS	170
3. Gen. Hospitals	24
4. Dispensaries	118
5. Other hospitals	141

The urban Malaria scheme (UMS) is functioning in Gujarat State in 12 Municipalities and 4 Municipal Corporations and one notified area. Names of Municipalities and Corporations where UMS are functioning at present are as follows.

CORPORATIONS	MUNICIPALITIES	NOTIFIED AREA
Ahmedabad	Nadiad,	Gandhinagar.
Baroda	Anand, Cambay, Bharuch	
Rajkot	Surendranagar, Gandhidham,	
Bhavnagar	Bhuj, Upleta, Morbi, Dabhoi,	
	Godhra and Dahod.	

During 1992-93 Government of Gujarat has sanctioned UMS in four new towns viz; Dhrangadra, Wadhwan, Junagadh and Dholka.

The main activities under this programme are (5):

- 1) Anti larval measures intra and peridomestic.
- 2) Biological control by larvivorous fish.
- 3) Source reduction through minor engineering works.
- 4) Entomological studies.
- 5) Enforcement of bye-laws.

As per the modified plan of operation of malaria areas having API 2 and above are required

to be covered under insecticidal spray operations. But due to financial constraints only 25-50% of the targetted population is being covered under insecticidal spray.

Despite these constraints and limitations, due to the integrated approach adopted by the State Malaria cases showed declining trend since 1989. The percentage of decline in malaria cases for the last 3 years in Gujarat is as under .

Year	Malaria cases	% of decline as compared to previous year	Falciparum cases	% of decline as compared to previous year.
1989	598653	-	185178	-
1990	515926	-13.9	142907	-22.3
1991	404735	-21.9	122839	-14.0
1992	331969	-17.0	93667	-23.8

3.4 EXPERIENCE IN IRRIGATION AREAS (MAHI PROJECT COMMAND AREA KHEDA DIST).

Temperature, humidity, and water collections accumulated by rainfall or by irrigation projects are the three main factors responsible for the transmission of malaria through the vector Anopheles. If they favour it during part of the year and prevent it during the remaining part of the year transmission is seasonal, or they are favourable throughout the year transmission will be perennial. Higher humidity (more than 60%) and temperature around 27°C are the most favourable climatological condition for malaria transmission. In these conditions the vector mosquito gets a longer life, that means large number of new generations and the malaria parasite in it completes its extrinsic phase, rapidly. This facilitates further transmission of malaria parasite from mosquito to man. In an irrigated area humidity can be more and temperature also will be less when compared with non irrigated areas. The impact of an irrigation project on malaria is attributed to the following factors.

- 1) Favourable mosquito breeding habitates created by the irrigation project/canal system.
- 2) Longer life of vector mosquito due to favourable temperature (27°C) and high humidity (>60).
- 3) Rapid completion of the extrinsic phase of malaria parasite in mosquito due to the favourable temperature and humidity.

The malaria research centre in Nadiad has conducted a study (6) from 1985 to 1989 on seasonal

prevalence of malaria in 3 different physiographic zones viz; (i) canal irrigated area (ii) Non-canal irrigated area (iii) Riverine area.

The findings of the study can be summarised as follows :

In any given area common mosquito species occur through out the year but the abundance of any species depends more upon the availability of preferential breeding habitats and survival rates. Several factors associated with canal irrigation like continuous irrigation, multiple cropping pattern, increased water logging due to seepage from canals and lack of proper and adequate drainage have resulted in the creation of extensive mosquitogenic conditions. Further deforestation , rapid urbanisation and industrialisation may also have contributed towards changes in the prevalence of anophelines in the district.

The study was conducted in Nadiad Taluka . Forty three villages in which irrigation was through an artificial channel using the stored water of river and lakes were grouped under the canal irrigation area. Thirty one villages were grouped under non-canal irrigated area where only sub surface water from wells and or tubewells was used to promote agriculture. Twenty six villages situated on the river bank or it's vicinity from which rain water flows directly into a nearby river or vice versa were grouped under Riverine area.

The finding of the study is given in the table below:

MAN HOUR DENSITY OF ANOPHELINE (1985-1988)

(i) Canal Irrigation area.

Vector species	J	F	M	A	M	J	J	A	S	O	N	D
An Culicifacies	0.84	6.93	22.2	8.64	3.69	0.72	0.42	5.12	4.27	5.00	2.11	1.40
An Stephensi	0.14	0.33	0.39	0.51	0.13	0.11	0.37	0.78	0.16	0.09	0.13	0.27

(ii) Non canal irrigation area.

An Culicifacies	0.28	0.95	1.85	1.10	0.17	0.05	0.26	2.54	1.90	1.81	1.03	1.04
An Stephensi	0.02	0.09	0.14	0.23	0.12	0.05	0.19	0.36	0.10	.06	0.04	0.03

(iii) Riverine Area.

An Culicifacies	20.79	34.57	34.55	10.56	2.07	1.84	3.62	6.36	7.02	2.47	4.63	7.27
An Stephensi	1.33	1.43	1.76	1.00	0.30	0.21	0.66	0.77	0.14	0.11	0.08	0.58

From the above table it is observed that wide fluctuations were observed in the density of Anophelines through out the year in all the three areas. In canal irrigated area density of An.Culicifacies was high in two periods from February to April with a peak in March at 22.2 i.e. before summer and from August to October i.e. during monsoon.

In non canal irrigated area density remained low throughout the year with less wider fluctuations.

In Riverine area high density was recorded from January to April with a peak in February and March at 34.5 and then again rise during September and December at around 7.

Highest density was recorded from riverine area followed by canal irrigation area and lowest density was recorded from non canal irrigation area. The study clearly shows that there were marked differences in the density patterns of Anophelines in three physiographic areas. Canal irrigation and riverine area shows high An.Culicifacies during February and March which support low level malaria transmission which in turn can help in building up the parasite load in the community, which may facilitate further transmission after monsoon when vector density increases.

Another study (7) conducted by MRC Nadiad on the Anopheline Fauna of Kheda district and species specific breeding habits has found that a total of 16 species were recorded from canal irrigation areas out of this only 2 are vectors of malaria. Habitate wise composition of anophelines was also carried out in this study. The results are given in the following table.

Percentage to the total of vectors of malaria found in different habitats.

Vector species	Irrigation canal	Irrigation channel	Small pools	In the domestic water	River	Paddy fields
1. An. Culicifacies. (Principal vector Rural)	45.5%	26.9%	1.42	2.58	36.4	7.23

E1

2. An stephensi principal vector (urban)	3.24	0.7	-	69.4	1.16	1.34
--	------	-----	---	------	------	------

An. Culicifacies the principal vector for Malaria preferred to breed mostly in the canals, rivers, irrigation channels, river pools and paddy fields.

3.5 IMPACT OF SSP ON MALARIA AND PROPOSED MEASURES.

The Sardar Sarovar project has taken a number of precautionary measures to avoid water logging and mosquitogenic conditions which can be highlighted as follows(8)

- a) Lining of canals right upto the lowest water course carryig about 1 cfs. upto 8 hectares turn-out units. This would avoid seepage and weed growth.
- b) Comprehensive surface drainage to be executed simultaneously with irrigation canal and tank.
- c) Vertical drainage by wells and tube wells for conjunctive work and avoiding water logging.
- d) Avoidance of borrow pits as far as possible for canal earth work.
- e) Drainage of borrow pits.
- f) Effective water control through computerised semi-automatic system upto a level of 300 cf's branch canal capacity.
- g) Monitoring and evaluation system for ground water and surface water.

If all these precautionary measures are implemented before and during the construction phase of the project and proper monitoring when water flows in the canal, subsidaries, field channels etc, the water logging and mosquitogenic conditions can be minimised to a large extent and hence malaria transmission.

Despite all these precautionary measures, when the project becomes fully operational and the water starts flowing it is likely to create more avenues for sustained mosquito breeding. High annual parasite incidence suggest that "human reservoirs" carrying malaria parasite are already existing in the community and when there is a favourable situation for increasing mosquito breeding habitate in and around the command area, that could further facilitate instant mosquito breeding and may lead to increase in vector borne disease like malaria. So we have to take effective anticipatory measures combining all the activities under the purview of health department as well

as irrigation and other engineering departments. Rigorous bio-environmental measures will be required to be undertaken by the project authorities alongwith routine health measures which are also taken by health department as discussed earlier. Looking to the potentiality of such a huge and gigantic work the problem is likely to pause as a manifold and the present health set up in the area may not be able to cope up with the problems, so it is highly essential to strengthen the present infrastructure available by creating a special unipurpose vertical malaria control units which would be solely responsible to carry out anti-malaria activities discussed earlier. This would give a good boost to the routine surveillance and containment measure being undertaken by the multi-purpose workers working under the primary health centres.

The STATEMENT NO. VII shows the comparative picture of rainfall and annual parasite incidence. It indicates that there is a close relationship between the rainfall and API. During the year of heavy rainfall, the API has shown increase as compared to the period of less rain and API continued to remain high for the following one or two years of heavy rain. When ever there is a heavy rainfall above the normal mosquito breeding habitats increases, which is responsible for the transmission of malaria. Likewise in the irrigated area, there will be increase in the malaria incidence because of increase in mosquito breeding habitats caused by water stagnation and seepages from canals. Hence if adequate measures for controlling malaria, by taking suitable steps in terms of infrastructure, facilities, insecticidal spraying and surveillance activities and effective monitoring and control are not taken it will aggravate the malaria transmission in command area.

To encounter the health problem anticipated in and around the command area a specific action plan was prepared by the State Health Commissionerate in consultation with NPG and was submitted to the Government in January, 1986. In July, 1991 as per the recommendations of Shri N.L. Kalra, the World Bank Consultant on Malaria, a proposal was submitted to SSNNL by the commissionerate for setting up a preventive health organisation at Kevadia colony under SSNNL (9). This proposal has already been approved by SSNNL in September, 1992 with some modifications which is a positive approach in the right direction. When this preventive health organisation at Kevadia colony starts functioning it will be able to take adequate preventive measures to keep water borne/related diseases in general and malaria in particular under control in and around Kevadia colony (S.S.P. area).

Shri Kalra during his visit of the S.S.P. area in July, 1992 has also prepared a work plan for malaria control activities for the 3 districts (Vadodara, Bharuch and Panchmahals), under Phase-I of SSP(10). This proposal has already been submitted to SSNNL alongwith his field reports. As mentioned earlier, Vadodara, Bharuch and Panchmahals districts are having high malariogenic potential. So these three districts need special attention and an anti-malaria unit as proposed by Shri Kalra is very essential. Likewise anti-malaria units for other districts coming under Phase-II and Phase-III can be created phasewise.

In para 3.3 it is also observed that due to financial constraints only 25 to 50% of the targetted

population is being covered under insecticidal spray, however, as per modified plan of operation of Malaria areas having more than API 2 and above are required to be covered. Hence it is recommended that three districts viz; Bharuch, Baroda and Panchmahals under Phase I must be covered under insecticidal spray to check malaria transmission.

4. FILARIA

Filariasis is caused by helminthine worms transmitted by mosquito most commonly *Culex quinquefasciatus* (Fatigan). This parasite in the blood causes obstruction to the lymphatics resulting in the fluid accumulation in limbs and external genital organs.

The parasite of Filaria is called micro-filarie (M.F). There are two types of M.F *Wuchereria bancrofti* and *Brugia malayi*. Out of these two only *W. bancrofti* infection is prevalent in Gujarat. The vector of filaria in Gujarat *Culex quinquefasciatus* breeds in association with human habitations and is the domestic pest mosquito. It prefers polluted waters, such as sewage and sullage water collections including cess pools, cess pits, drains and septic tanks. In the absence of such water collections, they can breed in comparatively clean water also. Newly established irrigation centres can provide a variety of breeding habitats unless comprehensive mosquito control programmes are deployed(11). Filariasis is confined to the coastal area of Saurashtra and south Gujarat which is outside the command area of SSP. Under the National Filaria control programme the State government has set up 9 control units, 8 detection cum treatment centres in Surat, Valsad, Junagadh, Amreli, and Jamnagar districts.

The main features of the NFCP can be summarised as follows :

- 1) Detection and treatment of micro filaria carriers in the community so as to reduce the 2)
- 2) Vector control measures to reduce man mosquito contact so as to interrupt transmission of the disease.
- 3) Environmental improvement measures aimed at vector breeding source reduction and minor engineering measures.
- 4) Health education of the community to achieve community involvement and participation with a view to enhance the effectiveness of the governmental efforts to control the disease.

This disease is not found anywhere near the dam site or in the command area. The risk appears to be limited in arid and semi arid areas of the command area like North Gujarat, Kutch and Saurashtra.

In the year 1985 Delimitation surveys(12) were carried out in the districts coming under the

SSP command area also by Filaria Survey units functioning at Gandhinagar, Vadodara, Surat and Rajkot. Prevalance of Filariasis detected during the survey is given in the table below :

No. District	Population 1981	Population surveyed	Total No.of PHC	M.F. rate	Disease Rate
1. Bharuch	12,96,451	1,19,590	14	0.05	0.01
2. Baroda	25,58,092	55,713	16	0.75	0.10
3. Panchmahals	23,21,689	20,059	24	0.11	0.08
4. Kheda	30,15,027	43,109	20	0.07	0.07
5. Ahmedabad(Rural)	13,44,874	42,618	10	0.10	0.20
6. Gandhinagar	2,89,088	17,922	2	0.07	0.23
7. Mehsana	25,48,787	28,161	19	0.07	0.56
8. Surendranagar	10,34,185	6,500	10	0.15	0.01
9. Banaskantha	16,67,914	14,472	12	0.00	0.03
10. Rajkot	20,93,094	41,512	16	0.05	0.20
11. Bhavnagar	18,79,340	37,953	16	0.02	0.03
12. Kutch	10,50,161	8,407	9	0.00	0.03

Total No.of persons found to harbour micro filaria

M.F Rate = ----- x100

Total No.of persons examined for M.F

Total No.of persons showing signs and symptoms
of Filaria disease manifestation.

Disease rate = ----- x 100

No.of persons examined for Filaria disease.

All the 12 districts in the command area are having MF rate below one . In short filariasis is

not widely spread in the command area, only isolated cases were detected during the survey. So filaria is not a threat to public health in command area.

5. GASTRO-ENTRITIS, TYPHOID AND CHOLERA

These common water borne diseases are caused by bacteria. The contamination of water by human waste and lack of personal hygiene are the two important factors responsible for the prevalence of these diseases.

The reported number of the above three water borne diseases in the 12 districts under SSP command area for the period 1986 to 1992 by year are given in the STATEMENT NO.VIII.

From the districtwise figures it is observed that incidence of Gastro-entritis, Typhoid and cholera was maximum during the year 1988 and 1989 when heavy rainfall and flood situation in almost all districts.

With the availability of potable water for the purpose of drinking, washing and sanitation from SSP, problem of inadequacy of water resulting into contamination will be minimised. However, this disease is linked up with local sanitation in the village, personal hygiene, eating habits, of population density etc. General health education programmes coupled with chlorinated water supply system will certainly reduce the prevalence of the above three water borne diseases irrespective of project command area or not..

The STATEMENT NO.VIII. indicates that the reported gastro-entritis cases were either highest or 2nd highest during 1988 and 1989 in all districts under command area except Rajkot where the highest cases were reported during 1987 and 2nd highest during 1988. It is further observed that the year 1988 witnessed highest rainfall in most of the districts except Panchmahals, Banaskantha and Surendranagar. However, Panchmahals and Banaskantha witnessed highest rainfall during 1989. This indicates that the out-break of gastro-entritis etc. do occur during the year of heavy rainfall and also during following year of the heavy rainfall.

The Statement No.IX. shows the ratio of average of maximum cases of gastro-entritis of two years to average of gastro-entritis cases during remaining 5 years. This ratio would indicate the number of times the gastro-entritis cases likely to occur during the year of heavy rains and the following year as compared to cases during normal years. The ratio for Gujarat works out to be 12:1. This indicates that during year of heavy rainfall and the following year gastro-entritis occurs in an epidemic form and occurrence of gastro-entritis cases increases 12 times the normal occurrence of cases. This indicator would help in planning, monitoring and management of the gastro-entritis cases during heavy rainfall. The maximum ratio of 44.8 has been observed in Banaskantha districts followed by Baroda at 27.69. The ratio is more than 10 in districts of Kheda (22.8), Bharuch (17.7) and Panchmahals (11.1). In remaining districts the ratio varies from 5.36

in Ahmedabad district to 8.16 in Mehsana district.

6. JAPANESE ENCEPHALITIS.

Japanese encephalitis is caused by a virus which is transmitted by Mosquitoes . This virus belongs to group-B virus. It causes acute inflammatory disease of short duration involving parts of brain, spinal cord and meninges. Culicine mosquitoes particularly culex vishnui complex mosquitoes are the vector of the infection. The vector mosquitoes are mainly outdoor resters but rest indoors during summer, particularly in areas where temperature is high and relative humidity is low. The density of mosquitoes shows a rising trend from August, reaching the peak during September. The species is mainly Zoophilic. Experimental studies shows that the species feed readily on humans in the immediate vicinity of cattle.

The disease occurs in a sporadic and spotty manner and generally did not attack more than one member of the household. It was mostly a disease of rural setting and was not seen in highly urbanised centres. In some out breaks, the affected villages were close to extensive rice field. Man to man transmission of Japanese encephalitis does not occur. The infection is picked up by the mosquitoes from the reservoir which is generally birds/animals and then transmitted to man . Man is the blind end of transmission.

Japanese encephalitis has not been reported anywhere in Gujarat or in the 12 districts of SSP command area.

Outbreak of Japanese encephalitis can be controlled by reducing density of vector of Japanese encephalitis i.e. by insecticidal spray and adopting anti-larval measures.

7. INFECTIVE HEPATITIS.

Infective hepatitis or "viral hepatitis" is caused by two viruses namely hepatitis A virus (HAV) and hepatitis B virus (HBV). In Gujarat both types are prevalent.

DISTINCTION BETWEEN HEPATITIS A AND HEPATITIS B.

	Hepatitis A	Hepatitis B.
1. Nature of virus	RNA	DNA
2. Main sources	Food, water	Blood or blood products.
3. Age-preference	Children and young adults.	Any age

1801

4. Major route of transmission. Faecal -oral Parenteral.

CONTROL OF TRANSMISSION.

The best means to prevent the spread of infection of Hepatitis A is by ensuring simple hygienic measures, sanitary disposal of excreta which will prevent faecal contamination of water, food and with chlorination of water is also an effective method of destroying the virus, while Hepatitis B can be prevented by proper screening of blood donors, proper sterilisation of syringes and needles and passive immunisation(14).

The reported cases and deaths of Infective hepatitis in the districts of command area from 1986 to 1992 are given in STATEMENT NO.X.

8. SCABIES/SKIN RELATED DISEASES.

Scabies is caused by *sarcoptes scabiei*. It is contagious and mainly attributed to the lack of proper personal hygiene. The incidence of scabies and other skin diseases is directly related to scarcity of water, local sanitation of the area, lack of personal hygiene and finally the educational levels and overall health education.

When SSP will become fully operational, because of availability of fresh unpolluted water for irrigation, drinking purpose and industrial use incidence of scabies and skin diseases which is attributed to inadequacy of water supply will certainly go down in the command area and also in towns and villages which are served outside the command area. But at the same time proper health education inputs should be increased in the command area particularly for improving personal hygiene in the community.

In one of the study conducted in Baroda district in 1992 it was found that around 3 to 4% of the total OPD cases were treated for scabies.

9.0 OTHER RELEVANT WATER RELATED DISEASES.

One of the water related disease not discussed earlier and is prevalent in Gujarat and SSP command area is Poliomyelitis.

POLIOMYELITIS.

Poliomyelitis is an acute viral infection caused by polio viruses. It is primarily an infection of the human alimentary tract, but may effect the central nervous system in a very small percentage of cases resulting in varying degree of paralysis. Poliomyelitis can occur sporadically, endemically or epidemically. In India, poliomyelitis is essentially a disease of infancy and child hood. Seasonal variation in the incidence of paralytic polio are also striking. Approximately 60 percent of the

total cases recorded were during June to September.

Mode of transmission of the disease is through contaminated water, food, fingers, milk etc., where hygiene is poor, it can spread by faecal and oral route.

Immunisation is the sole effective means of preventing poliomyelitis. It is essential to immunize all children in the beginning of infancy to minimise poliomyelitis cases in command area.

Poliomyelitis cases recorded in 12 districts under SSP command area is given in STATEMENT NO.XI.

10.0 INTEGRATION.

Sardar Sarovar Project is an important water development project, providing water for irrigation, drinking purposes and industrial use. It will also generate electricity, so when completed the project will facilitate all round development of Gujarat in agriculture sector particularly and industrial sector in general. It would ease the problem of safe drinking water in large number of villages and towns which at present fall under draught prone area and having no source of potable drinking water.

All developmental projects contribute to health hazards and S.S.P cannot be an exception. Hence SSNNL has attached utmost importance to environmental impact assessment study on public health in general and water borne/related diseases in particular. Looking to the data related to morbidity and mortality pattern of various water related diseases in Gujarat and the districts under S.S.P. command area, it is observed that Malaria is prevalent in the districts of SSP command area. It is the major water related disease in the command area which needs special attention, monitoring and proper control measures as already discussed and is very well amenable to effective measures already suggested.

Filaria is not a threat to the 12 districts as per the available data. But areas having filaria is nearer to the command area. So constant surveillance is required to detect hidden cases/carriers.

Water borne diseases like Gastro-entritis, cholera, typhoid, infective hepatitis, poliomyelitis are also prevalent in all the districts with wider fluctuations. It is observed that these diseases are caused by poor hygiene, contaminated water and food etc. Skin diseases like Scabies are also prevalent in all the 12 districts. But incidence of skin diseases and scabies may go down when SSP becomes operational, due to increased water supply for bathing and washing purposes. With improvement in hygienic conditions and potable water supply through out the year by the SSP, the incidence of water borne diseases can be minimised if adequate health education measures and effective monitoring and evaluation system is established.

Other water related diseases which are vector borne viz; Japanese Encephalitis, Dengue fever,

20.

Schistosomiasis also are not reported in the SSP command area. Studies conducted earlier revealed that Schistosomiasis is not a threat to the SSP command area. With the increase in vector breeding habitats, we cannot rule out the occurrence of any vector borne disease in the SSP command area.

To determine the magnitude of the health hazards, posed by the SSP on public health and water related diseases SSNNL has decided to undertake environmental impact assessment study. This study will be carried out in two phases.

PHASE - I Study based on institutional data of water borne /related diseases in SSP command area

PHASE - II Study based on household survey

Phase-I study is already in progress. This study is assigned to Commissionerate of Health, Medical Services and Medical Education, Gandhinagar which will be completed by the end of April, 1993. Based on the outcome of Phase-I study, Phase-II study will be initiated.

After the completion of the study a clear picture of the magnitude of water borne/related diseases in SSP command area will emerge. Based on that, adequate preventive and control measures can be planned and executed to reduce morbidity and mortality due to various water borne/related diseases.

The preventive health organisation already sanctioned by SSNNL at Kevadia colony may be started as early as possible. This organisation can function as a model unit to control water borne/related disease in the SSP project area. Based on the functioning and effectiveness of this organisation necessary modifications can be made in the similar vertical units to be created phase wise.

RECOMMENDATIONS :

- 1) Creation of Health monitoring cell at SSNNL headed by a health expert with interdisciplinary team of other experts and workers..
- 2) Sanctioned preventive health organisation at Kevadia colony may be started soon.
- 3) Creating an antimalaria vertical unit for the three districts under Phase-I .
- 4) Necessary preventive and control measures will have to be taken based on EIA study Phase-I already initiated.

20

- 5) Anti-malarial measures must be intensified upto an area of 3 kms. away from the canal systems on both sides.
- 6) Bharuch, Baroda and Panchmahals districts under Phase-I of SSP must be covered under insecticidal spray regularly.
- 7) Continuing Health Education programme will have to be strengthened in the command area.
- 8) Continuing training of Irrigation Engineers in malariology.

REFERENCES

1. Sardar Sarovar Narmada Nigam Ltd., Gandhinagar "FACTS" Sardar Sarovar Project.
2. National Malaria Eradication Programme, Delhi, "Guidelines for Modified Plan of Operation."
3. The World Bank/ International Finance Corporation Office Memorandum, February 19, 1986. "INDIA: Narmada program - Schistosomiasis - Back-to-office Report".
4. Division of Medical Entomology & Vector Control, National Institute of Communicable diseases, Delhi-54., "Manual on Entomological Surveillance of Vector Borne Diseases".
5. National Malaria Eradication Programme, Delhi, "Guidelines for Urban Malaria Scheme".
6. BHATT R.M., SHARMA R.C., GAUTAM A.S. AND GUPTA D.K.: "Seasonal Prevalence of Anophelines in Kheda district, Gujarat", Indian Journal of Malariology, Vol.28, March, 1991, pp.18.
7. R.S. YADAV, R.C. SHARMA, R.M. BHATT AND V.P. SHARMA,: "Studies on the Anopheline Fauna of Kheda district and species specific breeding habitats". Indian Journal of Malariology vol.26, Jan. 1989, pp.65-74.
8. Narmada Planning Group "Note on specific feature of S.S.P.
9. N.L. KALRA, World Bank Consultant (Malaria)" Status report on malaria and other

22

health related aspects of the project and recommendations regarding short term and long term remedial measures".

10. N.L.KALRA, World Bank Consultant (Malaria) "Review of the steps proposed by Health Department, GOG and SSNNL to ensure adequate control of malaria and other water borne diseases."
11. National Malaria Eradication Programme" Operational Manual on National Filaria Control programme".
12. State Bureau of Health Intelligence, Directorate of Health, Medical Services and Medical Education, Ahmedabad, Gujarat, "Health Statistics of Gujarat 1987".
13. National Malaria Eradication Programme, Delhi" Japanese Encephalitis in India".
14. J.E. PARK, K.PARK.: " Text book of Preventive and Social Medicine".

23

STATEMENT NO : I**S.S.P. BENEFIT AREA, NUMBER OF TALUKAS, VILLAGES BY DISTRICT, GUJARAT.**

Sr.Nameof No.district	Area	No.of Talukas	No.of Villages	Cultivable area in the district	SSP benefit Area	SSP benefit Talukas	SSP benefit Villages
1.Bharuch	903.80	11	1193	507.80	97.95	05	331
2.Baroda	779.40	12	1655	593.00	340.15	11	948
3.Panchmahals	885.00	11	1909	547.80	9.68	04	30
4.Kheda	719.90	10	968	536.10	116.01	05	269
5.Gandhinagar	64.90	01	75	51.90	10.65	01	34
6.Ahmedabad	870.70	07	669	676.20	331.27	07	493
7.Mehsana	902.70	11	1099	753.30	150.19	06	312
8.Banaskantha	1270.30	11	1375	925.60	313.89	06	392
9.Surendranagar	1048.90	09	651	782.50	303.73	06	352
10.Bhavnagar	115.50	12	876	703.10	48.27	05	106
11.Rajkot	1120.30	13	856	810.00	34.12	02	53
12.Kutch	4665.20	09	948	2363.20	37.85	04	73
Total	14346.6	117	12274	9250.4	1793.86	62	3393

Source: Sardar Sarovar Narmada Nigam Ltd., Gandhinagar.

STATEMENT NO.II

Population, density of population, percentage of SC/ST population, Literacy rate, Average rain fall and topography by district under SSP command area, Gujarat.

Name of No.District	Total population 1991 census	Density of population n/sq.Km.	Percentage of ST Population	Percentage of Scheduled caste population	General Literacy Rate	Average Rainfall mm.	Topography
1. Bharuch	15,46,145	199	45.5	4.2	51.8	908	hilly
2. Baroda	30,89,610	396	26.5	6.2	54.0	846	hilly & plain
3. Panchmahals	29,56,456	340	47.1	3.6	35.3	1011	hilly
4. Kheda	34,40,897	497	1.2	5.9	55.5	734	plain
5. Gandhinagar	4,08,992	630.0	1.4	4.4	73.3	625	plain
6. Ahmedabad	48,01,812	565.0	0.9	11.5	61.6	660	plain
7. Mehsana	29,37,810	327	0.4	8.9	54.5	594	plain sandy
8. Banaskantha	21,62,578	97	6.9	10.6	31.4	514	plain sandy
9. Surendranagar	12,08,872	116	0.8	11.2	45.2	483	plain sandy
10. Bhavnagar	22,92,026	250	0.14	6.0	47.3	531	plain coastal
11. Rajkot	25,14,122	225	0.2	7.3	56.4	511	plain
12. Kutch	12,62,507	65.1	6.9	11.9	43.3	471	plain sandy coastal

Source: 1991 Census of Gujarat State.

STATEMENT NO.III.

HEALTH INFRASTRUCTURE IN S S P COMMAND AREA.

Sr.No.	Name of district	No.of Gen.hospitals	No.of Community Health centres	No.of Primary Health centres	No.of Govt. dispensaries.	No.of sub-centres.
1.	Bharuch	1	2	17	5	119
2.	Baroda	-	9	50	14	389
3.	Panchmahals	-	3	6	-	47
4.	Kheda	1	2	25	4	102
5.	Gandhinagar	-	1	4	6	38
6.	Ahmedabad	1	7	39	8	319
7.	Mehsana	-	3	23	11	143
8.	Banaskantha	-	3	20	8	209
9.	Surendranagar	3	6	21	53	152
10.	Bhavnagar	1	-	4	7	31
11.	Rajkot	1	-	4	7	31
12.	Kutch	1	3	9	18	53
	Total	9	44	227	148	1676

Source: Commissionerate of Health, Medical Services and Medical Education, Gandhinagar.

STATEMENT NO.IV**DISTRICTWISE AVERAGE API FOR LAST FIVE YEARS.**

No. Name of district	API	No. Name of district	API
1. Ahmedabad	5.3	11. Valsad	16.8
2. Kheda	7.7	12. Dangs	13.4
3. Sabarkantha	7.4	13. Rajkot	10.4
4. Gandhinagar	8.4	14. Jamnagar	2.9
5. Banaskantha	6.7	15. Kutch	13.0
6. Mehsana	3.0	16. Junagadh	4.5
7. Baroda	21.7	17. Bhavnagar	1.9
8. Panchmahals	14.8	18. Amreli	8.9
9. Bharuch	22.7	19. Surendranagar	20.8
10. Surat	29.1		

Source: Commissionerate of Health, Medical Services and Medical Education, Gandhinagar.

STATEMENT NO.V

CASES/DEATHS BY WATER BORNE/RELATED DISEASES IN GUJARAT STATE FOR THE LAST 5 YEARS.

Year	Malaria positive cases	Malaria falciparum cases	Deaths	Filaria cases	Filaria deaths	Cholera cases	Cholera deaths	Gastro-enteritis cases	Gastro-enteritis deaths	Inf.hepatitis cases	Inf.hepatitis deaths	Typhoid cases	Typhoid deaths
1988	460,683	159,286	67	238	-	1207	29	260657	870	7,793	484	6,364	26
1989	598,653	185,178	60	260	-	274	6	254208	368	11,939	516	3,566	31
1990	515,926	142,907	84	328	-	144	3	23413	349	8095	305	3307	24
1991	404,735	122,838	37	164	-	107	2	25071	455	6,816	195	8401	42
1992	331,969	93,667	27	209	-	246	10	32683	409	4475	127	6225	35

Source: Commissionerate of Health, Medical Services and Medical Education, Gandhinagar.

STATEMENT VI
MORBIDITY AND MORTALITY DUE TO MALARIA IN THE 12 DISTRICT OF SSP COMMAND AREA FOR LAST 10 YEARS

DISTRICT	BANASKANTHA			SURENDRANAGAR			RAJKOT			BHAVNAGAR			KUTCH			MAHESANA		
YEAR	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES
1983	1913	96	0	24325	3345	0	21360	2365	0	4292	717	0	9177	665	0	7086	465	0
1984	2249	283	0	19989	2841	0	21395	1200	0	4185	802	0	4419	337	0	8129	461	0
1985	1732	418	0	10997	1165	0	8377	659	0	2529	450	0	2696	367	0	4707	232	0
1986	1550	307	0	7774	1114	0	7106	1100	0	1956	444	0	2013	369	0	2906	246	0
1987	1582	131	0	6200	481	0	4850	652	0	1235	143	0	1304	189	0	2500	113	0
1988	10838	2792	0	30227	6958	0	12268	4175	0	2247	720	0	7537	2214	1	5536	865	0
1989	20310	3993	0	39236	9320	0	26329	9010	0	6904	2310	2	41875	14403	3	11928	2184	4
1990	23201	5303	1	26599	3826	1	25363	3616	1	7669	2330	0	25931	4832	0	13214	1753	2
1991	13479	1923	0	14232	2695	0	17078	1879	0	4146	1490	0	8992	994	0	10378	1996	0
1992	7332	1448	0	12831	2145	0	11947	1309	0	3826	1490	0	9984	4220	0	7187	1004	0

SOURCE: Commissionerate of Health, Medical Services and
Medical Education, Gandhinagar.

STATEMENT VI
MORBIDITY AND MORTALITY DUE TO MALARIA IN THE 12 DISTRICT OF SSP COMMAND AREA FOR LAST 10 YEARS

YEAR	BHARUCH			VADODARA			PANCHMAHALS			KHEDA			AHMEDABAD			SANDHINAGAR		
	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES	TOTAL MALA- RIA CASES	P. FALCI PARUM CASES	DEATH DUE TO MA LARIA CASES
1983	11028	806	0	17523	924	0	19437	2769	0	32232	1106	0	14049	1884	0	3944	96	0
1984	9921	1186	0	17871	2804	0	12412	1275	0	17755	670	0	10647	1153	0	3321	119	0
1985	8981	1068	0	9878	1375	0	3417	499	0	6825	431	0	4097	529	0	1303	94	0
1986	14042	3415	0	13454	3208	0	6835	2098	0	8460	1619	0	3215	606	0	1012	89	0
1987	24599	5751	0	39799	11400	3	32116	8871	0	16376	2273	0	2055	285	0	642	28	0
1988	28160	5855	3	55096	17641	51	62479	22655	4	27845	11362	3	7383	3219	2	1595	552	0
1989	34158	6649	0	73906	22988	15	79815	22035	3	27271	8251	5	13706	4895	3	6406	1106	1
1990	38532	7718	0	51710	16784	58	67883	12717	0	31867	7147	4	11924	3003	0	4872	621	0
1991	30517	6245	0	43523	14486	18	62307	13814	0	27910	9308	2	12735	4556	0	1898	344	0
1992	25910	4098	0	44924	14934	14	51653	10516	0	29228	6945	2	6999	1654	3	1751	273	0

STATEMENT NO.VII.

RAINFALL AND ANNUAL PARASITE INCIDENCE BY YEAR

Sr.No..	District	Year	Rainfall	API
1.	Bharuch	1986	589.0	10.5
		1987	447.2	17.5
		1988	1134.0	20.8
		1989	837.0	25.3
		1990	905.0	28.3
		1991	433.0	21.7
		1992	942.0	14.3
2.	Baroda	1986	303.8	5.1
		1987	419.3	14.9
		1988	1068.3	23.6
		1989	585.6	31.2
		1990	879.0	21.4
		1991	703.0	18.0
		1992	764.0	10.1
3. Panchmahals		1986	401.0	2.6
		1987	471.0	12.0
		1988	906.0	23.2
		1989	1190.4	28.7
		1990	1542.0	23.8
		1991	667.4	21.3
		1992	755.2	16.4
4. Kheda		1986	649.0	2.4
		1987	483.0	5.0
		1988	1256.0	8.3
		1989	738.9	8.1
		1990	679.0	9.4
		1991	650.5	8.2
		1992	528.7	8.4

31

STATEMENT NO.VII. CONTD.

5. Gandhinagar	1986	537.4	3.3
	1987	135.9	1.8
	1988	650.0	4.5
	1989	532.9	17.9
	1990	1125.0	23.1
	1991	534.0	5.0
	1992	485.0	4.3
6. Ahmedabad	1986	452.1	1.9
	1987	251.3	1.1
	1988	728.4	3.9
	1989	704.8	7.6
	1990	1035.4	6.6
	1991	541.1	7.0
	1992	573.3	5.2
7. Mehsana	1986	169.1	1.1
	1987	109.4	0.9
	1988	635.5	1.9
	1989	373.6	4.5
	1990	900.3	4.5
	1991	460.0	3.8
	1992	516.0	2.5
8. Banaskantha	1986	328.8	0.8
	1987	060.8	0.8
	1988	729.2	5.5
	1989	797.0	10.0
	1990	770.2	11.2
	1991	536.6	6.4
	1992	934.1	3.4

STATEMENT NO.VII CONTD.

9. Surendranagar	1986	308.0	6.9
	1987	081.0	5.3
	1988	443.0	25.5
	1989	449.0	32.9
	1990	627.0	25.3
	1991	202.0	10.9
	1992	492.0	9.6
10. Rajkot	1986	200.0	3.3
	1987	180.0	2.2
	1988	1056.0	5.4
	1989	433.0	12.5
	1990	463.0	14.3
	1991	340.5	7.5
	1992	682.2	4.8
11. Bharuch	1986	364.0	1.0
	1987	121.0	0.6
	1988	761.0	1.1
	1989	573.0	3.0
	1990	736.0	3.2
	1991	348.0	1.6
	1992	612.0	1.7
12. Kutch (Bhuj)	1986	105.9	1.8
	1987	005.0	1.1
	1988	657.7	6.4
	1989	563.0	32.5
	1990	281.0	19.7
	1991	082.0	6.0
	1992	508.0	7.9

Source : Commissionerate of Health, Medical Services and Medical Education, Gandhinagar.

STATEMENT No.VIII

		NUMBER OF GASTRO-ENTERITIS, TYPHOID AND CHOLERA CASES AND DEATHS BY YEAR							
Sr. No.	NAME OF DIST	YEAR	RAINFALL GASTRO-ENTERITIS		TYPHOID		CHOLERA		
			CASES	DEATHS	CASES	DEATHS	CASES	DEATHS	
1	2	3	4	5	6	7	8	9	10
1	SHARDAH	1986	569	738	6	2	0	24	1
		1987	447	1047	13	128	0	6	0
		1988	1134	19478(1)	46(1)	315(1)	0	66(1)	2(1)
		1989	837	14967(2)	10	94	3(2)	0	0
		1990	905	439	21	178	2	4	0
		1991	433	513	39(2)	312(2)	4(1)	29	1
		1992	942	2118	13	63	0	62(2)	6(1)
2	BARODA	1986	303.8	427	9	0	0	41	1
		1987	419.3	900	0	158	0	22	0
		1988	1068.3(1)	17762(2)	4	998(1)	0	32(2)	1
		1989	585.6	18747(1)	0	413(2)	0	10	0
		1990	879.0(2)	36	3	51	0	15	1
		1991	703	281	51(2)	245	3(1)	17	0
		1992	764.9	1652	57(1)	2	0	89(1)	3(1)
3	PANCHMAHAL	1986	401	1057	6	0	0	7	1
		1987	471	1049	0	56	2(1)	19(1)	1(1)
		1988	906	6899(1)	0	51	0	15	0
		1989	1190.4(2)	4232(2)	5	0	0	1	0
		1990	1542.0(1)	173	17(2)	512(1)	1(2)	1	0
		1991	667.4	63	15	39	0	6	0
		1992	755.2	155	32(1)	8	0	4	0
4	KHEDA	1986	0	1070	13	1	0	8	0
		1987	483	100	9	0	0	2	0
		1988	1256(1)	16041(1)	4	292(1)	1	28(1)	0
		1989	738.9(2)	10320(2)	11(2)	185	0	14	0
		1990	679	307	6	28	1	21(2)	0
		1991	650.5	515	21(1)	268(2)	0	4	0
		1992	588.7	1120	0	196	0	14	0
5	BARNHINAGAR	1986	537.4	394	0	0	0	56	0
		1987	135.9	628	5	0	0	0	0
		1988	650(2)	2274(1)	0	0	0	52(1)	0
		1989	532.9	1238(2)	0	0	0	0	0
		1990	1125(1)	1	1	15	0	0	0
		1991	534	0	0	0	0	0	0
		1992	484	306	3	79(1)	1	2	0
6	AMNEDABAD	1986	452.1	1448	0	156	52	16	0
		1987	251.3	795	49(2)	0	0	11	0
		1988	728.4(2)	6585(1)	7	0	0	12	0
		1989	704	2716(2)	0	0	0	14(1)	0
		1990	1035.4(1)	37	1	79	0	2	0
		1991	541.1	1087	2	222(1)	0	1	0
		1992	573.3	870	8	13	0	11	0

STATEMENT No.VIII

NUMBER OF GASTRO-ENTRITIS, TYPHOID AND CHOLERA CASES AND DEATHS BY YEAR

Sr. NAME OF DIST YEAR RAINFALL GASTRO-ENTRITIS TYPHOID CHOLERA

No. CASES DEATHS CASES DEATHS CASES DEATHS

1	2	3	4	5	6	7	8	9	10
7 MAHESANA									
	1986	159.1	208	21	0	0	10	0	
	1987	109.4	244	14	57	0	2	0	
	1988	635.5(2)	17174(1)	7	75	0	25(1)	0	
	1989	373.6	15528(2)	0	68	0	0	0	
	1990	900.3(1)	238	12	272(2)	0	14	0	
	1991	460	76	0	813(1)	6	0	0	
	1992	516	235	2	162	0	2	0	
8 BANSKANATHA									
	1986	328	0	0	0	0	0	0	
	1987	60.8	180	0	136	0	0	0	
	1988	729.2	13139(1)	0	288(2)	0	1	0	
	1989	797(2)	9942(2)	0	347(1)	0	7(1)	0	
	1990	770.2	59	1	68	0	0	0	
	1991	535.6	527	0	249	0	0	0	
	1992	934.1(1)	521	0	85	0	1	0	
9 SURENDRANAGAR									
	1986	308	3439	0	4	2	2	1	
	1987	81	1780	20(2)	121	0	7	0	
	1988	443	11923(1)	32(1)	254	0	13(1)	0	
	1989	449	7579(2)	7	232	3	0	0	
	1990	627.0(1)	902	12	276	1	0	0	
	1991	202	889	9	379(1)	0	0	0	
	1992	492.0(2)	1331	10	269(2)	0	0	0	
10 KUTCH									
	1986	105.9	2341	13	12	3	0	0	
	1987	5.0	3905	15	133	0	0	0	
	1988	651.7(1)	3962(2)	9	103	5	6(1)	1	
	1989	563.0(2)	2435(1)	19	63	0	0	0	
	1990	281.0	882	3	198	2	0	0	
	1991	82.0	1224	9	402(2)	0	1	0	
	1992	508.0	328	0	406(1)	0	0	0	
11 RAJAST									
	1986	200.0	558	4	0	0	0	0	
	1987	160.0	23800(1)	0	14	0	0	0	
	1988	1056.0(1)	11671(2)	22	31	0	8(1)	2	
	1989	433.0	6362	7	43	0	0	0	
	1990	463.0	2873	0	191(1)	0	0	0	
	1991	340.0	331	2	25	0	0	0	
	1992	682.2(2)	814	0	6	0	0	0	
12 BHAVNAGAR									
	1986	364.0	1758	5	16	1	0	0	
	1987	121.0	3189	9	217	0	2	0	
	1988	761.0(1)	18312(1)	27	335	0	2	0	
	1989	573.0	17429(2)	7	256	4	3	0	
	1990	736.0(2)	1406	13	326	0	0	0	
	1991	348.0	2391	31	500(1)	9	0	0	
	1992	612.0	2842	22	712(1)	1	2	0	

Note: Figures in paranthesis indicates highest and second highest rainfall during 7 year period 1986-1992.

Source: Commissionerate of Health, Medical Services and Medical Education, Gandhinagar.

STATEMENT NO. X

TO AVERAGE OF GASTRO-ENTERITIS
CASES DURING REMAINING
5 YEARS

RATIO OF AVERAGE MAXIMUM GASTRO-ENTERITIS CASES OF TWO YEARS

District	Year	Average maximum gastro-enteritis cases of two years	Average of gastro-enteritis cases of remaining 5 years	Ratio of average of maximum cases/average of remaining period
1. Bharuch	1988	17222.5	9710.0	17.7
2. Baroda	1988	18254.5	659.2	27.7
3. Panchmahals	1989	5565.5	499.4	11.1
4. Kheda	1988	14180.5	622.4	22.8
5. Gandhinagar	1988	2056.0	305.8	6.7
6. Ahmedabad	1988	4650.5	867.4	5.4
7. Mehsana	1988	16351.1	200.2	8.2
8. Banaskantha	1989	11540.5	257.4	44.6
9. Surendranagar	1990	9751.0	1668.2	5.8
10. Kutch	1988	14159.0	1736.0	8.1
11. Rajkot	1988	17735.5	2187.6	8.1
12. Bhavnagar	1988	17870.5	2325.2	7.7
Total		148437.0	12291.8	12.1

Source: Commissionerate of Health, Medical Services and Medical Education, Gandhinagar.

STATEMENT NO. XI

Ratio of Average Maximum Gastro Enteritis
Cases of Two years to Average of Gastro
Enteritis cases during Remaining
5 years.

STATEMENT NO.X

Cases and deaths caused by infectious hepatitis in the 12 districts of SSP command area from 1986 to 1992.

Dist.	Bharuch		Baroda		Panchmahal		Kheda		Gandhinagar		Ahmedabad	
Year	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1986	155	5	414	9	254	5	50	-	56	-	-	-
1987	80	7	215	6	254	6	53	-	50	-	99	2
1988	343	16	309	2	183	10	115	-	52	1	79	-
1989	1321	31	569	12	100	-	33	2	107	-	76	-
1990	409	18	365	1	112	4	78	4	23	-	89	-
1991	277	14	531	-	162	2	718	7	58	3	14	-
1992	207	-	254	-	254	5	56	-	92	2	1	-

Dist.	Mehsana		Banaskantha		Surendranagar		Kutch		Rajkot		Bhavnagar	
Year	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1986	118	2	88	4	231	2	130	2	63	2	181	17
1987	276	-	78	3	159	7	74	1	80	-	137	13
1988	98	4	159	8	244	7	243	15	88	-	243	32
1989	320	5	378	-	461	7	139	7	53	-	387	34

STATEMENT NO.XI.

CASES AND DEATHS CAUSED BY POLIOMYELITIS IN THE 12 DISTRICTS OF SSP
COMMAND AREA FROM 1986-87 TO 1991-92.

	1986-87		1987-88		1988-89		1989-90		1990-91		1991-92	
Districts	cases	death	cases	death	cases	death	cases	death	cases	death	cases	death
Bharuch	-	-	3	-	6	-	-	-	1	-	2	1
Baroda	25	4	2	-	1	-	3	-	-	-	4	-
Panchmahals	-	-	8	-	11	-	6	-	2	-	7	-
Kheda	-	-	-	-	3	-	3	-	11	-	1	-
Gandhinagar	-	-	-	-	-	-	4	-	2	-	-	-
Ahmedabad	85	22	1	-	25	-	-	-	1	-	6	1
Mehsana	-	-	5	-	-	-	2	-	10	6	8	4
Banaskantha	-	-	-	-	-	-	5	-	-	-	1	1
Surendranagar	-	-	4	1	2	-	2	1	-	-	6	2
Kutch	13	2	9	-	9	-	9	-	9	-	2	-
Rajkot	124	21	9	-	6	-	30	3	64	11	21	3
Bhavnagar	-	-	6	-	10	-	1	-	2	1	14	2

Source: Commissionerate of Health, Medical Services and Medical Education, Gandhinagar.

FOR OFFICIAL USE



NARMADA CONTROL AUTHORITY

Environment Sub-Group Agenda for Nineteenth Meeting

Venue: Paryavaran Bhawan, New Delhi

Date: 28 July, 1993 12.00 Noon

NEW DELHI
JULY, 1993

AGENDA FOR 19TH MEETING OF THE ENVIRONMENT SUB-GROUP
NCA TO BE HELD ON 28TH JULY, 1993 AT PARYAVARAN
BHAWAN, CGO COMPLEX, NEW DELHI.

I N D E X

Item Nos.	Contents	Page No.
XIX-1(100)	Confirmation of the Minutes of the Eighteenth meeting of the Environment Sub-Group.	1
XIX-2(101)	Review of Action taken on the decisions of previous meeting.	2 - 4
XIX-3(102)	Present Status of Studies/ Surveys and Environmental Action Plans.	5 - 14
XIX-4(103)	Monitoring of the Reports under compilation by the project authorities.	15
	Any other Item) Date & Venue of Next meeting)	16

A N N E X U R E S

XIX-1	Status Report on studies and activities on environmental aspects of Sardar Sarovar and Narmada Sagar Projects for the period ending June, 1993.	1 - 27
XIX-2	Note on Catchment Area Treatment for SSP in Dhule Forest Circle of Maharashtra State.	28 - 41
XIX-3	Xth Quarterly progress report ending March, 1993 of SFRI, Jabalpur.	42 - 48

*****00000*****

**Item No.XIX-1(100): CONFIRMATION OF MINUTES OF THE 18TH
MEETING**

Minutes of the 18th meeting of Environment Sub-Group of Narmada Control Authority were circulated to all members and invitees seperately vide letter No.Env-34(18)/93/1467 dated 8.7.93. No comments are received.

The minutes may be confirmed.

**Item No.XIX-2(101): REVIEW OF ACTION TAKEN ON THE DECISIONS
OF THE PREVIOUS MEETING**

Consideration of Policy Issues.

1. **Extension of Time for Environmental and Forestry Approval [Item No.XVIII-2(97)(1)].**

During the last meeting a team was constituted to undertake a field visit to the areas getting submerged by SSP. The team visited the areas and submitted an Interim Report. Final Report is expected to be available to the Sub-group during the meeting.

2. **Submission of Catchment Area Treatment Plans for freely draining critically degraded sub-watersheds [Item No. XVIII-2(97)(2)].**

During the last Sub-group meeting held on 28th May, 1993, Chairman directed Govt. of Madhya Pradesh and Govt. of Maharashtra to submit plans for the critically degraded (High and Very High priority categories) sub-watersheds not covered by directly draining component being taken up in Phase-I by October 1993. Upto date progress shall be reported in the meeting.

3. **Cost Estimates for preparation of Action Plan and Implementation of Environment Safeguard Measures [Item No.XVIII-2(97)(3)].**

A brief summary of the cost estimates for survey/studies/Action Plans and their implementation was presented to the Sub-group during 18th Meeting for review. Complete details, as desired during the review, are still awaited. The data already available is presented below. Concerned State Government officers and representatives are requested kindly to supply up dated figures and confirm the same.

ENVIRONMENTAL COST OF SSPRELATED TO UNIT I & II DAM & POWER HOUSE :A) Expenditure by project authorities:1) Cost of Survey & Studies (Rs. in lacs)

S.No.	Component	<u>Estimate/Actual Expenditure</u>				Total
		GOG	GOM	GOMP	NCA	
1.	Compensatory Afforestation	NA	NA	NA/2.43		<u>NA</u> 2.43
2.	Catchment Area Treatment.	NA	NA	<u>3.28</u> 3.28		<u>3.28</u> 3.28
3.	Flora & Fauna	<u>129.2</u> 100.3	<u>38</u> 16	<u>20.334</u> 15.64	<u>15.27</u> 14.63	<u>221.77</u> 164.43
4.	Health	NA	NA	<u>30.00</u> 18.89		<u>30.00</u> 18.89
5.	Archaeology/Anthropology.	<u>1.3</u> 0.40	NA	<u>59</u> 35.73		<u>60.3</u> 40.40
6.	Seismicity & Rim Stability.	<u>1.3</u> 0.4	NA	<u>23.00</u> 12.55		<u>24.3</u> 12.95

11) Cost of Implementation (in lacs)

1.	Compensatory Afforestation.	<u>1757</u> 865	<u>2116</u> 822.98	<u>1800.000</u> 533.27		<u>5673</u> 1970.137
2.	Catchment Area Treatment.	<u>3509</u> 1291	<u>2848.6</u> 30.47	<u>8835.05</u> 517.08		<u>15192.65</u> 1838.55
3.	Flora & Fauna	<u>75</u> 62	NA	NA		<u>75</u> 62
4.	Health (Incremental expenditure) for 10 yrs.	<u>3800.0</u> 91	<u>210.15</u> -	<u>748.73</u> NIL		<u>4758</u> 91
5.	Archaeology/Anthropology.	<u>136.15</u> 18	NA	<u>700</u> NIL		<u>836.15</u> 18
6.	Seismicity & Rim Stability.	<u>129</u> 271	-	<u>N.A.</u> N.A.		<u>129</u> 271

Total: 25879.34
4368.917

* In addition several State/Central agencies have also incurred expenditure on various Environmental studies & Implementation aspects. Full details are not yet available.

NA : Not available.

ENVIRONMENTAL COST OF SSPRELATED TO UNIT - III. CANAL & DISTRIBUTION SYSTEM

	<u>Command Area Development</u>		
	GOG	GOR	Total
1) Cost of studies (in lacs.)	<u>1257.15</u>	NA	<u>1257.15</u>
Estimated/ Incurred	NA		NA
11) Cost of Implementation	<u>68500</u>	NA	<u>68500</u>
Estimated/Incurred	NA		NA

Item No.XIX-3(102): PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS.

The latest status report of studies and activities on environmental issues under consideration of the Sub-group for the quarter ending June, 1993 is placed at Annex-XIX-1. The progress/ present position of the issues under consideration is briefly given below for review by the Sub-group.

i) Phased Catchment Treatment

Narmada Sagar Project

Govt. of Madhya Pradesh

According to the reports received from AIS & LUSO and catchment area treatment plan prepared by NVDA the total catchment area of NSP below Bargi dam is 38,95,200 ha out of which 32 sub-watersheds covering an area of 81427 ha are identified to be directly draining. The forest area is estimated to be 15516 ha & non-forest area 65911 ha. As non-forest area of 6591 ha is not available for treatment, the GOMP is required to submit detailed plans for 59320 ha of non-forest land besides 15516 ha of forest area. GOMP may like to report the progress on updating of the plans submitted in June, 1991.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP has submitted the plan for treating 90,000 ha of critically degraded directly draining sub-watersheds during

May, 1991 which was revised in May, 1993. Accordingly, it is planned to treat 1,11,795 ha spread over 42 sub-watersheds excluding 13,019 ha of area which is undergoing submergence.

According to the information supplied by GOMP an area of 8800 ha has been treated against a target of 15000 ha of non-forest area. Whereas, progress is reported over 1000 ha of forest area by erection of engineering structures only, against a target of 2000 ha for 1992-93, GOMP may report the progress of works during 1993-94.

Govt. of Gujarat

Govt. of Gujarat has taken up the entire catchment in Gujarat upstream of SSP for treatment. Out of the 27,200 ha forest area, an area of 15311 ha has been treated upto 1992-93 as scheduled. Progress on treatment of non-forest area is reported to be 1534 ha against the total target of 3025 ha. Progress of works during 1993-94 may be reported.

Govt. of Maharashtra

Govt. of Maharashtra is required to treat 31400 ha of critically degraded sub-watersheds directly draining into the reservoirs. The detailed plan for treating 25400 ha of area was submitted earlier by GOM which is now revised and updated as annexed at Annex-XIX-2. GOM has planned to treat 950 ha of the forest area during 1993 monsoon and 5600 ha during 1994 monsoon season.

works on execution of plan for non forest area is not reported.

Sub-group may like to review the situation.

ii) **Compensatory Afforestation**

Narmada Sagar Project

Govt. of Madhya Pradesh

During the last meeting, GOMP reported a cumulative progress **of over** 34697 ha & after deleting 2997 ha area transferred for CAT works, net progress of 31977 ha is reported. In view of more area identified for CAT works GOMP has revised the targets as contained in the status report annexed. Progress of works during the current monsoon may be reported.

Sardar Sarovar Project

Govt. of Madhya Pradesh

According to the action plan, GOMP was required to plant 1980 ha area during 1992-93. But in accordance with the direction of the sub-group, the deficit of previous year was added up to the targets. Against a target of 2387, GOMP has reported progress over 2400 area completing the overall targets. However, it is observed that all works were carried out in forest areas during 1992-93 where target is exceeded but no work was done in non-forest area of 400 ha. GOMP may report the progress of advance works on non-forest area during the current monsoon. Sub-Group may like to review the difficulties being faced by GOMP in identifying the non forest areas.

Govt. of Gujarat

Govt. of Gujarat has reported that the works are going on as scheduled. Out of a total target of 4650 ha of non-forest area scheduled for completion by 1994-95, works are already completed in 3310 ha upto March, 1993. Similarly, reforestation in degraded forest are already completed over 5284 ha against the total targets of 9300 ha, thus achieving the progress as scheduled. GOG may report progress of advance works for plantations during the current monsoon.

Govt. of Maharashtra

Govt. of Maharashtra reported a progress on 12,936 ha in degraded forests against the total targets of 12987 ha; the balance 51 ha is scheduled to be planted during the current monsoon. However, the progress against 6490 ha of afforestation works in non forest land is reported to be only 84 ha. Further, afforestation over 2200 ha of non forest land against the set target of 2700 ha of forest land released for R&R works at Taloda is completed and the balance of 500 ha is scheduled for planting in the current monsoon. Sub-group may like to review the situation.

GOM is required to provide location map of the area being planted alongwith the details of the composition of the species, survival percentage, spacing and other relevant details as directed during the 16th meeting of the Sub-Group.

iii) COMMAND AREA DEVELOPMENT

Narmada Sagar Project

Govt. of Madhya Pradesh

Progress on data compilation by NVDA for supplying to the consultants for preparation of detailed plan may be reported.

Sardar Sarovar Project

Govt. of Gujarat

The detailed report on Environmental Impact Assessment of the command area development in 3 volumes was submitted during the meeting. Dr. Abrol and Dr. Mahesh Pathak were requested by the Sub-group to review the report in relation to cropping pattern, suitable agriculture other related aspects. Progress may be reported by GOG.

Govt. of Rajasthan

During the 18th meeting of the Sub-group it was directed that GOR will take up the studies in consultation with GOG. Progress may be reported by GOR.

iv) SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP may indicate the action taken by it on the comments received from members of the committee on the report of Friends of Nature Society, Bhopal & the

actions proposed to be taken for conservation of Wildlife.

Sardar Sarovar Project

Govt. of Madhya Pradesh

A copy of the report for the quarter ending March, 1993 submitted by State Forest Research Institute for the impact assessment studies in Madhya Pradesh is enclosed at Annex — XIX-3. Govt. of Madhya Pradesh would like to submit the report for the quarter ending June, 93 of the State Forest Research Institute, Jabalpur and summary of the actions proposed.

Govt. of Gujarat

Govt. of Gujarat may like to submit a detailed action plan based on the recommendations contained in the report of M.S. University, Vadodara.

Govt. of Maharashtra

School of Environmental Science, Pune University had submitted a preliminary report and an interim report for the work done upto December, 1992. Member (E&R) of NCA alongwith GOM officials held discussion to review the progress of works on 8th July, 1993. Scientists of School of Environmental Science, Pune were requested to submit their final report on the area getting submerged by SSP by the end of September, 1993 as directed by the Sub-Group. It was agreed that a report on the areas getting affected by the monsoon of 1993 and 1994 will be submitted soon. Progress upto date may be reported by GOM.

v) ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY

ARCHAEOLOGY

Narmada Sagar Project

Govt. of Madhya Pradesh

A detailed action plan for relocation/protection of central as well as state protected monuments are still awaited from NVDA.

Sardar Sarovar Project

Govt. of Madhya Pradesh

The finalised action plan giving time frame and cost estimates prepared by State Department of Archaeology and Museum, Madhya Pradesh is yet to be made available to MOE&F and NCA.

Govt. of Gujarat

It was reported that a new temple is already in place and diety is also shifted. However a firm date for completion of relocation works in view of likely submergence from the ~~CURRENT~~ monsoon may be indicated. The plans finalised by GOG on relocation of Hamfeshwar temple are still awaited.

Govt. of Maharashtra

No works are required to be done in Maharashtra in this regard.

ANTHROPOLOGY

Govt. of Madhya Pradesh

Studies completed by Dr. K.G. Dubey and Dr. Phillips of NCA are available for use in formulation of R&R plans.

vi) SEISMICITY AND RIM STABILITY OF RESERVOIR**Narmada Sagar Project****Govt. of Madhya Pradesh**

Govt. of Madhya Pradesh had requested Geological Survey of India to complete the balance studies on rim stability, the outcome of the studies completed may be reported.

GOMP is also to report the progress on procurement of Seismometers from IMD needed for obtaining preimpoundment data.

Sardar Sarovar Project

Rim stability analysis for the areas in Gujarat was completed in 1982. Similarly 130 sq. km area in Madhya Pradesh was covered up during 1991-92. It was indicated by GSI that the draft report for the balance area is available but before finalising the report confirmation on certain aspects is required. Some studies for the same have been entrusted to CW&PRS, Pune and an amount of Rs. 12.5 lakhs has been placed at their disposal. All necessary facilities have been made available. The joint inspection of the site was undertaken on 16th March, 1993 & it was found that some more data is needed. GOMP has been requested to collect and furnish the data to GSI & CWPRS at an early date. Progress is awaited from GOMP.

vii) HEALTH ASPECT

Govt. of Madhya Pradesh

Narmada Sagar Project and Sardar Sarovar Project

The interim report, on surveillance and control by Gandhi Medical College, Bhopal received from NVDA was annexed with agenda papers of the 18th meeting. Latest progress may be reported.

Sardar Sarovar Project

Govt. of Gujarat

A copy of the updated health plan is already enclosed in minutes of the 18th meeting at Annex-XVIII-3

Govt. of Maharashtra

Govt. of Maharashtra submitted an initial plan in 1987 which was revised in 1991 and it was again revised in 1993 and a short note on this revised plan was submitted during the 17th meeting. However, a copy of the detailed action plan on health indicating the latest revisions may be submitted to the MOE&F and NCA urgently.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

During the earlier meeting of the sub-group, Chairman has desired a clear picture on conservation aspect of fisheries. In pursuance, a Review of studies already done was commissioned to CICFRI, Barrackpore. These studies also address to the concern of the sub-group raised during the 16th meeting and the draft report is now submitted. The report is under printing by CICFRI and would be made available soon.

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh may like to indicate the progress of final report to be submitted by 3 universities on Liminological aspects.

Govt. of Gujarat

Govt. of Gujarat may like to report on the progress of studies on conservation and development of fish fauna in estuary and command.

Govt. of Maharashtra

Govt. of Maharashtra has already submitted a plan for fisheries development in Maharashtra in 1988 to the MOE&F and NCA.

*Direct to Govt
to implement
the report*

Item No. XIX-4(103):**MONITORING OF THE REPORTS UNDER COM-
PLILATION BY THE PROJECT AUTHORITIES**

i) **TOR on Environmental Management of the Narmada Basin.**

It was observed during the 18th meeting that, in the absence of proper funding arrangements the issue may get ignored. It was agreed during the meeting that MOE&F would take up the issue seperately.

ii) Environment Overview report the draft of which was approved **by the** State Governments and Chairman. NCA also incorporating the views of MOE&F. the report is submitted to MOE&F and copies are made available to the members of the Sub-group. Sub-group may like to approve the report.

iii) EIA report on command area development was submitted during the 18th meeting. A copy is available with NCA and MOE&F and is under scrutiny.

iv) Modified health plan is already covered under item XIX-3(102) and annexed with minutes of the 18th meeting. Sub-group may like to review the same.

Any Other Item

Date & Venue of next meeting.

ANNEXURES

ANNEX- XIX -1

STATUS REPORT
SARDAR SAROVAR PROJECT (SSP) ENVIRONMENTAL ASPECTS
JUNE - 1993

The action plans and status of studies and implementation of Environmental Safeguard Measures is as indicated below:

Environmental Safeguard Studies/Measures

- 1) Phased Catchment Area Treatment.
- 2) Compensatory Afforestation.
- 3) Command Area Development.
- 4) Flora, Fauna & Carrying Capacity.
- 5) Seismicity.
- 6) Health Aspects.
- 7) Archaeological & Anthropological, Studies.
- 8) Fisheries.
- 9) Rim Stability Analysis.

I. CATCHMENT AREA TREATMENT

The MOEF clearance granted in 1987 contained two conditions pertaining to CAT, as follows:

- more detailed surveys for prioritisation of the sub-catchments in the SSP area should be undertaken;
- a phased CAT programme should be prepared and implemented ahead of reservoir filling.

GOI issued a Directive in June 1992 that, for the SSP, the project would bear the costs of the treatment of all critically-degraded sub-watersheds draining directly into the reservoir. These watersheds were identified amongst those classified as either very high or high-priority categories by the All India Soil and Land Use Survey (AISLUS). The project would also be responsible for the treatment of those areas of the catchment which are directly damaged by the project activities.

In addition, plans are required to be prepared for the treatment of the balance of the critically-degraded watersheds but the cost of this will be met from other ongoing schemes and in a timeframe to be determined.

Studies

Surveys and studies have been undertaken to aid the development of a management plan for CAT in the SSP catchment.

- Report of Inter-Departmental Committee on Soil Conservation and Afforestation, (the Dewan Committee Report), 1985.

- Report on Prioritisation of Sub-watersheds in sub-catchments of Narmada Catchment, 1991.

Table 1.1 Summary of Status of CAT Planning

	GOG	GOM	GOMP
Preliminary Surveys)		
Prioritisation of sub-watersheds	:		
Development of Management Options	:	"Complete" for all item in all States.	
Annual Action Plan	:		
Effective monitoring)		
Phased Programme	Complete	Under finalisation	Under finalisation

Table 1.2 Principal Elements of Action Plans for CAT

Elements of Action Plans	GOG	GOM	GOMP
Survey work	)	"Complete" for all item & all States.	
Preparation of detailed map)		
Micro-watershed development map	Complete	Partly done & partly under pre-preparation.	Partly done & partly under pre-preparation.
Assignment of responsibility for conducting the work)		
Timetable	:	"Yes" for all item for all States	
Budget	:		
Menu of treatment	:		
Proposals for monitoring)		

Table 1.3 The total catchment area of SSP below NSP is 2448973 ha.

	GOMP	GOG	GOM	Total for the Basin
Total Catchment	2248601	36761*	163611	2448973 ha
Very High & High	541825	35412	116354	693591
Directly draining Very High & High	114606	29537	31423	175566
Areas directly damaged by project activities.	-	500	-	500
		Planned to treat 176200*		

* According to Govt. of Gujarat, the actual catchment area is only 30229 ha and entire area is planned for treatment.

Table 1.4 Implementation of CAT

	Gujarat	Maharashtra	Madhya Pradesh			
	<u>Area to be treated in ha.</u>					
	(Area in brackets indicate actual progress)					
	Forest	Non-Forest	Forest	Non-Forest	Forest	Non-Forest
<u>Monsoon year</u>						
1990-91	<u>4560</u> (4528)	<u>897</u> (897)	-	-	-	-
1991-92	<u>4750</u> (4770)	<u>830</u> (274)	-	-	-	-
1992-93	<u>6000</u> (6013)	<u>662</u> 363	<u>425</u>	-	<u>2000</u> (1000*)	<u>15000</u> (8800)
1993-94	6200	636	950		6000	<u>20000</u> 361
			Under finalisation			
1994-95	5700	-	-do-		5000	20000
1995-96	-	-	-do-		5000	20000
1997-98	-	-	-do-		5000	16600
TOTAL :	<u>27200</u> (15311)	<u>3000</u> (1534)	<u>27200**</u> (-)	<u>4200</u> (-)	<u>23000</u> (-)	<u>91600</u> (9161)

	<u>Gujarat</u>	<u>Maharashtra</u>	<u>Madhya Pradesh</u>
Implementation	56% complete work scheduled to finish 1995	work recently commenced scheduled to finish 1996	8% completed work scheduled to finish 1997

* Incomplete works on 1000 ha of forest areas are completed by erection of Engineering structures only.

** Net working area may be 50 to 60% of the targets indicated.

II. COMPENSATORY AFFORESTATION

Approval for the diversion of forest land for the SSP was granted by the MOEF in 1987 and in 1990 (for R&R works) but several conditions were attached relating to the planning and conduct of CAF. Principal amongst these were the following stipulations.

- For every hectare of forest land submerged or diverted for construction of the project there should be Compensatory Afforestation on one hectare of non-forest land plus reforestation on two hectares of degraded forest. This represents a two fold increase of the usual requirement.
- For the 2,700 hectares of forest land in Maharashtra which is to be used for R&R, an equal area of non-forest land or double the area of degraded forest should be planted.
- The governments of the three states involved should prepare plans detailing their proposals for Compensatory Afforestation and submit these to the MOEF before work in the forest area is due to commence.
- The project should supply firewood to its construction workers, at its own cost, to prevent them from having to meet their fuel needs from the surrounding forests.

Studies

These have been a number of studies in three states aimed at assessing the extent and significance of the loss of forest land attributable to the SSP.

- Sardar Sarovar (Narmada) Project Development Plan, Volume-II prepared by the Narmada Planning Group (NPG) in 1983.
- Studies on Ecology and Environment by M.S. University of Baroda (MSU) in 1983.
- Sardar Sarovar Project: Preparation of Environmental Work Plan by the Forest Department of Maharashtra in 1988.

- Eco-Environmental and Wildlife Management Studies on the Sardar Sarovar Submergence Area in Gujarat 1992 by MSU.
- Impact Assessment of Madhya Pradesh Land to be Submerged Under Sardar Sarovar Project and Adjoining Ecosystems by State Forest Research Institute, Jabalpur (1989-92).
- Status of Flora and Fauna in and Around Sardar Sarovar Project, Maharashtra is a preliminary report of an ongoing study by the University of Pune which began in 1992 and is due to run for two years.

The Action Plans

In compliance with the conditions set by the MOE&F, each state has prepared an action plan for the CAF of areas within its boundaries. The relevant documents are:

- Government of Gujarat Work Plan for Management of Environmental Effects, Section on Forests and Wildlife: The Compensatory Afforestation Plan for the Rann of Kutch, 1986.
- Project for Afforestation in Sardar Sarovar Project Impact Areas due to Diversion of Forest Lands for Sardar Sarovar Project (GOG), 1991.
- Compensatory Afforestation Scheme in Lieu of Sardar Sarovar Project in Dhule District, Maharashtra State (1989).
- Government of Madhya Pradesh Forest Department Action Plan of Compensatory Afforestation for Sardar Sarovar multi-purpose river-valley project (1989).

These plans were submitted in varying stages of completeness but each has now been revised and updated to take account of the comments of the MOEF and the NCA. Action plans of 3 State Govts. contained following components:

1. Identification of areas for CAF;
2. Description of selected areas,
3. Justification of Selection of Areas,
4. Identification of responsible agency,
5. Description of staffing requirements,
6. Description of material requirements,
7. Estimate of costs,
8. Identification of tree species,
9. Description of preparatory work needed,
10. Description of planting techniques,
11. Provision for aftercare,
12. Yearly planting target,
13. Yearly budget,
14. Provision made for monitoring implementation

These action plans spell out a programme of tree planting in the three states on both non-forest and degraded forest areas as shown in Table 2.1 & 2.2.

Table 2.1 Areas for Compensatory Afforestation

	Area of Forest divert for SSP	Area of Degraded forest to be Replanted	Area of Non-Forest Land to be Afforested	Total Area for CAF
Gujarat	4,523	9,300	4,650	13,950
Maharashtra	9,188*	12,980	9,190	22,170
Madhya Pradesh	2,732	6,547	2,190	8,737
TOTAL :	16,443	28,827	16,030	44,857

* This includes 2700 ha released for R&R works in Maharashtra in 1990 for which only equal non forest area is being raised as stipulated.

Table 2.2 Schedules for Implementation of CAF

	Gujarat		Maharashtra		Madhya Pradesh	
	Area to be Afforested in ha (Area in brackets indicates actual progress)					
	Degraded Forest	Non-Forest	Degraded Forest	Non-Forest	Degraded Forest	Non-Forest
Monsoon year						
1990		2,150 (2150)			132 (132)	716 (716)
1991	2,835 (2,835)	270 (276)	8,383 (8383)		1580 (1200)	400 (373)
1992	2,555 (2449)	880 (880)	4,552 (4552)	2,276 (2276)	1580 (2400)	400 (-)
1993	2,250	800	45	1,506	2300	400
1994	1,660	550		1,000	515	274
1995				4,408		
Total:	9,300	4,650	12,980	9,190	6547	2190
Achievement in ha.	(5284)	(3310)	(12935)	(2276)	(3732)	(1089)
Total Task Completion in %	57%	71%	99.65%	24.75%	57%	49.7%

Other Additional Afforestation Activities:**Plantation along Canal Banks:**

The total potential of canal bank plantations is estimated as 18000 ha. A project report prepared by forest Deptt. is under scrutiny of SSNNL. A programme of plantation is likely to be launched effectively from the year 1992. However to give start to the work of canal bank plantations, early plantations on 155 ha are already established till the rains of 1992.

Additional Activities**(a) Dam Vicinity Plantation (235 ha)**

Planted till rains of 1992 - 240.00 ha

(b) Forest Plantation (500 ha)

Ravine lands on the left bank of the Sabarmati in village Ratanpur (300 ha) and Pirojpur (200 ha). In Pirojpur entire area of 200 ha is planted up by the rains of 1992.

(c) Project area plantations: (255 ha)

Plantations are already completed by rains of 1992.

(d) Additional Plantation in Non-forest Areas (1098 ha)

Non-forest land in Kutch district. Lands have already been released. The plantations will be completed by 1994-95.

III. COMMAND AREA DEVELOPMENT (INCLUDING DRAINAGE STUDIES)

(A) **Government of Gujarat:** Govt. of Gujarat has undertaken several studies related to the Command area development which included the following:

Sl. No.	Name of Study	Name of Agency	Year of Completion
1.	Mathematical Modelling of Ground Water for Baroda & Bharuch Area.	Operation Research Group, Baroda.	1981
2.	Pre-Feasibility study for Low Level Canal.	Jyoti Consultants Ltd. Baroda.	1981
3.	Pre-Feasibility level Drainage study of Narmada Mahi Doab of SSP Command.	Core Consultants Ltd. Ahmedabad.	1982

- | | | | |
|-----|---|--|------|
| 4. | Some Aspects of Role of Panchyats and Institutional Arrangements for canal irrigation in Two Talukas of Ahmedabad District. | Institute of Cultural and Urban Anthropology, Ahmedabad. | 1982 |
| 5. | A study of settlement Pattern (6 Talukhas sub Districts in the Narmada Command Area of Mahesana District of Gujarat). | Department of Geography, Gujarat University, Ahmedabad. | 1982 |
| 6. | Regionalisation of Narmada Command. | Operations Research Group, Baroda. | 1982 |
| 7. | Marginal cost study of two Typical Distributerries and Two Typical Branches. | Dr. C.R.Shah, Baroda | 1983 |
| 8. | Population Projection and Migration study for Narmada Command Area. | Operations Research Group, Baroda. | 1983 |
| 9. | Cropping Pattern and Water Demand Study in Narmada Command Area. | Operations Research Group, Baroda. | 1983 |
| 10. | Study on Water Demand for Non-Agricultural use from Narmada Project. | Gujarat Water Supply and Sewerage Board, Gandhinagar. | 1983 |
| 11. | Consumer Expenditure, Assets and Indebtedness of Rural Households of the Command Areas of Sardar Sarovar (Narmada) Project, 1982. | Directorate of Economics & Statistics, Gandhinagar. | 1983 |
| 12. | Methodological frame work for Economic Appraisal of Narmada Project. | Tata Economic Consultancy Services, Bombay. | 1983 |
| 13. | Wasteland Development Project for command Area of Narmada Canal (Region 11 and 12). | Gujarat State Rural Development Corporation Ltd., Gandhinagar. | 1984 |
| 14. | Studies for Optimisation of Hydro Power Installation and pumping Units along Saurashtra Branch Canal. | Premier Consultants, Bombay. | 1985 |

- | | | | |
|-----|--|--|------|
| 15. | Additional work on Mathematical Modelling of Ground Water System-Single Layer Model Narmada Mahi Doab. | Operations Research Group, Baroda. | 1985 |
| 16. | Socio-Economic Bench Mark survey of 62 Talukas (Sub-districts) of Narmada Command Area. | Fourteen Different Agencies Including Universities, Research Institutions, Private Institutions. | 1985 |
| 17. | Land Use and Cropping Pattern Survey and Mapping of Narmada Command Area Zone 4A & 4B. | Department of Geography, M.S. University, Baroda. | 1986 |
| 18. | Inter-Regional Water allocation and Determination of Branch Canal capacity. | Operations Research Group, Baroda. | 1989 |
| 19. | Extended study on Inter Regional Water Allocation and determination of Branch Canal Capacity. | Operations Research Group, Baroda. | 1989 |
| 20. | Rate of Adoption of Improved Technology in Narmada Command and Rest of Gujarat State (Based on Analysis of Crop cutting Experiments Data). | Operations Research Group, Baroda. | 1989 |
| 21. | Computer aided Planning of conveyance and distributory Network. | Indian Institute of Management, Ahmedabad. | 1990 |
| 22. | Growth of Agro-Processing Industries in Phase-I of the Sardar Sarovar Project. | Gujarat Industrial & Technical Consultancy Organisation Ltd. Ahmedabad. | 1990 |
| 23. | Consultancy work for Control, Telemetry and Communication Net Work on Narmada Canal System for SSP. | Gujarat Communication & Electronics Ltd., Baroda. | 1991 |
| 24. | Mathematical Modelling of Ground Water System Single Layer Model Narmada Mahi Doab. | Operations Research Group, Baroda. | 1982 |

25.	Techno-Economic Study for utilising Village Tanks as Borrow Area for Construction of Canal Net Work.	Operations Research Group, Baroda.	1992
26.	Area Development Strategies for selected Regions Adjacent to Narmada Main Canal.	Operations Research Group, Baroda	1992
27.	Water Rates Policy in 3 parts. i) Pricing of a public Utility Survey of Literature ii) Financial working of Irrigation Projects - A case of four projects in Gujarat. iii) Some policy issue for Canal Water Rates in Gujarat.	Department of Economics, South Gujarat University, Surat. Department of Economics, Sardar Patel University, Vallabh Vidyanagar. Department of Economics, Sardar Patel University, Vallabh Vidyanagar.	1992 1992 1992
28.	Mathematical Modelling of Ground Water System for SSP Command between Rivers Shedhi and Sabarmati.	Consultancy Engineering Services, New Delhi.	1992
29.	Mathematical Modelling of Ground Water System for SSP Command between Rivers Sabarmati and Banas.	Operation Research Group, Baroda.	1992
30.	Mathematical Modelling of Groundwater System for SSP Command beyond Banas upto Rajasthan Border.	Dalal Consultants, Ahmedabad.	1992
31.	Prefeasibility level Drainage study for SSP Command beyond Mahi.	Consultancy Engineering Service, New Delhi.	1992
32.	Action Research on People's Participation in Water Management in SSP.	Gandhi Labour Institute, Ahmedabad.	1993
33.	Extension of 4th reservoir Modelling Study.	Operations Research Group, Vadodara.	1993
34.	Action Research in Peoples Involvement in Water Management.	Gandhi Labour Institute	1993

35.	Development and Management Plan for Black Buck Sanctuary at Velavadar.	Expert Multi-Disciplinary Group.	1993
36.	Development and Management Plan for Wild Ass Sanctuary in Little Rann of Kachchh.	Expert Multi-Disciplinary Group.	1993
37.	Integrated Command Area Development Plan for SSP.	Wamana Consultants Hyderabad and through GOG.	1993
38.	Impact study on water Borne/ Water related Diseases in Command Area including area down stream of SSP Dam.	Commissionerate of Health Medical Services & Medical Education.	1993
39.	EIA studies of Fisheries (Inland as well as marine) relevant to command area of SSP.	M.S. University.	1993
40.	Impact on Monuments of Historical Archaeological Importance in SSP Command.	Status note to be provided by (i) Director of Archaeology GOG (ii) Archaeological Survey of India, GOI.	1993
41.	Review of Ground Water Studies and problems.	International Consultant.	1993
42.	Review of studies and Problems on Drainage.	International Consultant.	1993
43.	Review of Soil Studies	National Expert	1993
44.	Survey and Investigation work of Ground Water Resources beyond River Mahi in SSP Command.	Gujarat Water Resources Development Corporation Ltd. Gandhinagar.	1994
45.	Survey and Investigation of Ground Water Resources beyond River Mahi in SSP Command.	Gujarat Water Resources Development Co., Limited.	1994
46.	Research in Irrigated Agriculture	Gujarat Agriculture University.	Long-term study

47.	Pre irrigation and institutional training for functionaries of Nigam and farmers in the command area of SSP, field visit etc.	Department of Agriculture	1994
48.	Flora and Fauna studies of Command area of SSP.	M.S.University	1994
49.	Operational level drainage studies for the command area of SSP (on appropriate packages).	To be identified	1994
50.	Impact of Agriculture Run-off on Quality of Ground-water in SSP.	Indian Agriculture Research Institute	1994
51.	Socio-economic Survey in Command Area updating earlier Bench Mark Studies.	To be identified	1994
52.	Field Level Studies on farmers participation including pilot VSA Studies.	To be identified	1994
53.	Agricultural Research Studies.	Gujarat Agricultural University, Ahmedabad.	1998 pn12

Synthesis of Ongoing Work

Topic	Date of Award	Duration	Agency
1. Flora and Fauna of Command Area (3 part)	January 1993	18 months	Sardar Patel University, Gujarat and Saurashtra University
2. Wildlife Sanctuaries (4 nos.)	Started Sept. 1992	6 months	Experts coordinated by SSNNL.
6. Fisheries	January 1993	12 months	MSU, CICFRI, and Commissariat of Fisheries, GOG
7. Public Health	December 1992	4 months	SCHMS GOG

8.	Impacts of Agricultural Chemicals on runoff and Groundwater	Due to start March 1993	12 months	Indian Agricultural Institute, Delhi.
9.	Command Area Development	Started in December 1992	12 months	WAMANA Consultant, Hyderabad.
10.	Integrated Review of Soil Studies	Due to start in March, 1993	6 months	Dr. Agarwal, consultant
11.	Groundwater & Drainage	Start date to be determined	4 months	HR Wallingford
12.				
13.	Revision of 4th Reservoir Model Study	December 1992	4 months	Operations Research Group, Baroda.
14.	SSP downstream study.)	
15.	Impact on monuments of historical/Archaeological importance in SSP command.		)	Details awaited.
16.	Saurashtra and Kutch Water Supply Distribution system	Start date to be determined	6 months	Commissioning agency to be determined.

(E) **Government of Rajasthan**

The Government of Rajasthan has submitted a report on Environmental & Ecological aspects and remedial measures for Narmada Canal Project. Copy of the report is submitted to Ministry of Environment and Forests. Govt. of Rajasthan has been directed to carry out Impact Assessment Studies on the lines followed by Govt. of Gujarat. Terms of Reference are made available to Govt. of Rajasthan. Govt. of Rajasthan has approached WAPCOS for the same & matter is under negotiation.

IV. **FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY**

The guidelines of the MOEF require that while seeking environmental clearance for the hydropower projects, surveys should be conducted so that the status of the flora and fauna present can be assessed, listed (rare and endangered) species can be detected, if present, and appropriate conservation measures devised.

On the basis of relevant details supplied, MOEF issued clearance for the SSP in 1987. A condition of this clearance, as far as it related specifically to the Flora & Fauna, was that

Narmada Control Authority would ensure indepth studies on flora & fauna needed for implementation of Environmental Safeguard measures.

Studies/Surveys :

Important survey work has included the following:

- The Environmental Impact Study of 1983 prepared by (MSU).
- Preliminary Report on First Botanical Exploration and Plant Collection from Narmada Valley by the Botanical Survey of India in 1986.
- Report on the Survey of the Narmada Sagar Area by Zoological Survey of India, 1988.
- Note on Sardar Sarovar Project - Preparation of Environmental Work Plan for Forest and Wildlife by the State Forest Department, GOM, 1988.
- Status of Flora and Fauna in and Around Sardar Sarovar Project, Maharashtra is an ongoing study by the University of Pune (1992-94).
- Eco-Environmental and Wildlife Management Studies in the Sardar Sarovar Area in Gujarat, 1992, by MSU.
- Impact Assessment of Madhya Pradesh Land to be Submerged Under Sardar Sarovar Project and Adjoining Ecosystems is an ongoing study which began in September 1990 and for which quarterly reports and two interim reports (1990-1991) and 1991-92) are available. The study is being conducted by the State Forest Research Institute (SFRI) in Jabalpur and financed by the NVDA.
- Workshop on Approaches to Integrated Wildlife Management in Gujarat: A Report by the SSNNL, October 1990.
- People's Involvement in Wildlife Management, by VIKSAT in 1991.
- Wildlife Management Studies in the Submergence and Catchment Area of Narmada Project: With Special Reference to Shoolpaneshwar Wildlife Sanctuary, by the SSNNL, 1992.
- Narmada Easin Water Development Plan: Development of Fisheries, 1987, was prepared by the Narmada Planning Agency, GOMP.
- Rapid Reconnaissance Survey of Limnological Aspects Part I, II and III, 1987, were undertaken by the Universities of Bhopal, Vikram and Rani Durgavati for GOMP.

- Water quality data has been collected by the Central Pollution Control Board, Central Water Commission, the State Pollution Control Boards and the National Institute of Oceanography.
- Narmada River Basin Development Project: Fisheries Component, 1991 by the German Consultants to the World Bank, GOPA.
- Sociological Survey of the Fishing Families of the Narmada River by CICFRI, 1991.
- Aquatic Fauna (Fish) Studies in Indira Sagar Submergence Area, prepared by the Friends of Nature Society in 1991 on behalf on the NVDA reported on the fish fauna of the Narmada.
- Pre-and Post-Impoundment Limnological Studies of Narmada Basin, involves the same three universities coordinated by Barkatullah University for the NVDA. (1989-92)
- Studies on Fish Conservation in Narmada Sagar, Sardar Sarovar and its Downstream is a desk review sponsored by the NCA and undertaken by CICFRI, 1993.
- Ecology and Fisheries of the Narmada Estuarine System with Special Reference to Proposed Impoundment (Sardar Sarovar Dam), is an ongoing study begun in 1988 by CICFRI.

The Action Plans

To ensure that the wildlife conservation measures are implemented effectively, action plans for the three states were prepared as follows:

- felling plans for the forest area coming under submergence in Maharashtra and Madhya Pradesh which will avoid the possibility of animals being trapped in the submergence area;
- plans for improvement works in the wildlife sanctuaries of Gujarat;

Fisheries Component:

Three state Govts. submitted the fisheries development plans as follows:

- The Narmada Basin Water Development Plan: The Development of Fisheries, 1984. This comprehensive plan for GOMP addressed the development of fisheries in the NSP, Omkareshwar, Maheshwar and SSP areas. Phasing and programming with respect to pre and post-impoundment, clearance of the forests, training of fishermen, cooperative societies and post-impoundment management were proposed.

- **Environmental Work Plan: Sector Fish and Fisheries, GOG, 1986.** This work plan, prepared in compliance with the agreement with the World Bank included the establishment of fish hatcheries and fish farms, training of fishermen, establishing primary cooperatives, and establishing an Inter State Fisheries Board. In addition, it included proposals for conducting hydrobiological studies, studies on the morphology of the river, investigations into the physical and chemical characteristic of the water and soil, and studies on flora, fauna, fish yield, plankton, and productivity in the reservoir.
- **A Note on SSP: Preparation of Environmental Work Plan for Fisheries Development in Maharashtra, 1987.** This plan included proposals for the felling in the reservoir submergence zone, fish seed, hatcheries, stocking, fishing, manpower requirements, and training and management through the Inter-State Board.

Subsequently, the state governments revised their plans to address further issues as they arose. The revised plan for GOM included proposals for the fishing population to be resettled on the periphery of the reservoir or in R&R sites in Maharashtra. In addition, the establishment of low-cost hatcheries and irrigation tanks, the development of pen cage culture fisheries, and intensive fish farming were proposed.

Table 4.1 Summary of Status of Environmental Planning:

A) Wildlife

	Gujarat	Maharashtra	Madhya Pradesh
Preliminary Surveys	Complete	Complete	Complete
In-Depth Studies	Complete	Underway (Poona Univ.)	Complete
Development of Management Options	Complete for Shoolpaneshwar	Some work completed but awaiting results of study and deliberations of the expert group	Some work completed but awaiting results of study and deliberations of the expert group

Action Plan

Migratory corridors	Not needed	Completed	Complete
----------------------------	------------	-----------	----------

Sanctuary development	Complete for Shoolpaneshwar development.	Plans for establishment of wildlife sanctuaries await study results and expert group	Plans for establishment of wildlife sanctuaries await study result and expert group
Wildlife conservation	Massive afforestation in entire catchment of SSP	It depends on deliberations of expert group	May not be required. Await final outcome of study
Implementation	Shoolpaneshwar development almost complete, CAT work (increasing carrying capacity) nearing completion	Awaiting outcome of the study. CAF nearly completion, CAT work recently accelerated	Arrangements complete, awaiting final outcome of study

Progress in Shoolpaneshwar Sanctuary Development

	Target	Achieved to	% Complete
Fencing	100km	107	100
Firelines	60km	60	100
Barricades	2km	2km	100
Check Dams	14	14	100
Construction of Quarters	21	21	100
Construction of Rest House	1	1	100
Improvement of Communications	Not fixed	15km	100

The SSP will also provide an opportunity to enhance nature conservation outside the immediate catchment area of the Narmada. In particular three wildlife sanctuaries located in the command area of the project will benefit from the increased freshwater availability resulting from the project and there are plans by the GOG to expand these. They comprise:

- Nal Sarovar, a freshwater lake;
- A Wild Ass Sanctuary in the Rann of Kutch.
- A Black Buck Sanctuary at Veladar.

Summary of Status of Environmental Planning:**B) Fisheries**

	GOG	GOM	GOMP
Preliminary surveys)		
Detailed surveys/ studies of fish fauna	)	"Complete" for all item in all States.	
Action plans)		
Monitoring and evaluation cell)		
Plan for training of fishermen	Yes	Yes	Yes
Implementation			
1. Plan for clear felling	Under imple- mentation	Yes to synchronise with submer- gence	Yes to synchronise with submer- gence
2. development of fish farms	Under imple- mentation	Yes, awaits submergence	Yes, awaits submergence
3. establishment of IFDB for future R&D management	Agreed	Agreed	Yet to agree

Progress of Implementation

CICFRI have already established one hatchery in Gujarat for augmenting the numbers of the Hilsa fish in the reservoir. This currently produce around 250,00 spawn per year. CICFRI have also been commissioned to monitor the whole of the estuary and their study has been extended to examine pollution and to undertake modelling studies in the downstream environment.

A draft plan for the creation of an Interstate Fisheries Development Board (IFDB) has been prepared by the NCA and agreed, in principle, by the governments of Gujarat and Maharashtra. The organisation is expected to be set up and fully functioning prior to reservoir filling. the IFDB will be an autonomous organisation with the NCA represented on the Board.

GOG has already provided 16 hectares of land to the project for the development of fish farms. In addition, the State Fisheries Department is exploring the development of riverine fisheries and the development of the reservoir for commercial and game fisheries.

Execution of felling as per felling plans prepared will await the commencement of impounding.

V. SEISMICITY:

Studies

Studies of reservoir-induced seismicity (RIS) and rim stability have been carried out by the Geological Survey of India (GSI), Central Water and Power Research Station (CWPRS), University of Roorkee and World Bank Consultants. The principal studies are described below:

- University of Roorkee. 1980. Geological and Seismological Investigations of the Environs of Narmada Valley around Navagam Dam site in Gujarat.
- GSI. 1981-82 and 1982-83. A Geotechnical Report on the Reservoir Competency Investigations in Parts of Sardar Sarovar Area, Bharuch & Vadodara Districts. Volumes I&II.
- Shenoi et al. 1982. Shenoi et al presented at the New Delhi conference on the significance of seismotectonic aspects on reservoir development.
- Balasundaram, M.S. 1982 Sardar Sarovar Project: A Geotechnical Report Compiled and Edited for the Government of Gujarat.
- MSU. 1983. The Sardar Sarovar Narmada Project Studies on Ecology and Environment.
- NVDA published a Position Paper on Seismic Studies in January 1986.
- Krishna, Dr. J. 1989. Dams and Seismicity.
- GSI. 1990. Study of the Rim Stability of the SSP.
- GOI. 1993. Sardar Sarovar Project Seismicity and Sardar Sarovar Dam.

* Progress of Implementation

The various recommendations for modification of the dam design have all been carried out and are summarised as:

- adoption of horizontal design coefficient of 0.125g on the recommendation of the Dam Review Panel;
- installation of stress monitors in the main body of the dam;
- increase of the depth of the foundation to 18m below the lowest river bed.

The Government of Gujarat has identified 9 locations for the installation of seismic monitoring stations, 4 each on either side of the Sardar Sarovar reservoir in Madhya Pradesh and Maharashtra and 1 at Kevadia in Gujarat. By mid 1992, 4 stations had been installed. A further 5 stations are under construction and completion expected by the end of 1993. Selection of the initial sites was carried out by the SSNNL.

The progress of implementation is illustrated in Table below:

Implementation of Actions

Action	Status
Dam design modifications	Complete
Installation of monitoring stations	4 stations installed by end 1991, 5 more awaited
GSI (Nagpur Division) rim stability studies	Completed in Gujarat, work in progress in M.P. and Maharashtra

VI. HEALTH ASPECTS

Studies

A large number of studies have been carried out on the health profile of villages in the three affected states. The key studies are summarised below:

- Narmada Programme - Schistosomiasis - Back-to-Office Report, 1986 assessment was carried out by Goodland, consultant to the World Bank, the National Institute of Communicable Diseases (NICD) and the World Health Organisation (WHO).
- Proceedings and Recommendations of the Meeting on Schistosomiasis Research and Surveillance held at NICD on 22nd November 1985.
- Disease Profile of Command Area by the State Commissariat of Health, Medical Services and Medical Education (SCHMS), 1986.
- Health Statistics, GOM, 1987. The state department of health produced a report on the health profile of 33 project-affected villages in Dhule District, Maharashtra.
- Health Statistic 1982-84, GOMP. This study, published by GOMP in 1985.
- The Sardar Sarovar Narmada Project Studies on Ecology and Environment by MSU in 1983 considered public health in Chapter-3.

- Numerous studies have been conducted on the incident of malaria in India by, amongst others, the Malaria Research Centre (MRC) and Dr. Kalra.

Status of Implementation of Actions for Public Health

Action	Gujarat	Maharashtra	Madhya Pradesh
Baseline studies	Complete	Complete	Complete
Preparation of state action plan	Submitted and modified in 1986; Urban Malaria Scheme proposed	Original submitted in 1987, revised in 1991 and 1992; modified version with MO&EF	Original submitted in 1986, revised in 1988 and final plan submitted in 1991
Survey of existing facilities	Complete	Complete	Sufficient facilities
Establishment of new facilities	Hospital at Kevadia for workers; laboratory and mobile unit complete, drug dispensaries	Somawal village hospital; functional, health centres and health units sanctioned	Hospital, mobile unit and civil dispensaries for labour; detailed scheme for resettled population
Vector control measures in place	NMEP; SSNNL workshop on malaria control; laboratory established; entomological studies underway	NMEP; adoption malaria control guidelines of irrigation Department	NMEP; state malaria control organisations strengthened
Appointment of specialist staff	Complete	Complete at one R&R site at Somawal village	Needs identified
Disease Monitoring and responsibility	SCHMS plan in progress; SSNNL created Health Organisation at Kevadia	Entrusted to regular health department	Evaluation cell established

VII. ARCHAEOLOGICAL SURVEY AND ANTHROPOLOGICAL STUDIES/ ARCHAEOLOGICAL SURVEY

In the case of SSP, where some sites may be submerged the NWDT award stipulated that, the entire cost of relocation and protection should be chargeable to GOG. Relocation work is to be supervised by the Department of Archaeology under the provisions of the 1958 Act.

Studies:

Survey conducted for identification of various sites & monuments of significance has included the following:

- Gujarat: Archaeological Survey of Nineteen Villages Submerged by Sardar Sarovar Reservoir, 1989.
- Maharashtra : Survey of Department of Archaeology. A survey was carried out by the Department of Archaeology of cultural sites in 24 villages of Akkrani Taluk and nine village from Akkalkuwa Taluk, Dhule District.
- Madhya Pradesh : Survey of State Department of Archaeology and Museum (1992).
- Anthropological Survey of India: Narmada Salvage Plan.
- Anthropological Survey of India: Peoples of India.
- Parishad, A.K. Survey of Material Cultural in the Narmada Valley.
- Rashtriya Manav Sanghralaya : Narmada Salvage Plan.

Cultural Heritage in SSP Area

	Gujarat	Madhya Pradesh	Maharashtra
Temples	8(2)*	16(6)*	-
Mounds	-	3	-
Gateway	-	1	-
Rock shelters,	-	6	-
cave paintings	-		
Tombs	-	2	-

* Figures in brackets indicate number of sites designated for relocation.

Summary of Current Situation and Progress

	BOB	GOIP	GOH
Survey of Villages in Submergence Zone.)		
Identification of Cultural Sites	)	"Complete" for all item in all States.	
Collection of Data and Documentation of Sites)		
Selection of appropriate sites.	Complete	In process	Not required
Action plan	Complete	Not finalised,	Not required

ANTHROPOLOGICAL STUDIES

Government of Madhya Pradesh has informed that in view of the studies being carried out in connection with Narmada Sagar Project, no separate anthropological studies are required and that the Director General, Anthropological Survey of India has also expressed the same view. M.P. State Adivasi Kala Parishad has submitted its report on Tribal arts & culture. Besides Anthropological Survey of India has informed that Narmada Basin is already covered extensively under the project "people's of India". Besides Rashtriya Manav Sanghralaya has conducted needed studies in the past as follows. Further studies are covered under R&R plan of the state Governments.

- a study of the palaeo-ecology of quaternary fossils in the central Narmada Valley;
- excavation of upper palaeolithic site of Mehtakhaeda and further exploration of Nimar;
- collection of tribal artifacts in Madhya Pradesh.

Institutional responsibility for these actions was specified in the action plan whereby the first two elements were completed by Deccan College, Pune and the third by Adivasi Kala Parishad, for the Rashtriya Manav Sanghralaya, Bhopal.

STATUS REPORT
NARMADA SAGAR PROJECT (NSP) ENVIRONMENTAL ASPECTS
JUNE - 1993

1) Phased Catchment Area Treatment :

The free draining area of Narmada Sagar Project down stream of Bargi Dam is about 38,952 sq.kms. As per the guidelines of MDWR, directly draining watersheds of very high and high priority categories only are to be treated. Prioritisation survey of the watersheds was entrusted earlier to GSIT&S, Indore. However, the survey is now entrusted to the All India Soil & Land Use Survey Organisation, New Delhi, and they are carrying out the prioritisation survey of the entire catchment of NSP.

AIISLUS has divided the middle Narmada Basin (from Bargi dam to NSP dam) into 9 subcatchments. AIISLUS has completed prioritisation survey of 8 subcatchments and has submitted its report. The details related to the progress of survey in remaining 1 subcatchment as well as the survey report is awaited from AIISLUS. On the basis of the reports submitted by the AIISLUS, 32 sub-watersheds belonging to the very high and high priority categories and directly draining into the reservoir have been identified for treatment. These 32 sub-watersheds cover an area of about 81427 ha. On the basis of planimetry exercise conducted by the NVDA, these 32 sub-watersheds comprise an estimated 15516 ha forest area and 65911 ha non-forest area. As for the non-forest area, it has been estimated that 59320 ha non-forest area will be available for treatment.

Programme and Progress of Works:

	<u>Upto 92-93</u>	<u>93-94</u>	<u>94-95</u>	<u>95-96</u>	<u>96-97</u>
	<u>Cumulative Progress</u>		<u>Target</u>		
Non-Forest area/ ha. (59,320 ha)	13075	12000	12000	11500	10745
Forest area/ (15,516 ha)	1883	3000	4000	4000	2633
Total Area: (74,836 ha)	14958	15000	16000	16500	12378

2) Compensatory Afforestation :

A total of 40332 ha forest land would come under submergence and an additional 779.9 ha of forest land has been diverted for the residential colony, power house complex, dam, saddle dam and approach roads. Subsequently, another 308.4 ha of forest land was permitted to be diverted for power house. Thus a total of 41,420

ha of forest land has been permitted to be utilised for the construction of ISP. To compensate for this loss of forest, 10,143 ha of non-forest and 70,802 ha of degraded forest land has been identified for compensatory afforestation.

Programme of Compensatory Afforestation:

	Commulative Progress till 91-92	92-93 Target/ Progress	93-94	94-95	95-96
Degraded Forest area (70,802 ha)	23048	<u>12528</u> 11919	12400	12400	12370
Non-Forest area (10,143 ha)	5239	<u>1534</u> 1390	1500	1500	1037
(80,945) (say 81,000 ha)	28287	<u>14062</u> 13309	13900	13900	13407

3) Command Area Development :

The Government of Madhya Pradesh has submitted command area development plan. The project on completion will provide annual irrigation to 1.69 lakh ha.

The implementation of the plan would be taken up in three phases for completion in 6/2007. Monthly observation of water levels started in November, 1991 for subsequent supply of this data to the consultants, already shortlisted, are likely to be continued for 2 seasons to draw inference for preparation of master plan for drainage. NVDA has addressed J.L. Agricultural University for studies on effect of pesticides, insecticides in the command area. The study proposal received from the University has been scrutinized in NVDA by a team of experts in light of suggestions/observations received from WALMI, Bhopal, WALMI Aurangabad, M.P. State Pollution Control Board, Bhopal, and MAPCOST Bhopal. Accordingly, the University has now modified its study proposal. This modified proposal has been sent to NCA for their observation. Meanwhile the study proposal is under active consideration of NVDA.

4) Flora, Fauna, Wildlife and Carrying Capacity :

Studies on these aspects were entrusted to the Wildlife Institute of India, Dehradun in December, 1989 and were expected to be completed by March, 1993. Action plan will be ready by March, 1994. Implementation of the action plan will be completed by March, 1996. Progress report upto June, 1992 has been submitted by the Wildlife Institute of India.

Friends of Nature's Society, Bhopal, were entrusted with preparation of Wildlife Retrieval and Conservation Plan. They have submitted the final draft which is under scrutiny of NVDA.

5) Seismicity and Rim Stability

The reservoir competency survey has been done by GSI and report is submitted. In the report, GSI has suggested further studies for some patches of narrow water divide. As such they were requested to carry out the study in the required area. Final report is awaited.

Establishment of seismic observatories in the Narmada Sagar Complex area is under correspondence with IMD and CWC. The specification have been finalised and procurement of imported instruments as suggested by IMD is under finalisation with CWC. Meanwhile action for procurement of indigenous wood Anderson Seismometers from IMD has already been taken so as to obtain pre-impoundment data. Price bids received for tender of supply of Micro-earthquake recorders are under consideration with NVDA.

6) Health Aspect:

A note on health aspects of NSP prepared by NVDA was examined in the Ministry of E&F and comments were sent for modifying the report. NVDA has submitted the revised plan costing Rs.748.73 lacs for the preventive and curative aspects of health. Regarding preventive aspects, a MOU has been signed with the Department of Preventive and Social Medicine, Gandhi Medical College, Bhopal, whereas, for studies on health aspect in project impact areas of SSP and NSP, work is proposed through a cell of monitoring and evaluation under the Directorate of Health Services, Bhopal. The approved plan is being implemented.

Pre-impoundment and post-impoundment Limnological studies being carried out by three Universities will take care of water quality aspect.

7) Fisheries Development:

The studies of certain aspects of fisheries have been included in the Limnological studies being conducted by the three Universities of the State; studies in the Upper Narmada, (Bargi Reservoir) by Rani Durgawati University, Jabalpur, studies in the Middle Narmada (Tawa, Barna and Kolar Reservoirs) by Barkatullah University, Bhopal, studies in the Lower Narmada by Vikram University, Ujjain. All the three Universities have completed the studies in their respective areas and final report is awaited as per MOU. Aquatic fauna has also been covered under the studies completed by Friends of Nature Society, Bhopal.

8) Archaeological and Anthropological Surveys:

A survey of the 254 villages is required for identification of the archaeological monuments falling within the submergence area. The State Department of Archaeology and Museum, Bhopal was entrusted with the survey of 87 villages which has been completed. Archaeological Survey of India has also completed the

survey for 167 villages assigned for identification of the monuments of significance. Report is submitted to head office and is under scrutiny.

Action plan would be ready by June, 1994. Action will be taken to preserve material of archaeological importance in consultation with experts.

As only lower bastion in north of the Joga Fort is likely to be affected by scour action of water and the Siddeshwar temple is well above the FRL of 860 ft., these two structures are not considered as affected by the project. However, other structures/monuments will be considered for shifting or protection after their archaeological significance is established through joint inspection of the competent authorities.

Anthropological Studies:

Efforts are being made for retrieval of bio-cultural material from the Narmada Basin. A lot of information is gathered from the field which generates immense data of Socio-Anthropological significance.

Rashtriya Manav Sanghralaya has constituted a working group for the retrieval of bio-cultural material in Narmada Basin. Survey of tribal art and handicraft entrusted to M.P. Adivasi Kala Parishad is completed and report is available. Besides Anthropological Survey of India has covered these studies under its own project called "people of India". The report is in 61 volume out of which 7 volume are under final editing. A Narmada Salvage plan is also launched by Anthropological Survey of India recently and the entire area is scanned and some ancient tools have been found.

**Note on
Catchment Area Treatment
For Sardar Sarovar Project
In Dhule Forest Circle
of Maharashtra State
DHULE - 424001.**

NOTES OF CATCHMENT AREA TREATMENT PLAN
OF SARDAR SAROVAR PROJECT

DHULE CIRCLE, DHULE.

The total submergence area of the Sardar Sarovar Project in Maharashtra is 7725.00 ha. out of which 6488.54 ha. area is under forests. Central Government while according approval to the project has stipulated fulfillment of various conditions. One of the conditions stipulates that the State Government should finalise Catchment Area Treatment plan and implement it scrupulously.

2. To fulfill the above condition a detailed report has been prepared by All India Soil and Land Use Survey, Government of India, New Delhi showing the Catchment Areas falling in Maharashtra which are divided into various categories depending on erosion intensity. The detailed categorywise area falling in Narmada Catchment of Maharashtra State area as under.

Sr. No.	Priority Category	No. of watershed	Total area (in Ha.)
1.	Very High	25	53247
2.	High	26	57332
3.	Medium	24	38607
4.	Low & very Low	5	7650
Grand Total		80	156836

3. Further, as per the guidelines issued by Ministry of watersheds, Government of India, it has been laid down that the subwatersheds will be considered as endependent unit and the cost of treatment works is directly draining subwatersheds will

...2...

2

be charged to the cost of project. Considering these guideline the Subwatersheds directly draining in to the reservoir have been identified and Macro Catchment Area Treatment Plan for these directly draining subwatersheds has been prepared & submitted to the Government of India. The Micro level plan is under preparation and will be ready before implementation of works in each sub watershed.

4. There are in all 17 subwatersheds which are directly draining in Narmada River. Out of these 17 watersheds, eight subwatersheds are under very high priority and nine sub watersheds are under High priority. The total area of 17 watersheds is 31423 ha. list of directly draining subwatersheds is as under.

Sr. No.	Subwatershed Code No.	Very High priority	High priority
1.	Na 3 c	3800	--
2.	Na 3 h	1650	--
3.	Na 3 d	1337	--
4.	Na 3 a	1800	--
5.	Na 3 f	2525	--
6.	Na 5 b	1725	--
7.	Na 3 b	1450	--
8.	Na 5 a	--	1187
9.	Na 3 j	--	1200
10.	Na 5 g	--	2250
11.	Na 3 k	--	837
12.	Na 4 a	--	2150
13.	Na 4 c	--	1525
14.	Na 5 d	--	1725

...3...

3

Sr. No.	Subwatershed Code No.	Very High priority	High priority
15.	Na 7 d	--	1525
16.	Na 7 k	--	3112
17.	Na 8 a	1625	--
Total		15912	15511

5. As said in para No. 4 the total area of directly draining subwatersheds is 31423 ha. out of which the forest area constitute 90 % of the total area. Hence it has been decided that the entire Catchment Area Treatment plan work will be implemented by the Forest Department, excluding the area under agriculture which will be treated by Agriculture Department.

6. Considering the enormity of the area, magnitude of the work and the fixed time frame in which these works are to be completed, Government of Maharashtra have created 4 independent watershed divisions with full complement of staff vide Govt. Resolution No. PLD/1092/Pra.Kra-203/F-10, dt. 31-3-1993. Out of these 4 newly created divisions, 2 divisions have already been started functioning at Dhule & Shahada. Since these divisions were formerly meant for Tapi Watersheds and have now been diverted or Sardar Sarovar works. The remaining 2 divisions are yet to start functioning for which posting orders of Deputy Conservator of Forests, and Assistant Conservator of Firests are being issued seperately by the Principal Chief Conservator of Forests, Maharashtra State, Nagpur who have been requested into the matter. The remaining executive and

...4...

4

administrative staff i.e. Range Forests Officers, & below, Head-clerk and other ministerial staff is being posted by Dhule Forest Circle; orders for which are being issued shortly.

7. The detailed distribution of subwatersheds under the 4 newly created watershed divisions are been finalised seperately. Presently work of Catchment Area Treatment is being carriedout by the two divisions which has already started functioning. The subwatersheds which has been tackled by these two divisions for taking planting in 1993 rains are as under.

	Total Area	Area to be treated during 1993 rains.
1. Na 3 c	3800	560 Ha.
2. Na 4 c	1525	400 Ha.
	Total:	960 Ha.

8. In the above watershed work or detailed survey have been carriedout and the area which are to be given detailed treatment has been finalised and premansoon works like soil and moisture conservation works such as cattle proof trench, digging of pits, preparation of grass beds, raising of seedlings, etc. have been carried out over on area of 900 ha. which will be planted during 1993 rains. The species which are to be planted in these areas has been chosen taking into consideration the locality factors and emphasis have been given on indegenous species like Khair, Babul, Anjan, Siras, Chinch, Ber, etc. The soil & moisture conservation works have been taken according to draining line treatment plan, and the nallas and streams has been provided treatment starting from up stream and down below.

9. Since the newly created divisions are yet to start functioning with their full compliments of the staff, the area tackled for 1993 rains is less, however, during 1994 rains it is expected that these 4 divisions will be tackling an area of 1400 ha. each and the entire 17 subwatersheds will be completed by the end of 1997-98.

10. A detailed statement showing the quantity of seedlings raised for the planting programme is enclosed herewith as app. I.

11. The cost of the catchment area treatment at an average rate of Rs.10830/- per ha. for 28260 ha. over 5 years comes to Rs. 2848.60 lacs.

12. Details of field work for Catchment Area Treatment Plan carriedout by Deputy Conservator of Forests, Mewasi, Dn. Taloda is attached appl. II.

13. Details of field work for Catchment Area Treatment Plan carriedout by Watershed Management Planning Division (Sardar Sarovar Project) Dhule Dn. is attached as app. III.

14. Details of field work for Catchment Area Treatment Plan carriedout by Watershed Management Planning Division (Sardar Sarovar Project) Dn.Shahada-2 is attached as app. IV.

15. Map of the directly draining 17 subwatersheds is attached as app. V.

App. II

Mewasi Forest Division

Taloda/Range-Khati

Scheme :- Catchment Area Treatment Plan -
Sardar Sarovar.
Location :- Gaman-Fr S.No. 156 of Sub watershed-Na-3C
Area :- 100 ha.
Year :- 1992-93 (Pre monsoon works).

Premonsoon works:-

1. TCM 450 Rm 800 Rm WAT
2. Pits 2,50,000
3. Nala bunds 3036 M³

4. Nursery

Shivam)
Sisoo)
Shirus) Polythene bags 126600
Subabul)
Nilgiri)

5. Total expenditure on PMW works 254104-00
6. Total man days generated :- 9411

App. I

STATEMENT SHOWING THE QUANTITY OF SEEDLINGS IN NURSERY

Name of Division	Name of Nursery	Khair	Accasia Auriculi -formis.	Babul	Anjan	Sitafal	Shiras	Chinch	Bor	Total	Remarks
D.F.O. W.M.P. Dhule	1)Kuktar (on the bank of khat River.)	1.52	0.26	0.42	0.26	0.31	0.73	-	-	3.50	Period of seed sowing 13th Feb. to 2nd March Avg. ht. 20 cm.
	2)Roshmal. (On the bank of khat River.)	0.42	0.22	0.30	0.18	--	0.04	-	0.18	1.34	Seed sowing from 1st Feb. to 31st March.
	3)Nalgavan	0.59	0.22	0.07	0.09	--	0.04	0.02	0.07	1.10	15th Feb. to 31st March.
D.F.O. W.M.P.D. Yawal.	4)Chongya Amba.	0.80	--	--	0.20	0.10	--	0.01	0.09	1.20	- " -

App. II**Mewasi Forest Division****Taloda/Range-Khati**

Scheme :- Catchment Area Treatment Plan -
Sardar Sarovar.

Location :- Gaman-Fr S.No. 156 of Sub watershed-Na-3C

Area :- 100 ha.

Year :- 1992-93 (Pre monsoon works).

Premonsoon works:-

1. TCM 450 Rm 800 Rm WAT
2. Pits 2,50,000
3. Nala bunds 3036 M³
4. Nursery
 - Shivam)
 - Sisoo)
 - Shirus) Polythene bags 126600
 - Subabul)
 - Nilgiri)
5. Total expenditure on PMW works 254104-00
6. Total man days generated :- 9411

Mewasi Forest Division**Taloda/Range-Molgi**

Scheme :- Catchment Area Treatment Plan -
Sardar Sarovar.

Location :- Gaman-F.S.No.156 of Sub watershed-Na-3C.

Area :- 100 ha.

Year :- 1992-93 (Premonsoon works)

Premonsoon works:-

1. TCM 1281 Rm.
2. Pits 2,50,000
3. Nala bunds 4290
4. Nursery
 - Shivan)
 - Sisoo)
 - Shesham) Total Naked Plants 81,000
 - Subabul)
 - Nilgiri) .
5. Total expenditure on PMW works 3,14,468-00
6. Total man days generated : 11647

App. 2**Mewasi Forest Division****Taloda/Range-Manibelli**

Scheme :- Catchment Area Treatment Plan -
Sardar Sarovar

Location :- Gaman Frs.Sur.No.156 of Sub-watershed
Na-3c.

Area :- 100 ha.

Year :- 1992-93 (Premonsoon works)

Premonsoon works:-

1. TCM 1549 Rm
2. Pits 2,50,000
3. Nala bunds 1305 M³
4. Nursery
 - Shivan)
 - Siso)
 - Shirus) Polythene bags 1,50,000
 - Subabul)
 - Nilgiri)
5. Total expenditure on PMW works 2,61,198-00
6. Total man days generated : 9674

App. III**WMPD (SSP) DIVISION : DHULE**Range : Dhadgaon

1. Location :- Compt. 174, 175, 176(P), 177, 178, 198, 197(P), of Sub watershed Na.4C.

2. Area :- 400 ha out of the total area of watershed 1525 ha.

3. Period of works :- 1992-93 (PMW works) to be planted in 93 rains.

4. Details of PMW works :-

a) TCM : running Mts. & Dogebelling 4000 RMT

b) Pits of 30 x 30 x 30 Cm : 10 lac- No.

c) Nala bunds : 1200 M³

d) Nursery : SPP No. of polyplanteraiced

1. Khair 2.53

2. A.Auriculiformis 0.70

3. Babul 0.79

4. Anjan 0.53

5. Shiras 0.81

6. Fruit trees 0.81

7. Shitafal 0.31

5.94

5. Total expenditure on PMW works Rs. 16,17,222 upto May
(It includes expenditure of Rs.3 lacs. on establishments.)

6. Total man days generated : 3.30 lacs app.

App. IV**WMPD (SSP) DIVISION, SHAHADA-2, SHAHADA**Range : Kathi(Mewasi) DN. Molgi

1. Location :- S.No.156 of subwatershed Na-3C
2. Area :- 260 ha.
3. Period of works :- 1992-93 (PMW works) to be planted in 93 rains.
4. Details of PMW Works :
 - a) TCM : 315 RMT.
 - b) Dogbeling : 2890 RMT.
 - c) Pits of 30 cm³ :- 6,50,000 No.
 - d) Nalabunds :- 1650 M³
 - e) Nursery :- SSP No.of polybots

1. Sisoo	125000
2. Siris	50000
3. Khair	40000
4. Shivan	2000
5. Volayate Chinda	5000
6. Misc Spp	28000
	<u>260000</u>
5. Total expenditure on PMW works Rs.599971-00 March 93.
6. Total mandays generated : 22230 Approxy.

App. III**WMPD (SSP) DIVISION : DHULE**Range : Dhadgaon

1. Location :- Compt. 174, 175, 176(P), 177, 178, 198, 197(P), of Sub watershed Na.4C.
2. Area :- 400 ha out of the total area of watershed 1525 ha.
3. Period of works :- 1992-93 (PMW works) to be planted in 93 rains.
4. Details of PMW works :-
 - a) TCM : running Mts. & Dogebelling 4000 RMT
 - b) Pits of 30 x 30 x 30 Cm : 10 lac- No.
 - c) Nala bunds : 1200 M³
 - d) Nursery : SPP

	<u>No. of polyplanter raised</u>
1. Khair	2.53
2. A. Auriculiformis	0.70
3. Babul	0.79
4. Anjan	0.53
5. Shiras	0.81
6. Fruit trees	0.81
7. Shitafal	0.31
	5.94
5. Total expenditure on PMW works Rs. 16,17,222 upto May
(It includes expenditure of Rs.3 lacs. on establishments.)
6. Total man days generated : 3.30 lacs app.

App. IV**WMPD (SSP) DIVISION, SHAHADA-2, SHAHADA**Range : Kathi(Mewasi) DN. Molgi

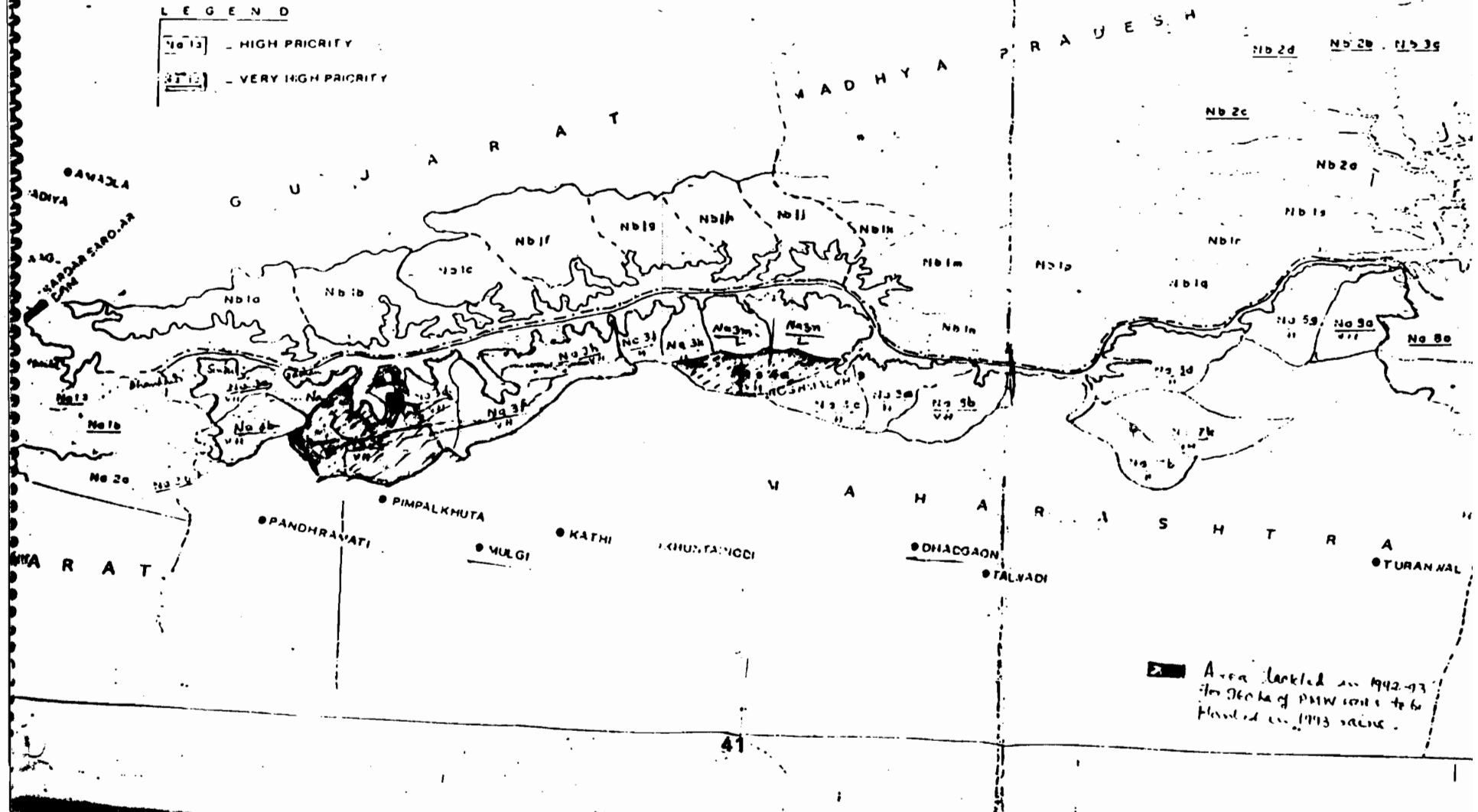
1. Location :- S.No.156 of subwatershed Na-3C
2. Area :- 260 ha.
3. Period of works :- 1992-93 (PMW works) to be planted in 93 rains.
4. Details of PMW Works :
 - a) TCM : 315 RMT.
 - b) Dogbeling : 2890 RMT.
 - c) Pits of 30 cm³ :- 6,50,000 No.
 - d) Nalabunds :- 1650 M³
 - e) Nursery :-SSP

	<u>No.of polybots</u>
1. Sisoo	125000
2. Siris	50000
3. Khair	40000
4. Shivan	2000
5. Volayate Chinda	5000
6. Misc Spp	28000
	260000
5. Total expenditure on PMW works Rs.599971-00 March 93.
6. Total mandays generated : 22230 Appoxy.

APP V (MAP #17 SUBWATERSHEDS TO BE TREATED)

LEGEND

- No 13 - HIGH PRIORITY
- No 15 - VERY HIGH PRIORITY



ANNEX - XIX -3

OFFICE OF THE DIRECTOR,
STATE FOREST RESEARCH INSTITUTE, POLIPATHAR,
JABALPUR - 482 008.

No.SFRI/SSP/NVDA/FMA/ 2069

Jabalpur, Dated : 7/6/93

To,

Member (Env. & Forests),
Narmada Valley Development Authority,
Narmada Bhawan, Tulsi Nagar,
BHOPAL (M.P.)

Sub: Xth Quarterly progress report ending March '93 - Flora, fauna
and carrying capacity studies of Sardar Sarovar Project.

Ref: Your letter No.Tech/994, dt.11.5.93.

Kindly find herewith the 'Xth Quarterly report ending March '93
- Flora, fauna and carrying capacity studies of Sardar Sarovar Project
for favour of your kind perusal.

Encl: 2 copies of report.

(P.K. Shukla)
Project Director &
Director, SFRI, Jabalpur

Regd. A.D.

Copy forwarded to member (Civil), Narmada Control Authority,
Vishal Tower, Indira Complex, Navlakha, Indore, M.P. for favour of perusal
and necessary action.

may kindly see.

14 (E82)

6
11/6/93

/francis/

(P.K. Shukla)
Project Director &
Director, SFRI, Jabalpur

27/6/93

Xth QUARTERLY PROGRESS REPORT AND REVIEW OF PROGRAMME

PERIOD : 1st January 1993 to 31st March 1993

1 TITLE OF THE PROJECT

"Impact Assessment of Madhya Pradesh Lands to be submerged under Sardar Sarovar Project and adjoining Ecosystem : Flora, Fauna and other Biotic Components".

2 NAME OF THE PRINCIPAL INVESTIGATOR AND INSTITUTION

Shri P.K. Shukla, IFS, Director, State Forest Research Institute, Polipathar, Jabalpur - 482 008.

3 OBJECTIVES

Objectives set for the present investigation have already been discussed in the previous reports and therefore, are not being reproduced here.

4 STUDY SITE AND AREA OF WORK

Already mentioned in previous reports.

5 AREA OF INVESTIGATION DURING THE QUARTER UNDER REPORT

Fifteen revenue villages as listed in the Table - I and coming under the submergence and impact of Sardar Sarovar Project were surveyed during the quarter under this report. These villages are distributed in Dharampuri and Manawar tahsils of Bilar district and Kargali and Thikri tahsils of West Nimar district, during the period 100% enumeration work of growing stock was done in these villages. Collection of plant species and socio-economic information through sampling was also carried out.

6 PLAN OF WORK FOR THE PERIOD UNDER REFERENCE

(i) Plant specimens numbering 100 have been collected. Sorting, identification and arrangement according to the classification is in progress.

(ii) Ecological data collected from the field have been compiled and analysis of the data is in progress.

(iii) Compilation and rechecking of multifariously useful plant species are in progress.

(iv) Information on wildlife and birds found in the survey area was collected and listed.

(v) Socio-economic study has been conducted with special emphasis to livestock, labourers, social status of farmers, agricultural technology, male and female population, status of various ethnic groups etc. the compilation and analysis of collected data is in progress.

7 METHODOLOGY FOR INVESTIGATION

Methodology followed for the collection of the information pertaining to ecological status, floristic composition, limnological component, enumeration of growing stock, ethnobotanically important plant species, livestock and socio-economic status was the same as described in the previous reports.

8 MONTHWISE WORK DONE

January 1993 : 18th quarterly report of the project has finalised. The data collected from October '92 to December '92 was compiled and analysed and submitted to financing authority, Ministry (Forest and Env't.), NVDA, Bhopal vide letter No. SFRI/NVDA/1032, dated 23.4.93. Balance work of forest enumeration was conducted.

February 1993 : The remaining survey work in 15 villages, which could not be completed due to activists and non-cooperation of villagers was again taken up and completed. The work of data compilation and analysis is in progress at the headquarters of S.F.R.I., Jabalpur.

9 ANALYSIS AND RESULTS

9.1 **Enumeration** : The enumeration work badly affected due to the non-cooperation of local villagers and Narmada Bachao participants has now been undertaken on priority and 15 revenue villages were enumerated 100% and their growing stock status is given in Table 2.

9.2 Ethnobotanical and Ecological Study : The information given by the local villagers and inhabitants was recorded in the field proforma and was tabulated according to their multifarious uses and the analysis work of the recorded data is in progress.

In the ecological studies, about 25 quadrats were laid and data were collected with special reference to ecological status of ground vegetation.

9.3 Fauna : No new information of wild animals was observed in the villages surveyed during this quarter.

9.4 Socio-Economic Aspect : Extensive survey was done in the submergence and impact areas of SSP. During this quarter, the rechecking of collected data of fuelwood, population, livestock, labour pattern have been undertaken in SSP areas.

10 MODIFICATION REQUIRED

Not necessary at this stage.

11 WORK PLAN FOR NEXT QUARTER ENDING ON 30th JUNE 1993

1 Survey of about 50 revenue villages where the enumeration work has not yet been done.

2 Quarterly Project Report and Annual Report for the year 1992-93 writing and data analysis work of the present investigation.

12 CONSTRAINTS

General opinion of the villagers in submergence areas is not favourable. The activists continue to threaten survey parties and forest staff involved in enumeration work and field survey.

About 50 revenue villages of SSP coming under submergence are yet to be enumerated. Most of the Field Investigators with Forest Staff were involved in the enumeration work and this work is under progress.

13 FINANCIAL POSITION

Expenditure incurred upto 31.3.1993

S.No.	Item	Amount (Rs.)
1	Honararia/Salaries	2,59,341
2	Wages to labourers for assisting field staff	11,392
3	Contingent field expenses	11,392
4	T.A./D.A.	59,520
5	House rent allowance	36,602
6	Seminar, Meetings	34,617
7	Maintenance of vehicle, P.O.L.	1,17,111
8	Stationery/Postage/Printing	19,018
9	Contingent expenses	77,482
10	Rent for field office/station	42,634
11	Contractual services - Photocopy, drawings, typing	32,199

Grand Total Rs. 13,91,187

Certified that out of total amount Rs.15.64 lakhs, an amount of Rs.13,91,187/- (Thirteen Lakh Ninetyone Thousand One Hundred Eightyone) only has been incurred on scheme during 1990-91 to 1992-93 i.e. from starting of scheme to 31.3.93.

Jabalpur,

Dated: 7-6-93.

Project Director

Director
State Forest Research Institute
Jabalpur, M.P.

/francis/

Table 3 : List of submarginal villages surveyed during quarter
ending March '93

S.No.	District/Tehsil	Name of villages
A	District - DHAR	Uchawat
		Nimbola
	1 Tehsil - Dharampuri	Dharampuri
		Guleti
		Morgadi
		Khatadgaon
		Hatnawar
		Sulgaon
	2 Tehsil - Manawar	Shahpura
		Gargawa
B	District - West Nimar	
	3 Tehsil - Kasrawad	Khalbuzurg
		Chichli
	4 Tehsil - Thikri	Chainpura
		Nandgaon
		Brahmangaon

TABLE 2. Results of 100% enumeration carried out during the quarter January-March '93 in Revenue Villages ^{Comm. under} ~~showing~~ under the submergence of Sardar Sarovar Project

S.No.	District - Tehsil	Name of Villages	Different girth Classes (C.M.)							
			Upto 20	21/30	31/45	46/60	61/90	91/120	121/150	151/180
A	District DHAR	Dandwad	264	102	43	26	12	6	3	2
		1 Tehsil - Dharampuri								
		Nimbola	701	324	342	228	111	17	23	6
		Dharampuri	739	197	170	290	96	49	51	9
		Geleti	1506	691	334	231	76	29	26	2
		Morgadi	1376	826	455	214	198	92	18	-
		Khatadgaon	210	125	196	103	64	42	26	7
		Hatnawar	195	72	191	104	66	23	12	27
		Sulgaon	260	136	226	132	91	40	25	8
	2 Tehsil - Manawar	Shahpura	738	517	411	132	127	27	14	11
		Dagaula	204	101	103	69	64	34	18	10
B	District WEST NIMAR									
		3 Tehsil - Kasrawad								
		Khalbuzurg	760	433	295	228	113	87	12	-
		Chichli	127	102	203	117	81	33	12	5
	4 Tehsil - Thikri	Chandpura	226	126	257	82	67	33	13	11
		Nandigaon	87	62	60	48	41	34	12	15
		Brahmangaon	497	257	687	464	339	185	131	16
	TOTAL		7980	4182	4035	2492	1548	740	392	129
	PERCENTAGE		37.11	19.45	18.76	11.59	7.20	3.44		0.60

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण
NARMADA CONTROL AUTHORITY

पर्यावरण उपदल
Environment Sub-Group

उन्नीसवीं बैठक का कार्यवृत्त
Minutes of the Nineteenth Meeting

28 जुलाई, 1993 को
पर्यावरण भवन नई दिल्ली में हुई

Held at Paryavaran Bhawan New Delhi
on 28th July, 1993

इन्दौर
अगस्त, 1993

INDORE
August, 1993

MINUTES OF THE 19TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 28TH JULY, 1993 AT 12 NOON
IN PARYAVARAN BHAWAN, NEW DELHI.

I N D E X

Item No.	Contents	Page No.
	Introduction	1
XIX-1(100)	Confirmation of the Minutes of the 18th meeting.	2
XIX-2(101)	Review of Action taken on the decisions of the previous meeting.	3 - 7
XIX-3(102)	Present status of studies/surveys and Environment Action Plans.	8 - 13
	Date & Venue of Next Meeting.	14

A N N E X U R E

XIX.Min.1	List of participants of XIXth meeting.	1
XIX.Min.2(a)	Letter of Dr. Shekhar Singh dated 20th July, 1993.	2 - 3
XIX.Min.2(b)	Letter of Commissioner(PP) dated 27th July, 1993.	4
XIX.Min.3	Corrigendum to the 18th meeting of Environment Sub-Group of NCA.	5
XIX.Min.4	Annexure to the Interim Report on "Status of Flora and Fauna in and around the Sardar Sarovar Project, Maharashtra".	6 - 9

MINUTES OF THE 19TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 28TH JULY, 1993 AT 12 NOON
IN PARYAVARAN BHAWAN, NEW DELHI.

Shri R. Rajamani, Secretary, Govt. of India, Ministry of Environment & Forests and Chairman of the Environment Sub-group of NCA welcomed the Members and Invitees to the 19th meeting of the Environment Sub-group. The list of participants is enclosed at Annex.XIX.Min-1.

Discussion on the agenda items was taken up thereafter.

Item No.XIX-1(100): CONFIRMATION OF THE MINUTES OF THE 18TH MEETING

Minutes of the 18th meeting of the Environment Sub-Group of Narmada Control Authority were circulated to all members and invitees separately vide letter No.Env-34(18)/93/1467 dated 8.7.1993. Comments received are placed at Annex XIX-Min-2(a) & 2(b).

The minutes were confirmed with the following modifications:

- (1) The following points was added after point-2 on page-4 of the agenda i.e. as 3rd point :

"No clear felling to be permitted in Maharashtra till the team visit is completed and the final report of Pune University on Carrying Capacity has been submitted and assessed.

- (2) The following para was added after the first para of page-9 in the subhead-1 (NSP: GOMP).

"The Chairman enquired from the representative of GOMP, if it was correct that contracts for construction of NSP had been awarded? This was confirmed by GOMP representative. The Chairman desired that as a result of this the pari-passu aspect of NSP would also have to be considered and that no construction work relating to NSP should start till the pari-passu status was clear to the Sub-group.

- (3) On page-11 under Command Area Development, SSP, Gujarat, the following was added:

"Shri Shekar Singh enquired about the report on the drainage study beyond Mahi-Doab. He mentioned that this issue had also been raised in the last meeting by him. The GOG representative promised to send a copy of the final report to the members."

- (4) On page-8, the sentence beginning from 4th line of the para would now read as follows :

"Referring to the negotiations of the Govt. of Rajasthan with WAPCOS Chairman expressed that whichever organisation is choosen for entrusting the studies by GOR, it should take care of all the points of Terms of References (TOR) being pursued by GOG.

- (5) The Corrigendum was issued for inadvertent typographical errors which is enclosed at annexure XIX-Min-3.

**Item No.XIX-2(101): REVIEW OF ACTION TAKEN ON THE DECISIONS
OF THE PREVIOUS MEETING**

Consideration of Policy Issues.

**1. Extention of Time for Environmental and Forestry
Approval [Item No.XVIII-2(97)(1)].**

Chairman invited presentation of report of the Committee which made a field visit to the areas in Gujarat.

Dr. S. Ramaseshan presented the findings of the Committee to the members of the Sub-group.

Chairman opened the discussion and enquired about the planning of the Catchment Area Treatment for critically degraded sub-watersheds freely draining into the reservoir. It was explained that in the report of the Committee, the planning & implementation of only the directly draining critically degraded sub-watersheds has been considered. Chairman, however, pointed out that treatment of other areas should be given due attention and source for funding should also be identified. He enquired about the progress of submission of the plan by GOM. Shri M.S. Parasnis, CCF, GOM explained that the preparation of the plan is in progress and as promised earlier it would be possible to submit the same plan by October, 1993. Vice Chairman, NVDA, GOMP informed that almost half of the work on preparation of the plan under reference is over and the remaining work would be completed by October, 1993. Chairman stated that the plans are required to be prepared for treatment within the time frame to be determined and funding arrangements are also to be identified otherwise work would be considered as incomplete.

In response to a question on quality of the catchment area treatment, Shri B.U. Chengappa replied that he has visited plantation sites in Gujarat, where catchment treatment works were going on. The check dams and various other measures have been taken. There, in order to measure the silt flow, certain drums have been put up to collect the silt. Chairman, however, stressed that more modern equipments for measuring the silt are available and these should be used to the extent possible. GOG agreed to explore the possibility for the same.

Chairman wanted to know as to why khus grass is not being planted in Gujarat as in Madhya Pradesh. Shri M.B. Mehta, Chief Conservator of Forests, SSNNL informed that the conditions are different in Gujarat where most

of the catchment is adequately wooded and if khus is planted there will be a fear of its exploitation by the villagers because of the value of its root. Adding to this Member (E&R) explained that the land holding pattern in Madhya Pradesh are different from those in Gujarat. The areas being tackled in Madhya Pradesh are mostly private agriculture land where the protection of khus grass is assured by the owners.

Chairman also raised the question of planting of teak as main species in catchment treatment works. Shri M.B. Mehta, CCF, explained that teak is not the only species and polyculture is being maintained. The protection given to the plantation area is resulting in the overall regeneration of the area. In addition to tree coppice, some 20 species of grasses have also come up.

Dr. Shekar Singh, however, wanted to know whether the areas, where compensatory afforestation are being taken up were once the grass lands and whether these areas are at all suitable for plantations. He also questioned the desirability of irrigating the plantations. Dr. Abrol wanted to know, if the plantations can withstand, the changed water balance and desired that some studies should be done on soil water balance. Shri M.B. Mehta, explained that the support watering facilities being provided to the plantation initially cannot be referred to as irrigation. Mr. Chengappa also informed that support watering is an accepted silvicultural practice. Chairman, however, stated that the question is whether the plantations are sustainable on long-term basis or not. Dr. Shekar Singh also questioned the desirability of adding Gypsum to the soil on a long term basis.

Dr. Ramaseshan referring to his observations during the field visit informed the Sub-group that many of the plantations have survived the zero rainfall situation although some plantations of Neem trees have failed. He further stated that the plantations inspected by him, on road side have registered excellent growth. Shri Mehta, informed the Sub-group that the gypsum is being added only once at the time of planting and the plants once establish require no further adding of the gypsum. He was optimistic that the second generation of the trees would be more exacting and the salinity will also get reduced. He further explained that he has evidence that the plantations helps in reducing the salinity and that the 2000 odd trees standing on a ha of area would act as vertical drains to reduce the salinity.

Appreciating the work done by GOG in planting up the vast barren areas in Runn-of-Kuchch, Dr. Katti informed the Sub-group that many of the species including the Neem trees have come up very well and entirely a new eco-system has been created where in the past actually no resources existed. He further stated that it is a wonderful experiment in our country. Humus has already started accumulating, grasses are also coming up nicely and that it looks as if the desert is blooming.

Referring to the catchment area treatment works, Chairman stated that he has been raising the point that the sub-watersheds on the periphery of the areas getting inundated should be treated first. Dr. Ramaseshan explained the logistic and practical difficulties faced by state Govts. in concentrating the entire work in the limited area. Dr. A.K. Malhotra also sought to explain that catchment, subject to human interference is the same in all the states. States are only administrative boundaries. Therefore, the environmental aspects have to be looked issue by issue, in totality. Chairman, however, disagreed and stated that the areas near the dam site should be treated up first and the percentage of progress needs to be worked out in relation to the work executed by GOG and GOM on these areas only. Referring to the catchment area treatment in Maharashtra, he directed that the work in the areas just above the dam namely the sub-watersheds Na3a, Na3b and Na3c should be done before 1994 rains, if pari-passu condition is to be adhered to. He also referred to the point-3 of the further recommendations contained in the report of the Committee on page-13 and stated that, "the desired information should be made available to the Sub-group as early as possible for the effective monitoring".

Referrring to the impacts of impoundment on the environment, he expressed that the salt water intrusion should be studied. He desired that report of the studies done by CWPRS, Pune need to be examined in detail & outcome reported to the sub-group. Sub-group also discussed implications of the closure of sluices beyond December, 1993 and felt that the studies which have been done for mitigating the downstream impacts need to be scrutinised, mitigation measures proposed and their need to be checked and recommended measures should be implemented in time and in any case the Sub-Group cannot arrive at a firm recommendation or suggestion just now.

Chairman referring to the discussions of the 18th meeting of the Environment Sub-group stated that the Sub-group had recommended shifting of the dates for closing of the sluices to March, 1994, keeping in view

the delayed start of catchment treatment works in Maharashtra. This recommendation was made to provide one clear season for executing catchment area treatment works in Maharashtra so that they can catch up to the pari-passu approach.

Shri B.J.Parmar, Executive Director, SSP informed the Sub-group that the project authorities have got the model studies done by CWPRS, Pune on the possible environmental impacts downstream of the SSP. He also explained the measures which are proposed to be taken to safeguard the downstream reach. He further informed that major structures have been provided on both sides of the roads to safeguard the same and that the Karjan reservoir is to be used for providing water to downstream through the river sluices and also through the syphon. Based on the trend of floods this year he also informed that if sluices are plugged during December, dry conditions would prevail downstream of SSP only for 10 days. He further explained that routing of the flood has been considered and discussed in detail in the SSCAC's meetings where Chairman, CWC has also given suggestions. Based on the discussions of the SSCAC, the backwater effects which were based earlier on calculations have now been replaced with model studies. However, Dr. Ramaseshan reiterated that as per the data made available to the committee if the construction sluices are closed by mid December, the downstream dry conditions will prevail for 22 days. He also desired that the backwater effect is required to be superimposed over the submergence area. He also explained that the project authorities required two seasons to complete the works for constructing stilling basin downstream and for this reason it is proposed to close the sluices early. Dr. Ramaseshan expressed the opinion that unless we are to get substantial environmental benefits by delaying the closing of the sluices, these can be permitted to be closed in December itself.

Chairman, however, desired to know the impact of closing of the sluices or by postponing it on both upstream and downstream environment. Prof. Katti explained that since the wall has already been constructed and only pinholes have been left out for plugging, closing or not closing the same will not have substantial environmental impacts. Chairman, however, expressed that there is a clear anxiety about the downstream impacts which as per the report of the committee can not be ascertained very clearly till October, 1993 and that the main area of the concern is the catchment treatment works in Maharashtra where they seem to be lagging behind. He suggested that the Sub-group cannot decide on closing of the sluices unless data on the following aspects is available:

- (i) Provision of downstream water supply;
- (ii) Salt intrusion with and without dam; and
- (iii) Areas which are likely to be submerged at the level pool submergence (pondage).

Dr. Shekar Singh wanted to put on record that the catchment area treatment requires 3 to 4 years for stabilization. Shri M.B. Mehta stated that his observations and experiences are that one year is sufficient to get the catchment area stabilized after the treatment. Chairman, however, reserved the decision of the Sub-group on closing of the construction sluices till the next meeting of the sub-group, pending information as to what will be the environmental affects, of closing of sluices in March, 1994 and also if these are closed in December, 1993 itself as proposed in Committee's Report. Executive Member, NCA informed the sub-group that CWPRS, Pune was being requested by Govt. of Gujarat to carry out model tests on the above points, on a priority basis and these issues would also be discussed in the SSCAC meeting scheduled to be held shortly.

2. **Submission of Catchment Area Treatment Plans for freely draining critically degraded sub-watersheds [Item No. XVIII-2(97)(2)].**

This item is already covered under the discussion of Item-1 above.

3. **Cost Estimates for Preparation of Action Plan and Implementation of Environment Safeguard Measures [Item No. XVIII-2(97)(3)].**

Chairman expressed concern about the non-availability of the data on estimates and expenditure on environmental aspects and directed that as far as possible the gaps should be filled up before the next meeting. He also directed GOG to revise the cost estimates on implementation of command area development works which should take into consideration various mitigative measures that may be needed as a result of the recommendations of the studies commissioned.

Item No.XIX-3(102): PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLAN.

i) Phased Catchment Treatment

Narmada Sagar Project

Govt. of Madhya Pradesh

According to GOMP all the reports including revised/supplementary reports have been analysed by the experts in NVDA. As per the final results of the analysis, the total catchment area of NSP below Bargi Dam is 40,47,037 ha out of which 30 sub-watersheds covering total area of 73,713 ha and belonging to high and very high priority categories have been identified as directly draining into the reservoir. The total non-forest area within these 30 sub-watersheds comes out to be 57,697 ha, out of which 5,770 ha areas is not available for treatment, as these areas come under roads, buildings, canals and water bodies. As for the forest area, all those forest compartments either falling completely within these 30 subwatersheds or having some overlapping areas with these 30 subwatersheds will be taken up for treatment. Accordingly, 47 forest compartments situated in Khandwa & Harda (Territorial) Forest Divisions have been identified for pari passu treatment at the project cost. The total area of these 47 forest compartments works out to be 15,583 ha. After excluding the areas coming under submergence, encroachments, cultivations and the areas under previous years plantation the net available forest areas to be treated comes out to be 10,872 ha, out of which 5,295 ha forest areas is fully stocked and will need only minor engineering works, whereas the balance 5,577 ha forest area being blank/understocked will need both vegetative/afforestation measures as well as soil engineering works. The final CAT plan is under preparation and will be ready by 15th August, 1993.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP reported a progress of 13075 ha of non forest area by the end of March, 1993. GOMP has submitted a revised plan for the directly draining, high and very high critically degraded areas in the sub-watersheds. According to this plan a total of 73795 ha of non forest area is to be treated at a cost of Rs. 55.35 crores including the cost of establishment. The forest area

proposed to be treated is 59572 ha. Out of this 7642 ha area is not workable and another 13930 ha area being fully stocked, would require only engineering works. In the balance area of 38,000 ha full treatment works comprising engineering as well as vegetative and afforestation works will be taken up at an estimated cost of Rs. 33 crores.

As for the progress of works during 1993-94, 700 ha forest areas is expected to be completely treated by the end of July, 1993. It was informed by GOMP that complete treatment involves both vegetative/afforestation measures as well as soil engineering works.

Govt. of Gujarat

Besides completing the target of 21311 ha of degraded forests Govt. of Gujarat is yet to report on progress of non forest area.

Govt. of Maharashtra

Govt. of Maharashtra has reported the target of 960 ha of forest area for catchment area treatment during current monsoon of 1993.

ii) **Compensatory Afforestation**

Narmada Sagar Project

Govt. of Madhya Pradesh

As for the progress of works during the current monsoon, it was informed that planting works are being carried out all over the areas and a total of 12,987 ha of degraded forest area and 1,327 ha of non-forest/revenue area are expected to be afforested by the end of the current monsoon.

Sardar Sarovar Project

Govt. of Madhya Pradesh

During the current monsoon, progress on 2,215 ha of degraded forest area has been reported. Whereas no progress over non-forest area is not reported. It was further informed that the collectors of the concerned districts have not been able to provide suitable non-forest areas for compensatory afforestation works. Vice Chairman, NVDA has written a number of DO letters to the concerned collectors for this purpose.

Govt. of Gujarat

Govt. of Gujarat has reported a progress of 4147 ha of non forest areas and 7784 ha on degraded forest areas by the 15th July, 1993.

Govt. of Maharashtra

Sub-group noted the progress of works, on 7222 ha non-forest area and 12977 ha on degraded forest as reported by GOM.

However, the location map of the area being planted alongwith the composition of the species, survival, spacing and other inputs provided are not yet furnished.

iii) **Command Area Development**Narmada Sagar ProjectGovt. of Madhya Pradesh

GOMP officials informed that collection of field data in the command area of Narmada Sagar Project has been in progress since November, 1991 and the same would have to be continued at least for 2 seasons to form any useful information for the consultants, who should be entrusted with the preparation of Master plan on drainage. However, the field data collected till May, 1992 have been compiled and an interim report has been drafted which is being studied by NVDA.

Sardar Sarovar ProjectGovt. of Gujarat

Chairman enquired from Dr. Abrol about the progress of the work on scrutinising the studies as agreed in the last meeting. Dr. Abrol invited project authorities for discussions on the issue seperately.

Govt. of Rajasthan

Already discussed under item XIX-1(100).

iv) **SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES**Narmada Sagar ProjectGovt. of Madhya Pradesh

GOMP officials informed that comments on FONs report has been received from the Director, Zoological Survey of India, Calcutta and the same would be placed before the Wildlife Committee during the next meeting

fixed on 11th August, 1993. The comments from other members are expected to be presented during the meeting itself. The FONs report is yet to be deliberated upon and finalised by the Wildlife Committee constituted by NVDA.

Sardar Sarovar Project

Govt. of Madhya Pradesh

GOMP informed that the report for the quarter ending June, 1993 of the SFRI, Jabalpur is still awaited. Action Plan will be prepared only after the final study report is submitted by the SFRI, Jabalpur.

Govt. of Maharashtra

School of Environmental Science, Pune University has submitted a further report on submergence area in Maharashtra annexed at XIX-Min-4.

Govt. of Gujarat

Action plan based on the report of M.S. University is yet awaited.

v) **ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY**

ARCHAEOLOGY

Narmada Sagar & Sardar Sarovar Projects

Govt. of Madhya Pradesh

The revised action plan has been received by NVDA from Commissioner, Archaeology and Museum, Bhopal and is presently being examined in NVDA.

Govt. of Gujarat

Govt. of Gujarat informed that there will not be any permanent submergence during the coming monsoon and that the temple has been erected 15 Km downstream. Idol has also been installed with religious ceremonies.

Govt. of Maharashtra

No work is required.

ANTHROPOLOGY

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh submitted a copy of the studies completed by Dr. K.G. Dubey during 18th meeting

to NCA. GOMP is directed to implement the recommendation contained in the report in their R&R plans.

vi) **SEISMICITY AND RIM STABILITY OF RESERVOIR**

Govt. of Madhya Pradesh

Narmada Sagar Project

GSI had pointed out in their earlier geological report that a narrow sub valley in the reservoir area in the vicinity of dam site needs to be further examined. Accordingly, a request was made to GSI to include the identified area in their field programme. Aerial photographs of the suspected zone were also made available for preliminary study. Director, GSI Division, Bhopal is now of the opinion that no further field work is necessary. Final report in this regard is being obtained from GSI.

Firm order has been placed on IMD for supply and installation of 12 Nos of Wood Anderson Seismometer alongwith 6 Nos of photographic recorder in the project area.

Further price bids have also been received as recommended by CWC and IMD to install and commission Micro Earthquake recorders for recording pre-impounding seismic events till such time the entire package of instruments comprising various sophisticated instruments are imported and commissioned. The offers of various firms are under active consideration of NVDA.

Sardar Sarovar Project

GOMP informed that after making preliminary field investigations of the suspected sites on 16th March, 1993, the team finalised the type of experiments to be conducted and field data to be collected for which the equipments and personnel would be made available by CWPRS, Pune and GSI, Nagpur Division. This field work is likely to continue for a couple of months. Sources for the data, as required from GOMP, are being identified. Suggestions with regard to agencies to whom the observation and collection of requisite data could be entrusted have been received from Chief Engineer, Narmada Control Authority, Indore. Consultation with these agencies is in progress.

vii) HEALTH ASPECT**Narmada Sagar and Sardar Sarovar Projects****Govt. of Madhya Pradesh**

Final report on limnological aspects is awaited from the Barkatullah University which is principal coordinator. As for the epidemiological studies concerning surveillance of control of malaria, the studies are presently in progress.

Sardar Sarovar Project**Govt. of Gujarat**

It was observed that the report of SCHMS annexed with the minutes of 18th meeting are not forming a plan by themselves and requires translation in form of a comprehensive plan with time frame and budgetary provision.

Govt. of Maharashtra

Copy of the detailed health plan is yet to be received.

After some discussions on the health plans of the State Governments, Sub-group decided to specially invite Dr. Tripathi, Director General, ICMR for reviewing the health plans drawn by all the three States. It was also decided that NCA will make these plans available to Dr. Tripathi for a review.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

Communication has been received from CICFRI that the final report on desk review studies on conservation of fish fauna is under printing and would be available shortly.

Regarding report on Environmental Impact of downstream of SSP Govt. of Gujarat informed that the final report is awaited from HR Wallingford Institute, London.

The final report on limnological aspects is still awaited from the Barkatullah University, Bhopal which is the principal coordinator of all the three Universities viz. Rani Durgawati University, Jabalpur (For studies in Upper Narmada Zone), Barkatullah University, Bhopal (for studies in Middle Narmada zone) and Vikram University, Ujjain (for studies in Lower Narmada zone).

DATE & VENUE OF NEXT MEETING

The next meeting of the Environment Sub-group of NCA is proposed to be held on 3rd November, 1993 at 9.00 A.M. in the Committee Room of Narmada Control Authority, Vishal Tower, Indira Complex, Navlakha, INODRE- 452001. This will be followed by field visit on 4th and 5th November, 1993.

ANNEXURES

ANNEX-XIX.MIN.(1)LIST OF PARTICIPANTS ATTENDED THE 19TH ENVIRONMENT
SUB-GROUP MEETING HELD ON 28TH JULY, 1993 AT NEW DELHI.S.No. Name & Designation

1. Shri R. Rajamani, Secretary, Min. of Env. & Forests, New Delhi.
2. Shri N.V.V. Char, I/C Executive Member, NCA.
3. Shri B.S. Baswan, Vice Chairman, NVDA, Bhopal.
4. Shri N.Suryanarayanan, Commissioner (FP), Min. of Water Resources.
5. Dr. A.K. Malhotra, Member (E&R), NCA.
6. Shri I.P. Abrol, DDG, ICAR, New Delhi.
7. Prof. R.K. Katti, Director, UNEECS, Bombay.
8. Prof. S. Ramaseshan, IIT, Kanpur.
9. Dr. Shekhar Singh, Faculty Member, IIPA, New Delhi.
10. Dr.K.A. Kushalapa, CCF, MOE&F, Bhopal.
11. Shri M.B. Mehta, CCF, SSP, Vadodara.
12. Shri S.P. Mathur, Addl. Secretary, DOE, Govt. of Rajasthan, Jaipur.
13. Shri M.S. Parasnis, CCF (Cons.), Govt. of Maharashtra, Bombay.
14. Shri B.K. Verma, Member (E&F), NVDA, Bhopal.
15. Shri M.B. Mankare, CF, Dhule, Maharashtra.
16. Shri G.L. Java, Chief Engineer (Designs), SSP, Vadodara.
17. Shri B.J. Parmar, Executive Director, SSP, Vadodara.
18. Shri R.V. Rao, Director (EM Dte), CWC, New Delhi.
19. Smt. Nalini Bhat, Joint Director, MOE&F, New Delhi.
20. Shri B.U. Chengappa, CF, MOE&F, Bhopal.
21. Dr. Pawan Kumar, Specialist (Env), NCA.
22. Dr. Afroz Ahmad, Impact Assessment Officer, NCA.
23. Shri R.K. Behre, Specialist, NVDA, Bhopal.
24. Dr. C.S. Verma, DD, MOE&F, New Delhi.
25. Shri R.M.N. Sahni, Addl. Director (WR)
26. Shri K.K. Bakshi, Under Secretary, MOE&F, New Delhi.

ANNEX-XIX-MIN.2(8).

दूरभाष : 3317309 (9 लाइन)



भारतीय लोक प्रशासन संस्थान

इन्द्रप्रस्थ एस्टेट, रिंग रोड, नई दिल्ली-110002

INDIAN INSTITUTE OF PUBLIC ADMINISTRATION

INDRAPRASTHA ESTATE, RING ROAD

NEW DELHI-110002

 TELE [GRAMS : ADMNIST
 PHONES : 331-7309
 (9 LINES)

20 July, 1993

Dear Shri Malhotra,

Thank you very much for your letter dated 8 May, 1993 enclosing minutes of the eighteenth meeting of the environment Sub-group of NCA. I give below my comments on the said minutes:

1. The following point needs to be added after point 2 on page 4 of the agenda " (3). No clear-felling to be permitted in Maharashtra till the team visit is completed and the final report of Pune University on carrying capacity has been submitted and assessed."
2. The following sentence needs to be added after original point 3 (now point 4) on page 5 " Before taking a final decision on the date of opening the sluice gates, the NCA Sub-group on environment should be consulted."
3. While discussing submission of catchment area treatment plans, the following point was made and may kindly be added before the para starting "While reviewing the problems faced by State Governments" on page 5:

"Chairman also stated that Plans for other freely draining areas have to be made. If these areas are not treated at Project cost, funds would have to be identified for the purpose."

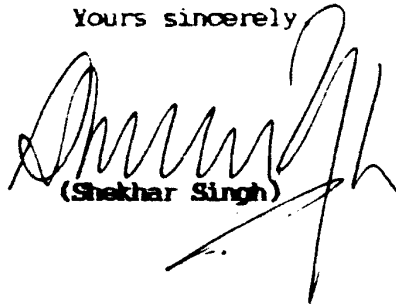
4. The following para may kindly be added after the first para on page 9 in sub head (i) "The Chairman enquired of representatives of GOMP whether it was correct that contracts for construction of NSP had been awarded. This was confirmed by GOMP representatives. The Chairman desired that subsequently the pari-passu aspects of NSP would also have to be considered and that no construction work relating to NSP should start till the pari-passu status was clear to the Sub-group."
5. On page 11 under command area development: SSP: Gujarat, the following may kindly be added:

"Shri Shekhar Singh enquired after the report of the drainage study, beyond Mahi Doab. He mentioned that this issue had also been raised in the last meeting. The GOG representative promised to send a copy of the final report to the members."

6. On page 11 there are references to Item XVIII-2(101)1. However, these are not tracable in the minutes.

With regards,

Yours sincerely



(Shekhar Singh)

Shri A.K. Malhotra
Member(E&R)
Narmada Control Authority
Vishal Tower,
Indira Complex,
Navlakha,
Indore-452001 (M.P.)

wizard\ss\letters\930720.mal

ANNEX-XIX-MIN.2(b)

No.5/26/92-PP.
GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES

.....

New Delhi, the 27th July, 1993.

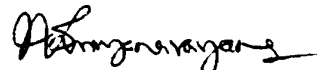
To

The Member-Secretary,
Environmental Sub-Group of NCA,
INDORE.

Sir,

Kindly refer to page No.8 of the minutes of the 18th Meeting of the Environmental Sub-Group held on 28-5-93 in New Delhi. There is a reference to the negotiations of the Government of Rajasthan with WAPCOS for entrusting the studies for the areas in Rajasthan. In this connection, it is to be stated that this item was not discussed in the meeting of the Sub-Group and the representatives of Government of Rajasthan were also not present in the meeting. Hence, it is suggested that second sentence onwards in this para may be deleted from the minutes. *Done*

Yours faithfully,



(N. SURYANARAYANAN)
COMMISSIONER (PP)

ANNEX.XIX.MIN.3.

CORRIGENDUM TO THE 18TH MEETING OF ENVIRONMENT SUB-GROUP OF INDIA

CORRIGENDUM

Under caption Command Area Development flowing to Page-11 - sub-head Sardar Sarovar Project, Govt. of Gujarat - Agenda item referred as XVIII-2(101)1 may be corrected as XVIII-2(97)3.

Under the same caption - sub-head Govt. of Rajasthan - Agenda item referred as XVIII-2(101)1 may be corrected as XVIII-2(97)3.

Under caption Survey of Flora, Fauna and Carrying Capacity Studies - Page-11 - Sub-head Sardar Sarovar Project, Govt. of Maharashtra - Agenda item referred as XVIII-2(101)1 may be corrected as XVIII-2(97)3.

ANNEX.XIX.MIN.4**ANNEXURE TO THE INTERIM REPORT ON "STATUS OF FLORA AND FAUNA IN AND AROUND THE SARDAR SAROVAR PROJECT, MAHARASHTRA"**

Field surveys were undertaken in the submergence area, at 61 M. and 91 M. level, along the bank of Narmada river and its tributaries. Canopy cover estimations were done.

Important plant species noticed in the region are-

<u>Acacia catechu</u> , Willd	<u>Butea monosperma</u> , Taub.
<u>Carissa conjesta</u> , Wight.	<u>Holarrhena antidysentrica</u> , Wall.
<u>Mangifera indica</u> , L.	<u>Pongamia pinnata</u> , Pierr.
<u>Santalum album</u> , L.	<u>Tectona grandis</u> , L.
<u>Terminalia arjuna</u> , W & A.	<u>Zizyphus trinervia</u> , Roxb.
<u>Anogeissus latifolia</u> , Wall.	<u>Madhuca indica</u> , Gmel.
<u>Mitragyna parviflora</u> , Korth.	<u>Diospyros melanoxylon</u> , Roxb.

In general, vegetation is of Dry - deciduous type. It is disturbed by human interference (cutting of wood), and also by grazing of animals.

Quality of forest is very poor, with forest density as low as 0.18. From the list of plants identified so far, none are included in the list of endangered or threatened species as per Red Data book of Botanical Survey of India.

Efforts are being made to identify corridors relevant for anticipated submergence in 1994.

Field surveys were carried out in and around the village Manibeli and in between Manibeli and Dhankhedi. The area surveyed are situated at altitude below 60 M. Between 115 and 225 trees (above 12 cm DBH) were noted per hectare though floral diversity was rather poor.

Using standard methods, floral lists were prepared and phytosociological analysis of plant communities was carried out to determine Frequency, Abundance and Density of constituent species in the community. Results are given in Table 1.

Table showing % forest canopy in the area investigated

Locality	Area Investigated in M ²	Area under canopy sq. Metre.	Total % Canopy	Canopy cover on 0.1 to 1.0 scale
Manibeli	10,000	855	8.55	< 0.1
Dhankhadi	10,000	1824	18.24	0.2
Junana	10,000	1800	18.00	0.2
Bhusa	10,000	78	7.83	< 0.1
Roshmal	10,000	650	6.50	< 0.1
Khardi Kh.	10,000	1772	17.72	0.2
Mal	10,000	681	6.81	< 0.1
Bilgaon	10,000	735	7.35	< 0.1
Domkhedi	10,000	809	8.09	< 0.1
Chimankhedi	10,000	1538	15.38	0.15
Pimpalkhunta (Valley)	10,000	6133	61.33	0.6
Vadphali	10,000	4355	43.55	0.4

Our surveys did not indicate the presence of any species that can be considered as threatened and endemic. Approximate density of the flora is 0.18.

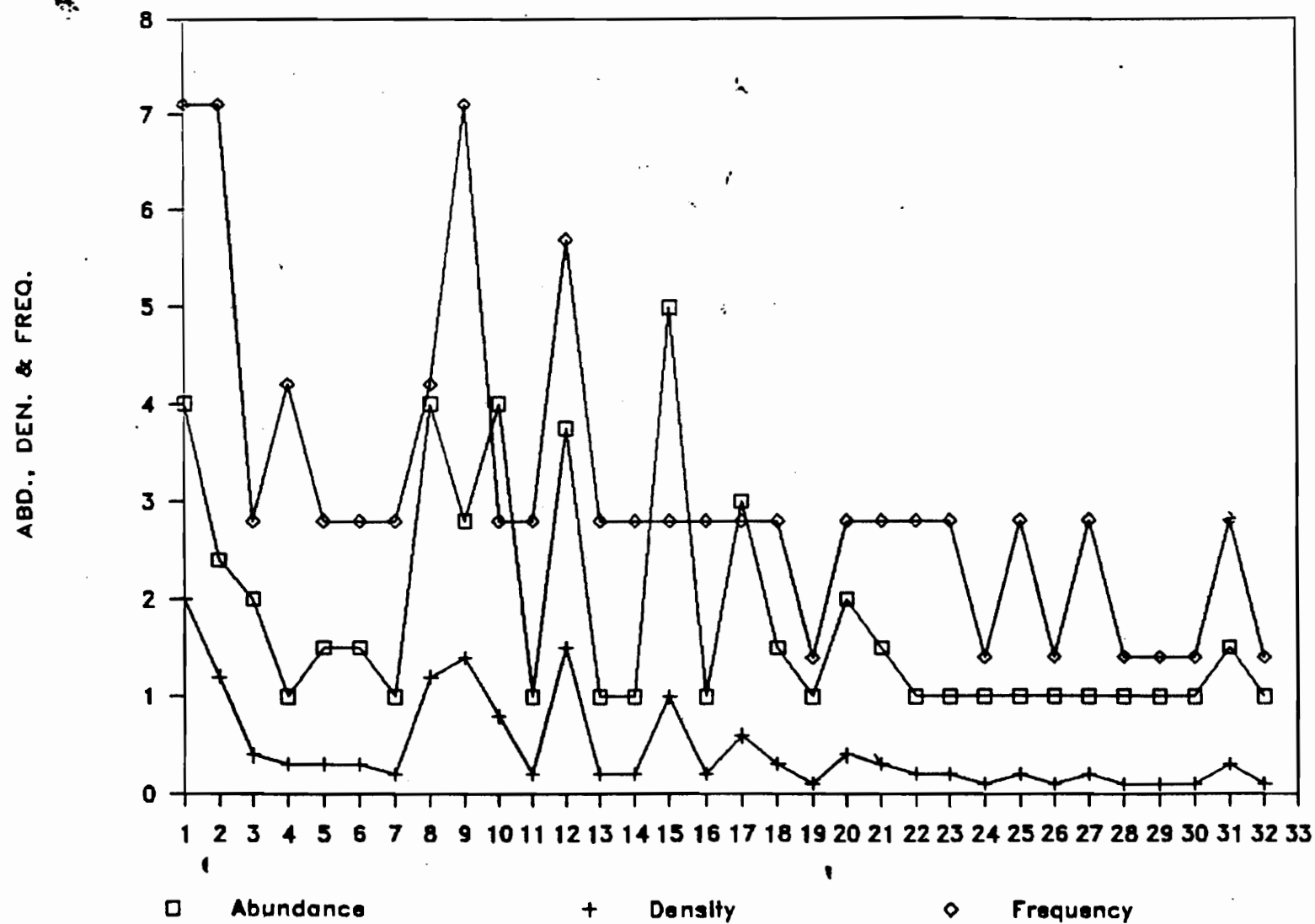
Attempts were made to find ethnobotanical significance of the plant species recorded during field surveys. More important method of local ethnobotanical significance of collected plants was impossible because of non-communicability with the villagers who were either scared to have liaison with our field workers or were

outright hostile, made this part of our work impossible.

List of plant species used in Graph for Abundance, Density and Frequency in Manibeli and in between Manibeli & Dhankhedi.

- | | |
|--|---|
| 1. <u>Tectona grandis</u> , L. | 2. <u>Holarrhena antidysenterica</u> , Wall. |
| 3. <u>Zizyphus rugosa</u> , Lam. | 4. <u>Morinda citrifolia</u> , L. |
| 5. <u>Garuga pinnata</u> , Roxb. | 6. <u>Bambusa arundinaceae</u> , Willd. |
| 7. <u>Hardwickia binata</u> , Roxb. | 8. <u>Acacia concinna</u> , DC. |
| 9. <u>Butea monosperma</u> , Taubert. | 10. <u>Nyctanthes arbor-tristis</u> , L. |
| 11. <u>Ficus retusa</u> , L. | 12. <u>Borassus flabellifer</u> , L. |
| 13. <u>Ficus glomerata</u> , Roxb. | 14. <u>Azadirachta indica</u> , Juss. |
| 15. <u>Vitex negundo</u> , Linn. | 16. <u>Mangifera indica</u> , L. |
| 17. <u>Anona squamosa</u> , L. | 18. <u>Bombax malabaricum</u> , DC. |
| 19. <u>Boswellia serrata</u> , Roxb. | 20. <u>Wrightia tinctoria</u> , Br. |
| 21. <u>Moringa concanensis</u> , Nimmo. | 22. <u>Bridelia retusa</u> , Spr. |
| 23. <u>Mitragyna parviflora</u> , Korth. | 24. <u>Aegle marmelos</u> , Corre. |
| 25. <u>Cassia fistula</u> , L. | 26. <u>Lagerstroemia parviflora</u> , D. & C. |
| 27. <u>Madhuca indica</u> , Gmel. | 28. <u>Acacia catachu</u> , Willd. |
| 29. <u>Terminalia bellerica</u> , Roxb. | 30. <u>Dendrocalamus strictus</u> , Nees. |
| 31. <u>Mimusops hexandra</u> , L. | 32. <u>Acacia farnesiana</u> , Willd. |

GRAPH SHOWING SPECIES ABD., DEN. & FREQ



केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

पर्यावरण उपदल
Environment Sub-Group

बीसवीं बैठक की कार्यसूची Agenda For Twentieth Meeting

स्थान : न. नि. प्रा. कार्यालय, इन्दौर
Venue : NCA Office, Indore

दिनांक : 3 नवम्बर, 1993, 9.00 बजे प्रातः
Date : 3rd November, 1993, 9.00 AM

इन्दौर
अक्टूबर, 1993

INDORE
October, 1993

AGENDA FOR 20TH MEETING OF THE ENVIRONMENT SUB-GROUP
NCA TO BE HELD ON 3RD NOVEMBER, 1993 AT INDORE

I N D E X

Item Nos.	Contents	Page No.
XX-1(104)	Confirmation of the Minutes of the Nineteenth meeting of the Environment Sub-Group.	1
XX-2(105)	Review of Action taken on the decisions of previous meeting.	2 - 3
XX-3(106)	Present Status of Studies/ Surveys and Environmental Action Plans.	4 - 12
XX-4(107)	Monitoring of the Reports under compilation by the project authorities.	13
	Any other Item } Date & Venue of Next meeting }	14

A N N E X U R E S

XX-I	Comments of GOG on the Minutes of 19th meeting.	1 - 2
XX-II	Progress of catchment area treatment works near the dam site.	3
XX-III	Map showing the area of CAT and CAF works in MP, Gujarat & Maharashtra.	4 - 5
XX-IV	Status report of studies and activities on environmental issues for the period ending September, 1993.	6 - 32
XX-V	Third Annual report on the impact assessment studies in MP submitted by SFRI, Jabalpur.	33- 59
XX-VI	Minutes of the 4th meeting on development & conservation of fish and fisheries in the NSP & SSP reservoirs.	60- 64

**Item No.XX-1(104): CONFIRMATION OF MINUTES OF THE 19TH
MEETING**

Minutes of the 19th meeting of Environment Sub-Group of Narmada Control Authority were circulated to all members and invitees seperately vide letter No.Env-34(20)/93/316 dated 27.8.93.

Govt. of Gujarat had sent some comments which are placed at Annex-I for consideration of the Sub-Group.

**Item No.XX-2(105): REVIEW OF ACTIONS TAKEN ON THE DECISIONS
OF THE PEVIOUS MEETING**

**1. Extension of Time for Environmental and Forestry
Approval (Item No. XIX-2(101) (1)).**

During the 18th meeting of the Environment Sub-Group a team was constituted to undertake a field visit to the areas getting submerged by SSP during 1993 and 1994 monsoon. The team visited the areas and submitted its report. The report was discussed during 19th meeting of the sub-group held on 28th July, 1993 at New Delhi.

Sub-Group discussed the issues contained in the report of the committee and requested for more information from the State Governments and NCA on the issue of closure of sluices during December, 1993 as recommended by the committee.

Annexure-II gives information regarding the progress of catchment area treatment in the areas near the dam site. Information regarding the progress of catchment area treatment and compensatory afforestation works alongwith the area of pondage is being given on maps annexed at Annex- III. The Govt. of Gujarat is preparing an operational plan for tackling the downstream conditions of the river during the closure operation of construction sluices which will be circulated separately incorporating the findings of the model experiments.

2. **Submission of Catchment Area Treatment Plans for freely draining critically degraded sub watersheds. (Item No. XIX-2(101) (2)).**

Govt. of Madhya Pradesh and Govt. of Maharashtra were to submit the plans for the critically degraded (High and Very High priority categories) sub watersheds other than directly draining into the reservoir by October, 1993. GOM and GOMP may report the progress.

Govt. of Gujarat was directed to explore the possibility of using more sophisticated equipment for measurement of silt during pre and post treatment regime. Govt. of Gujarat may report the progress during the meeting.

3. **Cost Estimates for preparation of Action Plan and implementation of Environment Safeguard Measures (Item No. XIX-2(101) (3)).**

Complete details about the cost estimates for survey/ studies/Action plans & their implementation are awaited. Concerned State Government officers and representatives are requested to kindly supply the updated figures during the meeting.

Item No. XX-3(106): PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS.

The latest status report of studies and activities on environmental issues under consideration of the sub-group for the quarter ending September, 1993 is placed at Annexure-IV.

Their progress/present position are briefly given below for review by the Sub-group.

i) Phased Catchment Treatment

Narmada Sagar Project

Govt. of Madhya Pradesh

After the receipt of recent reports from AIS & LUSO, NVDA had submitted a revised plan for treatment of critically degraded directly draining sub watersheds in September, 1993. A copy of this plan was also submitted to MOE&F. This plan is under implementation. According to this plan an area of ⁶²⁹⁷⁵64611 ha is proposed to be treated by the end of 1997. It is reported by NVDA that an area of 20128 ha has been treated by the end of July, 1993 and upto date progress shall be reported by NVDA during the meeting.

Sardar Sarovar Project

Govt. of Madhya Pradesh

NVDA had submitted a plan for treatment of critically degraded directly draining sub-watersheds initially in May, 1991 which was subsequently revised in May, 1993. Accordingly, it had planned to treat 1,11,795 ha area spread over 42 sub-watersheds.

According to the information supplied by NVDA 10550 ha of non-forest area has been treated by September, 1993, in addition to forest area of 700 ha. Latest progress is awaited.

Govt. of Gujarat

Govt. of Gujarat had taken up the entire catchment upstream of SSP for treatment. Out of the 27,200 ha forest area, an area of 21311 ha had been treated so far. Progress on treatment of non-forest area is reported to be 1534 ha against the total target of 3025 ha. Upto date progress shall be reported by SSNNL during the meeting.

Govt. of Maharashtra

Govt. of Maharashtra was required to treat 31400 ha of critically degraded sub watersheds directly draining into the reservoir. The detailed plan for treating 25400 ha of area was submitted earlier by GOM. This plan was later revised and was annexed with the agenda of Nineteenth meeting. GOM had again revised the targets vide page-3 of Annex-V. An area of 960 ha was treated during the rains of 1993. Upto date progress shall be reported by GOM during the meeting.

Sub-group may like to review the progress.

ii) Compensatory Afforestation

Narmada Sagar Project

Govt. of Madhya Pradesh

NVDA reported a cumulative progress of over 35910 ha upto 1993 rains.

Further progress of works during the current monsoon shall be reported by NVDA during the meeting.

Sardar Sarovar Project

Govt. of Madhya Pradesh

Against a target of rehabilitating degraded forests in an area of 2300 ha during 1993 monsoon, NVDA had reported a progress of 2215 ha. However, it was noted that no compensatory afforestation was done in non-forest area during 1992 and 1993 monsoons. Non allotment of areas by collector was stated to be the prime reason for the shortfall.

Sub-Group may like to review the difficulties being faced by NVDA in identifying the non forest areas.

Govt. of Gujarat

Against a target of 13950 ha, works have been completed by SSNNL in 10531 ha upto 1993 monsoon. Entire work is planned for completion by rains of 1994.

Govt. of Maharashtra

Govt. of Maharashtra reported that entire area of 12980 ha of degraded forests has been planted by the monsoon of 1993.

In addition, 7222 ha was afforested against a total target of 9190 ha of non forest land.

GOM was required to provide location map of the areas being planted alongwith the details of the composition of the species, survival percentage, spacing

and other relevant details during the 16th meeting of the Sub-Group. This information is yet awaited.

iii) **COMMAND AREA DEVELOPMENT**

Narmada Sagar Project

Govt. of Madhya Pradesh

Interim report containing the data collected till May, 1992 may be submitted by NVDA. Further data compilation by NVDA for supplying to the consultants to enable them to prepare a detailed plan is in progress. NVDA may submit the current status of the works during the meeting.

Sardar Sarovar Project

Govt. of Gujarat

The detailed report on Environmental Impact Assessment of the command area development in 3 volumes was submitted during the 18th meeting. Dr. Abrol, ICAR and Dr. Mahesh Pathak of Narmada Planning Group were requested by the Sub-group to review the reports of 87 studies commissioned by NPG in relation to cropping pattern, suitable agriculture and other related aspects. A meeting was convened by Deputy Director General, ICAR in his office chamber at New Delhi for the purpose. Outcome of the discussions shall be reported by NPG/ SSNNL during the meeting.

Govt. of Rajasthan

During the 18th meeting of the Sub-group it was directed that GOR will take up the studies in

consultation with GOG. GOR framed TOR for entrusting the studies to WAPCOS. The TOR, has been finalised by GOR in consultation with NPG and NCA and work awarded to WAPCOS.

iv) SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES

Narmada Sagar Project

Govt. of Madhya Pradesh

Friends of Nature Society, Bhopal had submitted its report on retrieval of bio cultural material from Narmada Basin to NVDA quite some time back. GOMP may indicate the action taken by it on the recommendations contained in the report of Friends of Nature Society, Bhopal. Progress of the studies being done by Wild Life Institute, Dehradun shall be reported by NVDA during the meeting.

Sardar Sarovar Project

Govt. of Madhya Pradesh

A copy of the third annual report for the period ending March, 1993 submitted by the State Forest Research Institute for the impact assessment studies in Madhya Pradesh is enclosed at Annexure-V. Govt. of Madhya Pradesh may explain for the completion of the final report and summary of the actions proposed on the recommendations contained in the interim reports received so far.

Govt. of Gujarat

Govt. of Gujarat may submit a detailed action plan based on the recommendations contained in the report of M.S. University, Vadodara.

Govt. of Maharashtra

GOM may like to report on progress of works being done by School of Environmental Science, Pune University, Pune.

v) ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY

ARCHAEOLOGY

Narmada Sagar Project

Govt. of Madhya Pradesh

A detailed action plan for relocation/protection of central as well as state protected monuments is still awaited from NVDA.

Sardar Sarovar Project

Govt. of Madhya Pradesh

The finalised action plan giving the time frame and cost estimates prepared by State Department of Archaeology and Museum, Madhya Pradesh is yet to be made available to MOE&F and NCA.

Govt. of Gujarat

It was reported that a new building for Shoolpaneshwar temple was already in place and the diety has also been shifted. Besides, the plan finalised by GOG for relocation of Hamfeshwar temple may also be submitted by GOG.

Govt. of Maharashtra

No works are required to be done in Maharashtra in this regard.

ANTHROPOLOGY**Govt. of Madhya Pradesh**

Anthropological Survey of India in 1992, had undertaken Narmada Salvage Plan. Information obtained from the survey undertaken by it was requested for possible use in R&R plans which is awaited.

vi) SEISMICITY AND RIM STABILITY OF RESERVOIR**Narmada Sagar Project****Govt. of Madhya Pradesh**

GOMP is to report about the progress regarding procurement of Seismometers from IMD needed for obtaining preimpoundment data.

Sardar Sarovar Project

Rim stability analysis for the areas in Gujarat was completed in 1982. In addition, 130 sq. km area in Madhya Pradesh was also covered up during 1988-89. It was indicated by GSI that the draft report was available but before finalising the report confirmation on certain aspects was required. Some studies have been entrusted to CW&PRS, Pune and an amount of Rs. 12.5 lakhs had been placed at their disposal. All necessary facilities have been made available. The joint inspection of the site was undertaken on 16th March,

1993 & it was found that some more data was needed and the field work was to continue for a couple of months. GOMP was requested to collect and furnish the additional data needed by GSI & CWPRS at an early date. Progress is awaited from GOMP.

To speed up the work further a meeting had been convened by Executive Member, NCA on 29th October, 1993, outcome of which will be reported during the meeting.

vii) HEALTH ASPECT

Govt. of Madhya Pradesh

Narmada Sagar Project and Sardar Sarovar Project

An interim report, on surveillance and control by the Gandhi Medical College, Bhopal received from NVDA was annexed with agenda papers of the 18th meeting. A copy of the report alongwith available health plan of the State Governments were forwarded to Director General, ICMR for his views. GOMP may furnish the II interm report of the surviellance and control studies being done by the Gandhi Medical College, Bhopal.

Sardar Sarovar Project

Govt. of Gujarat

A copy of the updated health plan is awaited from GOG.

Govt. of Maharashtra

Govt. of Maharashtra submitted a plan in 1987 which was revised in 1991 and it was again revised in

1993. A short note on this revised plan was submitted during the 17th meeting. However, a copy of the detailed action plan on health indicating the latest revisions may be submitted to the MOE&F and NCA urgently.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIR

During the earlier meeting of the sub-group, Chairman had desired a clear picture on the conservation aspect of fish fauna. In pursuance, a desk review of studies was commissioned to CICFRI, Barrackpore by the NCA. Report of the institute was available. Actions are initiated to implement the recommendations contained in the report. To review and speed up the work on development of fish and fisheries in the reservoir, a meeting was convened on 23.9.93 by the Executive Member, NCA. Minutes of the meeting are enclosed at Annex-VI.

NVDA was to report about the submission of final report on Liminological aspect by Barkatullah University, Bhopal. In addition, NVDA was also requested to report on the actions proposed to be taken on acceptable recommendations contained in the report of Friends of Nature Society, Bhopal.

SSNNL, GOM and NVDA were requested to update and revise their plan on sector fish and fisheries. Progress may be reported.

Item No. XX-4(106): MONITORING OF THE REPORTS UNDER COM-
PLILATION BY THE PROJECT AUTHORITIES

Completion report on performance benchmarks was
available and submitted to all concerned.

Any Other Item

Date & Venue of next meeting.

ANNEXURES

ANNEX-XX-1**Sardar Sarovar Punarvasavat Agency, Vadodara.**

Narmada Bhavan, 'A' Block, 6th Floor,
Indira Avenue Road, VADODARA-390 001 GUJARAT INDIA.

D. Rajagopalan
I.A.S.
Rehabilitation Commissioner
&
Chief Executive Officer

Phone : 45 17 23 (O)
33 57 77 (R)
Telex : 01756 541 NRMD IN
FAX : 0265 45 28 49
No:CEO/WS/1177/'93
15th September, '93

Dear Shri Chhar,

I draw your attention to the minutes of the 19th meeting of the Environmental Sub Group held on 28th July, 1993. This meeting was attended by the following officers from Gujarat.

Shri M.B. Mehta,
Chief Conservator of Forest,
Sardar Sarovar Project,
Gujarat State.

Shri B.J. Parmar,
Executive Director,
Sardar Sarovar Nigam Ltd.

Shri G.L. Jawa,
C.E. (Designs)
Sardar Sarovar Nigam Ltd.

In the last sentence of para 2 in page 4, instead of "20 species of grasses" it should be read as 20 tree species. *ok*

In page 10, para 1, in respect of progress of compensatory afforestation, we were expecting to complete the target of 4147 ha. by monsoon 1993. However, due to paucity of rains and scarcity conditions, we hope we will be able to complete 3747 ha. only in the non forest areas. *Not complete*

Regarding the discussions on policy issues as contained in page 3,4,5,6 and 7, it is noticed that in page 7, it is mentioned that "Chairman, however, reserved the decision of the Sub-group on closing of the construction sluices till the next meeting of the Sub-group. Pending information as to what will be the environmental affects, of closing of sluices in March, 1994 and also if these are closed in December, 1993 itself

- 1 -

Not c *Chh Took along exception to the letter.*

-2-

as proposed in Committee's Report." However, as reported by the officers from Gujarat, who attended this meeting, no such decision was taken in the meeting. In fact the Committee had categorically recommended that the best period for the closure of sluices gate is in December, 1993 and not in March, 1994, as mentioned in the minutes. It is very necessary that these corrections are carried out in the minutes, since the decision as reflected in the minutes at present will go contrary to the decision taken in the Sardar Sarovar Construction Advisory Committee. In the present atmosphere of agitation by the NBA, it may not be advisable to have contradicting views or decision expressed by the two different wings of NCA.

I sincerely request you to get this matter looked into, so that the minutes of the meeting are corrected in conformity with the actual decision taken in the meeting.

With regards,

Yours sincerely,

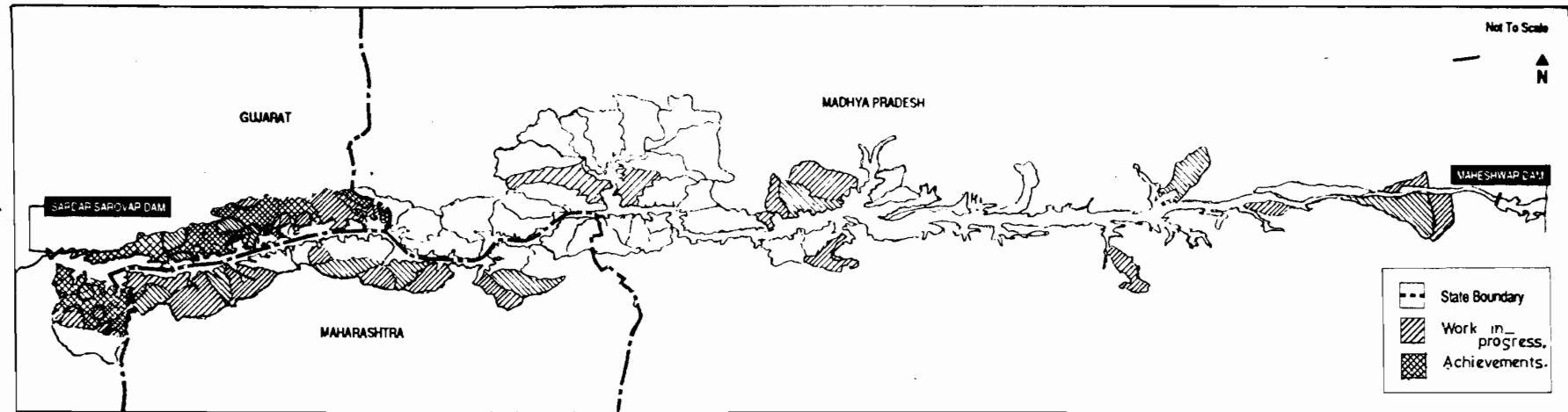

(D. RAJAGOBALAN)

Shri N.V.V. Chhar,
Executive Member,
NCA, Indore.

- 2 -

ANNEX-XX-IIPROGRESS OF CATCHMENT AREA TREATMENT NEAR THE DAM SITE

	<u>Maharashtra</u>	<u>Gujarat</u>
1. Total number of critically degraded sub-watersheds	51 Nos.	11 Nos.
2. Sub-watersheds to be treated	17 Nos.	11 Nos.
3. Gross area of sub-watersheds (to be treated)	(Area in ha.) 28226	29537
a) Total forest area that may be available for treatment	20000	27200
i) Net forest area available for treatment	17691	27200
ii) Forest area treated upto 1993 rains	960	23311
Percentage of forest area treated up to rain 1993	5.4 %	78.35 %
iii) Forest area to be treated upto 1994 rain	6560	27200
iv) Percentage of forest area to be treated upto rain 1994	37 %	100 %
B. Non Forest area	5734	3000
i) Non forest area treated upto 1993 rains	N.A.	1534
ii) Percentage of non-forest area treated	-	51 %
iii) Non forest area to be treated upto rain 1994.	N.A.	2170
iv) Percentage of non-forest area upto rain 1994	-	72.3 %



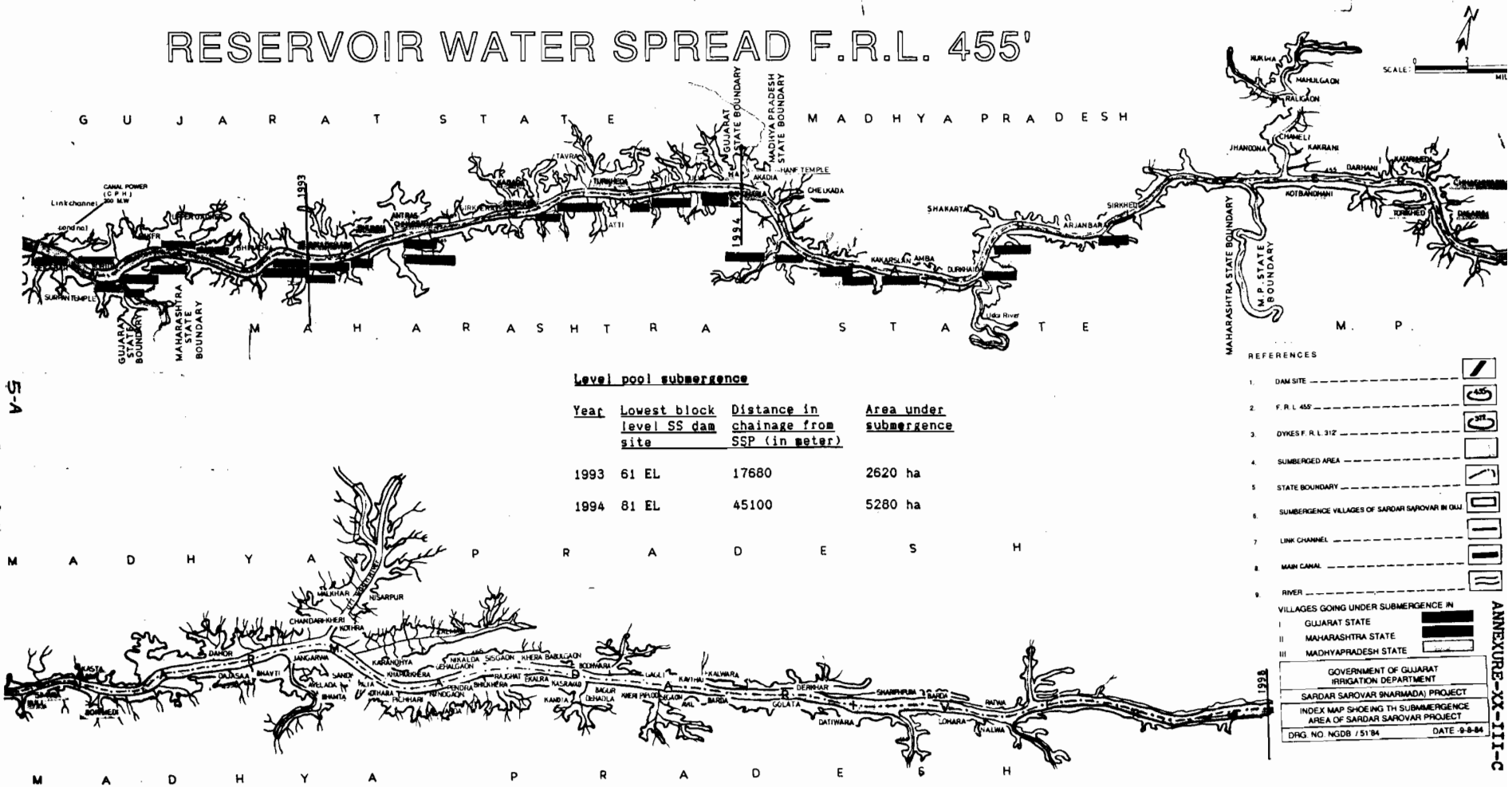
STATUS OF CATCHMENT AREA TREATMENT

mgd Sec (EWS)
 Form 2029388-
 022

COMPENSATORY AFFORESTATION IN GUJARAT, MAHARASHTRA & M.P.

SUBMERGENCE AREA OF SARDAR SAROVAR PROJECT

RESERVOIR WATER SPREAD F.R.L. 455'



ANNEX - XX-IV

STATUS REPORT
SARDAR SAROVAR PROJECT (SSP) ENVIRONMENTAL ASPECTS
SEPTEMBER - 1993

The action plans and status of studies and implementation of Environmental Safeguard Measures is as indicated below:

Environmental Safeguard Studies/Measures

- 1) Phased Catchment Area Treatment.
- 2) Compensatory Afforestation.
- 3) Command Area Development.
- 4) Flora, Fauna & Carrying Capacity.
- 5) Seismicity.
- 6) Health Aspects.
- 7) Archaeological & Anthropological, Studies.
- 8) Fisheries.
- 9) Rim Stability Analysis.

I. CATCHMENT AREA TREATMENT

The MOEF clearance granted in 1987 contained two conditions pertaining to CAT, as follows:

- more detailed surveys for prioritisation of the sub-catchments in the SSP area should be undertaken;
- a phased CAT programme should be prepared and implemented ahead of reservoir filling.

GOI issued a Directive in June 1992 that, for the SSP, the project would bear the costs of the treatment of all critically-degraded sub-watersheds draining directly into the reservoir. These watersheds were identified amongst those classified as either very high or high-priority categories by the All India Soil and Land Use Survey (AISLUS). The project would also be responsible for the treatment of those areas of the catchment which are directly damaged by the project activities.

In addition, plans are required to be prepared for the treatment of the balance of the critically-degraded watersheds but the cost of this will be met from other ongoing schemes and in a timeframe to be determined.

Studies

Surveys and studies have been undertaken to aid the development of a management plan for CAT in the SSP catchment.

- Report of Inter-Departmental Committee on Soil Conservation and Afforestation, (the Dewan Committee Report), 1985.

- Report on Prioritisation of Sub-watersheds in sub-catchments of Narmada Catchment, 1991.

Table 1.1 Summary of Status of CAT Planning

	GOG	GOM	GOMP
Preliminary Surveys)		
Prioritisation of sub-watersheds	:		
Development of Management Options	:	"Complete" for all item in all States.	
Annual Action Plan	:		
Effective monitoring)		
Phased Programme	Complete	Under finali- sation	Under finali- sation

Table 1.2 Principal Elements of Action Plans for CAT

Elements of Action Plans	GOG	GOM	GOMP
Survey work	)	"Complete" for all item & all States.	
Preparation of detailed map)		
Micro-watershed development map	Complete	Partly done & partly under pre- paration.	Partly done & partly under pre- paration.
Assignment of responsibility for conducting the work)		
Timetable	:		
Budget	:	"Yes" for all item for all States	
Menu of treatment	:		
Proposals for monitoring)		

Table 1.3 The total catchment area of BSP below NSP is 2448973 ha.

	GOMP	GOG	GOM	Total for the Basin
Total Catchment	2248601	36761*	163611	2448973 ha
Very High & High	541825	35412	116354	693591
Directly draining Very High & High	114606	29537	31423	175566
Areas directly damaged by project activities.	-	500	-	500
		Planned to treat 176200*		

* According to Govt. of Gujarat, the actual catchment area is only 30229 ha and entire area is planned for treatment.

Table 1.4 Implementation of CAT

	Gujarat		Maharashtra		Madhya Pradesh	
	Area to be treated in ha.					
	(Area in brackets indicate actual progress)					
	Forest	Non-Forest	Forest	Non-Forest	Forest	Non-Forest
<u>Monsoon year</u>						
1990-91	<u>4560</u> (4528)	<u>897</u> (897)	-	-	-	-
1991-92	<u>4750</u> (4770)	<u>830</u> (274)	-	-	-	-
1992-93	<u>6000</u> (6013)	<u>662</u> 363	(-)	-	<u>2000</u>	<u>15000</u> (8800)
1993-94	<u>6000</u> (6000)	636	<u>950*</u> (960)	Not finalised	<u>6000</u> (700)	<u>20000</u> 1750
1994-95	5893	-	6347*		5000	20000
1995-96	-	-	6347		5000	20000
1996-97	-	-	6346		5000	16600
TOTAL:	<u>27200</u> (21311)	<u>3000</u> (1534)	<u>20000*</u> (960)	<u>3771</u> (-)	<u>23000</u> (700)	<u>91600</u> (10550)

* 4 Forest divisions have been created by Govt. of Maharashtra. Target for 93-94 have been achieved. Works are also initiated on 6000 ha of catchment.

	<u>Gujarat</u>	<u>Maharashtra</u>	<u>Madhya Pradesh</u>
Implementation	76% complete work scheduled to finish 1995	work recently commenced scheduled to finish 1997	9.8% completed work scheduled to finish 1997

- * Net working area is 20,000 ha in forest and 3771 ha in non forest, out of total 31400 ha area.

II. COMPENSATORY AFFORESTATION

Approval for the diversion of forest land for the SSP was granted by the MOEF in 1987 and in 1990 (for R&R works) but several conditions were attached relating to the planning and conduct of CAF. Principal amongst these were the following stipulations.

- For every hectare of forest land submerged or diverted for construction of the project there should be Compensatory Afforestation on one hectare of non-forest land plus reforestation on two hectares of degraded forest. This represents a two fold increase of the usual requirement.
- For the 2,700 hectares of forest land in Maharashtra which is to be used for R&R, an equal area of non-forest land or double the area of degraded forest should be planted.
- The governments of the three states involved should prepare plans detailing their proposals for Compensatory Afforestation and submit these to the MOEF before work in the forest area is due to commence.
- The project should supply firewood to its construction workers, at its own cost, to prevent them from having to meet their fuel needs from the surrounding forests.

Studies

These have been a number of studies in three states aimed at assessing the extent and significance of the loss of forest land attributable to the SSP.

- Sardar Sarovar (Narmada) Project Development Plan, Volume-II prepared by the Narmada Planning Group (NPG) in 1983.
- Studies on Ecology and Environment by M.S. University of Baroda (MSU) in 1983.
- Sardar Sarovar Project: Preparation of Environmental Work Plan by the Forest Department of Maharashtra in 1988.

- Eco-Environmental and Wildlife Management Studies on the Sardar Sarovar Submergence Area in Gujarat 1992 by MSU.
- Impact Assessment of Madhya Pradesh Land to be Submerged Under Sardar Sarovar Project and Adjoining Ecosystems by State Forest Research Institute, Jabalpur (1989-92).
- Status of Flora and Fauna in and Around Sardar Sarovar Project, Maharashtra is a preliminary report of an ongoing study by the University of Pune which began in 1992 and is due to run for two years.

The Action Plans

In compliance with the conditions set by the MOEF, each state has prepared an action plan for the CAF of areas within its boundaries. The relevant documents are:

- Government of Gujarat Work Plan for Management of Environmental Effects, Section on Forests and Wildlife: The Compensatory Afforestation Plan for the Rann of Kutch, 1986.
- Project for Afforestation in Sardar Sarovar Project Impact Areas due to Diversion of Forest Lands for Sardar Sarovar Project (GOG), 1991.
- Compensatory Afforestation Scheme in Lieu of Sardar Sarovar Project in Dhule District, Maharashtra State (1989).
- Government of Madhya Pradesh Forest Department Action Plan of Compensatory Afforestation for Sardar Sarovar multi-purpose river-valley project (1989).

These plans were submitted in varying stages of completeness but each has now been revised and updated to take account of the comments of the MOEF and the NCA. Action plans of 3 State Govts. contained following components:

1. Identification of areas for CAF;
2. Description of selected areas,
3. Justification of Selection of Areas,
4. Identification of responsible agency,
5. Description of staffing requirements,
6. Description of material requirements,
7. Estimate of costs,
8. Identification of tree species,
9. Description of preparatory work needed,
10. Description of planting techniques,
11. Provision for aftercare,
12. Yearly planting target,
13. Yearly budget,
14. Provision made for monitoring implementation

These action plans spell out a programme of tree planting in the three states on both non-forest and degraded forest areas as shown in Table 2.1 & 2.2.

Table 2.1 Areas for Compensatory Afforestation

	Area of Forest divert for SSP	Area of Degraded forest to be Replanted	Area of Non-Forest Land to be Afforested	Total Area for CAF
Gujarat	4,523	9,300	4,650	13,950
Maharashtra	9,188*	12,980	9,190	22,170
Madhya Pradesh	2,732	6,547	2,190	8,737
TOTAL :	16,443	28,827	16,030	44,857

* This includes 2700 ha released for R&R works in Maharashtra in 1990 for which only equal non forest area is being raised as stipulated.

Table 2.2 Schedules for Implementation of CAF

	Gujarat		Maharashtra		Madhya Pradesh	
	Area to be Afforested in ha (Area in brackets indicates actual progress)					
	Degraded Forest	Non-Forest	Degraded Forest	Non-Forest	Degraded Forest	Non-Forest
Monsoon year						
1990		2,150 (2150)			132 (132)	716 (716)
1991	2,834 (2,835)	270 (350)	8,383 (8383)		1580 (1200)	400 (373)
1992	2,450 (2449)	880 (847)	4,552 (4552)	2,276 (2276)	1580 (2400)	400 (-)
1993	2,500 (2,500)	800 (400)	45 (45)	1,506 (4,946)	2300 (2215) 3347	400 (-)
1994	1,516	503		1,968	600	274
1995	-	-		-	-	-
Total:	9,300	4,650	12,980	9,190	6547	2190
Achievement in ha.	(7784)	(3747)	(12980)	(7222) 5030	(5947)	(1089)
Total Task Completion in %	83.7%	80%	100%	78%	91%	49.7%

Other Additional Afforestation Activities:

Plantation along Canal Banks:

The total potential of canal bank plantations is estimated as 18000 ha. A project report prepared by forest Deptt. is under scrutiny of SSNNL. A programme of plantation is likely to be launched effectively from the year 1992. However to give start to the work of canal bank plantations, early plantations on 155 ha are already established till the rains of 1992.

Additional Activities

(a) Dam Vicinity Plantation (235 ha)

Planted till rains of 1992 - 240.00 ha

(b) Forest Plantation (500 ha)

Ravine lands on the left bank of the Sabarmati in village Ratanpur (300 ha) and Pirojpur (200 ha). In Pirojpur entire area of 200 ha is planted up by the rains of 1992.

(c) Project area plantations: (255 ha)

Plantations are already completed by rains of 1992.

(d) Additional Plantation in Non-forest Areas (1088 ha)

Non-forest land in Kutch district. Lands have already been released. The plantations will be completed by 1994-95.

III. COMMAND AREA DEVELOPMENT (INCLUDING DRAINAGE STUDIES)

(A) Government of Gujarat: Govt. of Gujarat has undertaken several studies related to the Command area development which included the following:

Sl. No.	Name of Study	Name of Agency	Year of Completion
1.	Mathematical Modelling of Ground Water for Baroda & Bharuch Area.	Operation Research Group, Baroda.	1981
2.	Pre-Feasibility study for Low Level Canal.	Jyoti Consultants Ltd. Baroda.	1981
3.	Pre-Feasibility level Drainage study of Narmada Mahi Doab of SSP Command.	Core Consultants Ltd. Ahmedabad.	1982

- | | | | |
|-----|---|--|------|
| 4. | Some Aspects of Role of Panchyats and Institutional Arrangements for canal irrigation in Two Talukas of Ahmedabad District. | Institute of Cultural and Urban Anthropology, Ahmedabad. | 1982 |
| 5. | A study of settlement Pattern (6 Talukhas sub Districts in the Narmada Command Area of Mahesana District of Gujarat). | Department of Geography, Gujarat University, Ahmedabad. | 1982 |
| 6. | Regionalisation of Narmada Command. | Operations Research Group, Baroda. | 1982 |
| 7. | Marginal cost study of two Typical Distributerries and Two Typical Branches. | Dr. C.R.Shah, Baroda | 1983 |
| 8. | Population Projection and Migration study for Narmada Command Area. | Operations Research Group, Baroda. | 1983 |
| 9. | Cropping Pattern and Water Demand Study in Narmada Command Area. | Operations Research Group, Baroda. | 1983 |
| 10. | Study on Water Demand for Non-Agricultural use from Narmada Project. | Gujarat Water Supply and Sewerage Board, Gandhinagar. | 1983 |
| 11. | Consumer Expenditure, Assets and Indebtedness of Rural Households of the Command Areas of Sardar Sarovar (Narmada) Project, 1982. | Directorate of Economics & Statistics, Gandhinagar. | 1983 |
| 12. | Methodological frame work for Economic Appraisal of Narmada Project. | Tata Economic Consultancy Services, Bombay. | 1983 |
| 13. | Wasteland Development Project for command Area of Narmada Canal (Region 11 and 12). | Gujarat State Rural Development Corporation Ltd., Gandhinagar. | 1984 |
| 14. | Studies for Optimisation of Hydro Power Installation and pumping Units along Saurashtra Branch Canal. | Premier Consultants, Bombay. | 1985 |

- | | | | |
|-----|--|--|------|
| 15. | Additional work on Mathematical Modelling of Ground Water System-Single Layer Model Narmada Mahi Doab. | Operations Research Group, Baroda. | 1985 |
| 16. | Socio-Economic Bench Mark survey of 62 Talukas (Sub-districts) of Narmada Command Area. | Fourteen Different Agencies Including Universities, Research Institutions, Private Institutions. | 1985 |
| 17. | Land Use and Cropping Pattern Survey and Mapping of Narmada Command Area Zone 4A & 4B. | Department of Geography, M.S.University, Baroda. | 1986 |
| 18. | Inter-Regional Water allocation and Determination of Branch Canal capacity. | Operations Research Group, Baroda. | 1989 |
| 19. | Extended study on Inter Regional Water Allocation and determination of Branch Canal Capacity. | Operations Research Group, Baroda. | 1989 |
| 20. | Rate of Adoption of Improved Technology in Narmada Command and Rest of Gujarat State (Based on Analysis of Crop cutting Experiments Data). | Operations Research Group, Baroda. | 1989 |
| 21. | Computer aided Planning of conveyance and distributory Network. | Indian Institute of Management, Ahmedabad. | 1990 |
| 22. | Growth of Agro-Processing Industries in Phase-I of the Sardar Sarovar Project. | Gujarat Industrial & Technical Consultancy Organisation Ltd. Ahmedabad. | 1990 |
| 23. | Consultancy work for Control, Telemetry and Communication Net Work on Narmada Canal System for SSP. | Gujarat Communication & Electronics Ltd., Baroda. | 1991 |
| 24. | Mathematical Modelling of Ground Water System Single Layer Model Narmada Mahi Doab. | Operations Research Group, Baroda. | 1982 |

25.	Techno-Economic Study for utilising Village Tanks as Borrow Area for Construction of Canal Net Work.	Operations Research Group, Baroda.	1992
26.	Area Development Strategies for selected Regions Adjacent to Narmada Main Canal.	Operations Research Group, Baroda	1992
27.	Water Rates Policy in 3 parts.		
	i) Pricing of a public Utility Survey of Literature	Department of Economics, South Gujarat University, Surat.	1992
	ii) Financial working of Irrigation Projects - A case of four projects in Gujarat.	Department of Economics, Sardar Patel University, Vallabh Vidyanagar.	1992
	iii) Some policy issue for Canal Water Rates in Gujarat.	Department of Economics, Sardar Patel University, Vallabh Vidyanagar.	1992
28.	Mathematical Modelling of Ground Water System for SSP Command between Rivers Shedi and Sabarmati.	Consultancy Engineering Services, New Delhi.	1992
29.	Mathematical Modelling of Ground Water System for SSP Command between Rivers Sabarmati and Banas.	Operation Research Group, Baroda.	1992
30.	Mathematical Modelling of Groundwater System for SSP Command beyond Banas upto Rajasthan Border.	Dalal Consultants, Ahmedabad.	1992
31.	Prefeasibility level Drainage study for SSP Command beyond Mahi.	Consultancy Engineering Service, New Delhi.	1992
32.	Action Research on People's Participation in Water Management in SSP.	Gandhi Labour Institute, Ahmedabad.	1993
33.	Extension of 4th reservoir Modelling Study.	Operations Research Group, Vadodara.	1993
34.	Action Research in Peoples Involvement in Water Management.	Gandhi Labour Institute	1993

35.	Development and Management Plan for Black Buck Sanctuary at Velavadar.	Expert Multi-Disciplinary Group.	1993
36.	Development and Management Plan for Wild Ass Sanctuary in Little Rann of Kachchh.	Expert Multi-Disciplinary Group.	1993
37.	Integrated Command Area Development Plan for SSP.	Wamana Consultants Hyderabad and through GOG.	1993
38.	Impact study on water Borne/ Water related Diseases in Command Area including area down stream of SSP Dam.	Commissionerate of Health Medical Services & Medical Education.	1993
39.	EIA studies of Fisheries (Inland as well as marine) relevant to command area of SSP.	M.S. University.	1993
40.	Impact on Monuments of Historical Archaeological Importance in SSP Command.	Status note to be provided by (i) Director of Archaeology GOG (ii) Archaeological Survey of India, GOI.	1993
41.	Review of Ground Water Studies and problems.	International Consultant.	1993
42.	Review of studies and Problems on Drainage.	International Consultant.	1993
43.	Review of Soil Studies	National Expert	1993
44.	Survey and Investigation work of Ground Water Resources beyond River Mahi in SSP Command.	Gujarat Water Resources Development Corporation Ltd. Gandhi-Nagar.	1994
45.	Survey and Investigation of Ground Water Resources beyond River Mahi in SSP Command.	Gujarat Water Resources Development Co., Limited.	1994
46.	Research in Irrigated Agriculture	Gujarat Agriculture University.	Long-term study

47.	Pre irrigation and institutional training for functionaries of Nigam and farmers in the command area of SSP, field visit etc.	Department of Agriculture	1994
48.	Flora and Fauna studies of Command area of SSP.	M.S.University	1994
49.	Operational level drainage studies for the command area of SSP (on appropriate packages).	To be identified	1994
50.	Impact of Agriculture Run-off on Quality of Ground-water in SSP.	Indian Agriculture Research Institute	1994
51.	Socio-economic Survey in Command Area updating earlier Bench Mark Studies.	To be identified	1994
52.	Field Level Studies on farmers participation including pilot VSA Studies.	To be identified	1994
53.	Agricultural Research Studies.	Gujarat Agricultural University, Ahmedabad.	1998 on 12

Synthesis of Ongoing Work

Topic	Date of Award	Duration	Agency
1. Flora and Fauna of Command Area (3 part)	January 1993	18 months	Sardar Patel University, Gujarat and Saurashtra University
2. Wildlife Sanctuaries (4 nos.)	Started Sept. 1992	6 months	Experts coordinated by SSNNL.
6. Fisheries	January 1993	12 months	MSU, CICFRI, and Commissariat of Fisheries, GOG.
7. Public Health	December 1992	4 months	SCHMS GOG

8.	Impacts of Agricultural Chemicals on runoff and Groundwater	Due to start March 1993	12 months	Indian Agricultural Institute, Delhi.
9.	Command Area Development	Started in December 1992	12 months	WAMANA Consultant, Hyderabad.
10.	Integrated Review of Soil Studies	Due to start in March, 1993	6 months	Dr. Agarwal, consultant
11.	Groundwater & Drainage	Start date to be determined	4 months	HR Wallingford
12.				
13.	Revision of 4th Reservoir Model Study	December 1992	4 months	Operations Research Group, Baroda.
14.	SSP downstream study.)	
15.	Impact on monuments of historical/Archaeological importance in SSP command.		)	Details awaited.
16.	Saurashtra and Kutch Water Supply Distribution system	Start date to be determined	6 months	Commissioning agency to be determined.

(B) Government of Rajasthan

The Government of Rajasthan had submitted a report on Environmental & Ecological aspects and remedial measures for Narmada Canal Project. Copy of the report was submitted to Ministry of Environment and Forests. Govt. of Rajasthan has been directed to carry out Impact Assessment Studies on the lines followed by Govt. of Gujarat. Terms of Reference are made available to Govt. of Rajasthan. Govt. of Rajasthan has approached WAPCOS for the same & matter is under negotiation.

IV. FLORA, FAUNA, WILDLIFE AND CARRYING CAPACITY

The guidelines of the MOEF require that while seeking environmental clearance for the hydropower projects, surveys should be conducted so that the status of the flora and fauna present can be assessed, listed (rare and endangered) species can be detected, if present, and appropriate conservation measures devised.

On the basis of relevant details supplied, MOEF issued clearance for the SSP in 1987. A condition of this clearance, as

far as it related specifically to the Flora & Fauna, was that Narmada Control Authority would ensure indepth studies on flora & fauna needed for implementation of Environmental Safeguard measures.

Studies/Surveys :

Important survey work has included the following:

- The Environmental Impact Study of 1983 prepared by (MSU).
- Preliminary Report on First Botanical Exploration and Plant Collection from Narmada Valley by the Botanical Survey of India in 1986.
- Report on the Survey of the Narmada Sagar Area by Zoological Survey of India, 1988.
- Note on Sardar Sarovar Project - Preparation of Environmental Work Plan for Forest and Wildlife by the State Forest Department, GOM, 1988.
- Status of Flora and Fauna in and Around Sardar Sarovar Project, Maharashtra is an ongoing study by the University of Pune (1992-94).
- Eco-Environmental and Wildlife Management Studies in the Sardar Sarovar Area in Gujarat, 1992, by MSU.
- Impact Assessment of Madhya Pradesh Land to be Submerged Under Sardar Sarovar Project and Adjoining Ecosystems is an ongoing study which began in September 1990 and for which quarterly reports and two interim reports (1990-1991) and 1991-92) are available. The study is being conducted by the State Forest Research Institute (SFRI) in Jabalpur and financed by the NVDA.
- Workshop on Approaches to Integrated Wildlife Management in Gujarat: A Report by the SSNNL, October 1990.
- People's Involvement in Wildlife Management, by VIKSAT in 1991.
- Wildlife Management Studies in the Submergence and Catchment Area of Narmada Project: With Special Reference to Shoolpaneshwar Wildlife Sanctuary, by the SSNNL, 1992.
- Narmada Basin Water Development Plan: Development of Fisheries, 1987, was prepared by the Narmada Planning Agency, GOMP.
- Rapid Reconnaissance Survey of Limnological Aspects Part I, II and III, 1987, were undertaken by the Universities of Bhopal, Vikram and Rani Durgavati for GOMP.

- Water quality data has been collected by the Central Pollution Control Board, Central Water Commission, the State Pollution Control Boards and the National Institute of Oceanography.
- Narmada River Basin Development Project: Fisheries Component, 1991 by the German Consultants to the World Bank, GOPA.
- Sociological Survey of the Fishing Families of the Narmada River by CICFRI, 1991.
- Aquatic Fauna (Fish) Studies in Indira Sagar Submergence Area, prepared by the Friends of Nature Society in 1991 on behalf of the NVDA reported on the fish fauna of the Narmada.
- Pre-and Post-Impoundment Limnological Studies of Narmada Basin, involves the same three universities coordinated by Barkatullah University for the NVDA. (1989-92)
- Studies on Fish Conservation in Narmada Sagar, Sardar Sarovar and its Downstream is a desk review sponsored by the NCA and undertaken by CICFRI, 1993.
- Ecology and Fisheries of the Narmada Estuarine System with Special Reference to Proposed Impoundment (Sardar Sarovar Dam), is an ongoing study begun in 1988 by CICFRI.

The Action Plans

To ensure that the wildlife conservation measures are implemented effectively, action plans for the three states were prepared as follows:

- felling plans for the forest area coming under submergence in Maharashtra and Madhya Pradesh which will avoid the possibility of animals being trapped in the submergence area;
- plans for improvement works in the wildlife sanctuaries of Gujarat;

Fisheries Component:

Three state Govts. submitted the fisheries development plans as follows:

- The Narmada Basin Water Development Plan: The Development of Fisheries, 1984. This comprehensive plan for GOMP addressed the development of fisheries in the NSP, Omkareshwar, Maheshwar and SSP areas. Phasing and programming with respect to pre and post-impoundment, clearance of the forests, training of fishermen, cooperative societies and post-impoundment management were proposed.

- Environmental Work Plan: Sector Fish and Fisheries, GOG, 1986. This work plan, prepared in compliance with the agreement with the World Bank included the establishment of fish hatcheries and fish farms, training of fishermen, establishing primary cooperatives, and establishing an Inter State Fisheries Board. In addition, it included proposals for conducting hydrobiological studies, studies on the morphology of the river, investigations into the physical and chemical characteristic of the water and soil, and studies on flora, fauna, fish yield, plankton, and productivity in the reservoir.
- A Note on SSP: Preparation of Environmental Work Plan for Fisheries Development in Maharashtra, 1987. This plan included proposals for the felling in the reservoir submergence zone, fish seed, hatcheries, stocking, fishing, manpower requirements, and training and management through the Inter-State Board.

Subsequently, the state governments revised their plans to address further issues as they arose. The revised plan for GOM included proposals for the fishing population to be resettled on the periphery of the reservoir or in R&R sites in Maharashtra. In addition, the establishment of low-cost hatcheries and irrigation tanks, the development of pen cage culture fisheries, and intensive fish farming were proposed.

Table 4.1 Summary of Status of Environmental Planning:

A) **Wildlife**

	Gujarat	Maharashtra	Madhya Pradesh
Preliminary Surveys	Complete	Complete	Complete
In-Depth Studies	Complete	Underway (Poona Univ.)	Complete
Development of Management Options	Complete for Shoolpaneshwar	Some work completed but awaiting results of study and deliberations of the expert group	Some work completed but awaiting results of study and deliberations of the expert group
<u>Action Plan</u>			
Migratory corridors	Not needed	Completed	Complete
Sanctuary development	Complete for Shoolpaneshwar development.	Plans for establishment of wildlife sanctuaries await study results and expert group	Plans for establishment of wildlife sanctuaries await study result and expert group

Wildlife conservation	Massive afforestation in entire catchment of SSP	It depends on deliberations of expert group	May not be required. Await final outcome of study
Implementation	Shoolpaneshwar development almost complete, CAT work (increasing carrying capacity)nearing completion	Awaiting outcome of the study. CAF nearly completion, CAT work recently accelerated	Arrangements complete, awaiting final outcome of study

Progress in Shoolpaneshwar Sanctuary Development

	Target	Achieved to	% Complete
Fencing	100km	107	100
Firelines	60km	60	100
Barricades	2km	2km	100
Check Dams	14	14	100
Construction of Quarters	21	21	100
Construction of Rest House	1	1	100
Improvement of Communications	Not fixed	15km	100

The SSP will also provide an opportunity to enhance nature conservation outside the immediate catchment area of the Narmada. In particular three wildlife sanctuaries located in the command area of the project will benefit from the increased freshwater availability resulting from the project and there are plans by the GOG to expand these. They comprise:

- Nal Sarovar, a freshwater lake;
- A Wild Ass Sanctuary in the Rann of Kutch.
- A Black Buck Sanctuary at Velvadar.

Summary of Status of Environmental Planning:**B) Fisheries**

	GOG	GOM	GOMP
Preliminary surveys)		
	:		
Detailed surveys/ studies of fish fauna	:		
	:	"Complete" for all item in all States.	
Action plans	:		
	:		
Monitoring and evaluation cell)		
Plan for training of fishermen	Yes	Yes	Yes

Implementation

1. Plan for clear felling	Under imple- mentation	Yes to synchronise with submer- gence	Yes to synchronise with submer- gence
2. development of fish farms	Under imple- mentation	Yes, awaits submergence	Yes, awaits submergence
3. establishment of IFDB for future R&D management	Agreed	Agreed	Yet to agree

Progress of Implementation

CICFRI have already established one hatchery in Gujarat for augmenting the numbers of the Hilsa fish in the reservoir. This currently produce around 250,00 spawn per year. CICFRI have also been commissioned to monitor the whole of the estuary and their study has been extended to examine pollution and to undertake modelling studies in the downstream environment.

A draft plan for the creation of an Interstate Fisheries Development Board (IFDB) has been prepared by the NCA and agreed, in principle, by the governments of Gujarat and Maharashtra. The organisation is expected to be set up and fully functioning prior to reservoir filling. the IFDB will be an autonomous organisation with the NCA represented on the Board.

GOG has already provided 16 hectares of land to the project for the development of fish farms. In addition, the State Fisheries Department is exploring the development of riverine

fisheries and the development of the reservoir for commercial and game fisheries.

Execution of felling as per felling plans prepared will await the commencement of impounding.

V. SEISMICITY:

Studies

Studies of reservoir-induced seismicity (RIS) and rim stability have been carried out by the Geological Survey of India (GSI), Central Water and Power Research Station (CWPRS), University of Roorkee and World Bank Consultants. The principal studies are described below:

- University of Roorkee. 1980. Geological and Seismological Investigations of the Environs of Narmada Valley around Navagam Dam site in Gujarat.
- GSI. 1981-82 and 1982-83. A Geotechnical Report on the Reservoir Competency Investigations in Parts of Sardar Sarovar Area, Bharuch & Vadodara Districts. Volumes I&II.
- Shenoj et al. 1982. Shenoj et al presented at the New Delhi conference on the significance of seismotectonic aspects on reservoir development.
- Balasundaram, M.S. 1982 Sardar Sarovar Project: A Geotechnical Report Compiled and Edited for the Government of Gujarat.
- MSU. 1983. The Sardar Sarovar Narmada Project Studies on Ecology and Environment.
- NVDA published a Position Paper on Seismic Studies in January 1986.
- Krishna, Dr. J. 1989. Dams and Seismicity.
- GSI. 1990. Study of the Rim Stability of the SSP.
- GOI. 1993. Sardar Sarovar Project Seismicity and Sardar Sarovar Dam.

Progress of Implementation

The various recommendations for modification of the dam design have all been carried out and are summarised as:

- adoption of horizontal design coefficient of 0.125g on the recommendation of the Dam Review Panel;

- installation of stress monitors in the main body of the dam;
- increase of the depth of the foundation to 18m below the lowest river bed.

The Government of Gujarat has identified 9 locations for the installation of seismic monitoring stations, 4 each on either side of the Sardar Sarovar reservoir in Madhya Pradesh and Maharashtra and 1 at Kevadia in Gujarat. By mid 1992, 4 stations had been installed. A further 5 stations are under construction and completion expected by the end of 1993. Selection of the initial sites was carried out by the SSNNL.

The progress of implementation is illustrated in Table below:

Implementation of Actions

Action	Status
Dam design modifications	Complete
Installation of monitoring stations	5 stations installed by end 1991, 4 more awaited
GSI (Nagpur Division) rim stability studies	Completed in Gujarat, work in progress in M.P. and Maharashtra

VI. HEALTH ASPECTS

Studies

A large number of studies have been carried out on the health profile of villages in the three affected states. The key studies are summarised below:

- Narmada Programme - Schistosomiasis - Back-to-Office Report, 1986 assessment was carried out by Goodland, consultant to the World Bank, the National Institute of Communicable Diseases (NICD) and the World Health Organisation (WHO).
- Proceedings and Recommendations of the Meeting on Schistosomiasis Research and Surveillance held at NICD on 22nd November 1985.
- Disease Profile of Command Area by the State Commissariat of Health, Medical Services and Medical Education (SCHMS), 1986.
- Health Statistics, GOM, 1987. The state department of health produced a report on the health profile of 33 project-affected villages in Dhule District, Maharashtra.

- Health Statistic 1982-84, GOMP. This study, published by GOMP in 1985.
- The Sardar Sarovar Narmada Project Studies on Ecology and Environment by MSU in 1983 considered public health in Chapter-3.
- Numerous studies have been conducted on the incident of malaria in India by, amongst others, the Malaria Research Centre (MRC) and Dr. Kalra.

Status of Implementation of Actions for Public Health

Action	Gujarat	Maharashtra	Madhya Pradesh
Baseline studies	Complete	Complete	Complete
Preparation of state action plan	Submitted and modified in 1986; Urban Malaria Scheme proposed	Original submitted in 1987, revised in 1991 and 1992; modified version with MO&EF	Original submitted in 1986, revised in 1988 and final plan submitted in 1991
Survey of existing facilities	Complete	Complete	Suifficient facilities
Establishment of new facilities	Hospital at Kevadia for workers; laboratory and mobile unit complete, drug dispensaries	Somawal village hospital; functional, health centres and health units sanctioned	Hospital, mobile unit and civil dispensaries for labour; detailed scheme for resettled population
Vector control measures in place	NMEP; SSNNL workshop on malaria control; laboratory established; entomological studies underway	NMEP; adoption malaria control guidelines of irrigation Department	NMEP; state malaria control organisations strengthened
Appointment of specialist staff	Complete	Complete at one R&R site at Somaval village	Needs identified

Disease Monitoring and responsibility	SCHMS plan in progress; SSNNL created Health Organisation at Kevadia	Entrusted to regular health department	Evaluation cell established
---------------------------------------	--	--	-----------------------------

VII. ARCHAEOLOGICAL SURVEY AND ANTHROPOLOGICAL STUDIES/ ARCHAEOLOGICAL SURVEY

In the case of SSP, where some sites may be submerged the NWDT award stipulated that, the entire cost of relocation and protection should be chargeable to GOG. Relocation work is to be supervised by the Department of Archaeology under the provisions of the 1958 Act.

Studies:

Survey conducted for identification of various sites & monuments of significance has included the following:

- Gujarat: Archaeological Survey of Nineteen Villages Submerged by Sardar Sarovar Reservoir, 1989.
- Maharashtra : Survey of Department of Archaeology. A survey was carried out by the Department of Archaeology of cultural sites in 24 villages of Akkrani Taluk and nine village from Akkalkuwa Taluk, Dhule District.
- Madhya Pradesh : Survey of State Department of Archaeology and Museum (1992).
- Anthropological Survey of India: Narmada Salvage Plan.
- Anthropological Survey of India: Peoples of India.
- Parishad, A.K. Survey of Material Cultural in the Narmada Valley.
- Rashtriya Manav Sanghralaya : Narmada Salvage Plan.

Cultural Heritage in SSP Area

	Gujarat	Madhya Pradesh	Maharashtra
Temples	8(2)*	16(6)*	-
Mounds	-	3	-
Gateway	-	1	-

Rock shelters,	-	6	-
cave paintings			
Tombs	-	2	-

* Figures in brackets indicate number of sites designated for relocation.

Summary of Current Situation and Progress

	GOG	GOMP	GOM
Survey of Villages in Submergence Zone.)		
Identification of Cultural Sites	)	"Complete" for all item in all States.	
Collection of Data and Documentation of Sites)		
Selection of appropriate sites.	Complete	In process	Not required
Action plan	Complete	Not finalised,	Not required

ANTHROPOLOGICAL STUDIES

Government of Madhya Pradesh has informed that in view of the studies being carried out in connection with Narmada Sagar Project, no separate anthropological studies are required and that the Director General, Anthropological Survey of India has also expressed the same view. M.P. State Adivasi Kala Parishad has submitted its report on Tribal arts & culture. Besides Anthropological Survey of India has informed that Narmada Basin is already covered extensively under the project "people's of India". Besides Rashtriya Manav Sanghralaya has conducted needed studies in the past as follows. Further studies are covered under R&R plan of the state Governments.

- a study of the palaeo-ecology of quaternary fossils in the central Narmada Valley;
- excavation of upper palaeolithic site of Mehtakhaeda and further exploration of Nimar;
- collection of tribal artifacts in Madhya Pradesh.

Institutional responsibility for these actions was specified in the action plan whereby the first two elements were completed by Deccan College, Pune and the third by Adivasi Kala Parishad, for the Rashtriya Manav Sanghralaya, Bhopal.

STATUS REPORT
NARMADA SAGAR PROJECT (NSP) ENVIRONMENTAL ASPECTS
SEPTEMBER - 1993

1) Phased Catchment Area Treatment :

The free draining area of Narmada Sagar Project down stream of Bargi Dam is about 38,952 sq.kms. As per the guidelines of MOWR, directly draining watersheds of very high and high priority categories only are to be treated. Prioritisation survey of the watersheds was entrusted earlier to GSIT&S, Indore. However, the survey is now entrusted to the All India Soil & Land Use Survey Organisation, New Delhi, and they are carrying out the prioritisation survey of the entire catchment of NSP.

AIISLUS has divided the middle Narmada Basin (from Bargi dam to NSP dam) into 9 subcatchments. AIISLUS has completed prioritisation survey of 8 subcatchments and has submitted its report. The details related to the progress of survey in remaining 1 subcatchment as well as the survey report is awaited from AIISLUS. On the basis of the reports submitted by the AIISLUS, 30 sub-watersheds belonging to the very high and high priority categories and directly draining into the reservoir have been identified for treatment. These 30 sub-watersheds cover an area of about 73001 ha. On the basis of planimetry exercise conducted by the NVDA, these 30 sub-watersheds comprise an estimated 15304 ha forest area and 57697 ha non-forest area. As for the non-forest area, it has been estimated that 53563 ha non-forest area will be available for treatment. In forest area after excluding the area under submergence, encroachments/cultivations and the area under previous year plantation, the net available area for treatment comes out to be 11,048 ha. Out of this 11,048 ha of forest area 4903 ha forest area is fully stocked and will need only minor engineering work. The balance 6145 ha forest area will need full measures.

Programme and Progress of Works:

	<u>Upto 92-93</u>	<u>93-94</u>	<u>94-95</u>	<u>95-96</u>	<u>96-97</u>
	<u>Comulative Progress</u>	<u>Target/ Progress</u>	<u>Target</u>		
Non-Forest area/ ha. (53,563 ha)	13075	<u>13636</u> 4935	12000	11500	3352
Forest area/ (11,048 ha)	1883	<u>235</u> 235	3000	3000	2930
Total Area: (64,611 ha)	14958	<u>13871</u> 5170	15000	14500	6282

2) Compensatory Afforestation :

A total of 40332 ha forest land would come under submergence and an additional 779.9 ha of forest land has been diverted for the residential colony, power house complex, dam, saddle dam and approach roads. Subsequently, another 308.4 ha of forest land was permitted to be diverted for power house. Thus a total of 41,420 ha of forest land has been permitted to be utilised for the construction of ISP. To compensate for this loss of forest, 10,143 ha of non-forest and 70,802 ha of degraded forest land has been identified for compensatory afforestation.

Programme of Compensatory Afforestation:

	Commulative Progress till 91-92	92-93 Target/ Progress	93-94 Target/ Progress	94-95	95-96
Degraded Forest area (70,802 ha)	23048	<u>12528</u> 11919	<u>12400</u> 12987	12400	12370
Non-Forest area (10,143 ha)	5239	<u>1534</u> 1390	<u>1500</u> 1327	1500	1037
(80,945) (say 81,000 ha)	28287	<u>14062</u> 13309	<u>13900</u> 14314	13900	13407

3) Command Area Development :

The Government of Madhya Pradesh has submitted command area development plan. The project on completion will provide annual irrigation to 1.69 lakh ha.

The implementation of the plan would be taken up in three phases for completion in 6/2007. Monthly observation of water levels started in November, 1991 for subsequent supply of this data to the consultants, already shortlisted, are likely to be continued for 2 seasons to draw inference for preparation of master plan for drainage. NVDA has addressed J.L. Agricultural University for studies on effect of pesticides, insecticides in the command area. The study proposal received from the University has been scrutinized in NVDA by a team of experts in light of suggestions/observations received from WALMI, Bhopal, WALMI Aurangabad, M.P. State Pollution Control Board, Bhopal, and MAPCOST Bhopal. Accordingly, the University has now modified its study proposal, the proposal is under active consideration of NVDA.

4) Flora, Fauna, Wildlife and Carrying Capacity :

Studies on these aspects were entrusted to the Wildlife Institute of India, Dehradun in December, 1989 and were scheduled to be completed by March, 1993. The studies have been completed. Progress report upto June, 1992 has been submitted to the NVDA by

the Wild Life Institute of India. The final study report is awaited for the WII, Dehradun.

Besides this, the Friends of Nature's Society, Bhopal was entrusted with the preparation of Wildlife Retrieval and Conservation Plan. They have submitted the preliminary draft report. This report is to be examined and finalized by the Wildlife Committee constituted by the GOMP in accordance with GOI's stipulations given in Environmental Clearance. The next meeting of this committee was scheduled on 11th August, 1993.

5) Seismicity and Rim Stability

The reservoir competency survey has been done by GSI and report is submitted. In the report, GSI has suggested further studies for some patches of narrow water divide. As such they were requested to carry out the study in the required area. GSI is further reviewing the need to survey the area identified earlier.

Establishment of seismic observatories in the Narmada Sagar Complex area is under correspondence with IMD and CWC. The specification have been finalised and procurement of imported instruments as suggested by IMD is under finalisation with CWC. Meanwhile action for procurement of indigenous wood Anderson Seismometers from IMD has already been taken so as to obtain pre-impoundment data. Price bids received for tender of supply of Micro-earthquake recorders are under consideration with NVDA.

6) Health Aspect:

A note on health aspects of NSP prepared by NVDA was examined in the Ministry of E&F and comments were sent for modifying the report. NVDA has submitted the revised plan costing Rs.748.73 lacs for the preventive and curative aspects of health. Regarding preventive aspects, a MOU has been signed with the Department of Preventive and Social Medicine, Gandhi Medical College, Bhopal, whereas, for studies on health aspect in project impact areas of SSP and NSP, work is proposed through a cell of monitoring and evaluation under the Directorate of Health Services, Bhopal. The approved plan is being implemented.

Pre-impoundment and post-impoundment Limnological studies being carried out by three Universities will take care of water quality aspect.

7) Fisheries Development:

The studies of certain aspects of fisheries have been included in the Limnological studies being conducted by the three Universities of the State; studies in the Upper Narmada, (Bargi Reservoir) by Rani Durgawati University, Jabalpur, studies in the Middle Narmada (Tawa, Barna and Kolar Reservoirs) by Barkatullah University, Bhopal, studies in the Lower Narmada by Vikram University, Ujjain. All the three Universities have completed the

studies in their respective areas and final report is awaited as per MDU. Aquatic fauna has also been covered under the studies completed by Friends of Nature Society, Bhopal.

8) Archaeological and Anthropological Survey:

A survey of the 254 villages is required for identification of the archaeological monuments falling within the submergence area. The State Department of Archaeology and Museum, Bhopal was entrusted with the survey of 87 villages which has been completed. Archaeological Survey of India has also completed the survey for 167 villages assigned for identification of the monuments of significance. Report is submitted to head office and is under scrutiny.

Action plan would be ready by June, 1994. Action will be taken to preserve material of archaeological importance in consultation with experts.

As only lower bastion in north of the Joga Fort is likely to be affected by scour action of water and the Siddeshwar temple is well above the FRL of 960 ft., these two structures are not considered as affected by the project. However, other structures/monuments will be considered for shifting or protection after their archaeological significance is established through joint inspection of the competent authorities.

9) Anthropological Studies:

Efforts are being made for retrieval of bio-cultural material from the Narmada Basin. A lot of information is gathered from the field which generates immense data of Socio-Anthropological significance.

Rashtriya Manav Sanghralaya has constituted a working group for the retrieval of bio-cultural material in Narmada Basin. Survey of tribal art and handicraft entrusted to M.P. Adivasi Kala Parishad is completed and report is available. Besides Anthropological Survey of India has covered these studies under its own project called "people of India". The report is in 61 volume out of which 7 volume are under final editing. A Narmada Salvage plan is also launched by Anthropological Survey of India recently and the entire area is scanned and some ancient tools have been found.

THIRD INTERIM PROJECT REPORT
PERIOD : 1st APRIL 1992 - 31st MARCH 1993

**TITLE : IMPACT ASSESSMENT OF MADHYA PRADESH LANDS TO BE
SUBMERGED UNDER SARDAR SAROVAR PROJECT AND ADJOINING
ECOSYSTEMS ; FLORA, FAUNA AND OTHER
BIOTIC COMPONENTS**

**P.K. Shukla
(Project Director)
SFRI, JABALPUR**

**INSTITUTE : State Forest Research Institute, Polipathar
J A B A L P U R (M.P.)**

JUNE, 1993

CUNIENTS

- I. Introduction
- II. Objectives
- III. Physical Work Distribution
- IV. Methodology
- V. Results
 - a. Enumeration
 - b. Analysis of vegetation
 - c. Fauna
 - d. Ethnobotanical and Ecological Aspects
 - e. Socio-economic Aspects
- VI. Constraints
- VII. Financial Position
- VIII. Tables and Plates

I. Introduction:

The project has been sponsored by the Narmada Valley Development Authority, Narmada Bhawan, Bhopal (M.P.) for a period of three years i.e. from Sept. '90 to Aug. '93.

The Sardar Sarovar Project site is located at Nawagaon in Bharuch district of Gujarat state. It has submergence area of 39.134 ha. out of which the forest area is 13.744 ha and agricultural land 11.318 ha, extending from Maheshwar tahsil in district West Nimar of Madhya Pradesh to Bharuch in Nawagaon district of Gujarat state. Out of this submergence area, 19,628 ha area is in Madhya Pradesh from Maheshwar in West Nimar district is Akadiya in Jhabua district. This 19,268 ha of submergence area is comprised of 2732 ha forest area, 6,709 ha of agricultural land and 10,194 ha of wastelands.

The area of three districts viz.. : Dhar, Jhabua and West Nimar are coming under submergence. 193 villages of these districts are coming under submergence. The villages of M.P. coming under submergence are tabulated in Table No. I. 94 villages of impact area have been selected for the impact assessment study and have been tabulated in Table No. II.

During the year (April '92 to March '93) survey of all the submergence villages (193) and impact villages (94) has been completed for the floristic, ecological, ethnobotanical, socio-economical and faunal studies. But the enumeration work of trees standing in villages has been affected due to non-co-operation of villagers and Narmada Bachao activists. Despite agitation and non-co-operation of the villagers, the enumeration work of 143 villages has been completed and has been shown in table no. III and IV.

II. Objectives :

The objectives of the study have already been given in the 1st Annual Report.

III. Aspect Covered in the study :

- I 100% Enumeration of growing stock
 - 1.1 Govt. forest 100%
 - 1.2 Revenue villages 100%

2 Floristic Survey of

- 2.1 Trees and
- 2.2 Herbs, Shrubs
- 2.3 Climbers and other vegetation in
 - 1 Forest Areas
 - 2 Revenue Areas

3 Ethno-botanical and Ecological Study

- 3.1 Medicinal plants
- 3.2 Edible plants
- 3.3 Fuel plants
- 3.4 Other multifarious plants
- 3.5 Ecological data collection with the help of quadrat method on
 - 3.5.1 River Banks
 - 3.5.2 Grounds
 - 3.5.3 Agricultural fields
 - 3.5.4 River water
 - 3.5.5 Waste lands
 - 3.5.6 Forest Areas
 - 3.5.7 Revenue Areas
- 3.6 Ecological data collection with the help of quantitative methods for
 - 3.6.1 Green biomass
 - 3.6.2 Dry biomass

4 Faunal Survey

- 4.1 Animals
- 4.2 Reptiles
- 4.3 Fishes
- 4.4 Birds

5 Socio-economic Study

- 5.1 Population Survey
 - 5.1.1 Male
 - 5.1.2 Female
 - 5.1.3 Children
- 5.2 Live Stock
 - 5.2.1 Cow
 - 5.2.2 Buffallow
 - 5.2.3 Goat
 - 5.2.4 Donkey
 - 5.2.5 Hen
- 5.3 Fuel wood consumption
 - 5.3.1 Forest Areas
 - 5.3.2 Revenue villages
 - 5.3.3 Impact villages
- 5.4 Dependence on MFP
 - 5.4.1 Forest Areas
 - 5.4.2 Revenue Areas

III Physical work Distribution :**A. Officials**

1. Dr. Ram Prasad.
CCF, (W.L.) M.P., General supervision and technical guidance of the project.
2. Shri B.P. Chaurasia.
Nodal Officer, (ACF)
SFRI, Jabalpur General supervision and field camp arrangements.
3. Dr. P. Bhatnagar.
SFRI, Jabalpur Provide guidance for socio-economic studies.
4. Shri R.M. Shukla.
Dy. Ranger of Indore
subcentre Assisting in collection of field data and enumeration work.
5. 3 Forest Guards of -do-
Nepanagar Research Centre
of SFRI

B. Project Assistants - Field Investigators

1. Shri G.P. Date Compilation and analysis of data.
editing of report etc.
2. Dr. S.K. Masih Compilation of data on flora. eco-
logical studies and ethno-botanical
work.
3. Shri Ashok Goswami Faunal and Ecological work.
4. Shri Anil Shrivastava Socio-economic survey.
5. Shri D.K. Ghodke Cartography (Mapping etc.)
Dealing of important files.
6. Shri Raiendra P. Kahar Driver (CPZ 6454)
7. Shri Vinod Kumar Driver (MP-02-1300)

IV. Methodology :

Methodology for the present investigation and for the collection of information pertaining to the aspects involved in the project i.e. 100% enumeration, ethno-botanical and ecological aspects, faunal, floristic survey, socio-economic study etc. remained the same as described in the interim report I (90-91) already submitted.

V. Results :

2.1. Enumeration :

2.1.1. Forest Areas :

Enumeration work in 10 compartments of Jhabua district was done. 20,870 plants were enumerated. Distribution of plants in different girth classes is as under - 10,508 (up to 20 cm), 6029 (21/30 cm), 1712 (31/45 cm), 1310 (46/60 cm), 837 (61/90 cm), 348 (91/120 cm), 89 (121/150 cm) and 37 (over 150 cm) plant (Table V). It is also observed that the percentage of growing stock in different girth classes was decreased from lower class to higher class (Table VI).

2.1.2 Revenue Areas :

100% enumeration of growing stock was done in 21 revenue villages during the year. These villages included 9 villages of Dharmपुरi tahsil, 1 village of Manawar tahsil, 4 villages of Barwani tahsil, 4 villages of Kasrawad and 3 villages of Thikeri tahsil of West Nimar district. The data on growing stock of the above mentioned villages are tabulated in Table VII. The table shows that 14,508 plants were in 9 villages of Dharmपुरi tahsil and 623 plants from 1 village of Manawar tahsil, 53,040 plants in Barwani tahsil, 11,554 plants in Kasrawad tahsil and 3759 plants in Thikeri tahsil of district west Nimar were enumerated (Table VIII).

Forest Composition : Submergence area in Jhabua district bear M.P. IV b quality forest. Most of the good forest patches are confined to hills and slopes. Forests are usually understocked and are of coppice origin middle aged and mature crop is sparse. Young malformed saplings and poles predominate. The hill tops are barren or sparsely stocked with Boswellia serrata, Diospyros melanoxylon, Butea monosperma, Anogeissus latifolia and Tectona grandis. Teak of M.P. IV b quality occurs in patches and is about 20% in area. The remaining area is under-stocked. Encroachments are found in pockets.

Submergence area of Badwani division is under-stocked and encroachments are commonly met with. Mixed species are found sparse and are of poor IV b quality.

In Dhar district the submergence forest areas is under-stocked, blank and encroachments are commonly met with.

Submergence area of revenue villages bear mostly ornamental, fruit and shade trees.

2.2 Floristic Survey :

About 250 plant specimens were collected. The processing, mounting, identification work and final arrangement in systematic position have been done. The floristic survey shows that very common weed plants were present all over the submergence areas. There is no new and endangered plant species found during the survey. Specimens of important trees, herbs, shrubs and climbers were collected. Plants species of parasites and epiphytes were also collected and listed in their respective position in system (Table IX).

2.3 Faunal Survey :

During the year, information on wild animals found in the forest areas as well as revenue areas coming under submergence due to Sardar Sarovar Project was compiled. The analysis of this aspect shows that there is no threatened or endangered wild animal species. It was also observed that due to high rate of degradation in forest and increased human population in the revenue villages, the wild animals have migrated to the denser forests of Dhule district in Maharashtra state. Very few animals and reptiles were observed in the forest areas of Jhabua and Barwani. Information was also collected on the basis of the interviews with fishermen involved in the fishing on the river banks in the submergence areas. Some common bird species were found. All the information regarding wild animals, birds, reptiles and fishes was incorporated in the Table X.

Wild Life :

On the southern side of the Narmada river in Dhule district of Maharashtra state, area known as Toranmal Teak forests has good quality teak. In Badwani division of M.P., Pati R.F. block areas contain poor quality teak, with under stocked and blank areas, and encroachments. Some of the forest areas near village Bokrata in Pati range of Badwani division do contain good quality teak. This patch may be included in the proposed Toranmal National park comprising of the part of the areas of North Dhule division (Maharashtra) and Badwani division (M.P.). Mathwad sanctuary in Jhabua is also proposed as detailed below :-

Proposed Toranmal National Park

S.No.	District	Division	Area proposed for the National Park	Remarks
1.	Dhule (Maharashtra)	North Dhule Division	About 400 sq km R.F. area of Toranmal	After spot inspection, more area may be added to N.P.
2.	West Nimar (Khargone)	Badwani	About 100 sq km R.F. area of Pati	- do -
			Total 500 sq. km.	

Proposed Mathwad Sanctuary

1.	Jhabua	Jhabua	Mathwad R.F./P.F. area 300 sq. km.	- do -
----	--------	--------	---------------------------------------	--------

Formation of the proposed National Park and Sanctuary will save wild life species and good quality teak areas of Toranmal R.F. and Mathwad R.F. blocks in future.

2.4. Ethno-botanical and Ecological Aspects :**2.4.1 Ethno-botanical Aspects :**

Intensive and extensive survey of the submergence areas in Dhar, Jhabua and West Nimar districts has been conducted with special emphasis on collection from the villagers, forest dwellers, tribals, tribal heads, ojhas, medicinemen and village heads. Due to non-co-operation of villagers and threats of Narmada Bachao participants, this aspect has also been partially affected. Very little informations regarding the plants used by the local inhabitants for the medicine, food, fodder, fuel and other multifarious uses could be gathered. The information pertaining to this aspect is tabulated in Table XI to XIII, which shows that the informations of 24 medicinal plants, 20 edible plants, 18 fuel plants was collected during the year.

4.2 Ecological Aspects :

Ecological study of submergence areas of SSP, was carried out through the following two methods.

4.2.1 Quantative Method :

Quadrates in size 1m x 1m were laid for this type of ecological study. About 10-25 quadrats in each village were laid out and the plants of each species were counted in the each quadrat and were noted down in the field.

proforma. In the analysis of data, the density, abundance, frequency etc. were calculated and tabulated in Table XIV.

4.2.2 Weighing Method :

Under this method about 10-25 quadrates laid in different ecological sites like; slopes, hills, grounds, wastelands, agricultural lands and river banks in each village. Biomass in each quadrat was noted after weighing. In the analysis mean, standard deviation and standard errors have been calculated and summarised to assess the biomass productivity. The results of this study are tabulated in Table XV.

7.5 Socio-economic Aspects :

It is a common knowledge that inhabitants of forest villages and those residing in villages adjoining forest areas heavily depend on fuelwood for their domestic energy consumption whereas the persons residing away from the forests are less dependant on fuelwood and their dependance on agricultural residues and other energy alternatives increases. This fact has been clearly brought about in the domestic energy consumption study made in the submergence areas of Dhar and Badwani districts carried out during the year. The results of this study are tabulated in Table XVI and XVII, respectively. The table shows that the per capita annual fuelwood consumption varies from 0.68 quintals to 2.02 quintals in villages situated away from forests whereas, it is as high as 6.20 quintals in villages Simrali of Badwani tehsil which is surrounded by forests.

Financial Position :

Total amount Rs. 13,91,187/- (Rs. Thirteen lakhs Ninety one thousand one hundred and eighty seven has been incurred on scheme during 1-9-90 to 31-3-93.

VI Constrains

Although villagers in the impact areas willingly extended their cooperation in the survey work, the inhabitants of submergence area did not cooperate and even threatened the field parties. As a result, field work in these area was affected and could not be completed in time enumerated work in 50 village remained to be completed.

Table I : Tahsil and District wise Breakup of villages coming under submergence of Sardar Sarovar Project in M.P.

District	Tahsil	No. of villages
I Dhar	I) Dharpuri	22
	II) Kukshi	36
	III) Manawar	23
	3	81
II Jhabua	(I) Alirajpur	26
III West Nimar	I) Barwani	41
	II) Kasrawad	15
	III) Maheshwar	2
	IV) Thikri	28
	4	86
G. Total	8	193

Table II : Distribution of impact villages of Sardar Sarovar Project in M.P. selected for study.

District	Tahsil	No. of Village
Dhar	Dharpuri	43
	Manawar	
	Kukshi	
Jhabua	Alirajpur	10
West Nimar	Barwani	41
	Kasrawad	
	Maheshwar	
	Thikri	
Total	8	94

Table III : Survey of villages affected due to S.S.P.

S.No.	District/Tahsil	Name of Villages
A. DHAR	a. Kukshi	1. Bodhwara
		2. Khaperkeda
		3. Malagaon
		4. Karondi
		5. Amla Bardi
		6. Batgaon

7. Kadmal
 8. Bajdi
 9. Raswa
 10. Rekati
 11. Kolgaon
 12. Bhawaria
 13. Malkhedi
 14. Malwada
 15. Nawdabadi
 16. Chandankedi
 17. Dhana
 18. Susari
 19. Nanonda
 20. Pipripura
 21. Deshwalia
 22. Kikarwas
 23. Kothala
 24. Nisharpur
 25. Katnera
 26. Chikhalda
 27. Bhilsur
 28. Dharmrai
 29. Chhachkuwa
 30. Sisgaon
 31. Keda
 32. Babulgaon
- b. Manawar
1. Barda
 2. Akalwara
 3. Kaothi
 4. Kalvanpur
 5. Rajpura
 6. Gangli
 7. Urdana
 8. Mahapura
 9. Gopalpura
 10. Malangaon
 11. Kattawara
 12. Ealavara
 13. Ratwa
 14. Jatpur
 15. Sarasgone
 16. Achhoda
 17. Dagadpura
 18. Sharikpura
 19. Narayanpura
 20. Perkhad
 21. Semlda
 22. Devgarh
 23. Sorsi
 24. Mandvi
 25. Pipalya
 26. Loni
 27. Gogawan
- c. Dharpuri
1. Sulgaon
 2. Khatadgaon

3. Hatnawar
4. Khujawa
5. Dharpuri
6. Guleti
7. Nimbola
8. Bhawgaon
9. Nagjhhiri
10. Pipaldagari
11. Lunehera
12. Khalkhurd
13. Morgarhi
14. Shahpura
15. Khalbuzurg
16. Beganda
17. Uchhawad
18. Lasangaon
19. Sala
20. Gajipura

B. JHABUA**a. Alirajpur**

1. Mehalgaon
2. Jalsindhi
3. Chilkada
4. Kakersela
5. Bada Ammba
6. Dubkhadda
7. Sakarja

C. WEST NIMAR**a. Barwani**

1. Kheda
2. Pipari
3. Utawad
4. Piplod
5. Bijasan
6. Bhawati
7. Segaoon
8. Sondul
9. Simrali
10. Babultade
11. Awalda
12. Eklara
13. Kukra
14. Pichodi
15. Bhamta
16. Kathora
17. Jangarwa
18. Kalyanpur
19. Nandgaon

b. Thikri

1. Gawala II
2. Kheda
3. Babulgaon
4. Malwada
5. Kesharpura
6. Panya
7. Kirmohi
8. Pichnola
9. Khedi khurd

	10.	Takyapur
	11.	Lohara
	12.	Mandwara
	13.	Nalwai
	14.	Vishwanathkhedi
	15.	Mahgaon
	16.	Larkhangaon
	17.	Gawal I
	18.	Brahmangaon
	19.	Mohipura
	20.	Chainpura
	21.	Nandgaon
c. Maeshwar	1.	Semalda
	2.	Jalkoti
d. Kasrawad	1.	Dalkheda
	2.	Mubarkbad
	3.	Adalpura
	4.	Kothora
	5.	Bhatbadiya
	6.	Gvanpura
	7.	Bhoinda
	8.	Ghatbadiya
	9.	Rehmanpura
	10.	Khalkhurd
	11.	Chichli
	12.	Khalbuzurg
	13.	Akbarpura
	14.	Jalanpur
	15.	Belgaon

Table IV : No. of submergence villges surveyed during 1992-93

S.No.	District/Tahsil	No. of Villages
A. DHAR		
	a. Kukshi	32
	b. Manawar	27
	c. Dharmपुरi	20
B. JHABUA		
	a. Alirajpur	7
C. WEST NIMAR		
	a. Barwani	19
	b. Thikri	21
	c. Maheshwar	2
	d. Kasrawad	15
Total		143

Table V : Results of 100% Enumeration of trees standing in the forest compartments of S.S.P. areas in district Jhabua (M.P.)

Compartment No.	Different Girth Classes (cm)								Total
	up to 20	21/30	31/45	46/60	61/90	91/120	121/150	Over 151	
37	136	51	22	16	20	7	4	-	258
38	3084	1986	247	350	239	122	30	10	6068
55	1262	1097	305	269	136	88	13	7	3317
56	982	585	151	149	83	13	5	4	1972
58	413	158	181	74	62	26	4	7	925
60	1293	330	30	26	16	4	2	-	1701
75	842	426	239	114	74	41	14	5	1757
76	1286	724	16	20	4	3	3	2	2058
77	525	282	153	121	37	18	8	2	1146
87	683	386	368	169	166	26	6	2	1808
10	10508	6029	1712	1310	837	348	89	37	20,870

Table VI : Percentage of different girth classes in forest compartments of Jhabua

S.No.	Different Girth Classes cm.	Percentage
1	up to 20	50.34
2	21/30	28.88
3	31/45	8.20
4	46/60	6.27
5	61/90	4.01
6	91/120	1.66
7	121/150	0.42
8	Over 151	0.17

Table VII : Results of Enumeration of trees standing in the submergence villages of S.S.P.
in district Dhar and West Nimar (M.P.)

District and Name of villages	Different Girth Classess (cm)								Total
	Upto 20	21/30	31/45	45/60	61/90	91/120	121/150	Over/151	
District - DHAR									
Tahsil - Dharmपुर									
1. Uchhawad	264	102	43	26	12	6	3	2	458
2. Nemolia	701	324	342	128	111	17	23	6	1752
3. Dharmपुर	739	197	170	290	98	49	51	9	1603
4. Gulaiti	1596	692	394	235	76	29	20	2	3044
5. Moregaon	1376	826	455	214	198	92	18	-	3179
6. Knataogaon	210	125	198	103	64	42	28	7	777
7. Surgaon	260	146	226	132	91	40	25	8	928
8. Hathnawar	195	72	191	104	66	23	12	27	690
9. Shandura	738	617	411	132	127	27	14	11	2077
Tahsil - Manawar									
1. Gogawan	204	101	103	89	64	34	18	10	623
District - West Nimar									
Tahsil - Barwani									
1. Jangarwa	8044	2753	2162	1524	377	169	37	27	15088
2. Bhamta	8074	4503	1709	1177	755	183	55	13	16469
3. Sondui	6905	2383	2267	1538	1054	375	20	3	14445
4. Pipri	3645	793	1579	746	212	37	16	10	7038
Tahsil - Kasrawad									
1. Khaibuzurg	760	433	295	228	113	87	12	-	1928
2. Chichli	127	102	203	117	81	33	12	5	680
3. Ghatdoga	2200	1276	880	240	156	15	10	6	4783
4. Adalpura	3111	612	237	45	126	11	14	7	4163
Tahsil - Thikri									
1. Chainpura	226	126	257	82	67	42	13	11	824
2. Nandgaon	87	62	60	48	41	34	12	15	359
3. Brahmanagaon	497	257	687	464	339	185	131	16	2576
	39959	16502	12869	7762	4229	1530	544	195	83484

Table VIII : No. of trees standing in different tahsils of Dhar and West Nimar (M.P.)

S.No.	Tahsil	No. of Trees enumerated
1	Dharmपुरी (Dhar)	14,508
2	Manawar (Dhar)	623
3	Barwani (WN)	53,040
4	Kasrawad (WN)	11,554
5	Thekeri (WN)	3,759
Total		83,484

Table IX : List of different plant species belonging to various angiospermic families, available in S.S.P. areas

1. Acanthaceae

1. Andrographis achioides
2. Blepharis boerharifolia
3. Justicia micrantha
4. Lepidagathis trinervis
5. Nygrophila polysperma
6. Peristrophe bicalyculata
7. Tubiflora aculis

2. Aizoaceae

1. Glinus latoides

3. Amaranthaceae

1. Achyranthus aspera
2. Aerva lanata
3. Alternanthera parachyroides
4. A. sessilis
5. Amaranthus polygamous
6. A. tricolor
7. Digera muricata
8. Celosia argentea
9. Pupalia lappocea

4. Amarylidaceae

1. Crinum defixum

5. Anacardiaceae

1. Buchanania lanzan
2. Mengifera indica

6. **Apocynaceae**
 1. *Holarrhena antidysenterica*
7. **Aracaceae**
 1. *Ageratum conyzoides*
 2. *Blumea lacera*
 3. *Caesalia oxillaris*
 4. *Cyathocline purpurea*
 5. *Eclipta prostrata*
 6. *Glossocardia boswellia*
 7. *Gnaphalium luteoalbum*
 8. *Launaea nudicaulis*
 9. *Parthenium hysterophorus*
 10. *Tricholepis glaberrima*
 11. *Tridax procumbens*
 12. *Vernonia cinerea*
 13. *Vicco indica*
 14. *Xanthium stramenium*
11. **Bombacaceae**
 1. *Bombex ceiba*
12. **Burseraceae**
 1. *Balanitis aegyptiaca*
13. **Caesalpiniaceae**
 1. *Cassia auriculata*
 2. *C. obtusifolia*
 3. *C. occidentales*
 4. *C. pumila*
 5. *Delonix elata*
14. **Euphorbiaceae**
 1. *Acalypha indica*
 2. *Chrozophora rotlerii*
 3. *Euphorbia hirta*
 4. *E. hypersifolia*
 5. *E. prostrata*
 6. *Phyllanthus maderaspatana*
 7. *P. virgatus*
15. **Fabaceae**
 1. *Alysicarpus homosus*
 2. *A. monilifer*
 3. *A. longifolius*
 4. *A. rugosus var styrsifolius*

5. *Crotalaria medicaginea*
6. *Goniogyna hirta*
7. *Indigofera astragalina*
8. *I. linaii*
9. *I. linifolia*
10. *I. tinctoria*
11. *Phaseolus trilobus*
12. *Rhynchosia minima*
13. *Stylosanthes mucronata*
14. *Tephrosia purpurea*
15. *Zornia gibbosa*

16. **Gentianaceae**
1. *Canscora* spp.

17. **Lamiaceae**
1. *Ocimum americanum*
2. *Leucas biflora*
3. *L. cephalotus*
4. *L. urticaefolia*
5. *L. nutans*
6. *L. zeylanica*

18. **Liliaceae**
1. *Asperagus racemosus* var. *javanicus*

19. **Lytheraceae**
1. *Ammannia baceifera*
2. *Lawsonia inermis*
3. *Woodfordia fruticosa*

20. **Malvaceae**
1. *Sida cordifolia*

21. **Meliaceae**
1. *Azadirachta indica*
2. *Melia azedrach*

22. **Mimosaceae**
1. *Acacia cambelii*
2. *A. nilotica*
3. *A. leucopholea*
4. *Prosopis cinera*
5. *P. juliflora*

23. Moraceae

1. *Ficus beghalensis*
2. *F. prostrata*

24. Moringaceae

1. *Moringa oleifera*

25. Myrtaceae

1. *Eucalyptus* spp.
2. *Syzygium cuminii*

26. Nyctaginaceae

1. *Boerhavia diffusa*

27. Papaveraceae

1. *Argemone mexicana*

28. Poaceae

1. *Andropogon pumillus*
2. *Apluda mutica*
3. *Aristida depressa*
4. *A. funiculata*
5. *Arundinella punila*
6. *Bothriochloa pertussa*
7. *Brachiaria eruciformis*
8. *Brachiaria septans*
9. *Cenchrus biflorus*
10. *C. ciliaris*
11. *C. setigerus*
12. *Cherysoporon fulvus*
13. *Chloris virgata*
14. *Chrysopogon polyphyllus*
15. *Cymbopogon martinii*
16. *Cynodon dactylon*
17. *Daityloctenium aegyptium*
18. *Dendrocalamus strictus*
19. *Dichanthium annulatum*
20. *D. caricosum*
21. *Digitaria biformis*
22. *Elengive indica*
23. *Eragrostis ciliaris* var. *ciliaris*
24. *E. ciliaris* var. *brachystachys*
25. *E. diarrhena*
26. *E. gangetica*
27. *E. japonica*
28. *E. namaquensis*
29. *E. tremula*

- 30. *Eremopogon faveolatus*
- 31. *Fimbristytis dicatoma*
- 32. *Nelanocenehris jacqueminiteo*
- 33. *Paspalidium geminatum*
- 34. *Saccharium spontaneum*
- 35. *Themeda triandra*
- 36. *Tripogon jacquemontii*

- 29. **Polygonaceae**
- 1. *Polygonum plebejum*
- 30. **Portulacaceae**
- 1. *Portulaca oleracea*
- 31. **Rhamnaceae**
- 1. *Zizyphus mauritiana*
- 32. **Rubiaceae**
- 1. *Oldenlandia corymbosa*
- 33. **Salvedoraceae**
- 1. *Salvadora persica*
- 34. **Sapotaceae**
- 1. *Madhuca indica*
- 2. *Minusopes elengi*
- 35. **Scrophulariaceae**
- 1. *Bacopa monerii*
- 2. *Celsia coromondelica*
- 3. *Lindenbergia urticaefolia*
- 4. *Sopubia delphinifolia*
- 5. *Stemodia viocosa*
- 36. **Simar ubiaceae**
- 1. *Ailanthus excelsa*
- 37. **Solanaceae**
- 1. *Datura metel*
- 2. *Physalis minima*
- 3. *Solanum nigrum*
- 4. *S. xanthocarpum*
- 5. *Withania somnifera*

38. Tamricaceae
 1. Tamrix dioica
 39. Typhaceae
 1. Typha angustaia
 40. Ulmaceae
 1. Holoptelia intrigfolia
 41. Verbenaceae
 1. Vitex negundu
 42. Vitaceae
 1. Vitis trifoliata

Table X : List of Wild Animals, Birds and Snakes observed in the submergence Area

S.No.	Local Name	Scientific Name
A. WILD ANIMALS		
1.	Bat	Rousettus lsephanulti
2.	Black Buck	Antilope cervicapre
3.	Jungle Billi	Felis chaus
4.	Chital	Asix axis
5.	Chinkara	Gazella gazella
6.	Red Fox	Vulpes vulpes
7.	Rufuous tailed Hare	Lepus nigricollis funicaudatus
8.	Stripped Hyena	Hyaena hyaena
9.	Common Langur	Presbytis entellus
10.	Leopard	Panthera pardus
11.	Indian Field Mouse	Muse booduga
12.	Nilgai	Boselaphus tagoemaeus
13.	Indian House Rat	Mus musculus
B. BIRDS		
14.	Jungle Babbler	Turdoides straitus
15.	Barbet Crimson breasted	Megalima haemacephala
16.	Red vented Bulbul	Pycnontus cafer
17.	Little Cormorant	Phalacrocorax niger
18.	Jungle Crow	Corvus macrorhynchos
19.	Common Hawk Cuckoo	Cuculus vanius
20.	Dabchick or Little grebe	Podiceps ruficollis
21.	Red Turtle Dove	Streptopelia tranguelbarcia

22.	Little Egret	<i>Egretta garzetta</i>
23.	Flamingo	<i>Phoenicopterus roseus</i>
24.	Green Shank	<i>inga totanus</i>
25.	Heron Grey	<i>Ardea cinerea</i>
26.	Hoopoe	<i>Upupa epos</i>
27.	Jacana Pheasant Jailed	<i>Hydrophasianus chirurgus</i>
28.	Pied Kingfisher	<i>Ceryle rudis</i>
29.	Kite common Pariah	<i>Milvus migrans</i>
30.	Indian moorhen	<i>Gallinula chloropus</i>
31.	Black headed Munia	<i>Lonchura punctualata</i>
32.	Indian Myna	<i>Acridotheres tristis</i>
33.	Golden Oriole	<i>Oriolus oriolus</i>
34.	Indian Great Owl	<i>Bubo bubo</i>
35.	Partridge Grey	<i>Francolinus pondicereanus</i>
36.	Blue Rock Pigeon	<i>Columba livia</i>
37.	Paintail Duck	<i>Anas acuta</i>
38.	Pipit Indian	<i>Anthus mawaeseelandisae</i>
39.	Jungle Bush Quail	<i>Perdica asiatica</i>
40.	Indian Robin	<i>Saxicoloides fulicata</i>
41.	Shama	<i>Copsychus malabaricus</i>
42.	Shikra	<i>Accipiter badius</i>
43.	Little stint	<i>Calidris minuta</i>
44.	Sparrow House	<i>passer domesticus</i>
45.	Black necked Stork	<i>Ephippiorhynchus asiaticus</i>
46.	Stork White	<i>Ciconia ciconia</i>
47.	Tailor Bird	<i>Orthotomus sutorius</i>
48.	Blue headed Thrush	<i>Monticola cinclorhynchus</i>
49.	Tree Pie	<i>Dendrocitta vagabunda</i>
50.	Grey Wagtail	<i>Montacilla caspica</i>
51.	White Waterhen	<i>Amaurornis phoenicurus</i>
52.	Golden backed Woodpecker	<i>Dinopium benghalense</i>
53.	Pegmy woodpecker	<i>Picodes nanus</i>

C. SNAKES

54.	Common Worm Snake	<i>Typhlina bramina</i>
55.	Indian Python	<i>Python molurus</i>
56.	Common Wolf Snake	<i>Lycondon aulicus</i>
57.	Common Kukri Snake	<i>Oligodon arenesis</i>
58.	Dumeril's Black headed Snake	<i>Sibynophis subpunctatus</i>
59.	Common Trinket Snake	<i>Elathephelena</i>
60.	Rate Sanke or Dhaman	<i>Ptyas mocusus</i>
61.	Common Cat Snake	<i>Boiga trigonata</i>
62.	Common krait	<i>Bungarus caeruleus</i>
63.	Slender Coral Sanke	<i>Callophis melanurus</i>
64.	Binocellate or spectacled Common Cobra	<i>Naja naja</i>
65.	Saw scelled Viper	<i>Achis carinatus</i>
66.	Bamboo pitviper	<i>Trimeresurus gramineus</i>

Table XI : Medicinal Plants

S.No.	Botanical Name	Parts used
1.	<u>Ononcha squamosa</u>	Fruits
2.	<u>Artemone mexicana</u>	Juice
3.	<u>Kydia calycina</u>	Bark
4.	<u>Sida acuta</u>	Leaves
5.	<u>Bombax ceiba</u>	Bark
6.	<u>Helictres isora</u>	Fruits
7.	<u>Oxalis corniculata</u>	Stem
8.	<u>Aegle marmelos</u>	Fruits. Bark
9.	<u>Ailanthus excelsa</u>	Bark
10.	<u>Azadirachta indica</u>	Whole plant
11.	<u>Boswellia serrata</u>	Bark, Branches
12.	<u>Melia azadirach</u>	Leaves, Stem, Fruits
13.	<u>Launea caromendalica</u>	Stem
14.	<u>Cassia tora</u>	Leaves
15.	<u>C. fistula</u>	Leaves, Seeds
16.	<u>Acacia nilotica</u>	Bark, Fruits
17.	<u>Woodfordia fruticosa</u>	Flowers, Stem
18.	<u>Eutea monosperma</u>	Stem, Fruits, Bark
19.	<u>Madhuca indica</u>	Fruits, Flowers
20.	<u>Eclipta prostrata</u>	Leaves, Stem
21.	<u>Xanthium strumarium</u>	Fruits
22.	<u>Nyctanthes arbor-tristis</u>	Leaves, Fruits
23.	<u>Solanum nigrum</u>	Fruits
24.	<u>Ocimum americanum</u>	Leaves, Juice

Table XII : Plant with edible parts

S.No.	Botanical Names	Parts Used
1.	<u>A. Squamosa</u>	Fruits
2.	<u>A. manihot</u>	Fruits
3.	<u>Gossypium hirsutum</u>	Seeds
4.	<u>Bombax ceiba</u>	Seeds
5.	<u>Oxalis corniculata</u>	Leaves
6.	<u>A. marmelos</u>	Fruits
7.	<u>Feronia lemonia</u>	Fruits
8.	<u>Zizyphus mauritiana</u>	Fruits
9.	<u>Z. oenopia</u>	Fruits
10.	<u>Buchnanania lanzan</u>	Seeds, Fruits
11.	<u>Mencifera indica</u>	Fruits
12.	<u>Tamarindus indica</u>	Fruits
13.	<u>Momordia charantia</u>	Fruits
14.	<u>M. dipica</u>	Fruits
15.	<u>Madhuca indica</u>	Leaves, Flowers
16.	<u>Ocimum americanum</u>	Leaves, Seeds
17.	<u>Amaranthes spinosa</u>	Leaves, Seeds
18.	<u>A. viridis</u>	Leaves, Seeds
19.	<u>Phoenix sylvestris</u>	Fruits, Juice
20.	<u>Borassus flabellifer</u>	Juice

Table XIII : Plants used for fuel

S.No.	Botanical Names	Parts Used
1.	<u>Gossypium hirsutum</u>	Dry Stem
2.	<u>Kydia calycina</u>	Stem & branch wood
3.	<u>Bombax ceiba</u>	"
4.	<u>Helicteres isora</u>	Stem, Branches
5.	<u>Feronia lemonia</u>	"
6.	<u>Ailanthus excelsa</u>	"
7.	<u>Boswellia serrata</u>	"
8.	<u>Zizyphus mauritiana</u>	Stem
9.	<u>Z. oenophlia</u>	Stem
10.	<u>Buchanania lanzan</u>	Stem & branch wood
11.	<u>Cassia tora</u>	Whole plant
12.	<u>Cassia fistula</u>	Stem, Branches
13.	<u>Lamarindus indica</u>	Dry branches
14.	<u>Acacia nilotica</u>	Stem & branch wood
15.	<u>A. catechu</u>	Stem & Branches
16.	<u>Butea monosperma</u>	Stem & branch wood
17.	<u>Xanthium strumarium</u>	Dry plant
18.	<u>Wrightia tinctoria</u>	Stem & branch wood

Table XIV : Productivity of biomass in S.S.P. areas

S.No.	District/ Tahsil	Biomass (gms) (1m x 1m)		Biomass t/h area		SD±		SE±	
		Green	Dry	Green	Dry	Green	Dry	Green	Dry
A. DHAR									
1.	Kukshi	991.0	473.50	9.91	4.74	48.57	42.88	4.85	4.28
2.	Manawar	817.0	426.50	8.17	4.27	226.91	33.00	22.69	3.3
B. WEST NIMAR									
1.	Kasrawad	1389.25	422.25	13.89	4.22	214.78	94.76	10.73	4.73
2.	Barwani	1124.50	565.50	11.25	5.66	49.52	31.13	4.95	3.3

- 56 -

Table XV : Ecological status of ground vegetation in submergence area
(Area covered 48.400 sq. mt.)

Species	Total No. of individual	Occurance under quadrat	Per cent + frequency	Abundance	Density	Relative Frequency	Relative Density	Density /ha
<u>Lenchrus setigaris</u>	945	150	68.18	15.87	195.24	2.72	2.72	9450000
<u>Xanthium strumarium</u>	1675	200	90.90	49.94	346.07	3.59	4.82	16750000
<u>Lizychnus nummularis</u>	800	175	79.54	29.87	165.28	3.17	2.30	3000000
<u>Solanum nigrum</u>	675	120	54.54	17.77	139.46	2.17	1.94	6750000
<u>Lythodan dactylon</u>	2506	210	95.45	8.37	547.76	3.80	7.21	25060000
<u>Mzara lamoas</u>	750	125	56.81	16.66	154.95	2.26	2.15	7500000
<u>Embellia tjeriameottam</u>	500	110	50.00	22.00	227.27	4.38	3.16	5000000
<u>Vicanthium annulatum</u>	865	190	86.36	29.96	178.71	3.44	2.49	8650000
<u>Placourtia vandames</u>	750	165	75.00	22.00	227.27	4.38	3.16	5000000
<u>Grewia rowthii</u>	700	170	77.27	18.88	185.95	3.08	2.59	7000000
<u>Phoenix acaulis</u>	481	154	70.00	32.00	123.96	2.79	1.72	4810000
<u>Digitaria griffithii</u>	600	135	61.36	22.50	123.96	2.44	1.72	6000000
<u>Ultneria indica</u>	775	126	57.27	16.25	160.12	2.28	2.23	1750000
<u>Sida acuta</u>	848	151	68.63	17.80	175.20	2.73	2.44	8480000
<u>Calotropis procera</u>	644	172	78.18	26.70	133.05	3.11	1.85	6440000
<u>Hroisia solance</u>	510	136	61.81	26.66	105.37	2.46	1.46	5100000
<u>Mangla dumetorum</u>	727	110	50.00	15.13	150.20	1.89	2.09	2700000
<u>Caoparis decidua</u>	709	196	89.09	21.56	187.80	3.55	2.61	7090000
<u>Lirium+etta rnambedines</u>	388	105	47.72	27.06	80.16	1.90	1.11	3880000
<u>Datura stramonium</u>	876	125	56.81	14.26	180.99	2.26	2.52	8760000
<u>Helicteres isora</u>	408	128	58.18	31.13	84.29	2.32	1.17	4080000
<u>Clausena lansium</u>	817	155	70.45	18.97	168.80	2.81	2.35	8170000
<u>Heteropogon contortus</u>	668	108	49.09	16.16	138.01	1.95	1.92	6680000
<u>Digitaria longiflora</u>	1100	176	80.00	16.00	227.27	3.19	3.16	1100000
<u>Euphorbia hirta</u>	989	140	63.83	14.15	204.33	2.53	2.84	9890000
<u>Monatoda vasica</u>	1600	120	54.54	7.50	330.57	2.17	4.60	16000000
<u>Hroimone mexicana</u>	1980	196	89.09	9.89	409.09	3.55	5.70	19800000
<u>Vesmodium cephalotei</u>	1365	176	80.00	12.89	282.02	3.19	3.93	13650000
<u>Lantana camara</u>	1275	185	84.09	14.50	263.42	3.35	3.67	12750000
<u>Inolodera cassioides</u>	867	130	59.39	14.99	179.13	2.35	2.49	8670000
<u>Iridex procumbens</u>	1060	158	71.81	14.90	219.00	2.85	3.05	10600000
<u>Woodfora fruticosa</u>	465	95	43.18	20.43	96.07	1.72	1.33	4650000
<u>Oxalis corniculata</u>	660	119	54.09	18.03	136.36	2.15	1.90	6600000
<u>Holudia mutica</u>	581	112	50.90	19.27	120.04	2.03	1.67	5810000
<u>Vicera muricata</u>	800	143	65.00	17.87	165.28	2.59	2.30	8000000
<u>Stylo hamata</u>	1890	188	95.45	9.94	390.49	3.36	5.44	18900000
<u>Grewia hirsuta</u>	640	108	49.09	16.87	137.23	1.95	1.84	6400000
<u>Grewia elastica</u>	815	162	73.63	21.10	166.38	2.93	2.34	8150000

- 45 -

Table XVI : Per capita annual domestic energy consumption in submergence area of S.S.P.
in Dhar district

S. No.	Distance from forest	Name of village	No. of respondents	Per capita annual energy consumption in quintals		
				Fuelwood	Agri. Residue	Dung Cake
Tahsil - Kuksni						
1.	Away from forest*	Bhodhwarda	35	0.88	6.29	1.22
2.	-oo-	Khaderkheda	50	0.89	5.97	0.98
3.	-oo-	Gainalgaoan	20	0.75	6.45	2.34
4.	-oo-	Karondiva	35	0.90	5.88	1.24
5.	-oo-	Rakti	20	1.10	4.93	2.03
6.	-oo-	Batgaon	10	0.82	6.03	0.93
7.	-oo-	Kadmai	50	0.75	6.36	0.75
8.	-oo-	Baidi	30	0.93	5.78	1.45
9.	-oo-	Kaswa	30	0.98	6.21	0.89
10.	-oo-	Kalgaon	48	0.85	5.90	1.35
11.	-oo-	Bhawaliva	100	0.94	5.78	1.68
12.	-oo-	Maiknad	15	1.02	5.86	1.03
13.	-oo-	Malwada	40	0.79	6.02	0.94
14.	-oo-	Nawadpura	30	1.50	5.96	1.45
15.	-oo-	Kikarwas	60	1.98	5.88	9.91
16.	-oo-	Sisgaon	30	1.43	5.87	1.30
17.	-oo-	Kheda	200	1.32	6.01	1.03
18.	-oo-	Bapulgaon	325	1.71	5.63	0.94
19.	-oo-	Malwada	200	1.31	6.04	1.10
Tahsil - Manawar						
1.	Away from forest	Baroa	450	1.29	5.04	1.64
2.	-oo-	Akalwara	275	0.94	6.19	1.68
3.	-oo-	Kavthi	170	1.68	5.75	1.75
4.	-oo-	Kalvanpura	105	1.03	6.03	0.89
5.	-oo-	Rajpura	50	1.94	5.82	1.20
6.	-oo-	Gangli	240	1.13	5.63	1.19
7.	-oo-	Urdana	120	0.93	5.89	1.27
8.	-oo-	Manapura	130	0.89	6.10	1.41
9.	-oo-	Gopalpura	100	1.32	5.87	1.07
10.	-oo-	Malangaon	150	1.62	5.54	1.30
11.	-oo-	Kothada	300	1.53	6.01	0.93

* Away from forest means more than 5 km from the forest boundary.

-85-

Table XVII : Per capita annual domestic energy consumption in submergence area of S.S.P.
in Khargone district

S. No.	Distance from forest	Name of village	No. of respondent	Per capita annual energy consumption in quintals		
				Fuelwood	Agri. Residue	Dung Lake
Tehsil - Kasrawat						
1.	Away from forest	Kesharpura	98	0.97	6.04	1.08
2.	-do-	Kanya	210	1.08	5.97	1.32
3.	-do-	Kirmoni	156	1.16	5.33	1.44
4.	-do-	Pichnola	185	1.08	5.72	1.40
5.	-do-	Khedikhurd	135	1.22	5.84	1.31
6.	-do-	Lakavapur	170	1.53	5.67	1.72
7.	-do-	Lohara	180	1.24	5.14	1.84
8.	-do-	Mandwada	847	1.63	5.21	1.93
9.	-do-	Kailwai	166	1.46	6.02	1.04
10.	-do-	Vishwanathkheda	215	1.63	5.93	1.14
11.	-do-	Mengaon	185	1.17	5.07	1.64
12.	-do-	Lakhangaon	227	1.28	5.93	1.45
13.	-do-	Gawla	60	1.24	5.82	1.29
14.	-do-	Brahmangaon	48	1.31	5.97	1.71
15.	-do-	Monipura	461	1.43	5.88	1.35
Tehsil - Bhikari						
1.	Away from forest	Gawla	100	1.44	5.98	1.25
2.	-do-	Datwada	350	0.95	5.64	1.44
3.	-do-	Chichali	260	1.20	6.02	1.01
Tehsil - Barmani						
1.	Surrounded by forest	Bimraji	70	6.20	0.95	0.53
2.	Near forest	Bilason	325	4.68	2.07	0.96
3.	-do-	Bhawti	406	4.73	2.18	0.88
4.	-do-	Begaon	134	4.84	2.32	1.04
5.	-do-	Bondul	614	4.72	1.98	1.10
6.	-do-	Hwalda	50	3.23	3.69	0.98
7.	-do-	Pichnodi	83	3.36	3.64	1.23
8.	-do-	Bhanta	23	4.02	2.47	1.27
9.	-do-	Kathora	45	3.51	3.98	0.79
10.	-do-	Jagarwa	51	4.41	2.39	1.32
11.	-do-	Kalvanpura	35	3.76	3.84	1.40
12.	-do-	Nandgaon	38	3.23	3.99	1.31
13.	Away from forest	Khedi	80	0.95	6.20	1.23
14.	-do-	Piparai	105	1.50	6.58	0.96
15.	-do-	Piplod	236	1.01	6.12	0.98
17.	-do-	Eklara	20	1.01	6.29	0.85
18.	-do-	Kukra	40	1.23	6.54	0.95

- 59 -

ANNEX - XX-VIMINUTES OF 4TH MEETING ON FISHERIES DEVELOPMENT
AND CONSERVATION HELD AT NEW DELHI ON 22.9.1993.

Shri N.V.V. Char, Executive Member welcomed all those who participated in the discussion. Discussion on agenda items was taken up thereafter. List of participants is enclosed at Annex-I.

Confirmation of the Minutes of 3rd Meeting.

Minutes of the 3rd meeting on fisheries development and conservation were circulated vide letter No.E-4(10)/92/711 dated 6.4.92.

As per the communication received from GOMP, it was agreed to delete end part of the first sentence of 3rd para on page-1 to read as "Shri S.N. Chatterjee..... 70 to 90 important fish species have been identified in the Narmada River".

The minutes were confirmed with the above amendment.

Agenda Item No.IV(1): Desk Review study on fish conservation in Narmada Sagar and Sardar Sarovar and its downstream by CICFRI.

Shri N.V.V. Char, Executive Member opened the discussions and invited Specialist (Env) of NCA to give a brief summary of the earlier developments on the issue.

Dr. Pawan Kumar, Specialist (Env), NCA explained that during 13th meeting of Environment Sub-group held on 29.11.91 Chairman of the Sub-group had desired that NCA should present a clear picture on conservation aspects of fisheries development of the NSP and SSP reservoirs. To ascertain the current status Executive Member, NCA took a meeting of the officers concerned with fish conservation on 24.2.1992 where it was decided to entrust a desk review study on fish conservation to CICFRI. As per terms of references drawn up by the NCA the CICRI carried out a desk review study and their report has been made available to all concerned.

Dr. A.K. Malhotra, Member (E&R) of NCA briefed the members on the salient recommendations in the report and suggestions made by NCA on the same.

Chairman, invited members to discuss the recommendations. Mr. K.G.S. Nair, Superintendent of Fisheries explained the importance of giant fresh water prawn (Macrobrachium rosenbergi) in the region's economy and expressed concern on possible losses that might occur due to the damming of the river.

It was explained that, as the issue relates to fisheries, there were 3 sets of concerns on impacts downstream of SSP. Firstly, it was established that due to damming of the river and consequent reduced flow downstream hilsa and prawn yield could decline. The losses in the revenue could be compensated substantially by the development of fisheries in the reservoir. The second set of concern was about the families engaged in fishing for whom contingency plans were to be prepared by concerned States to rehabilitate them. The third and the main concern about the status of these fishes in the global scenario. To dispel any fear on this account it was further explained that CICFRI report had clearly stated that as the distribution of the species identified as vulnerable in Narmada was very wide and as such no threat of extinction of any species due to damming of the river was likely.

Chairman, however, desired to know if this would have any impact on prawn culture due to closing of the sluices during December, 1993. Shri G.L. Java, Chief Engineer explained that as per the available hydrological trends flow downstream of SSP would be restricted to virgin flows from the left and right bank tributaries downstream and also regulated releases from the Karjon dam for 6 to 10 days during closing operation which would result in flow quantities similar to the lean flow discharges of March/April. He further stated that CWPRS, Pune findings have suggested that it would take over a month's time for any negative impact to manifest. Shri Nair stated that the seed collection period for the prawn is after January, therefore, closing of the sluices during December, 1993 would not affect prawn culture. He also referred to the ISI standards on salinity gradient conducive to prawn culture in the estuary. He agreed to make copies of the above publication available to the members.

Chairman drew attention of the members to the possible impacts on fishes in the reach between dam site and Orsang river and desired to know the availability of deep pools where fishes would take shelter during closing of the sluices. Shri Nair desired some time to examine the issue. Chairman requested for an early action.

Members discussed the possible impact of flood moderation on migration of hilsa. After some discussions it was agreed that the NFG officials would examine the need for entrusting a study on the above aspect to establish the relationship between flood flows and migration of fish upstream during the monsoon season.

Regarding recommendations on carrying out long term hydrobiological monitoring, it was agreed that the State Governments would explore the possibility of entrusting these studies either to the State Pollution Control Boards or to the Universities who have carried out limnological

studies for the State Governments. Shri Sirohi, Secretary (Fisheries), GOMP also agreed to entrust a study on thermal stratification of Bargi and Tawa reservoirs in consultation with NVDA officials.

On the issue of entrusting studies on identification of spawning grounds of Mahaseer at the confluence of tributaries with river Narmada, Shri B. Roy, Deputy Commissioner, GOI expressed that breeding also needs to be encouraged as the fishes may not be able to locate breeding grounds themselves. GOM & GOMP agreed to examine the issue for entrusting the studies as suggested.

Regarding faunistic survey of deep pools above MDDL and declaration of the same as closed areas it was stated by GOG, GOMP and GOI officials that the period between 15th June to 15th October is already declared a closed season for fish harvesting. However, Mr. Jatkar, GOM stated that no closed season was observed in Maharashtra. Mr. Roy, Deputy Commissioner, Fisheries, GOI stated that he would take up the issue with the State Government of Maharashtra since it was the directive of the GOI to observe a closed season for fish harvesting.

On the issue of inclusion of experiments on the artificial breeding of two species viz. N. chitala and L. fambrriatus Shri B. Roy conveyed that his department would encourage such studies and he would take up the issue at the appropriate level for acceptance.

Members discussed the issue of development of R&R plan and the urgent need to update and revise the earlier plans of the GOMP and GOM for the people residing along the Narmada upstream of SSP; GOMP & GOM officials agreed to take up the task immediately. GOG officials also agreed to examine the need for developing an action plan for rehabilitation of all those fisherman likely to be affected by reduced flows downstream of the SSP. It was also agreed that the baseline data provided by the CICFRI's study on sociological survey of 1991 would be utilised for drawing up the R&R plans at an early date.

Agenda Item No.IV(2) Implementation of Environmental Action Plan on sector fish and fisheries.

Members agreed to take up the issue of revising and updating the existing plans with the concerned agencies.

Agenda Item No.IV(3) Formation of Sardar Sarovar Inter-state Fisheries Development Board.

On the issue of formation of Sardar Sarovar Interstate Fisheries Development Board, Shri Sirohi stated that as the issue relates to management of the reservoir for better fish

production, he would take up the matter with his Government for examining the proposal. However, he requested the NCA to supply him all essential documents alongwith the background information for ready reference. It was agreed that NCA would prepare a background information note and would send the same alongwith necessary enclosures to all concerned whereafter Executive Member, NCA would again convene a meeting to review and decide all related aspects within a months time.

Agenda Item No. IV(4) Studies on fish & fisheries entrusted to Friends of Nature Society, Bhopal by NVDA.

The issues could not be discussed as NVDA officials were not available during the discussions.

Agenda Item No. IV(5) Studies on Limnological aspects of SSP & NSP entrusted to three Universities by NVDA.

The issues could not be discussed as NVDA officials were not available during the discussions.

Agenda Item No. IV(6) Rehabilitation plan for fishermen families.

The item is already covered under Agenda Item-IV(1).

ANNEX-I.

LIST OF OFFICERS ATTENDED IN THE 4TH MEETING OF
FISHERIES DEVELOPMENT AND CONSERVATION HELD ON 22.9.93
AT NEW DELHI.

NARMADA CONTROL AUTHORITY

1. Shri N.V.V. Char, Executive Member
2. Dr. A.K. Malhotra, Member (E&R)
3. Dr. Pawan Kumar, Specialist (Environment).

GOVERNMENT OF MADHYA PRADESH.

1. Shri Reghuvendra S Sirohi, Secretary (Fisheries),
Vallabh Bhawan, Bhopal.
2. Shri S.K. Khare, Director (Fisheries), Bhopal.

GOVERNMENT OF GUJARAT.

1. Shri K.G.S. Nair, Superintendent of Fisheries,
Gandhinagar.
2. Shri G.L. Java, Chief Engineer, Designs, SSNNL.

GOVERNMENT OF MAHARASHTRA

Shri J.K. Jatar, Dy. Commissioner (Fisheries).

GOVERNMENT OF INDIA

Shri B. Roy, Deputy Commissioner, Fisheries, DAC,
Ministry of Agriculture, Krishi Bhawan, New Delhi.

केवल सरकारी प्रयोग के लिए
FOR OFFICIAL USE ONLY



नर्मदा नियंत्रण प्राधिकरण **NARMADA CONTROL AUTHORITY**

पर्यावरण उपदल
Environmental Sub-Group

बीसवीं बैठक का कार्यवृत्त
Minutes of the Twentieth Meeting

3, नवम्बर 1993 को
इन्दौर में हुई

Held at Indore
On 3rd November, 1993

इन्दौर
नवम्बर, 1993

INDORE
November, 1993

**MINUTES OF THE 20TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 3RD NOVEMBER, 1993 AT INDORE.**

I N D E X

Item No.	Contents	Page No.
	Introduction	1
XX-1(104)	Confirmation of the minutes of the 19th meeting.	2
XX-2(105)	Review of Actions taken on the decision of the previous meeting	3 - 6
XX-3(106)	Present Status of Studies/Surveys and Environmental Action Plans	7 - 17
XX-4(107)	Monitoring of the Reports under compilation by the project authorities.	18
XX-5(108)	Any Other Item	19 - 20

A N N E X U R E

XX-Min.I	List of participants in the 20th meeting.	1 - 2
XX-Min.II	Report of GOG expert group on Environmental Impacts of the closure of construction sluices provided in the SS Dam.	3 - 42
XX-Min-III	Interim Report of CE, Tube Well, Lift Irrigation, Bhopal on ground water level studies.	43 - 64
XX-Min-IV	A copy of TOR signed by GOR with WAPCOS for carrying out of EIA of the command area in Rajasthan.	65 - 115
XX-Min-V	Action plan on archaeological aspect prepared by State Deptt. of Archaeology & Museum.	116 - 192
XX-Min-VI	Salient features of the draft report of GSI on rim stability prepared by NCA.	193

**MINUTES OF THE 20TH MEETING OF ENVIRONMENT SUB-GROUP
HELD ON 3RD NOVEMBER, 1993 AT INDORE AT 9.00 A.M.**

Shri R. Rajamani, Secretary to the Govt. of India in the Ministry of Environment & Forests and Chairman of the Environment Sub-Group of NCA welcomed the Members and Invitees to the 20th meeting of Environment Sub-Group. The list of participants is enclosed at Annex.XX.Min.1.

Discussions on the various agenda items was taken up thereafter.

Item No.XX-1(104): CONFIRMATION OF THE MINUTES OF THE 19TH MEETING.

Minutes of the 19th meeting of Environment Sub- Group of the Narmada Control Authority were circulated to all members and invitees separately vide letter No.Env-34(20)/93/316 dt. 27.8.93.

At the outset the Chairman felt unhappy about the observations of the Govt. of Gujarat seeking modifications in the minutes vide the letter written by the Secretary, R&R of Govt. of Gujarat. Executive Member, NCA tried to explain the circumstances which could have prompted the Govt. of Gujarat to write this letter. The Chairman disagreed with him and expressed his anguish over the comments contained in 3rd para of the Annex-I of the agenda notes. Chairman informed that the minutes of the meeting were approved by him personally before they were issued and if the officers from the Govt. of Gujarat later on tried to make a basic change in them he saw it as a disregard towards the chair. At this juncture he asked Shri M.B. Mehta, CCF, SSP to confirm whether what was written in the Secretary, R&R's letter was correct. Mr. Mehta did not have any comments on this. After some discussions, during which Chairman expressed his displeasure, Shri N. Ramaswamy, Secretary (Narmada), Govt. of Gujarat while assuring the Chairman of their deep regard to the Chair expressed regret for the observations contained in their letter at Annex-I. The minutes were then confirmed with the following modifications.

1. Referring to the para 2 of the Annex-I, it was observed that the figures indicated in the minutes were as supplied by the Govt. of Gujarat during the meeting and therefore no change in the minutes was necessary. However, if subsequently progress of plantation have not been met this could be recorded as a part of discussion during the current meeting.
2. Last sentence of para-2 at page-4 which read as 20 species of grass was agreed to be replaced by "20 tree species".

Item No.XX-2(105): REVIEW OF ACTIONS TAKEN ON THE DECISION OF THE PREVIOUS MEETING.

1. Extension of Time for Environmental and Forestry Approval {Item No.XIX-2(101)(1)}.

Referring to this agenda, Shri Shekar Singh stated that since this item was long pending in the agenda he wanted to know the present position. Chairman informed that there was no change in the status of this issue.

SSNNL vide their letter No. NPG/EX.Gr/NPG/NCA/ENV-Sub-Group/1540 dated 27.10.93 had circulated a copy of the report of the Expert Group of the Govt. of Gujarat on the downstream Environmental Impacts due to the Closure of the construction sluices provided in the Sardar Sarovar Dam (enclosed at Annex-XX-II-Min.) for discussions by the Members. Chairman desired that the question of closure of sluices may be taken up as a separate item after the status of environmental safeguard measures was reviewed.

2. Submission of Catchment Area Treatment Plans for freely draining critically degraded sub watersheds. {Item No. XIX-2(101)(2)}

Chairman enquired the present position of the submission of plans from the State Governments.

As the Govt. of Maharashtra was represented by Forest Deptt. officials only, the information regarding the catchment area treatment in agriculture areas, health aspects, fisheries plans and other related issues could not be clarified. The Chairman expressed concern on non participation of Secretary rank officers from Govt. of Maharashtra in the last several meetings. He directed that a letter should be addressed to the Chief Secretary, Govt. of Maharashtra in this regard. Shri M.S. Parasnis informed that he had been nominated by the Secretary, Forests to attend the meeting and report the progress of works related to the forest areas. He explained that as per the interpretation of satellite imageries carried out by the ISRO, Ahmedabad, 43000 ha area of catchment in the forest would require treatment. In addition approximately 40,000 ha of agriculture area would also need to be treated in the balance of the critically degraded subwatersheds and the detailed plan for this would be made available soon.

Shri B.K. Verma, Member (E&F), NVDA reported that due to some unavoidable circumstances the finalisation of the plan in Madhya Pradesh was delayed by about 15 days and the same would now be available by 15th November, 1993.

Chairman enquired about the identification of source of funding and time frame for treating the critically degraded areas not directly draining into the reservoir. He stated that the State authorities were keeping this issue vague and urgency was essential to prepare detailed plans. Dr. A.K. Malhotra, Member (E&R), NCA, informed that he had held discussions on this issue with the Collector of Dhar District and later also written to the Collectors of Dhar, Jhabua and Khargone Districts in Madhya Pradesh and Dhule District in Maharashtra. A copy of the map of freely draining critically degraded subwatersheds had been made available to the District Collectors under intimation to the Divisional Commissioners and they had been requested to provide information on these maps about various ongoing soil conservation schemes within their administrative jurisdiction. Chairman, however, expressed that identification of sources of funding had to be properly reflected in the plans to be prepared by NVDA. He, therefore, suggested that the Chief Secretary, GOMP should be addressed in this regard for needful action.

Chairman suggested that the funds available with the organisations like National Waste land Development Board, Planning Commission and Agriculture Department etc. for watershed development under various employment guarantee schemes, Waste Land development plans etc., would need to be diverted, on priority, to these areas.

Chairman enquired about progress in the installation of sophisticated equipment for measuring silt during the pre and post treatment phase. CCF, GOG, informed that some officers from their state had visited Central Soil Conservation Research Institute at Dehradun regarding this and they would soon install the instruments. Member (E&F), NVDA, also informed that they had taken steps for installing the equipment. Member (E&R), NCA, informed that during his field visit for inspection of the catchment area treatment works in the subwatershed No. Na 7y in Madhya Pradesh accumulation of silt near the check dams on drainage lines being treated was observed and expressed that it should be possible to measure the silt flow by installing suitable equipments at the proper sites. Dr. H.S. Panwar, Director, Wild Life Institute of India informed that it was his experience that the flow of silt from well vegetated regions was negligible. Chairman, however, expressed the need for installation of equipment for measuring the silt flow during the pre and post treatment phases in order to analyse the data to present a documentary proof. At this juncture Dr. Ranjit Singh, Chairman, NVDA read out the technical note of CWC which had observed that the catchment area treatment did not significantly enhance the life of reservoir and it was primarily a land development activity. He expressed that if the MOE&F felt that the treatment of freely draining areas was going to stop soil erosion and enhance the life of the reservoir, then NCA may be directed to impress upon GOG to

pay all costs for the treatment of the freely draining areas also. He further stated that the cost of treating the directly draining catchment area should be charged to the Unit-I only and not to the project as a whole. Shri N.V.V. Char, Executive Member, NCA informed that the issue of cost sharing for various items was being debated in the NCA meetings and as such the Sub-group was not the appropriate forum to discuss this issue. Reacting to the observations in the CWC note, the Chairman stated that this note presented only one side of the view to which the MOE&F did not agree. He also informed that the observations of the CWC had been countered by the MOE&F based on several other studies. However, in the specific case of SSP the committee of Secretaries of the Govt. of India had discussed and resolved that the cost of treatment of critically degraded directly draining sub-watersheds only was to be charged to the project. The decision of the committee of Secretaries had already been made available to the Sub-group in the previous meetings. This was however a distinct issue and not to be mixed up with the need to treat the whole of the Catchment whether directly or freely draining.

3. **Cost Estimates for preparation of Action Plan and Implementation of Environment Safeguard Measures (Item No.XIX-2(101)(3)).**

Chairman expressed concern over the non availability of data on cost aspects of various studies, surveys and implementation of action plans by the three State Governments. He referred to the agenda of the 19th meeting and stated that the gaps in the table presented therein are still continuing. Shri M.E. Mehta, CCF, GOG expressed that cost of survey, and studies of the catchment area treatment and compensatory afforestation etc. were not available separately since they were actually included in the normal budget of the forest department. Chairman directed that some estimates for preparation of such plans should be included atleast for the purpose of estimating rough costs of the environmental studies and impact mitigation measures of a water resources project which could serve as a useful guide for future projects. He further directed that GOG, GOM and GOMP should immediately make available the latest estimates and expenditure. He desired that where the cost of survey and studies had been included in the action plan this should also be confirmed in writing to the NCA. Member (E&R), NCA, requested the State Governments to fill up the form annexed with the agenda of the 19th meeting. Referring to the cost estimates on implementation of the flora and fauna studies, Chairman desired to know whether the agencies carrying out the studies were also incorporating the likely cost of mitigative measures being proposed by them. He further enquired about the follow up actions on studies carried out by the M.S. University. CCF, GOG stated that a number of recommendations had been made which were being scrutinised. Dr. Shekhar Singh, however expressed that he was not aware of

the report under reference. Chairman directed that the agencies commissioned for the purpose of environmental studies may also be advised to frame a broad cost estimate and action plan in their final report.

Item No.XX-3(106): PRESENT STATUS OF STUDIES/SURVEYS AND ENVIRONMENT ACTION PLANS.

i) Phased Catchment Treatment

Narmada Sagar Project

Govt. of Madhya Pradesh

Chairman enquired about the map of the sub-watersheds under treatment and directed that a map similar to the SSP should be made available to the Sub-group for proper monitoring. Shri B.K. Verma reported that the 64611 ha area proposed to be treated by the end of 1997 infact included the area of pilot projects treated by GOMP earlier. Upon receipt of the AIS&LUSD prioritisation report it was found that these areas were outside the areas identified and, therefore, had been deleted from the targets. The revised target should now read as 62975 ha. He also reported that some of the areas treated were outside the priority areas and required to be deleted from the progress reported earlier. Hence, a figure of 3754 ha had to be deducted from the previously reported figure of 20128 ha.

Sardar Sarovar Project

Govt. of Madhya Pradesh

It was reported that during the current year 11250 ha non forest area and 966 ha of forest area had been treated so far. Chairman, however, stated that the achievements were less than the targets and the work needed to be accelerated. It was also reported by NVDA that as per the plan submitted the area identified under critically degraded sub-watersheds was 125725 ha. Member (E&R), NCA, however, stated that the exact area requiring treatment had not been finalised by the NCA and a meeting was proposed by him with NVDA officials to which response from NVDA was still awaited. Sub-group discussed about the frequent changes of the figures on progress and targets by the NVDA from time to time due to one reason or the other. After some discussions, Chairman directed Mr. Kushalappa, RCCF under MOE&F at Bhopal, to make a spot verification and report his findings to the Sub-group. Chairman also referred to page-4 of the Annexure and stated that these map should form a part of the annexures for all future meetings.

Govt. of Gujarat

The progress reported in the agenda was noted by the Sub-group.

Govt. of Maharashtra

GOM submitted a copy of the catchment area treatment plan prepared by the Forest Department with the help of ISRO, Ahmedabad for the directly draining sub-watersheds which was based on the satellite imageries. In response to a query from the Chairman, GOM officials informed that they had so far been able to treat 960 ha area near the dam site corresponding to the permanent pondage stretch of the reservoir mainly due to the agitation by the people in the valley. It was further explained that GOM had planned to treat all the sub-watersheds and had drawn up a programme to treat 6000 ha during 1993-94 for which preparatory work had already started. In response to a question from Dr. H.S. Panwar, GOM officials stated that the labourers were drawn from the areas above the FRL which were to be benefited by the treatment works. He further inquired about the joint participation of these people for proper protection of the areas being treated. Chairman stated that large areas were well managed, protected and supervised by the forest department even without the involvement of the local people especially where villages were not nearby. CCF, GOM informed that the joint forest management being practiced in Gujarat which was started quite some time back was functioning smoothly.

Chairman directed that GOM should treat the areas of sub watersheds near the dam site atleast through soil working by the end of 1993-94. In response to a question from Member (E&R), NCA, CCF, Maharashtra informed that Four (4) Forest Divisions had been created and that all staff was already in position for taking up the treatment works on a war footing. Chairman also enquired about the high cost being incurred by GOM on treatment works and stated that in case the cost of treatment was very high for directly draining areas it may just be possible that funds for treating balance of the critically degraded sub watersheds may not be available and, therefore, it had to be kept at a reasonably optimum level. GOM officials stated that difficult terrain and high rates for daily wages were the main factors for high cost in Maharashtra.

ii) Compensatory Afforestation

Narmada Sagar Project

Govt. of Madhya Pradesh

NVDA reported a cumulative progress of 55910 ha upto date.

Sardar Sarovar Project

Govt. of Madhya Pradesh

Against a target of afforesting 2190 ha of non forest area, GOMP reported a progress of 1089 ha. The balance 1101

ha non-forest area would be afforested during the 1994 monsoon. The problem of securing suitable non forest land for afforestation was being tackled by NVDA.

Govt. of Gujarat

GOG reported that in place of 800 ha area scheduled for plantation during 1993 rains, plantation could be done in 425 ha area due to paucity of rains in the Rann of Kutchch. The balance works in the forest and non-forest areas were now planned for completion during the rains of 1994.

Govt. of Maharashtra

GOM reported that only 22 ha area was left for reforestation in the degraded forest, while the progress of afforestation in the non-forest area was 5000 ha. CCF, GOM, informed the Sub-group that maps for the areas of compensatory afforestation for the divisions of Mevasi, Dhule and Hoshangabad were available and copies of which would be given to NCA. However, for the Yewathmal and Nasik divisions, maps were not yet available and the same were being procured.

iii) Command Area Development

Narmada Sagar Project

Govt. of Madhya Pradesh

On the basis of ground water level studies, an interim report had been prepared by the Chief Engineer, Tube Well, Lift Irrigation, Bhopal (Annex-XX-III-Min.). In addition, separate studies on impact of Agro-Chemical run-off from the fields on contamination of surface and ground water in the Narmada Sagar Complex had been entrusted to Jawaharlal Nehru Krishi Vidyalaya, Jabalpur. Chairman stressed that all the points suggested by him earlier in the Sub-group meetings related to integrated development of the command area be addressed properly. Specifically it was mentioned it was no use looking at only drainage issue but on several views like impact on soils, human settlements, area planning, infrastructures including roads, human health, lower commands, etc. Also, effect of water use and optimisation of use of water should be studied and enforced. Dr. Shekhar Singh suggested that issues should be identified first and then negotiations held with those institutes who have the expertise to do such studies. Chairman, however, desired that a comprehensive Environmental Impact Assessment report should be prepared first. He also suggested that eventhough the areas were currently irrigated but adding extra water in the command would definitely change the micro planning and many of the towns which were presently smaller may grow into

major towns and that such issues had to be focused in integrated development while preparing the comprehensive command area development plan.

Sardar Sarovar Project

Govt. of Gujarat

Referring to the report on command area development submitted by the Narmada Planning Group, Dr. Shekar Singh requested that an executive summary of the EIA prepared by NPG should be made available to him. GOG agreed. Dr. Pathak, Executive Member, NPG referring to the discussions with Dr. Abrol, DDG, ICAR and his officers on review of the reports of studies commissioned by NPG in relation to cropping pattern and suitable agriculture and other related aspects, stated that indepth discussions were held and it was agreed that the issue would be discussed further if required. In response to a query from Chairman, he stated that satellite imageries were available with ISRO, Ahmedabad but were not readily available to NPG and that Dr. Abrol had promised to help NPG in procuring these imageries from ISRO. He also informed that EIA studies had been commissioned to the various universities and multi-disciplinary groups were involved. Chairman directed that a diagnostic study was needed first.

Referring to the directive issued by the Sub-group earlier on canal alignment in the Rann of Kutch, Chairman stated that unless the studies on the impact on the Wild where was Sanctuary were completed no work should proceed in that reach of the canal. He was not in favour of canal dividing the sanctuaries unless professionals recommended it. He stressed that, if necessary, re-alignment of the canal may be done. Member (E&R), NCA stated that NCA was not aware of the developments in this regard as in the committees formed by NPG, NCA was not represented. Chairman, stated that the committee should include professionals and experts. GOG agreed to reactivate the committee. Dr. Pathak further informed that the back ground note for the committee was under preparation and that a meeting of the committee would be convened shortly. Chairman, however, suggested that the notes for the meeting should be sent well in advance to enable the experts to participate. Chairman desired that the issue of irrigated agro-forestry in the command area of Gujarat may also be discussed with Dr. Abrol. He suggested that for developing the integrated command area development plan agro-economist should also be consulted as it would have an impact on national economy also. He further suggested formation of a committee for Command Area Development which should include multi disciplinary experts in the areas of economy, industry, town planning, agro-economics etc.

Govt. of Rajasthan

Shri S.P. Mathur, Additional Secretary (Env), Govt. of Rajasthan made available a copy of the TOR signed by GOR with WAPCOS (copy of the finalised TOR enclosed Annex- XX-Min-IV) *

iv) SURVEY OF FLORA, FAUNA AND CARRYING CAPACITY STUDIES

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP informed that to discuss and decide the acceptable recommendations of the Friends of Nature Society, Bhopal a committee was constituted; the last meeting of which was held on 11.8.93 and thereafter it was agreed to call another meeting for the purpose. The action plan will be developed after the committee accepts the recommendations.

It was also informed by GOMP that Wild Life Institute of India had submitted half yearly report upto June, 1992.

Dr. H.S. Panwar informed the Sub-group that Wild Life Institute of India had completed the studies and data was being analysed in detail for finalisation of the report alongwith action plan. He also made a brief presentation of the salient features of the report and the main recommendation. He suggested that felling of the forests coming under submergence should be restricted upto 8 m below the FRL as against the norm of 4 m below the FRL as presently advised by the MOEF. He stated that this would not only help the biodiversity and provide shelter to the fish but also help in the stability of the rim. He suggested draw down cultivation on the left bank where most of the people were presently settled. He explained the setting of the area on a map and suggested formation of a national park on the right bank which had substantial prime forest. He also suggested for adoption of adequate protection measures on the road which was passing through the sanctuary. In response to a query from the Chairman about alternative plan for diverting the road away from the sanctuary, Dr. Ranjit Singh, Chairman, NVDA stated that this was not possible. Chairman suggested that if the area was suitable for declaring it as a biosphere reserve this could also be considered as per recommendations of the Wild Life Institute of India. Dr. Panwar agreed to re-examine the issue. Dr. Panwar further suggested that the forest areas 8 m below the FRL should not be felled. He drew attention of the Sub-group that felling operation in the submergence area have started prematurely. He stressed that the people in the villages on the periphery and the dam site should be given fuel wood to reduce pressure on the surrounding forests.

Dr. Pawan Kumar, Specialist (Env.) informed the Sub-group that MOE&F while permitting diversion of the forest areas for NSP/SSP had clearly laid down conditions which include provision of fuel wood supplies to the villagers at the dam site and also to people in the villages on the periphery. He also stated that leaving the forest undisturbed upto 8 m below FRL may have its own negative environmental impact; say if the forests going under submergence belong to the dry deciduous forests type then they would find it difficult to withstand the change in moisture regime specially if these were to be submerged for a period exceeding 2 months as a result of submergence. The forest may decay and produce hydro-sulphuric sludge which may act as a fish kill in addition to eutrophication. After decay, ecological succession may take place by more exacting flood tolerant tree species which could withstand waterlogging and submergence. In this context he also quoted the findings of CICFRI which recommended that all forests coming under submergence should be clear felled before impoundment. He suggested plantation of flood tolerant species to improve aesthetics and for conserving the bio-diversity. Dr. Afroz Ahmad, Impact Assessment Officer, NCA stated that some of the studies in the tropical countries had indicated that the forest growth at the periphery of the reservoir may hinder the circulation of water and may help in formation of thermocline strata which was detrimental not only to the aquatic fauna but also to the reservoir operation. The non aerated water on bottom layer may produce hydro sulphuric sludge. The Chairman observed that no such effects had been seen in Sanctuary like Periyar where many trees had been left standing.

On a query from Shri Shekar Singh, the Executive Member, NCA informed the Sub-group that rim stability refers to the capacity of the rocks to hold the water. GSI had not made any recommendation in respect of SSP for retaining the forest or felling the same. Chairman, however, wanted detailed analysis of the issues involved by the experts. He further stated that if necessary he may get the issue of restricting the felling upto 4 m below the FRL reviewed in the Ministry.

Sardar Sarovar Project

Govt. of Madhya Pradesh

Govt. of Madhya Pradesh informed that the final report of the SFRI, Jabalpur was still awaited and that SFRI had sought extension of time for completion of the studies upto March, 1994. It was further informed that after receipt of the final report it would be placed before the Wild Life Committee and if necessary action plans would be formulated for implementation. Chairman drew attention of the Chairman, NVDA to the report of SFRI which were not exhaustive. Member (E&R), NCA, explained that areas of SSP are much different

from areas of NSP where only 2732 ha of forest area was involved which support a very scanty vegetation interspaced with villages. Total enumeration had been carried out by SFRI which confirmed the extremely degraded conditions of the area. He also referred to the terms of reference of the studies entrusted to SFRI for drawing up of migratory corridors for big game animals after surveying the flora and fauna of the areas. A number of species had been identified for ethno botanical use. Chairman, however, expressed that the various interim reports of SFRI were not very exhaustive, as they only highlighted the mega fauna and flora while micro-fauna and flora which were of equal importance did not find a place in it. Member (E&R), NCA suggested that the final report of SFRI may be examined in the light of TOR signed by NVDA before accepting the same.

Govt. of Gujarat

Shri M.B. Mehta, CCF, GOG stated that the report of the M.S. University had been sent to the State Forest Department and other concerned officers for perusal. The NPG will arrange expert deliberations for preparing the action plan.

Govt. of Maharashtra

Dr. V.R. Gunale, Project Director of the School of Environmental Science, Pune University informed the sub-group of the studies undertaken by them. Chairman, however, wanted to know the status of studies being done by them for the areas coming under submergence. Dr. Chapekar stated that it would take at least 2 months for them to complete the studies in the submergence area. Chairman suggested that cost estimates may also be worked out for implementation of the various mitigative measures likely to be suggested.

v) ARCHAEOLOGICAL & ANTHROPOLOGICAL SURVEY

ARCHAEOLOGY

Narmada Sagar Project

Govt. of Madhya Pradesh

GOMP submitted a copy of the action plan on archaeological aspects prepared by the State Department of Archaeology and Museum during the meeting. (placed at Annex-XX-V.Min.). Chairman, NVDA informed the sub-group that earlier plan was to develop the Lalbagh Palace museum at Indore only but now he was taking steps to develop the museum at Maheshwar, Mandleshwar and Barwani also. Chairman desired that the paleontological issues may also be looked into and desired that the Birbal Sahni Institute of Paleobotany, Lucknow may be contacted by NVDA under intimation to NCA for needful action in this regard.

Govt. of Gujarat

State Department of Archaeology and Museum had carried out a detailed survey of the 19 villages coming under submergence in Gujarat and the preservation of the two temples viz, Shoolpaneshwar and Hamfeshwar had been recommended. The Shoolpaneshwar temple had been shifted but the plan finalised by GOG for relocation of Hamfeshwar temple was still awaited. GOG agreed to submit the plans for shifting of Hamfeshwar temple.

Govt. of Maharashtra

Member (E&R), NCA informed that the State Department of Archaeology and Museum of GDM had carried out a detailed survey of the 33 villages coming under submergence and the report was submitted. The recommendation includes mainly the preservation of Shoolpaneshwar temple located on the border of Gujarat and Maharashtra; Govt. of Gujarat had already shifted this temple.

ANTHROPOLOGY**Narmada Saagar Project****Govt. of Madhya Pradesh**

Orders for procurement of seismo-meters had been placed with IMD; the delivery of the equipment was awaited.

Sardar Sarovar Project

It was informed by GOMP that necessary data called for by GSI and CW&PRS had been submitted. Executive Member, NCA had reviewed the studies on rim stability, in the meeting taken by him on 29.10.93. A brief summary of the findings of GSI as discussed in the meeting was read out during the meeting. A copy of the salient features of the draft report of GSI on rim stability is placed at Annex-XX-Min-VI. It was noted that the rim stability aspects had been adequately addressed. Referring to the status on limnological studies which indicated some fluoride deposits in the river Narmada, EM, NCA however informed the Sub-group that according to the report of GSI "The basaltic terrain was generally devoid of significant minerals deposits. Carbonate rich rock along the left bank of Narmada river in Dhule District was examined. The results indicated that the rock was not cabronatite type and had no significant economic implications with a direct bearing on the progressive filling and dam construction". Shri B.J. Parmar, Executive Director, SSNNL, GOG informed that out of the 9 MCO stations 7 had been installed and

started functioning and all these were located around the periphery of the reservoir. In response to a query from the Chairman he informed that all these stations had been provided with automatic recorders. Chairman also referred to the Disaster Management Plan (DMP) and stated that this was a must for a development project and hence DMP should be prepared for SSP also. In this connection he referred to the Tehri Dam where they had been asked to prepare such a plan. Shri N. Ramaswamy, Secretary (Narmada), GOG stated that the Disaster Management Plan was needed not only for the water resources project but also for each sphere of life.

After some discussion Chairman desired that the EM, NCA may continue further discussion with GOG on preparation of Disaster Management Plan for SSP.

vii) HEALTH

Govt. of Madhya Pradesh

Narmada Sagar Project and Sardar Sarovar Project

Member (E&R), NCA, informed the sub-group that as desired during the 19th meeting of the sub-group the plans prepared by the State Governments had been handed over to the Director General, ICMR. GOMP submitted the second interim report of Gandhi Medical College, Bhopal during the meeting. Chairman desired that it should be forwarded to the Director General, ICMR for his views and that the Director General, ICMR may be specially requested to participate in the 21st meeting scheduled for 7th December, 1993.

Sardar Sarovar Project

Govt. of Gujarat

Dr. Mahesh Pathak, NPG, informed the sub-group that the final report of the health surveillance entrusted to State Commissionerate of Medical Services (SCHMS) was expected within a month's time. Upon receipt of this report the tentative action plan would be formulated. He further explained that the health plan consisted mainly of two components one was for command area that would be implemented over a period of 17 years and another for the project site which was already under implementation.

Govt. of Maharashtra

As officials concerned with health aspects were not present, Chairman directed that Chief Secretary of GOM should be addressed for ensuring participation of the officials of Govt. of Maharashtra at the senior level in future meetings.

viii) FISHERIES DEVELOPMENT OF SSP AND NSP RESERVOIRS

GOMP informed that the final report on Limnological aspect of Barkatullah University was still awaited. GOMP also informed that the reports produced by Friends of Nature Society, Bhopal was to be scrutinised by the Wild Life Committee of GOMP and appropriate action plan for conservation and development of aquatic fauna would be prepared and implemented after finalisation of the report. Member (E&R), NCA, informed the Sub-group that a desk review study was entrusted to CICFRI on conservation aspects of fisheries development in SSP and NSP reservoirs on the recommendation of the Sub-group. The report was made available to all concerned.

Chairman referred to the action plan contained in the report and desired to know the action initiated for their speedy implementation. Member (E&R), NCA explained that the report was examined in NCA and the acceptable recommendations of the report had been conveyed to the State Governments for speedy implementation. A meeting to discuss the progress and review the above aspects was convened by Executive Member, NCA. The minutes of the meeting on fisheries taken by the E.M., NCA on 22.10.1993 have been annexed with the agenda papers for the 20th meeting of the Sub-group. Chairman while expressing satisfaction over the technical evaluation of the report carried out by NCA for the purpose of implementing the recommendations contained therein, desired that Senior officials of the State Govts. connected with fisheries should attend the meetings of the Sub-group to explain various steps taken by him to conserve, preserve and develop fisheries both upstream and downstream of SSP. He, therefore, suggested that EM, NCA may continue the dialogue with State Fisheries Departments and come out with a comprehensive note on this issue in the next meeting of the Sub-group.

On the issue of setting up of an Inter-State Fisheries Board, GOMP expressed disagreement over the suggestions made by NCA pending a final decision from the Government. Chairman wanted to know the idea behind setting up the Inter-State Fisheries Board. Specialist (Env.), NCA informed that to ensure conservation and development of fisheries, the technical reports produced by CICFRI and the earlier reports prepared by German consultants had recommended the setting up of the Inter-State Fisheries Board. Member (E&R), NCA explained that the NWDT Award limited the fishing rights of each state within their own water spread area of the reservoir. To regulate this and to give a boost to the conservation and development efforts the need for such a Board was felt. Chairman wanted to know the action taken by the project authorities on the recommendations contained in the desk review studies conducted by CICFRI. Chairman suggested that in case Inter-State Fisheries Development Board was not acceptable alternative arrangement for

management and conservation of the aquatic and fish fauna of the reservoir would need to be worked out. EM, NCA, however, clarified that setting up of Inter State Fisheries Development Board was being discussed in the NCA meeting. He further informed that in order to review the follow up action on the decisions taken during the 4th meeting of the fisheries development and conservation he had called yet another meeting on 10.11.93 to discuss the issue further. Chairman desired that a full paper on past developments in this regard should be put up to the Sub-group before the next meeting.

Referring to the recommendations made by NCA, Chairman wanted to know the steps taken for declaring the deep pools (both upstream and downstream) as closed areas or sanctuaries with statutory regulations and desired that these issues should be looked into in greater detail by the State Governments and the information should be made available to the Sub-group by the next meeting.

**Item No. XX-4(107): MONITORING OF THE REPORTS UNDER COMPI-
LATION BY THE PROJECT AUTHORITIES**

Sub-Group noted the progress.

Item No.XX-5(10B): ANY OTHER ITEM

1. Report of the Expert Group of Government of Gujarat on the Environmental Impact of Closure of Construction Sluices provided in the Sardar Sarovar Dam.

Shri B.J. Parmar, Executive Director, SSNNL, GOG made a brief Video presentation of the measures proposed to be taken to supplement flows in the river downstream of Sardar Sarovar Dam during the proposed closure operation. The releases proposed from the Karjan Dam and its canal distribution system extending upto Gora on the upstream and upto Bharuch on the downstream was explained in detail. He also explained that a discharge of about 67 cumecs would be maintained downstream of the confluence of the Karjan river with Narmada which would ensure limiting the tidal effect to the 70 Km. stretch from the estuary and between Bharuch to Gora on the upstream a discharge of about 12.5 cumecs would be maintained through releases from the canal system, lean season flows from the left and the right bank tributaries and the regeneration flows. Chairman asked Secretary, GOG to present his views on the closure operation and wished to know specifically the provisions made for the water supply particularly in the first 5 Km. stretch below the dam since the report of Expert Group submitted by GOG did not cover this aspect. He also wanted GOG to explain why the closure of sluices in December, 1993 was essential.

Shri N. Ramaswamy, Secretary, GOG explained that it was essential to close the construction sluices from technical considerations particularly the safety of the dam structure, since the downstream stilling basin area below the sluices was not concreted and was, therefore, subject to erosion from falling waters during the monsoon season. He further amplified that minimum flow in the river observed in the past was about 15 cumecs only in the month of April and as already indicated in the report, a minimum flow of about 12.5 cumecs would be maintained below Gora upto Bharuch and below that reach a flow of 67 cumecs would be ensured to limit the tidal ingress. Shri J.L. Java, Chief Engineer, GOG informed that it would be difficult to maintain 12.5 cumecs of water in the first 5 Km. stretch below the dam as pumping was difficult. He further explained that this issue was also posed to the multi-disciplinary expert group for a solution. However, it may be possible to supply about 5 cumecs of water in this reach by some alternate arrangements. He clarified that the water supply requirements downstream had been assessed and the releases proposed in various stretches of the river would take care of these needs. Chairman, however, felt that the Project authorities had considered the closure issue from engineering considerations alone. Even then he felt a decision on this could not be taken in isolation from the issue of parri-passu inforcement of conditions. In any case closure of sluices can not signal action to further raise the

height of dam in violation of parri-passu conditions. He emphasised that adequate steps were also required to be taken to protect environment in the downstream. In this context, he wanted specific comments of the members on issues raised by Shri Shekar Singh in his letter circulated during the meeting and also in the memoranda of the NBA submitted to his Ministry which was also circulated to the members in the meeting. He also referred to different figures being quoted for number of days required for closure operation and wanted a specific proposal on this.

Dr. Mahesh Pathak, Executive Director, NPG, GOG, informed that for developing the operational plan for conserving the eco-system downstream, an Expert Group was constituted by GOG which included Dr. S.N. Singh of CICFRI and experts from M.S. University, Baroda. Chairman, however, stated that the expert group had not adequately covered issues related to deep pools in the downstream, water supply to the villages, effect on ground water and also upstream R&R aspects. He also sought replies from the SSNNL, GOG and the State of Maharashtra and the GOI, MOWR on issues raised by the NBA and also Shri Shekar Singh. He also wanted the concurrence of the GOMP for release of water from the Bargi reservoir during the closure operation as per plans formulated by GOG. To facilitate an early decision on the closure issue he agreed to hold the 21st meeting of the Sub-group on 7th Dec., 1993 at 10.00 A.M. in the Conference Hall of the Ministry of Environment & Forests, New Delhi. He further stated that during this meeting, only three point agenda related to (i) closing of construction sluices; (ii) health issues; and (iii) fisheries development and conservation shall be discussed. He wanted the States to send replies to the NCA on all these issues so that a consolidated note would be circulated to the members of the committee for consideration in the 21st Sub-group meeting. Executive Member, NCA, however, requested Chairman that since the time available with the Project authorities for closure in December was too short, it was necessary to take preparatory work in advance pending a decision. Chairman agreed that the preparatory work for closure operation could proceed and actual closure could take place after a decision is taken in the 21st Sub-group meeting on 7th December, 1993.

ANNEXURES

ANNEX-XX-MIN.-I.**LIST OF PARTICIPANTS ATTENDED THE 20TH ENVIRONMENT
SUB-GROUP MEETING HELD ON 3RD NOVEMBER, 1993 IN INDORE.**

S.No.	Name & Designation
1.	Shri R. Rajamani, Secretary, Min. of Env. & Forests, New Delhi.
2.	Dr. M.K. Ranjiesinh, Chairman, NVDA., Bhopal.
3.	Shri N.V.V. Char, I/C Executive Member, NCA, Indore.
4.	Shri N. Suryanarayanan, Commissioner, (PP), Ministry of Water Resources, New Delhi.
5.	Shri B.S. Paswan, Vice Chairman, NVDA, Bhopal.
6.	Dr. A.K. Malhotra, Member (E&R), NCA, Indore.
7.	Shri G.K. Pharlia, Member (P), NCA, Indore.
8.	Shri M.S. Menon, Member (C), NCA, Indore.
9.	Shri N.Ramaswamy, Secretary (Narmada), Govt.of Gujarat, Gandhinagar.
10.	Shri B.K. Verma, Member (E&F), NVDA, Bhopal.
11.	Shri H.S. Panwar, Director, Wildlife Institute of India, Dehradun.
12.	Shri B.J. Parmar, Executive Director, SSNNL, Vadodara.
13.	Mahesh Pathak, Executive Member, NPG., Gandhinagar.
14.	Shri G.L. Jawa, Chief Engineer (Design), SSNNL, Vadodara.
15.	Shri A.V. Joshi, Chief Engineer, Lower Narmada Project, Indore (M.P.)
16.	V.K. Vaidya, Chief Engineer (SSP), Canal, Sanawad.
17.	Shri S.P. Mathur, Addl. Secretary, GOR., Jaipur.
18.	Dr. K.A. Kushalapa, CCF, MOE&F, Bhopal.
19.	Shri M.B. Mehta, CCF, SSP, Vadodara.
20.	Shri M.S. Parasnis, CCF (C), GDM, Nagpur.
21.	Shri B.B. Sinha, Secretary, NCA, Indore.
22.	Dr. Shekhar Singh, IIPA, New Delhi.

23. Shri M.B. Mankare, Conservator of Forest, Dhule, GOM., FD., Dhule.
24. S.B. Chaphekar, University of Poona, Pune.
25. Dr. V.R. Gunale, Project Director, SSP., Research Project, University of Poona, Pune-7
26. Dr. D.R. Shirke, Principal Investigator, SSP. Research Project, Univ. of Poona, Pune-7.
27. Dr Pawan Kumar, Specialist (Env.), NCA, Indore.
28. Dr Afroz Ahmad, I.A.O., NCA., Indore.
29. Shri R.K. Behre, Subject Matter Specialised (Hydrology & Sedimentation, NVDA., Bhopal.
30. Shri K.G.Bhagchandani, Dy.Suptdg. Archaeological Engineer, Survey of India, (Govt. of India).
31. Shri L.P.R.Mohnani, Sr. Const. Assistant, Archaeological Survey of India.
32. Shri N.S. Bawahir, Deputy Director (Env.), NCA, Indore.
33. Shri K.K. Saman, Arch. Survey of India, Bhopal.
34. Shri A.K. Jain, DFO (MON) NVDA, Bhopal.
35. Dr. B.P. Singh, Conservator of Forest, NVDA, Bhopal.
36. Shri R.K. Sahu, Assistant Geopyetrologist, NSP (Canal), Sanawad.
37. Shri P.K. Jadhav, Attended Officer (Design), Sanawad.

REPORT OF THE EXPERT GROUP
ON ENVIRONMENTAL IMPACT OF
CLOSURE OF CONSTRUCTION
SLUICES PROVIDED IN
THE SARDAR SAROVAR DAM

OCTOBER 1993

NARMADA PLANNING GROUP
GOVERNMENT OF GUJARAT
GANDHINAGAR

REPORT OF THE EXPERT GROUP OF GOVERNMENT OF GUJARAT ON THE
ENVIRONMENTAL IMPACT OF CLOSURE OF CONSTRUCTION SLUICES
PROVIDED IN THE SARDAR SAROVAR DAM

INTRODUCTION.

The Sardar Sarovar Project on the river Narmada is an inter-state multi-purpose joint venture of the four States, namely, Gujarat, Madhya Pradesh, Maharashtra and Rajasthan. The Sardar Sarovar is the terminal reservoir on the main river in Gujarat. The construction of the dam started in the year 1987 and is due to be completed by 1998. Irrigation in the earlier stretch of the Sardar Sarovar Project command is planned to be provided by 1995. By then all the blocks of the dam are to be raised up to EL 110.5 m . for diverting water for irrigation and power generation. The first power unit is expected to be commissioned by August, 1995. About 50 per cent of the total volume of the concrete dam has been laid and the work is generally progressing as scheduled.

RATIONALE FOR CLOSURE OF CONSTRUCTION SLUICES :-

Construction of high dam on a major river like Narmada inevitably requires diversion works so that fair whether flow of the river can be diverted through diversion works thereby facilitating the construction work of excavation, concrete, etc. Such a diversion is normally attended to by providing bye-pass tunnels on the flanks or by providing construction sluices in the body of the dam depending upon the site logistics. As soon as the purpose of diverting flow and tackling the foundation of river channel is completed, the diversion works, which are of a temporary nature, are

-2-

required to be closed.

In the case of ~~the~~ Sardar Sarovar Project, ten construction sluices have been provided in the body of the dam for diversion of fair weather flow and a diversion channel is excavated on the up-stream as well on the down-stream. The construction sluices are located almost hugging the bed of the river at an elevation of 18 m. The fair weather flow has been diverted through the same. These construction sluices are to be plugged as the same where required only for a limited period to facilitate construction work as explained earlier. Due to the temporary nature of work involved in plugging operations, simple gates have been provided to facilitate such plugging. The sluices are to be plugged and diversion of flow is then to be accomplished through the river sluices provided higher up at an elevation of 53 m. Plate I shows the general arrangement and the related features.

It was earlier contemplated to close the construction sluices in March, 1993 so as to be in consonance with the contemplated schedule of work and take up the work of stilling basin area by providing the required concrete. The idea is to avoid damage to the toe of the dam as well as stilling basin area which otherwise would take place with the heavy velocity flows falling from a height of above 40 m. The closure had to be deferred to link it up with R & R programme till May, 1993. Plate I shows the longitudinal section of the dam with construction sluices, permanent river sluices alongwith the work executed upto June, 1993 and the ~~work to~~ be executed upto June, 1994. Plate II shows the section ~~of~~ the spillway with through

-3-

construction sluice. In view of ~~the~~ R & R constraints, closure of construction sluices was earlier contemplated during May, 1993 when the river flows during the hot weather season (April-June) would be at the lowest levels. This would have been the most appropriate time for the closure of sluices on technical and hydrological considerations. However, since the shifting of PAPs in the upstream could not be completed, the Government of Maharashtra had requested the Government of Gujarat to postpone the closure of sluices to a later period. The Sardar Sarovar Construction Advisory Committee at its 48th meeting held on 13th August, 1993 had, inter alia, recommended closure of construction sluices by December, 1993.

The closure of sluices cannot be postponed till the year 1994, as this is likely to cause severe damage on the downstream toe of the dam and in the uncovered stilling basin area, if the required protective works are not completed in this reach before the onset of monsoon of the year 1994. This has been indicated in the model studies carried out by the Central Water and Power Research Station (CW&PRS), Pune. It would be almost impossible to close the sluice gates due to high velocities and pressure head during the monsoon. After the monsoon ^{of 1993} it is highly probable that rubble and debris may get collected upstream of the sluices and this may clog the gate slots. The choking and clogging of the sluices would make the gate closure a very difficult operation. Experience on other projects both in India (Ukai) and abroad (Guri) have clearly indicated that closure under such conditions would become extremely difficult and hazardous even with the help of

-4-

underwater divers. The divers may not be able to even approach the opening due to prevalence of extremely high velocities. Given this brief background, it is clear that the closure of construction sluices brooks no further delay and has to be accomplished by December, 1993.

The Environment Sub Group of the NCA which examines and coordinates various environmental aspects relating to the construction of Sardar Sarovar Project also appreciated the problems that may arise due to closure of construction sluices. During the 18th meeting of the Environment Sub Group, an Expert Team was constituted to undertake a field visit of the areas that may get submerged by the Sardar Sarovar Dam during 1993 and 1994 monsoons. This Team inspected the relevant areas in Gujarat and Maharashtra and found that the closure of construction sluices would create certain environmental impacts especially in the down-stream river due to stoppage or reduction of flow for a period of about 22 days (assessed then). The NCA Environment Sub Group discussed the issues contained in the report of the Expert Team and requested for more information from the State Government and the NCA pertaining to the environmental impact of the closure of sluices during December, 1993.

EXPERT GROUP OF NPG/GOG :-

In light of the recommendations of the Environment Sub Group of the NCA, the NPG/GOG constituted a multi-disciplinary Expert Group to examine the environmental impacts

-5-

of the closure of construction sluices on the downstream area. The terms of reference for this Expert Group were as follows:-

- (1) To conduct a comprehensive environmental impact study in the area down-stream of Sardar Sarovar Dam as a result of the closure of construction sluices.
- (2) To suggest concrete measures for avoiding or mitigating the likely adverse impacts on this account and suggest formulation of an appropriate action plan towards this objective.

The members of the Expert Group are listed in Annexure-1. The Expert Group met on 24-9-1993, 7-10-1993 and 15-10-1993 and had wide ranging deliberations on the issues involved. The data required for the study were also assembled during the period on major parameters of environmental impact. The Expert Group also visited the down-stream area in order to have the first hand information about water flows through tributary rivers, nalas and escape-sites tailing in the Narmada river. The Expert Group had also invited the following senior officials of the Government of Gujarat for deliberations and advice :

- (1) Shri N. Ramaswamy, Secretary(Narmada)/GOG
- (2) Shri D. Rajagopalan, Secretary(R&E)/GOG
- (3) Shri L. Mansinh, Secretary(Fisheries)/GOG
- (4) Shri A.K. Luke, Commissioner of Fisheries/GOG
- (5) Shri A.M. Mogal, Chief Engineer, Gujarat Water Supply and Sewerage Board/GOG

- 6 -

The Expert Group deliberated on various likely impacts due to the closure of construction sluices and identified the following specific areas for closer scrutiny:-

- (1) Possible impact on R&R programme for the submergence area;
- (2) Impact on the existing sources for fresh water supply in the down-stream river specially on account of likely advancement of salinity front;
- (3) Impact on fisheries, both riverine and estuarine;
- (4) Likely impacts on flora and fauna in the down-stream area.

Keeping in view the limited period for which the flows were likely to be reduced, the other intangible impacts were not considered as important by the Expert Group. The sections that follow summarise the findings of the Expert Group under the related captions.

RIVER CONFIGURATION AND FLOW REGIMES

The river Narmada carries fresh water flows in the range of 50 to 500 cumecs during the month of December. The necessary flow data is assembled in Annexure - 2 for each week of the month of December from 1948 to 1991. The length of the river on the down-stream is 165 kms upto the Gulf of Khambhat. There are three major tributaries on the right bank, namely Orsang (meeting at about 30 kms down-stream of dam) Men (meeting at about 22 kms down-stream of dam) and Ashwin (meeting at about 26 kms down-stream) alongwith smaller streams. The major river on the left bank is the Karjan which meets the river Narmada 40 kms down-stream of the dam. The river down-stream may be divided into two distinct reaches for the purpose of impact assessment:-

- 7 -

- (1) Reach 1:- About 40 kms. long from the dam to the confluence of Karjan river.
- (2) Reach 2:- About 125 kms long from confluence of the Karjan river upto the Gulf of Khambhat.

A comprehensive plan showing the confluences of various tributary rivers and streams is shown in Plate No. III/1, Plate Nos III/2 and III/3 also show various flow contribution details.

The Expert Group found that one of the redeeming features of the impact assessment is the availability of flows from the Karjan right bank canal system and the Karjan reservoir on the left bank. Also the reservoir on Karjan has adequate storage available to cater to certain minimum flow requirements in the down-stream river specially after its confluence with the river Narmada. The right bank system of the Karjan Project provides an opportunity to release water in the first reach of the river at certain escapes through khadis subject of course to the available flow capacities of the irrigation channels. There are three escapes which are relevant. A small escape (capacity 0.2 cumecs) terminates in Gora Khadi located just up-stream of the Gora bridge near the dam. Further down-stream, there are two more escapes having an aggregate capacity of 5.5 cumecs. The second escape will serve the river through Hirapura Khadi and Kola Khadi (locations B 1 B and B 2 B on Plate No. III/3) and the last escape is through Waghai Kotar and Tarsal Khadi located just opposite to Tilakwada village (locations C 1 C and C 2 C in the same map). Further, some discharges from Dhir Khadi, Shamarla Khadi etc. will also be available. The contribution of

-8-

different rivers and streams and available flows from right bank system of the Karjan Project along the left and the right banks of the main river are summarised in Annexure-3. This statement shows contributions only upto the confluence of Karjan with the main river and the assessment of flow availability is 12.5 cumecs both from the left and right banks

arrived at on a conservative basis. The flow of 12.5 cumecs will gradually build up from the dam site to the confluence, as will be evident from Plate Nos. III/1 to III/3. This does not include the flow from the Karjan reservoir which can be passed through the main Karjan river channel. Further, possible ground water regeneration is also not included in this assessment.

The Karjan Reservoir is almost full with the available capacity of about 500 million cubic metres at its FRL 115.25 metres. There is a facility to release water from four river sluices which are located in the body of the Karjan dam and which are having a total capacity of 283 cumecs i.e. 10,000 cusecs. There is also a possibility of releasing water through radial gates above the crest of the spillway.

Consultations were held with the Water Resources Department of the Government of Gujarat with regard to the quantum that can be made available for mitigating the down-stream impacts without vitiating appreciably the present irrigation and water supply commitments on the reservoir. The Expert Group found that an aggregate flow **rate** of about 60 cumecs for a period of about 15 days can be conveniently

-9-

released and this can be stretched to a further period of about 7 days, if need be, on account of unforeseen problems that may be encountered during the closure of the construction sluices. Thus, adequate reserve is planned in the operation. As discussed hereafter, a flow exceeding this quantum may not be strictly needed considering the small period of closure and the timing of the closure which is in December, 1993.

To summarise, the flow availability picture immediately after the closure of the construction sluices would be as under :-

- (1) Reach 1 :- 12.5 cumecs (gradually built up in 30 kms. length.)
- (2) Reach 2 :- $12.5 + 55 = 67.5$ cumecs beyond the confluence of the Karjan river upto the sea ignoring the natural ground water regeneration).

STUDIES BY CWPRS, PUNE :

The CWPRS, Pune are already engaged in conducting 1-D morphological studies for assessing the effect of construction of Sardar Sarovar Dam on ^{the} river Narmada from Garudeshwar weir to Bharuch. As a part of this work, the organisation was specifically requested, in the context of proposed construction sluice closure, to carry out a study for the down-stream reach below the dam considering that there would be no flow of water in the river for a period of 2 to 4 weeks. The Station was also requested to study the environmental impact with reference to the aspects of salinity, fisheries

-10-

and domestic use of water on the downstream. The CWPRS, Pune have submitted their Technical Report No.3092 dated 31-8-1993 after studying the problem. The results of the mathematical modelling study are briefly as under :-

- (i) Total estimated discharge of 12-20 cumecs alone from all the tributaries in the first reach of Narmada river extending from the dam upto confluence of Orsang river may not suffice to keep the salinity ingress away from the relevant zone for a period exceeding one and half months after the closure of the construction sluices. The situation will be far better in case the flow passes down the river sluices (situated at EL +53 m) within a period of 4 weeks i.e. the estimated longest duration for no flow condition from the dam.
- (ii) Since the salinity ingress limit has been found to be about 75 kms ^(from the sea) /or smaller for a discharge of 30 cumecs or higher, it is recommended that sufficient amount of water may be released from Karjan Dam so that a discharge of 30 cumecs or more is always available in the river downstream of confluence of the Karjan river.
- (iii) Reduction of fresh water discharge to 30 cumecs will not produce any adverse effect as the estuarine part of Narmada may take more than one and half months to reach a new equilibrium state for the changed discharge of water and thus salinity intrusion effect as *discussed in the report* may not be observed to propagate upto Jhanor due to the proposed closure of the sluices for four weeks.

It may be seen that the threshold value of fresh water

-11-

discharge for substantial adverse environmental impact is around 30 cumecs while in the present case the discharge available after Karjan confluence is 67 cumecs. Plate IV shows salinity profiles in terms of parts per thousand (PPT) for different distances measured from the sea. The plate is self-evident and supports conclusions mentioned above.

IMPACTS ON R PROGRAMMES

The impact of the closure of sluice gates on the submergence of the villages has been examined separately for the monsoon period as well as dry season. As was noticed during the 1993 monsoon, the water level rose to a minimum height of EL 59 m. which was the minimum height upto which the dam was constructed. The water level rose from this level to the highest level of EL 76 m. and throughout the monsoon period, the level continued to remain at around EL 60 m. Thus the outflows of water from the sluice gates and from the river sluices at EL 53 m level were insignificant in comparison to the inflow of water. At then prevailing height, the outflow from sluice gates was of the order of 13,000 cusecs. Yet the water level during the monsoon period continued to remain at around EL 60 m. This clearly establishes that the sluice gates do not play any significant role towards the level of water during the monsoon period. During the monsoon period, the level upto which water rises is determined by the level upto which the dam is constructed in the river portion. During the dry season, when the inflow of water becomes limited, the level comes down nearabout the minimum natural level. During the dry seasons, the outflow of water from the construction

-12-

sluice gates varies from about 7000 cusecs to a minimum of 200 cusecs. When the sluice gates are closed, the water instead of coming out of the construction sluice gates, gets impounded upto a height of EL 53 m. at which river sluices are provided beyond which it starts flowing out of river. sluices constructed at this height. Since the four river sluices have sufficient capacity, the water level does not rise further during non-monsoon period. Therefore, the impounding of water during the dry season, due to the closure of sluice gates will not exceed a level of EL 53 m. The problems of rehabilitation of the affected families have already been addressed corresponding to the elevation of 53 m. The impounding of water would, however, result in the submergence of important road linkages below EL 53 m. It has, however, been decided to shift the household kits of the affected people through barges and the Government of Maharashtra has already been advised to do the needful in this regard. Further, they have also been advised to construct a road at higher elevation, so that the road communication could also be utilised for the resettlement of the affected people.

IMPACT ON DRINKING WATER SUPPLY IN THE DOWN-STREAM RIVER :

In consultation with the Gujarat Water Supply & Sewerage Board (GWSSB), the present picture of various organisations drawing domestic water from the river Narmada, down-stream of Sardar Sarovar Dam alongwith the locations of sources has been worked out. The position is summarised in the Table below :-

-13-

Sr.	Organisation	Location of source	Type of source	Quantity of water drawn from river	Commissioned in the year
1	2.	3.	4.	5.	6.
1.	Gujarat Water Supply and Sewerage Board, Bharuch.	Near Village Nand, Ta. Bharuch	Intake Well.	33 MLD	1993
2.	ONGG, Ankleshwar	-do-	-do-	30 MLD	1993
3.	GNFC, Bharuch	Near Angareshwar, Ta. Bharuch	-do-	60 MLD	1992
4.	District Panchayat, Bharuch	U/s of GNFC, H.W. at Zanor, Angareshwar, Nikora	Direct Pumping	24 MLD	1991
TOTAL				147 MLD	

The table shows that currently about 147 MLD are being drawn from various water supply schemes through intake wells or by direct pumping. Looking to the position of intake wells and pumping sites with reference to salinity affected zone and with a minimum flow of atleast 67 cumecs to be maintained, the Expert Group found that there will be no adverse salinity impacts whatsoever, because of the closure of construction sluices. This conclusion is corroborated by the GWSSB and also gets reinforced by the conclusions arrived at by the CWPRS, Pune. In fact, even a discharge of 30 cumecs would be adequate to keep the water free from salinity on account of tidal effects. The water supply, at present, is potable and will continue to remain so. The Expert Group arrived at this conclusion on the basis of the results of chemical analysis of

-14-

water corresponding to even dry summer months.

IMPACT ON FISHERIES (RIVERINE AND ESTUARINE) :

In respect of impacts on fisheries, the Expert Group had comprehensive deliberations with senior officials of the Fisheries Department, experts of the Central Inland Fisheries Capture Research Institute (CIFCRI), Barrack Pore, (Vadodara Unit), and with the experts of M.S. University, Vadodara. Dr. S.N. Singh, Head of Vadodara Unit of CIFCRI examined the likely impacts and had prepared a note on various aspects discussing the fishery potential, ecology of the Narmada riverine system, the biological study of the river and a broad assessment of macro-benthos. He found that with a large reduction in the flow of water in the river, the following repercussions may be expected :

- (i) Changes in habitat in terms of hydrographic and hydro-dynamic regimes;
- (ii) Tidal ingress and salinity tongue invasion;
- (iii) Hydro-biological aberrations;
- (iv) Pollutational severity and
- (v) Effect on mangroves eco-system.

Dr. Singh has also quoted case studies by Peter (1981) for the Mtera Reservoir (Great Ruaha river) and that by Davies (1975) for lower Zambezi floodplain. He has also discussed the behaviour of *Macrobrachium Rosenbergii* which migrates into the estuarine region where salinity fluctuates between 5 and 20 PPT. However, since a flow of over 67 cumecs is to be

-15-

maintained down-stream of the confluence of Karjan river with the Narmada and since the reduction of flow will be for a short duration of about 6 to 15 days only, the adverse impact on fisheries, in general, is expected to be limited. In any case, no quantitative assessment of the impact is possible as reported by him as also other experts who advised on fisheries aspects. The main consideration is that the reduction of flow is for a very limited period and there are a large number of factors which enter into such quantitative analysis which are very difficult to evaluate for such a short period.

The experts of the Fisheries Department also assisted in assessing the likely impacts in the down-stream river. The specieswise fish production from the Narmada Estuary is presented in Annexure + 4 for a period of 11 years from 1981-82 to 1991-92. These are the figures of actual catches and do not indicate the potential of the river as such. The Fisheries Department also attempted analysis of specieswise fish catches from the estuary for the month of December alone and the data for three years (1990, 1991 and 1992) is given in Annexure 5. Obviously, there are limitations of collection and compilation of monthwise data and the catches are dependent not only on flows in the river and availability of nutrients but also on other socio-economic factors like number of fishermen who choose to do fishing in the month of December, etc. Nevertheless, the catches vary from about 158 M.T. to about 877 M.T. which form limited percentages of annual catches. This clearly indicates that in the month of December, the catches are at a relatively low level. Second migration of Hilsa in the river Narmada occurs only in February and the

-16-

catches of this species will not be adversely affected. The Expert Group found that the following factors need consideration :-

- (1) Narmada estuary is a major source of seeds for the giant fresh water prawns (*Macrobrachium Spp.*) for the whole of Gujarat and annually about 1.5 to 1.75 crores of seedlings are collected from the river stretch from Zalod to Bharuch with about 400 families engaged in the trade. The seed is collected by bush traps along the shallow areas of the river. The seed collection is done in the period of November to January normally. It is likely that shallow areas may get exposed due to reduced flow during the period of reduced discharge which may affect the seed collection activity.
- (2) On account of reduction of fresh water discharge, the effect of pollution due to industrial effluent discharges near Aliabet may accentuate with the pollution remaining in the estuary for a longer period. This may affect the *aquatic* life in the relevant zone of the estuary.
- (3) So far as fresh water fishery in the main river is concerned, there is an apprehension that with sharp reduction in flow as a result of closure of sluices, the natural tendency of the fresh water fish will be to migrate upstream and cluster up in available pools and in the main constricted river current. Such clustering will result in large accumulations of fresh water fish in specific stretches specially in Reach-1 of the river, and it may be possible for the people to catch the fish very easily. This may result in temporary

-17-

over-fishing.

As regards the Prawn seedling collection, the Group found that it would be possible to manage and plan in advance the seedling collection in the period before closure of the sluices i.e. in the month of November and a part of December. After the flow is restored, say by late December, there would be no problems for seed collection. The impact on seedling collection, thus, can be mitigated considerably by a planned collection strategy which is proposed to be implemented by the Fisheries Department.

As regards the pollution aspect, it is true that the effluents from the Ankleshwar Industrial Estate are being discharged in the estuary at present after some treatment. Nevertheless, chances of pollution prevailing for a longer time in the estuary may not be ruled out. However, the Group suggested that during the period of flow reduction, the Gujarat Pollution Control Board may persuade the concerned industries to adopt stringent controls so that the quality of effluents is kept within permissible limits. It should not be difficult to obtain the necessary support and co-operation from the concerned industries for such a limited period.

As regards the apprehension about temporary over-fishing due to clustering of fresh water fish, this phenomenon may occur. However, the fact that the river would carry about 67 cumecs of flow which, in any case, is more than summer flow of the river in most years, may retrieve the situation partially. In any case, releases from right bank system of Karjan Project fairly in advance of actual closure of the sluices, say by about 12 to 24 hours, may also help in

mitigating sudden discharge reduction. It will be seen that by appropriate mitigatory actions, as discussed earlier, adverse impacts on fisheries will be reduced to a great extent.

IMPACT ON FLORA AND FAUNA :

The impact on fisheries fauna has been dealt with in the preceeding paragraph. Dr. Singh of CIFCRI, Baroda unit has discussed in his note the present status of planktonic biomass in different river reaches with reference to the long term studies that his Institute is conducting for the Narmada river and estuary. However, quantitative estimates of changes in planktonic biomass in the short period of fresh flow reduction in the river as well as to the estuary could not be made due to the interplay of a number of complex factors which need to be evaluated by full-fledged long duration studies.

In general, the closure being for a short period and with the flow of about 67 cumecs being maintained in the closure period (which is higher than the minimum natural flow of the river in the past in December in many years), the Expert Group felt that there may not arise any noticeable adverse impacts on flora and fauna of the river and the estuary other than those on fish and aquatic life on a limited scale as brought out earlier in the report.

SYNTHESIS OF MITIGATORY PLANS :

The Expert Group examined all relevant implications linked to the closure of construction sluices of the Sardar

-19-

Sarovar Dam. In the first instance, the Group was convinced that the closure of construction sluices in the year 1993 is inevitable and is a must from considerations of safety and long term trouble-free operation of the massive concrete dam. Postponing of closure to 1994 is faced with several hazards on which chances cannot be taken as indicated earlier.

The Group also examined the timing of the closure in the year 1993. The month of December is considered to be the most appropriate time for closure in view of the following reasons:

- (a) This would provide sufficient time for the required follow-up works for making a start on tackling down-stream energy dissipation arrangement from January, 1994 to June, 1994.
- (b) Natural flow in the river will also be adequate to ensure fast filling up of the pool up to Elevation 53^m in the month of December. Efforts should also be made to obtain releases from Bargi Dam to further shorten the filling period.
- (c) A part of storage available in Karjan Reservoir can be effectively utilised to mitigate the down-stream environmental impacts both by way of releases from the canal system as well as from the reservoir via the main Karjan river. Releases from the canal system would specially help in providing satisfactory flow levels in the first reach of the river (a critical reach) from the dam to the confluence of the river Karjan with the Narmada.

-20-

- (d) Natural flow in the tributary rivers and streams would also be at a good level in the month of December to maintain satisfactory flow conditions specially in Reach-1.
- (e) From the view point of impact on fisheries, the month of December is more preferable with larger planktonic activities occurring in the river in the spring and summer months. After the floods of August and September, the second migration of Hilsa occurs only in February.
- (f) Advantage of low tides in the month of December would also be available to minimise likely salinity problems.

The following plan of mitigatory action from the environmental standpoint needs to be followed once the decision to close the construction sluices in the month of December is taken :

- (a) Efforts should be made to keep the period of closure to a minimum. While a period of 15 days is conservatively planned, a shorter period of 6 to 10 days would further help minimising the limited adverse impacts identified.
- (b) Flows from the Karjan systems have to commence in time atleast 12 to 24 hours in advance of actual full closure so that the projected flows get established in the river channel before the main river flow is cut off.
- (c) Planning and collection of prawn seedlings may be arranged in advance (November, 1993) or after the river flow is re-established in January, 1994 to mitigate likely impacts on quantum of seedling collection.

-21-

- (d) The Gujarat Pollution Control Board may arrange in advance dialogues with the Ankleshwar Group of Industries so that the quality of the industrial effluent discharge during the closure period is maintained to an acceptable level. The quality should also be closely monitored.
- (e) A close inter-departmental co-ordination should be maintained so that the concerned departments (Water Resources, Industries, Fisheries, Gujarat Pollution Control Board, etc.) are fully aware of the dates of closure and likely dates of restoration of flow in the river after plugging is completed.
- (f) Each Department should prepare a time-bound mitigatory action plan on the lines recommended in this report. The NPG should be kept informed about such plans.

RECOMMENDATION

On the basis of an overall assessment of the situation, the Expert Group is of the view that the proposal for the closure of construction sluices in the month of December may be accepted. The Expert Group also recommends that necessary follow-up work on the action plan suggested above should be taken up by the concerned Departments of Government of Gujarat so as to minimise, to the extent possible, the limited adverse environmental impacts likely to be associated with the closure

-22-

of construction sluices. The exact date for the closure of construction sluices may be announced by the Sardar Sarovar Narmada Nigam latest by 15th of November, 1993.

* * *

ANNEXURE

Annexure - I

List of Members of the Expert Group of Govt. of Gujarat
constituted by the NPG vide Resolution No.
NPG/Ex.Gr/CSS/238/1365 dated 28/9/1993.

(1)	Dr. M.T. Pathak Executive Member, Narmada Planning Group	Chairman
(2)	Shri D.T. Buch Invited Member, NPG	Member
(3)	Shri B.J. Parmar Executive Director, SSNNL	Member
(4)	Shri G.L. Jawa, Chief Engineer (Designs) SSNNL	Member
(5)	Shri M.B. Mehta Chief Conservator of Forest for SSP	Member
(6)	Dr. Bony Pilo Professor, Zoology, M.S. University, Baroda	Member
(7)	Dr. S.J. Bedi Professor, Botony, M.S.U., Baroda	Member
(8)	Dr. S.N. Singh Senior Scientist, CIFCRI, Vadodara Unit, Vadodara	Member
(9)	Shri R.G. Bhatt, OSD (E&S), NPG	Member
(10)	Shri K.M. Menon Deputy Director (Fisheries) Fisheries Dept., Vadodara	Member,
(10)	Shri K.M. Pathak OSD (Technical), NPG	Member & Convenor

.....

ANNEXURE-2

AVERAGE DISCHARGE FOR THE MONTH OF DECEMBER

GAUGE SITE: GARUDESHWAR

RIVER: NARMADA

YEAR	TOTAL DISCHARGE	AVERAGE DISCHARGE CUMecs
(1)	(2)	(3)
1948	7980.0	498.8
	5256.0	328.5
	4623.0	288.9
	3851.0	275.1
1949	4592.0	287.0
	4181.0	261.3
	3440.0	215.0
	2936.0	209.7
1950	3615.0	225.9
	3127.0	195.4
	2446.0	152.9
	2192.0	156.6
1951	2192.0	137.0
	2039.0	127.4
	1959.0	122.4
	1612.0	115.1
1952	2038.0	127.4
	1706.0	106.6
	1588.0	99.3
	1326.0	94.7
1953	2351.0	146.9
	2088.0	130.5
	1837.0	114.8
	1579.0	112.8
1954	5465.0	341.6
	4375.0	273.4
	3471.0	216.9
	2891.0	206.5
1955	5165.0	322.8
	4064.0	254.0
	3811.0	238.2
	2937.0	209.8

-2-

(1)	(2)	(3)
1956	3797.0	237.3
	3763.0	235.2
	3554.0	222.1
	3158.0	225.6
1957	2583.0	161.4
	2379.0	148.7
	2266.0	141.6
	1748.0	124.9
1958	2070.0	129.4
	1136.0	91.0
	1352.0	84.5
	1036.0	73.1
1959	11939.0	497.5
	10687.0	445.2
	9057.0	377.4
	6029.00	334.9
1960	3766.0	156.9
	3608.0	150.2
	3176.0	144.4
	2363.0	132.4
1961	6269.0	348.3
	6444.0	268.5
	5432.0	226.6
	4512.0	218.5
1962	1825.0	229.8
	8757.0	366.1
	6569.00	279.1
	3377.0	187.6
1963	4388.0	182.8
	2922.0	121.8
	2249.0	93.7
	1909.0	90.9

-3-

(1)	(2)	(3)
1964	4189.0	174.5
	3769.0	157.0
	3619.0	150.8
	2984.0	142.1
1965	433.00	54.1
	411.0	51.4
	461.0	57.6
	344.0	49.1
1966	1121.0	70.1
	1072.0	67.0
	972.0	60.8
	800.0	57.1
1967	3949.0	164.5
	4591.0	191.3
	8900.0	370.8
	6064.0	303.2
1968	3940.0	164.2
	3798.0	158.3
	3669.0	152.9
	2946.0	140.3
1969	4038.0	168.3
	3462.0	144.3
	3084.0	128.5
	2505.0	119.3
1970	56	
1970	5664.0	236.0
	4749.0	197.9
	4065.0	169.4
	3169.0	150.9
1971	6494.0	270.6
	4965.0	206.9
	4334.0	180.6
	3753.0	178.7

:: 4 ::

=====

1	2	3
1972	5096.0	212.3
	4834.0	219.7
	4545.0	189.4
	3602.0	171.5
1973	6580.0	274.2
	6734.0	280.6
	4516.0	225.8
	4123.0	217.0
1974	4053.0	193.0
	4130.0	179.6
	3730.0	162.2
	2971.0	141.5
1975	5115.0	213.1
	5772.0	240.5
	4663.0	212.0
	3255.0	162.9
1976	3892.0	162.2
	3215.0	134.0
	2764.0	115.2
	2216.0	105.5
1977	19021.0	792.5
	11053.0	460.5
	9164.0	398.4
	3920.0	217.8
1978	6190.0	269.1
	8618.0	359.1
	4447.0	222.4
	3430.0	180.5
1979	9915.0	413.3
	3317.0	138.2
	2510.0	104.6
	1963.0	93.5
1980	3188.0	132.8
	2603.0	116.8
	2738.0	114.1
	2562.0	122.0

:: 5 ::

=====

1

2

3

=====

1981	3253.0	141.4
	2841.0	118.4
	3113.0	129.7
	3305.0	165.8
1982	3066.0	127.8
	2384.0	113.5
	2338.0	101.7
	1888.0	94.4
1983	4197.0	262.3
	4203.0	191.0
	3812.0	178.8
	2280.0	152.0
1984	1173.0	146.6
	1180.0	147.5
	1090.0	136.3
	921.0	131.6
1985	1353.0	169.1
	1145.0	143.1
	1114.0	139.3
	867.0	123.9
1986	1098.3	137.3
	973.3	121.7
	931.7	116.5
	796.2	113.7
1987	1401.2	175.1
	1157.9	144.7
	1065.4	133.2
	688.1	98.3

:: 6 ::

=====

1	2	3
---	---	---

=====

1988	1820.6	227.6
	1921.9	240.2
	1797.7	224.7
	1222.9	174.7
1989	1941.0	242.6
	1991.2	248.9
	1916.1	239.5
	1928.1	275.4
1990	2420.6	302.6
	2904.1	363.3
	2595.1	324.4
	1949.1	278.4
1991	2327.4	290.9
	2297.7	267.2
	2199.0	274.9
	1532.2	218.9

Averages of four weeks of December, 1946-1991.

I Week	232.25
II Week	202.85
III Week	182.56
IV Week	162.46

ANNEXURE-3

**EXPECTED RIVER FLOWS FROM DIFFERENT SOURCES
IN THE MONTH OF DECEMBER, 1993 IN D/S DAM
UPTO CONFLUENCE OF KARJAN RIVER**

Tributories			
Name of tributories	Catchment area in sq.km.	Capacity during December (in cumec)	Remarks
(a) Left Bank			
1.Dhir Khadi	50	0.50*	*The observed flow actually measured on 7-1-93 was 4.13 cumec
2.Shamaria Khadi	76	0.75	
3.Other small tributories	50	0.50	
4.Flow from Gora Distributory	+	5.70	+Gora - distributory is part of R.B.M.C. of Karjan Project
i.Gora Khadi	0.2		
ii.Tilakwada (Escape)	5.5		
200 cusec (135 + 70)			
Left bank Total		7.45 cumec	
Say		7.50 cumec	
Right Bank			
1. Rockfill dykes no.2 drift (2.0 x 1.80)		0.50	This is feasible by pumping
2. Sukhli Khadi	196	1.30	
3. Men river	275	1.50*	*The flow in Month of Dec.for Men River as per records is 3.5 Mm3 (year 1983-84) i.e. 1.50 cumec
4. Ashwin river	250	1.50	On pro-rata basis
Right bank Total		4.80 Cumec	
Say		5.00 Cumec	
Grand Total		12.50 Cumec	

const.sls

SX NO	NAMES OF FISH	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
1	CAT FISH	1818	1768	1434	874	1412	1177	1172	1184	1608	1097	915
2	BOMBAY DUCK	—	—	—	497	515	585	730	800	571	670	215
3	CLUPEIDS	3756	2733	2224	2845	1930	2901	3610	2691	4409	12243	1117
4	MULLET	1071	1068	845	823	1224	1178	1226	1081	1441	941	729
5	PRAWNS C MEDIUM	2327	2149	2402	1175	1254	742	477	643	598	635	778
6	PRAWN SMALL	—	1782	1794	1524	2344	1641	1437	817	1356	1072	589
7	CRAB	—	—	—	—	—	—	203	242	10	60	22
8	LEVTA	283	445	580	1142	321	379	534	172	174	408	270
TOTAL		9255	9945	9279	8880	9000	8403	9379	7630	10167	17126	14655

ANNE XURE - 5

TREND OF SPECIES WISE FISH CATCH FROM
NARMADA ESTUARY IN DECEMBER 1990 TO 1992
IN M. TONS.

Sr NO	TYPE OF FISH	DEC. 1990	DEC. 1991	DEC. 1992	REMARKS
1	CATLA	10.920	1.900	17.546	
2	ROHU	21.295	8.230	30.584	
3	MRIGAL	3.672	0.400	14.012	
4	CALBASU	---	---	---	
5	MINOR CARPS	---	---	0.248	
6	WALLAGUATTU	15.284	8.136	76.666	
7	MURREL	5.208	7.736	22.872	
8	MYSTUS SINGALI	70.177	27.738	162.641	
9	BOMBAY DUCK	53.304	0.320	111.704	
10	HILSA	---	---	13.540	
12	MULLETS	51.587	25.296	160.647	
13	EEL	---	---	2.418	
14	PRAWN (MED)	52.456	7.632	12.124	
15	PRAWN (SMALL)	71.767	40.474	132.028	
16	MUAS KIPPER (ZEUTA)	25.525	---	211.800	
17	MISC	149.041	29.738	177.433	
	TOTAL	510.438	154.600	877.232	

PLATES

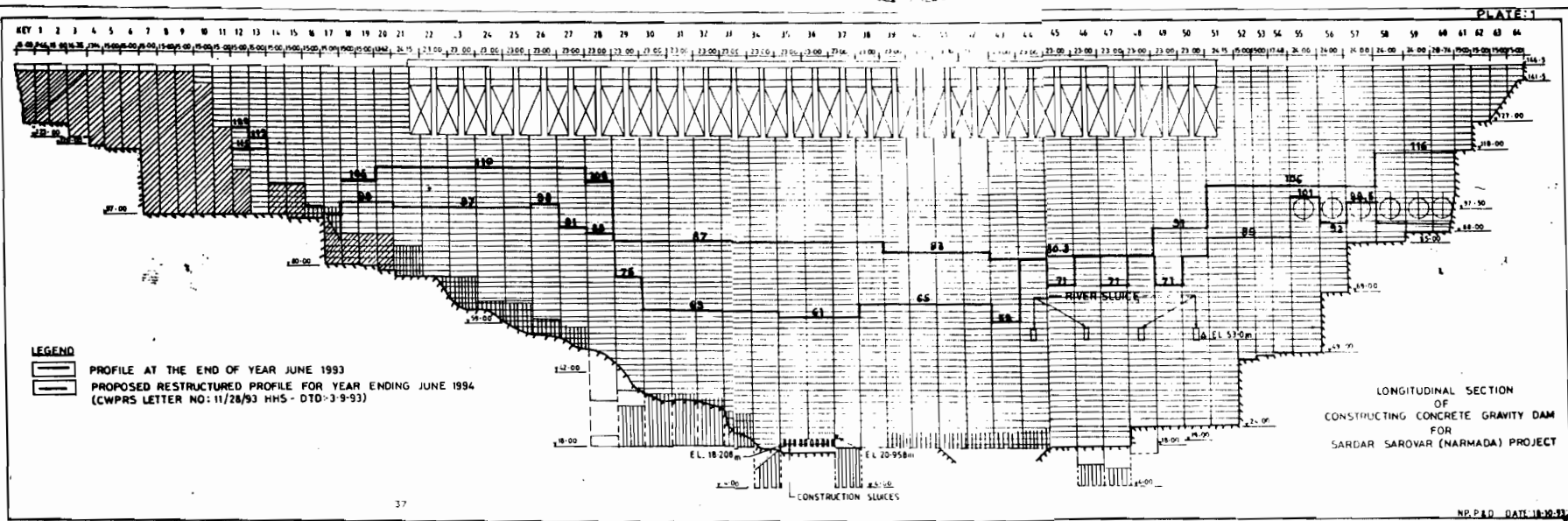
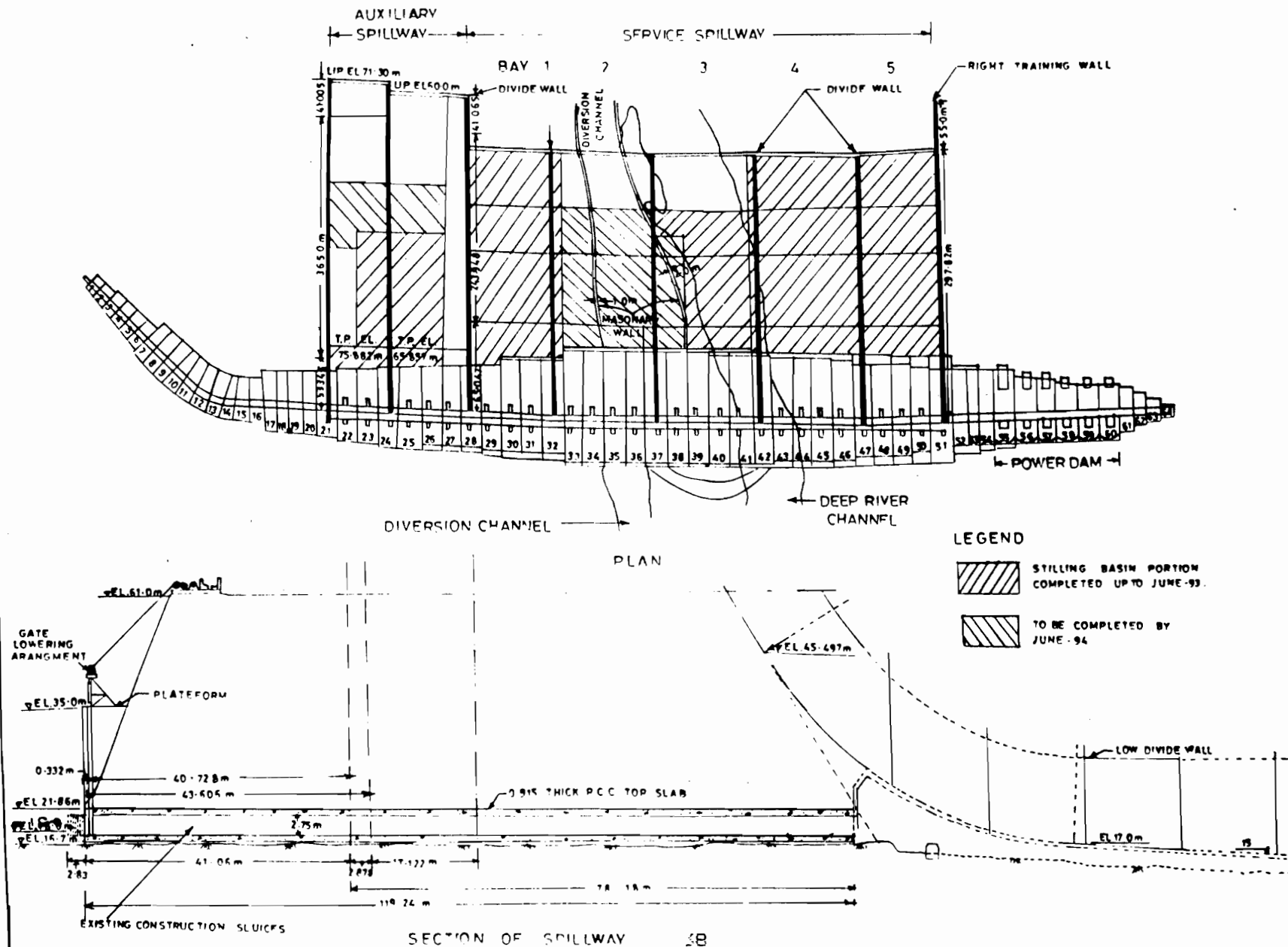


PLATE IV



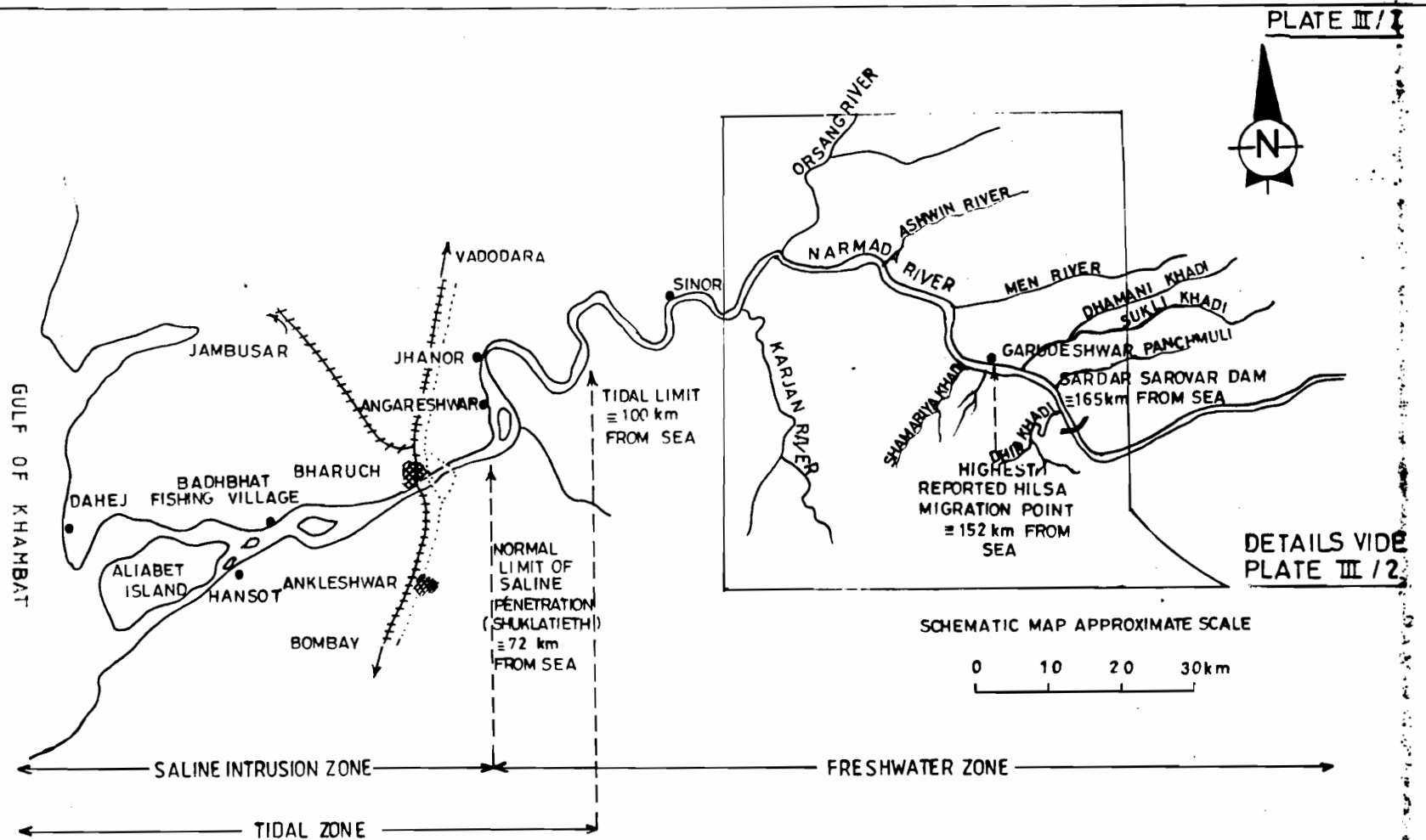
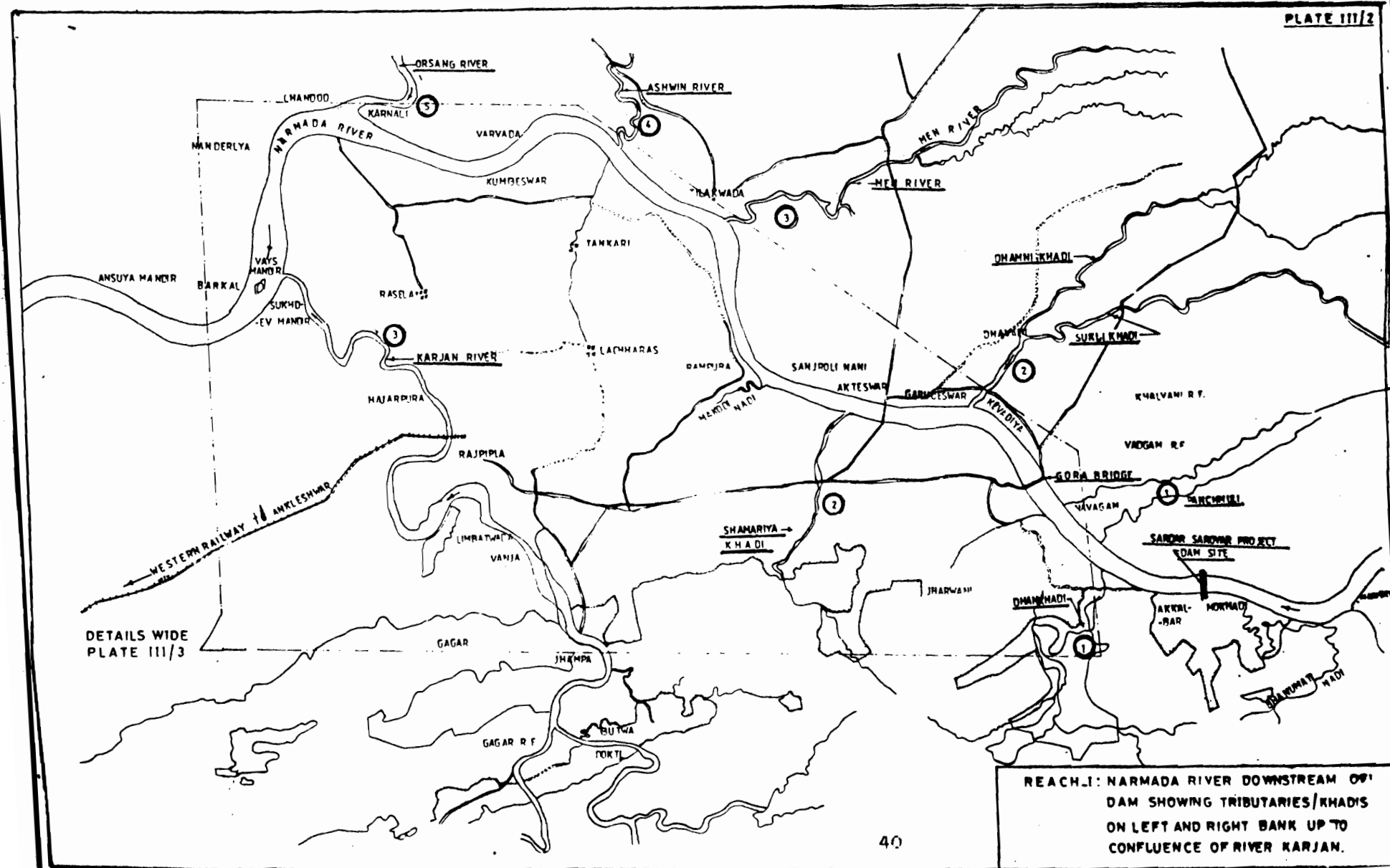
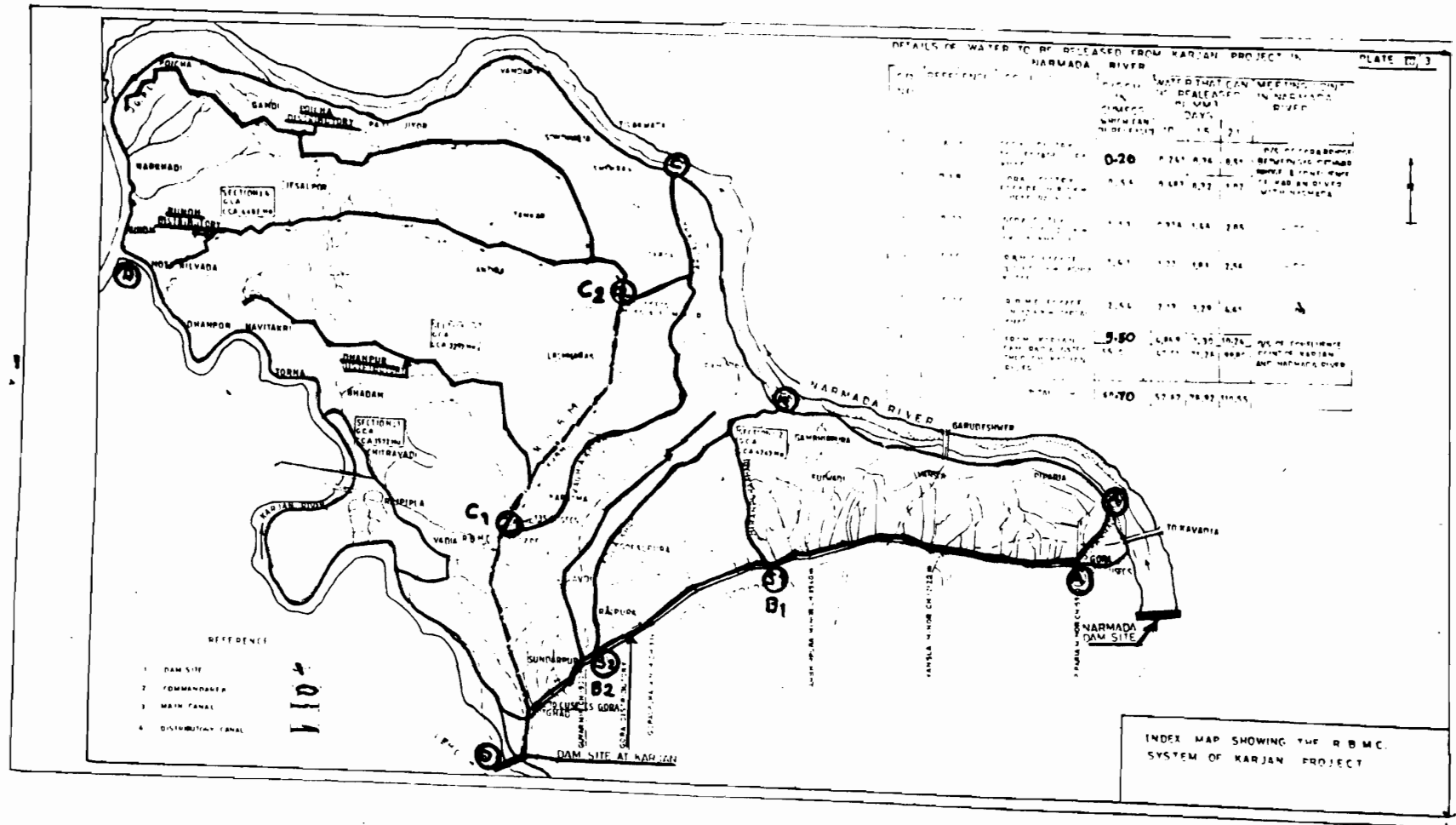
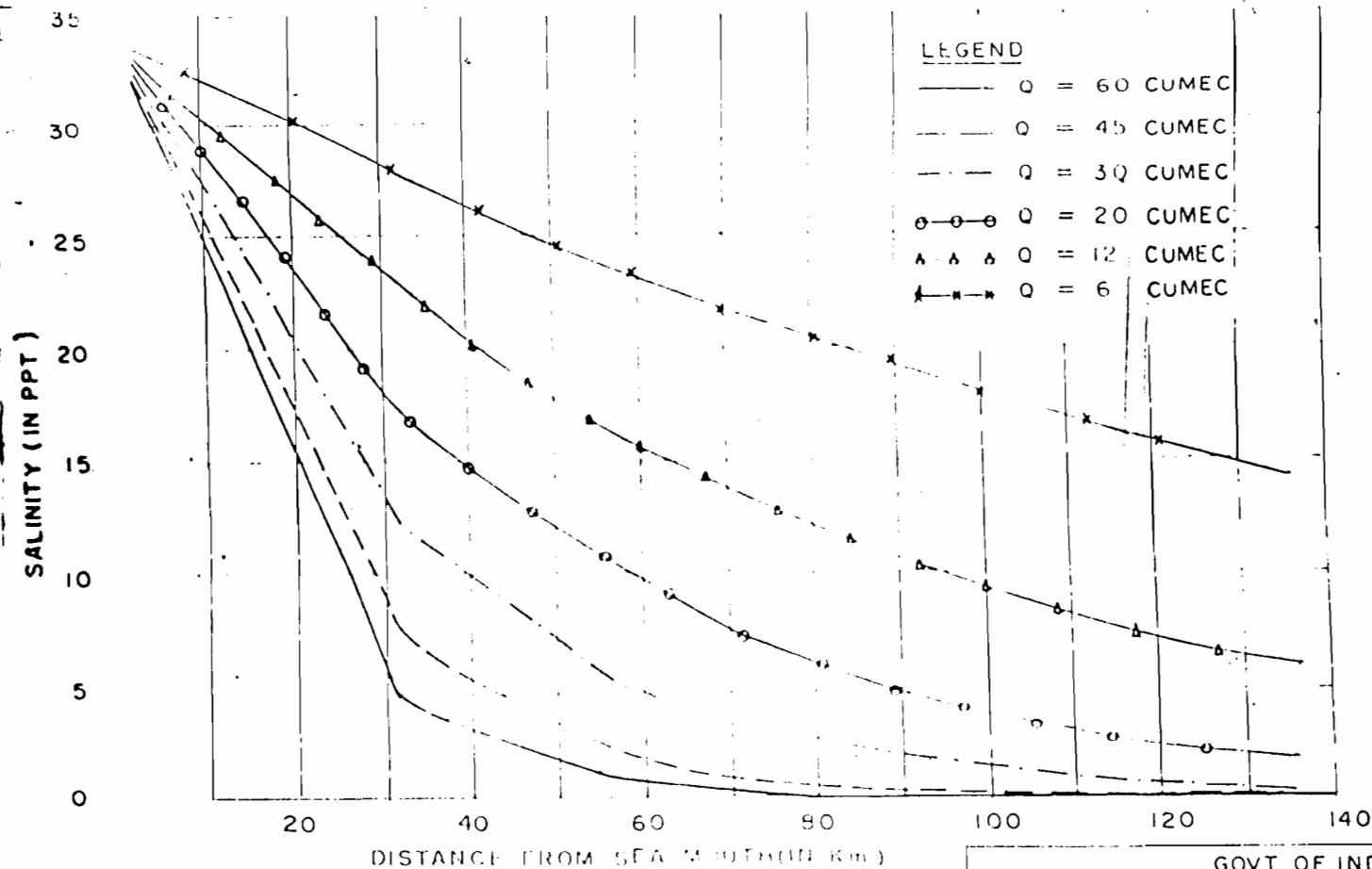


FIGURE 1 LOWER NARMADA RIVER AND ESTUARY







GOVT OF INDIA
CENTRAL WATER AND POWER RESEARCH STATION
KHADAKWASLA PUNE 411024

COMPARISON OF SALINITY IN
NARMADA RIVER FOR
DIFFERENT FRESH WATER DISCHARGES

DRN	FIG 5	APPD
TRD <i>— fuel</i>	SCALE	DATE
CHD <i>K. H.</i>	DIVN COMP	DRG No.

INTERIM REPORT ON THE GROUND WATER STUDIES IN THE COMMAND
AREA OF NARMADA SAGAR AND ONKARESHWAR PROJECTS.

-:: CONTENTS ::-

1.	<u>PRELUDE.</u>	1
2.	Ground water studies in Narmada Sagar Composite command.	(1)-4
3.	Monthly Rainfall Data.	5
4.	Sample Verification of important Aquifer Parameter, unit draft & Pumping tests.	(6)-7
5.	Study of natural Drainage, Dykes and Lineaments.	8
6.	Statistics regarding Tubewells and Dugwells in N.S.C. Command.	8
7.	<u>TABLE -1.</u> Static water level of 100 wells in entire composite command of N.S.C. and Onkarashwar Projects.	9-15
8.	<u>TABLE -2.</u> An Abstract of Different Values of Aquifer parameter obtained from pumping tests Conducted in Narmada Sagar Command.	(15-17)
9.	<u>TABLES -3.</u> Rain Fall Data.	18
10.	<u>MAP.</u>	19
1)	<u>Annexure -1.</u> MAP Showing Location of well in composite command.	
2)	<u>Annexure -2.</u> MAP Showing Depth to water table, post Monsoon 1991.	20
3)	<u>Annexure -3.</u> MAP Showing Depth to water table, premonsoon 1992.	21
4)	<u>Annexure -4.</u> MAP Showing Depth to water table in satak Command post-Monsoon.	22
5)	<u>Annexure -5.</u> MAP Showing Depth to water table in satak command pre-Monsoon.	23
		contd.2.

//2//

6)	<u>Annexure -6.</u>	24
	MAP Showing Depth to water level in Kunda Command Post-Monsoon.	
7)	<u>Annexure -7.</u>	25
	MAP Showing Depth to water level in Kunda Command Pre-Monsoon.	
8)	<u>Annexure -8.</u>	26
	MAP Showing water level Fluctuation Zones in N.S.C. Command Area.	
9)	<u>Annexure -9.</u>	27
	MAP Showing Permeability Zones N.S.C. Command.	
10)	<u>Annexure -10.</u>	28
	MAP Showing Specific Yield Zones in N.S.C. Command.	
11.	<u>GRAPH ANNEXURE -11.</u>	29
	Total Rainfall in year 1991-92.	
12.	<u>GRAPH ANNEXURE -12.</u>	30
	Total Rain Fall in year 1990-91.	

GUPTA//

①

INTERIM REPORT ON THE GROUND WATER STUDIES IN THE COMMAND AREA
NARMADA SAGAR AND ONKARESHWAR PROJECTS

1. PRELUDE :- On suggestion of member, (Engineering), N.V.D.A. a meeting was organised at Indore on 30-05-91 between officers of N.V.D.A. and ground water survey organisation to explore the possibilities of conducting further studies in respect of water logging aspect in Narmada Sagar composite command. In the meeting following terms of reference was decided and allocated to Groundwater:

- (A) Groundwater monitoring or monthly well observation.
 - (i) One well per two adjacent villages in the whole command area.
 - (ii) 50 wells evenly distributed in Satak command area.
 - (iii) 25 wells evenly distributed in Kunda command area.
 - (iv) A few wells up-stream and down-stream of dykes.
- (B) Monthly rainfall data.
- (c) Sample verification of important aquifer parameters, i.e. unit draft and pumping tests etc.
- (D) Study of natural drainage, dykes, lineaments in the command area.
- (E) Statistics regarding tubewells and dugwells.

2. Ground water studies in Narmada sagar composite command :-

On the basis of decision taken in the meeting etc. 30.5.91 ground water studies have been initiated after obtaining Administrative approval from chief Engineer, Indira Sagar Project, (canals), Sanawad. The details of study and results thereon are given below:-

//2//

2.1 Ground water monitoring :-

Ground water monitoring schedule adopted in the study is as given below :-

(a) Monthly water level monitoring in phreatic aquifer at 100 locations distributed in the entire area. This monitoring was done between November 1991 to March 1992 and later monitoring at 12 locations was discontinued to avoid duplication of observations by officers of N.V.D.A. and ground water organisation. The monthly monitoring on 88 locations is continuing. The location of 88 monitoring stations is indicated in map enclosed. This map shows the areas where water levels in Nov. 91 were in the range of 0 to 4 mts. All these areas have been indicated by red out line. These areas may become critical when irrigation is introduced. Critical monitoring in these areas will be needed adopting micro basin concept i.e. in ground water discharge areas.

The water level fluctuation map has also been prepared and is enclosed at annexure..8..... This map indicates the difference in water level of Nov. 91 and May 92, of the same precipitation year. It can be inferred from this map that where fluctuation is maximum more sub surface storage for ground water is available. The areas where fluctuation is low, the lesser sub surface ground water storage space is available. These maps will now be used for interpretation of areas susceptible to water logging. For this the microbasin map of the area will be superimposed and efforts will be made to understand the response of future irrigation. It is well known that in groundwater discharge areas the fluctuation is low and if these areas are subjected to further recharge by irrigation waters they may

//3//

convert in to critical areas, requiring attention. For deciding this the canal map, vis-a-vis, ground water recharge-discharge zones will be taken in-to account and suggesetions will be given in the final report.

Under groundwater monitoring the R.L!S of various observation points have not been taken for want of provisions in the Administrative approval. It is felt that this item be included in the study, so that groundwater contour map may be drawn.

2.2. Groundwater studies in Satak command :-

As per decision, water level monitoring is being done at 50 observation points located in phreatic aquifer. The frequency of observation is 12 times in a year, i.e. monthly.

2.3 Groundwater studies in Kunda command :-

As per decision water level monitoring is being done at 25 observation points located in phreatic aquifer. The frequency of observation is 12 times in a year i.e. monthly.

The comperative study of water levels in different seasons in these different commands has been done and is shown in the following table :-

//4//

Name of Command	Average water levels (in m)			Average fluctuation (in m)		
	Post monsoon (Nov.91)	End of Rabi (Feb. 92.)	Pre monsoon (May 92)	Post to Rabi	Rabi to Pre	Post to Pre
Narmada Sagar	8.50	10.06	10.92	1.56	0.88	2.42
Satak	6.35	7.12	9.14	0.77	2.02	2.79
Kunda	9.37	11.04	12.10	1.67	1.06	2.73

The above table shows that in the Narmada Sagar composite command, including Kunda command, the average water level decline between post monsoon to end of Rabi season is rapid, whereas in the same season, the water level decline in the Satak command is comparatively low. When we compare the average annual fluctuation in these (3) areas, it is roughly same. The difference in water levels and rate of decline is roughly indicated in the above table.

The water level decline from end of Rabi to pre-monsoon is 0.88, 2.02 and 1.06 mtr. This is less in case of Narmada Sagar and Kunda command. The probable reason for this less decline in the peak summer months may be due to the following reasons :-

(1) Inadequate monitoring of suitable wells. The wells are getting dry and hence water level observation in them in pre-monsoon is not possible. Monitoring on less number of dug well is probably insufficient. This inadequacy of water level observation may

//5//

probably be a reason for obtaining lower value of water table decline in summer months.

(ii) The low decline in peak summer months may be because of location of wells in discharge areas or in the upstream direction of dykes.

The cause will be examined and in the final report a possible explanation will be given.

3. Monthly Rainfall Data :-

The monthly rainfall data from June, 90 to May, 92 has been collected from 9 rain gauge stations located in Khargone, district. The details are enclosed in table No. 3. A bar diagram showing monthly average rainfall is also prepared and shown in Annexure. 1. 4. 2.

The perusal of table no. 3 shows that between Jan., 91 to May, 91 area received no rainfall, where as between June, 91 to May, 92, the months of Oct., 91 and Dec., 91 to May, 92 (7 months) no rainfall was received in the command area. The Table 3 also shows that the rainfall in the year 1991-92 was about 32% lower than the year 1990-91 was about previous year. The rainfall data for 92-93 has also been collected. This has not been enclosed because observations are still continuing but the indications are that in the year 92-93 the rain fall is still less. Complete rainfall data for 3 years will be given in the final report. Rainfall pattern during the period of observation shows that there is a

..6..

//6//

declining trend in the ⁿquantum of rainfall. However data on rainy days in the command is not available and hence the same has not been enclosed.

4. Sample Verification of Important Aquifer parameters, Unit draft & Pumping tests :-

The problem of water logging in Narmada Sagar composite command was referred to Indian Institute of science, Bangalore and they have conducted preliminary study by applying modern computer Techniques. In their study they determined certain parameters. These parameters were based on ground water monitoring data supplied by ground water surveying ^{wing} of water Resources Department, M.P. Their report is available with N.V.D..

This study has been taken to determine relevant ground water parameters of phreatic aquifer in the N.S.C. command taking more samples.

(a) Sample verification of important aquifer parameters:-

Groundwater survey wing has conducted pumping tests in 64 dugwells. The pumping tests have been conducted with a view to determine following parameters :-

(i) Specific capacity of wells located in phreatic aquifer. The specific capacity is determined at 49 locations.

(ii) Permeability of phreatic aquifer by using methods suggested by Adyalkar and Mani. The permeability has been determined at 49 locations.

..7..

1/7/11

(iii) The specific yield of phreatic aquifer has been determined at 49 locations.

(iv) The unit area specific capacity of dugwells has been determined at 49 points.

The data of 15 wells is under analysis. The average x values of different parameters along with their locations is shown in Table The location map is enclosed at Annexure..!.....

An attempt has been made to draw different permeability and specific yield zones in the N.S.C. command and the same is enclosed at Annexure.^{9 & 10}.....

(b) Unit Draft of dugwells :- Unit draft studies have been conducted on 70 wells. The purpose of this study is to give the probable average groundwater draft. from dugwells in different irrigation seasons. The ~~initial~~ analysis has not been completed but the initial indications suggest that the average unit draft may be 0.8 hectare meter per well per year.

The study of unit draft will also help in determining the dugwell elements viz. optimum diameter and minimum safe spacing. These two parameters will ultimately help in planning and management of dugwells in N.S.C. command when conjunctive use concept is introduced for integrated use of surface and ground water.

The pumping test data analysed till date in irrigated and unirrigated areas (Satak, Kunda and N.S.C. command) shows

..8..

//

difference in the yield capacities in these areas. The difference in well yield capabilities (quantity and hours) is due to impact of irrigation. These studies if taken in optimum numbers, can suggest an suggest effect on dugwells of future irrigation in N.S.C. command. The incremental quantity of ground water may be used for increasing irrigation intensity. This aspect needs attention and further study.

5. Study of natural drainage, dykes and lineaments :-

Natural drainage, dykes and lineaments in the command area are to be studied together to establish under ground drainage system.

On this aspect of study the dyke map annexed in the I.T.S., Bangalore, report has been used. The Madhya Pradesh council of science and Technology has also studied the area and their map indicating various dykes is also being utilized.

On above aspect, the study is in progress and effect of dykes on performance of wells is being studied. This study will be completed in next six months. The analysis of data and other relevant information shall be given in the final report.

6. Statistics regarding Tubewells and Dugwells in N.S.C. command :-

The data has been collected regarding the existing tubewells and dugwells in the entire command area. This data collection will continue till the end of study. The information collected under this item includes strata charts of tube wells, their yield test and design.

[Signature]
Superintending Engineer,
Ground Water Survey Circle,
Resources Deptt., Bhopal (M.P.)

[Signature]
Senior Geohydrologist
(Executive Engineer)
Divisional Ground Water Survey
Unit No. 6, Am. ~~000000~~ Khajuraho (M.P.)

[Signature]
Senior Geohydrologist
District Groundwater Survey Unit
KHANDWA

S.W.I. OF 100 WELLS IN ENTIRE COMPOSITE COMMAND OF
HARMADA S. R. & OKRA SHEVAR PROJECTS.

Well No.	Village	Total Depth (in mts)	Static water level (in mts) B.g.s		
			Post monsoon 1991	Rabi season 1992	Premonsoon 1993
1.	Kelwa	10.40	8.70	10.30	-
2.	Gaol	12.20	8.70	10.70	-
3.	Sulgaon	9.40	6.10	9.00	-
4.	Sanawad	18.70	3.70	6.20	9.10
5.	Baswa	16.10	14.30	15.40	-
6.	Bamangaon	10.70	8.80	10.10	-
7.	Bhanbarad	14.80	11.80	13.00	-
8.	Dhangaon	9.40	5.40	Dry	-
9.	Mortakk	10.10	5.60	5.80	6.60
10.	Barwaha	17.30	9.30	10.10	11.20
11.	Umariachauki	11.90	5.70	8.20	11.40
12.	Bardiya	10.20	7.00	8.30	9.40
13.	Pipaliya	5.70	2.50	3.35	5.50
14.	Jamaniya	13.40	12.60	Dry	Dry
15.	Karhi	5.80	3.20	5.60	Day
16.	Katargaon	15.80	11.30	15.30	14.60
17.	Dhargaan	12.10	10.60	11.50	11.80
18.	Mandleshwar	13.40	10.40	10.70	12.90
19.	Choli	6.00	2.60	3.05	5.80
20.	Mehatwada	13.20	10.70	11.35	13.10
21.	Maheshwar	10.60	7.20	8.00	8.40
22.	Badwi	12.70	10.45	11.75	12.00
23.	Dhani	11.10	8.00	11.10	Dry
24.	Sundrel	13.50	8.90	9.65	Dry
25.	Dharampur	18.75	16.10	17.40	18.80
26.	Eklara	9.10	7.25	7.80	7.60
27.	Tawla	11.00	6.30	Dry	9.80

(10)

Well No.	Village	Total Depth (in mts.)	Stated water level (in mts.) b.g.l.		
			Post monsoon 1991	Rabi season 1992	Premonsoon 1993
28.	Thangaon	17.50	13.50	14.80	14.40
29.	Bakaner	15.20	14.35	14.35	15.00
30.	Ajandi man	11.70	10.50	11.45	Dry
31.	Tonki	14.10	9.10	12.95	Dry
32.	Manawar	14.55	13.85	14.10	14.20
33.	Dedla	11.60	10.70	11.35	11.40
34.	Barud	9.10	7.20	Dry	Dry
35.	Singhana	10.20	6.70	7.85	Dry
36.	Chikhalda	9.50	8.30	Dry	17.80
37.	Chikhalda	20.90	16.40	10.10	17.80
38.	Kadmal	6.85	3.70	4.65	5.30
39.	Nisarpur	7.70	5.75	6.30	Dry
40.	Sondut	11.70	10.50	Dry	Dry
41.	Kathora.	7.70	5.50	6.20	7.40
42.	Pichhodi	3.00	280	Dry	Dry
43.	Barwani	7.50	3.10	4.10	7.40
44.	Sajwani	16.00	12.80	14.90	15.40
45.	Kari	10.70	5.10	7.80	10.30
46.	Talun	5.20	4.00	4.90	Dry
47.	Borlai	17.70	13.20	14.70	Dry
48.	Anjod	12.20	9.70	11.40	Dry
49.	Bilwa Road	8.40	3.30	5.10	Dry
50.	Chakeri	10.80 (+)	9.50	10.70	Dry
51.	Mandwada	27.00	20.50	24.00	26.00
52.	Surana	10.10	9.20	Dry	Dry
53.	Jalwada dep	10.70	3.80	6.35	8.20
54.	Hathda	14.65	7.70	10.00	14.30

(11)

...3..

1.	2.	3.	4.	5.	6.
55.	Davana	12.70	11.10	12.40	Dry
56.	Bramhangaon	23.00	15.50	19.50	Dry
57.	Kuwa.	11.70	8.20	9.90	1.10
58.	Thikari	13.10	9.40	10.60	12.00
59.	Kharrampur	7.40	6.80	Dry	Dry
60.	Barujatak	12.00	9.70	11.00	Dry
61.	Satrati	9.40 (12.00)	6.40	8.70	9.80
62.	Nimrani	12.40	7.60	9.30	9.70
63.	Khaltaka	12.30	7.90	10.00	12.10
64.	Khalghat	28.20	20.80	21.55	21.20
65.	Kasrawad	13.70	8.70	10.00	12.80
66.	Navdataudi	12.70	8.00	10.30	9.50
67.	Makadkheda	31.00	23.70	26.30	28.00
68.	Gopalpura	8.80	7.30	8.30	Dry
69.	Ojhara	7.80	4.00	6.00	7.20
70.	Sawada	9.70	5.30	7.40	9.50
71.	Jawada	6.30	4.00	Dry	Dry
72.	Lohary	8.40	5.40	7.50	Dry
73.	Dogawa	28.80	27.30	25.10	-
74.	Badi	12.20	9.00	9.50	-
75.	Pipalgon	3.40	4.50	6.00	6.60
76.	Laindi	9.40	6.60	7.65	Dry
77.	Konapur	8.20	4.70	6.20	7.90
78.	Katora	13.30	9.30	10.65	-
79.	Barud	17.10	16.00	Dry	Dry
80.	Salajana	6.70	5.20	Dry	Dry
81.	Chitawad	10.00	9.60	Dry	Dry
82.	Bedia	10.25	4.70	6.05	-

..4..

...4..

1.	2.	3.	4.	5.	6.
83.	Amba	5.90	3.70	Dry	-
84.	Rodia	10.10	5.70	6.90	Dry
85.	Ahirkheda	7.45	4.30	5.20	Dry
86.	Andhad.	8.95	5.40	7.35	Dry
87.	Machhalgaon	9.55	5.20	8.10	Dry
88.	Gogawa	7.25	5.20	5.85	Dry
89.	Mohammadpur	10.90	8.00	9.80	10.80
90.	Surpala		7.90	9.00	9.70
91.	Thibgaon	7.60	6.00	Dry	Dry
92.	Balwadi	8.40	5.60	7.00	Dry
93.	Kharone	15.10	9.80	10.30	11.8
94.	Gopalpura	13.50	8.10	10.00	11.55
95.	Ghugharia khedi	7.30	6.00	Dry	Dry
96.	Bildli	8.60	4.50	7.80	Dry
97.	Temarani	10.60	6.20	8.00	8.80
98.	Bamnala	13.80	12.10	12.70	Dry
99.	Surva	12.00	7.00	10.50	11.60
100.	Saikhedi	10.45	8.70	10.10	10.20
101.	Bhilgaon	8.80	6.15	7.80	Dry
102.	---	8.80	6.65	6.70	7.90
103.	---	8.00	5.90	6.85	7.70
104.	Ekalgariya	8.10	3.90	5.60	Dry
105.	---	10.60	5.10	6.35	9.40
106.	---	8.00	3.60	4.20	6.40
107.	Satkur	14.45	9.25	8.70	13.10
108.	---	16.40	9.80	8.40	12.10
109.	---	7.60	4.80	4.85	7.20
110.	-Katkur	8.80	5.80	5.80	8.10

..5..

(13)
...5...

1.	2.	3.	4.	5.	6.
111.	Pagabheddi	7.20	4.00	4.80	6.80
112.	"	8.80	3.70	4.55	6.20
113.	"	9.60	6.00	7.90	9.10
114.	Salimpura	9.20	5.50	5.85	8.10
115.	"	5.40	3.10	2.75	4.80
116.	"	8.70	5.50	5.70	Dry
117.	Bamandi	11.70	3.30	4.00	6.50
118.	"	7.70	5.85	6.00	Dry
119.	"	9.00	3.60	6.55	7.00
120.	Bamanda	7.00	5.80	5.95	6.60
121.	"	6.10	4.40	4.55	6.00
122.	"	8.80	2.90	3.75	6.00
123.	Roopkheda (chhota)	5.10	2.90	3.30	Dry
124.	"	9.80	4.40	5.10	Dry
125.	"	9.70	6.40	2.10	4.90
126.	Roopkheda (Bada)	8.70	1.90	2.85	6.40
127.	"	5.70	2.50	3.00	5.40
128.	"	9.50	3.50	3.45	6.90
129.	Regwa	9.30	2.90	2.70	4.60
130.	"	9.00	2.20	2.30	4.10
131.	Sonkhedi	8.70	6.70	8.10	Dry
132.	"	10.70	9.10	10.30	Dry
133.	"	7.90	5.50	7.15	Dry
134.	Dhamnod (Ahir)	8.40	5.40	7.00	Dry
135.	"	7.30	3.60	4.85	Dry
136.	Balkhad	9.70	7.80	7.75	9.60
137.	"	9.10	6.80	7.15	8.60
138.	"	10.50	8.20	8.00	Dry

57

...6...

...6..

(14)

1.	2.	3.	4.	5.	6.
139.	Pathora	11.60	7.30	8.25	10.20
140.	"	9.90	4.40	9.15	Dry
141.	"	10.45	8.30	9.00	Dry
142.	Balsamand	17.65	12.00	13.40	16.00
143.	"	14.60	12.90	Dry	Dry
144.	"	17.60	12.90	14.35	15.00
145.	Balgaon	21.40	12.90	16.80	18.80
146.	"	21.80	17.20	17.95	21.00
147.	"	23.30	18.70	21.70	22.50
148.	Maizampur	12.30	6.50	6.80	9.30
149.	"	10.80	4.40	4.55	10.75
150.	"	7.30	1.70	5.75	Dry

(15)

...7..

S.W.L. of 25 wells in Kunda command area.

1.	2.	3.	4.	5.	6.
151.	Dhannod	9.50	6.30	6.70	Dry
152.	"	13.00	9.90	11.30	Dry
153.	"	14.35	9.65	12.50	Dry
154.	"	8.90	6.50	8.25	Dry
155.	Guljhera	10.90	7.80	8.30	9.90
156.	"	13.60	10.30	11.75	13.10
157.	"	12.40	1.00	10.65	12.20
158.	"	9.10	5.75	8.00	Dry
159.	Pandhanla	13.00	10.70	10.40	Dry
160.	"	7.60	5.90	6.30	7.00
161.	"	10.40	8.70	10.00	9.50
162.	"	9.80	6.30	8.40	9.50
163.	Bikharone	11.60	10.60	Dry	Dry
164.	"	15.50	11.60	13.80	Dry
165.	"	16.35	13.00	15.60	Dry
166.	"	15.70	11.00	14.00	15.60
167.	Bhatpura	22.40	17.75	22.30	Dry
168.	"	20.70	19.10	Dry	Dry
169.	"	23.00	18.15	21.35	22.50
170.	Sala	14.15	5.65	8.40	11.00
180.	"	14.50	7.90	8.25	8.80
172.	"	14.00	9.00	10.20	8.90
173.	Duahi	4.40	2.90	3.55	Dry
174.	"	8.20	4.70	6.65	7.40
175.	"	9.10	5.20	7.10	8.10

TABLE

AN ABSTRACT OF DIFFERENT VALUES OF AQUIFER PARAMETERS OBTAINED
FROM PUMPING TESTS CONDUCTED IN NARMADA SAGAR COMMAND AREA.....

S.NO.	Well	Village	Specific capacity(c) (M3/hr/m)	Unit area capacity (Ks) (m3/hr/middle sq. mt.)	K (m/day)	Specific Yield			Average specific yiled.
						By watton's method	By Brown's method.	By Jacob's method.	

<u>NARMADA SAGAR COMMAND AREA (MIDDLE ZONE)</u>									
1.	62	Nimrani	6.52	0.346	1.36	0.0132	0.0048	0.0129	0.0103
2.	58	Thikari	0.275	0.207	0.11	0.0036	0.0027	0.0027	0.003
3.	53	Takwada Deb	16.56	1.387	2.35	0.0395	0.0156	0.039	0.0314
4.	60	Barufatak	5.90	0.371	5.90	0.0048	0.0037	0.0037	0.0041
5.	16	Badwi	15.52	0.69	12.93	0.0119	0.0092	0.00915	0.01
6.	21	Kasheshwar	27.02	0.525	11.03	0.0113	0.0087	0.0087	0.01
7.	20	Mehatwada	4.29	0.607	2.32	0.0157	0.012	0.012	0.0132
8.	18	Mandleshwar	5.60	0.72	2.435	0.0155	0.0119	0.0119	0.0131
9.	19	Choli	7.23	0.71	2.68	0.021	0.0109	0.0888	0.0404
10.	16	Katargoan	3.84	0.45	6.98	0.0039	0.00298	0.00298	0.0033
11.	13	Pipalya	8.05	0.657	5.75	0.0085	0.0065	0.0065	0.0072
12.	10	Barwaha	8.14	0.47	0.7268	0.0308	0.0119	0.0305	0.0244
13.	11	Umaria Chauki	3.65	0.553	1.14	0.026	0.0092	0.0264	0.02
14.	63	Khaltaka	3.12	0.159	0.39	0.0055	0.0042	0.0042	0.00463
15.	66	Nawadataudi.	4.444	0.246	1.096	0.0095	0.0073	0.0079	0.0082
		Average :-	8.01	0.54	3.85				0.0135
<u>NARMADA SAGAR COMMAND AREA (LOWER ZONE)</u>									
16.	54	Hathola	9.03	0.622	3.39	0.0107	0.002	0.00205	0.0049
17.	25	Dharampuri	1.72	0.38	1.042	0.0049	0.0038	0.0037	0.0041
18.	28	Thaggaon	2.91	0.2	0.75	0.0095	0.0073	0.0081	0.0083
19.	35	Singhana	4.50	0.397	1.64	0.0154	0.0115	0.0129	0.0133
20.	37	Chikhhalda	14.48	1.21	6.735	0.068	0.051	0.059	0.0593
21.	38	Kadmal	4.85	0.428	1.283	0.0221	0.017	0.017	0.0187
22.	39	Nisarpur	0.55	0.086	0.314	0.0009	0.0007	0.0008	0.0008
23.	41	Kathora	1.955	0.196	1.17	0.0018	0.0014	0.0014	0.00156
24.	43	Barwani	0.85	0.30	0.304	0.0041	0.0031	0.0031	0.00345
25.	44	Sajwani	2.15	0.167	1.536	0.00144	0.0011	0.0011	0.0012

11/2/1

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
26.	45	Kari	1.638	0.276	0.546	0.00396	0.00303	0.00334	0.00334	
27.	46	Talun	0.189	0.123	0.172	0.00106	0.00081	0.00081	0.0009	
28.	47	Berlai	2.92	0.118	1.825	0.00102	0.0008	0.0008	0.0009	
29.	9	Bilwa Road	3.38	0.166	0.914	0.0031	0.0024	0.0024	0.0026	
30.	48	Anjad	6.26	0.69	4.815	0.006	0.0046	0.0046	0.005	
31.	51	Mandivada	7.05	0.2765	2.07	0.00558	0.0043	0.0043	0.0047	
		Average	4.03	0.35	1.83				0.0083	

SATK COMMAND AREA :-

32.	105	Ekalgariya	29.24	0.011	4.57	0.027	0.008	0.0226	0.0178	
33.	108	Satkur	5.22	0.575	0.36	0.0316	0.0168	0.0313	0.0266	
34.	113	Fagekhedi.	3.83	0.845	1.596	0.0607	0.0206	0.0606	0.0473	
35.	127	Pocpkheda (	30.40	1.38	5.85	0.0728	0.0317	0.072	0.0588	
36.	129	Regwa	9.927	1.094	0.81	0.063	0.0093	0.07619	0.0547	
37.	133	Sonkhedi	4.17	0.553	4.63	0.0214	0.0165	0.0165	0.018	
38.	134	Dhamod(Ahir)	4.59	0.33	3.06	0.0072	0.0055	0.0055	0.006	
39.	138	Balkhad	4.21	0.304	1.20	0.0165	0.006	0.016	0.0128	
40.	140	Pathora	7.75	0.395	8.61	0.017	0.013	0.0131	0.0144	
41.	150	Malzanpur	17.31	0.49	2.308	0.0516	0.019	0.0551	0.0419	
42.	155	Salgaon	6.40	0.480	1.010	0.0404	0.020	0.0394	0.0333	
43.	142	Balsamand	7.54	0.74	1.32	0.0617	0.0307	0.0634	0.052	
		Average :-	10.88	0.58	2.94				0.032	

KUNDA COMMAND AREA :-

44.	175	Duchi	3.41	0.0026	0.99	0.004	0.003	0.0033	0.0034	
45.	151	Dhamod	0.93	0.002	0.33	0.0025	0.0018	0.002	0.0021	
46.	166	Bikharone	3.045	0.431	0.78	0.0186	0.0141	0.0153	0.016	
47.	155	Guljhera	2.18	0.22	0.715	0.0095	0.00716	0.00793	0.0082	
48.	169	Bhatpura	8.68	0.288	2.31	0.0099	0.0076	0.00825	0.0086	
49.	171	Sala	8.92	0.54	1.25	0.042	0.024	0.0419	0.036	
		Average	4.53	0.25	1.0625				0.0124	
		Over all Average	6.99	0.45	2.625				0.016	

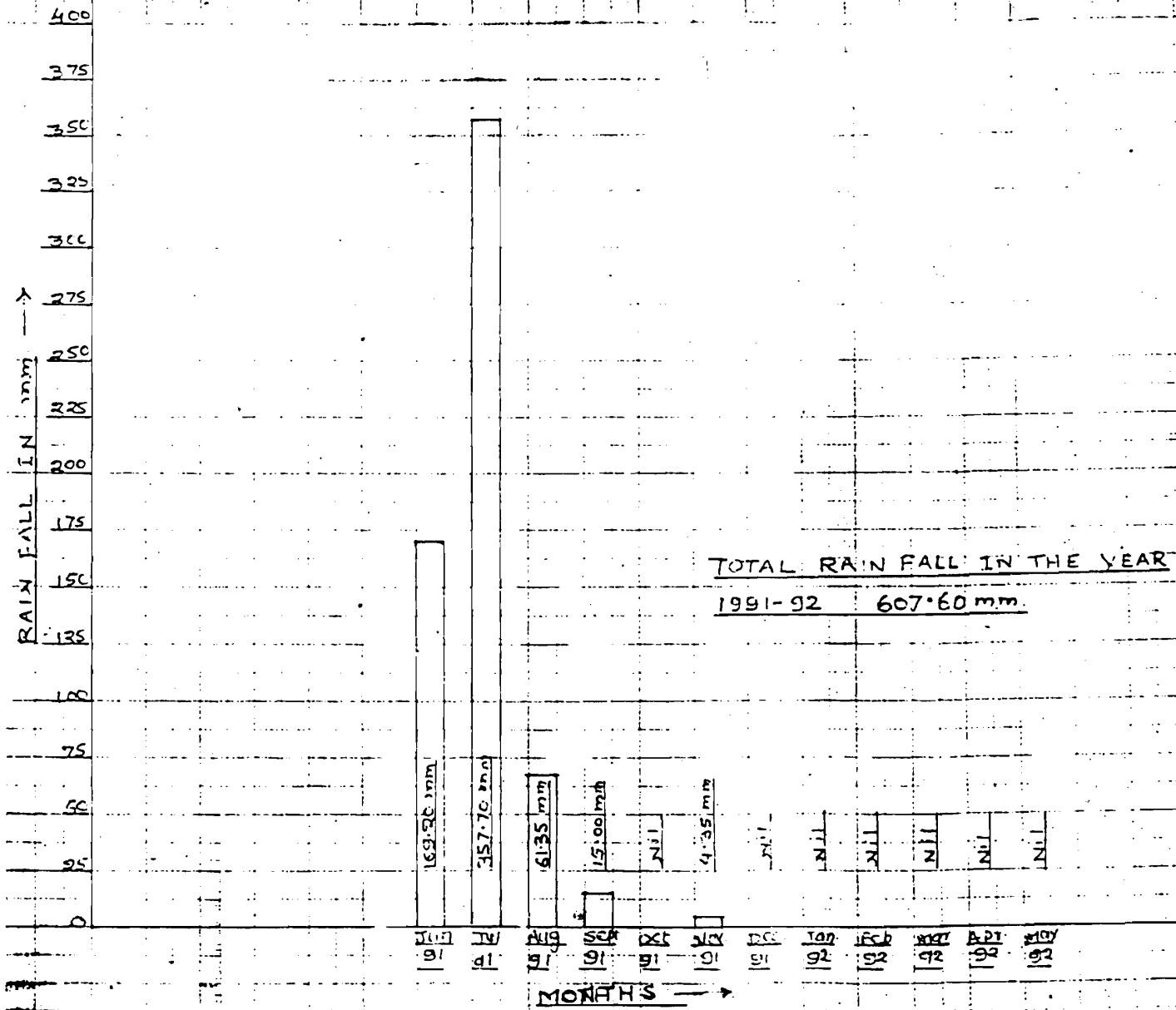
RAIN FALL DATA

S. Rain gauge No. Station	Monthly rainfall in (mm)												Total Rainfall (mm)	Non-monsoon rainfall (mm)	Monsoon rainfall in mm.
	1990-91														
	June 90	July 90	Aug. 90	Sept. 90	Oct. 90	Nov. 90	Dec. 90	Jan. 91	Feb. 91	March 91	April 91	May 91			
1. Khar gone	22.0	349.0	368.0	206.0	51.8	5.6	1.0	Nil	Nil	Nil	Nil	Nil	1003.4	58.4	945.0
2. Bhikangon	129.0	211.4	441.4	177.8	110.8	Nil	51.6	Nil	Nil	Nil	Nil	Nil	959.6	162.4	797.2
3. Bar waha	69.0	233.3	297.9	223.1	36.8	Nil	Nil	Nil	Nil	Nil	Nil	Nil	850.1	26.8	823.3
4. Kesrawad	46.2	226.8	260.0	171.2	81.6	Nil	6.0	Nil	Nil	Nil	Nil	Nil	791.8	87.6	704.2
5. Maheshwar	72.0	374.9	429.0	343.0	170.0	Nil	Nil	Nil	Nil	Nil	Nil	Nil	1368.9	170.0	1218.9
6. Barwani	69.9	118.2	396.2	247.7	Nil	Nil	7.6	Nil	Nil	Nil	Nil	Nil	838.7	7.6	831.1
7. Rajpur	69.0	319.0	283.0	353.0	79.0	Nil	Nil	Nil	Nil	Nil	Nil	Nil	1103.0	79.0	1024.0
8. Gogawa	44.0	229.0	317.0	148.0	25.0	Nil	Nil	Nil	Nil	Nil	Nil	Nil	763.0	25.0	738.0
9. Thikari	77.4	267.7	307.9	170.0	95.0	Nil	Nil	Nil	Nil	Nil	Nil	Nil	918.0	95.0	823.0
Average	66.5	251.81	344.42	215.53	71.11	0.62	0.13	Nil	Nil	Nil	Nil	Nil	964.42	79.12	885.30

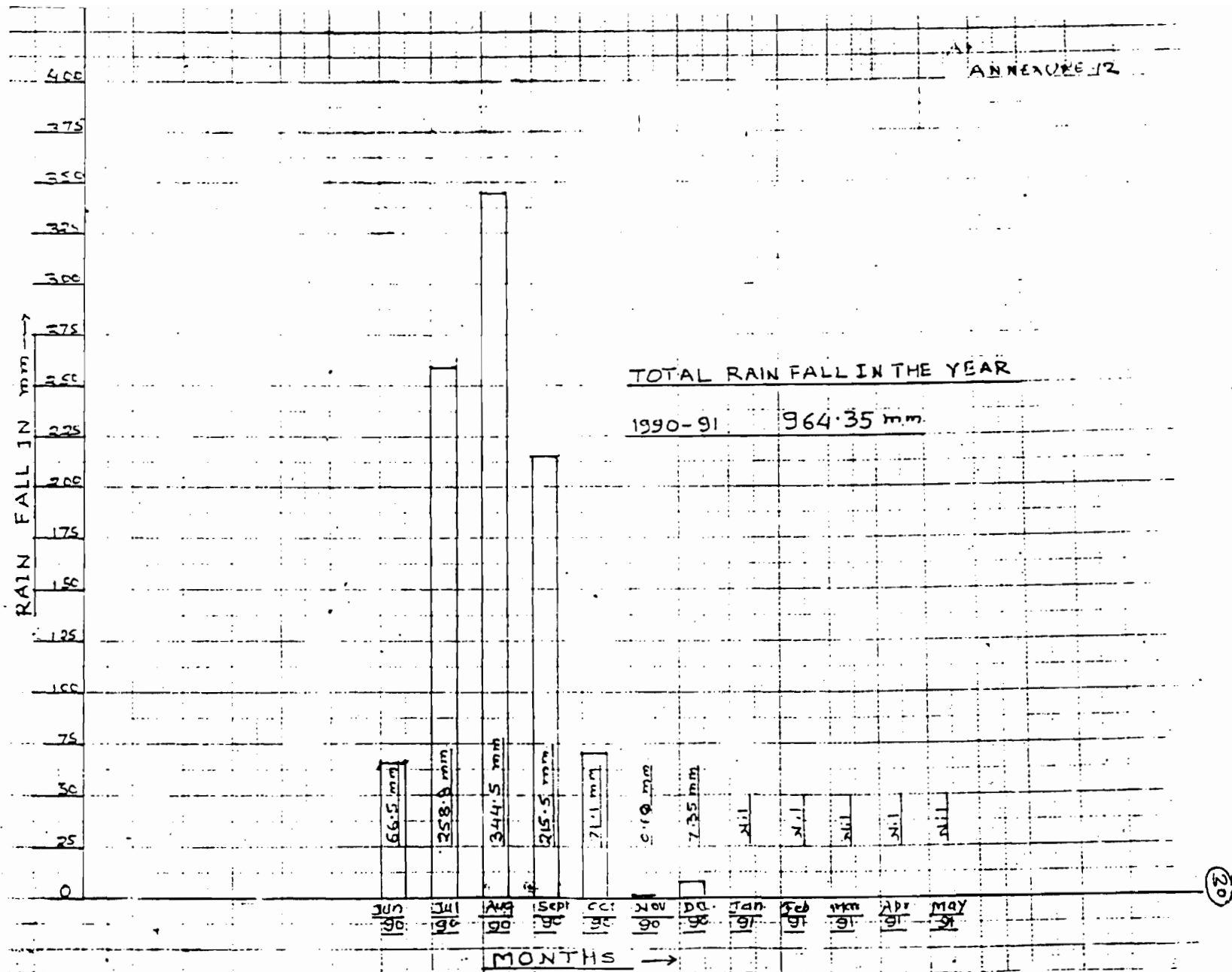
S. Rain gauge No. Station	Monthly rainfall (in mm) 1991-92												Total rainfall (mm)	Non monsoon rainfall (mm)	monsoon rainfall (mm)
	June 91	July 91	Aug. 91	Sept. 91	Oct. 91	Nov. 91	Dec. 91	Jan. 92	Feb. 92	March 92	April 92	May 92			
1. Khar gone	264.0	323.8	43.0	8.2	Nil	8.4	Nil	Nil	Nil	Nil	Nil	Nil	647.4	8.4	639.0
2. Bhikangon	199.2	345.8	44.4	3.6	Nil	10.0	Nil	Nil	Nil	Nil	Nil	Nil	603.0	10.0	593.0
3. Barwaha	254.6	312.0	45.4	15.6	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	627.6	Nil	627.6
4. Kesrawad	109.0	310.4	91.5	14.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	515.0	Nil	515.0
5. Maheshwar	230.0	466.0	77.7	9.4	Nil	20.6	Nil	Nil	Nil	Nil	Nil	Nil	803.7	20.6	783.1
6. Barwani	446.0	299.7	53.3	12.7	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	410.3	Nil	410.3
7. Rajpur	146.5	344.4	77.6	67.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	635.7	Nil	635.7
8. Gogawa	168.0	365.0	30.0	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	563.0	Nil	563.0
9. Thikari	107.0	452.5	102.3	4.4	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	666.2	Nil	666.2
Average	169.2	357.73	613.5	15.02	Nil	4.33	Nil	Nil	Nil	Nil	Nil	Nil	607.65	4.33	603.32

Signature
Date: 02/08/2021
Page 934

ANNEXURE II



Encl. Annexure II
 1. Groundwater Survey



64

S. K. Jais
 Assistant Geohydrologist
 District Groundwater Survey and
 Monitoring

(20)

INVESTIGATION, DESIGN AND RESEARCH, IRRIGATION
UNIT, IRRIGATION DEPARTMENT,
GOVERNMENT OF RAJASTHAN

AGREEMENT FOR ENVIRONMENTAL STUDIES
FOR
NARMADA CANAL PROJECT, (RAJASTHAN PORTION)

WAPCOS CENTRE FOR ENVIRONMENT
WATER AND POWER CONSULTANCY
SERVICES (INDIA) LIMITED.
9, COMMUNITY CENTRE, SAKET, NEW DELHI - 110 017

SEPTEMBER, 1993

**INVESTIGATION, DESIGN AND RESEARCH, IRRIGATION
UNIT, IRRIGATION DEPARTMENT,
GOVERNMENT OF RAJASTHAN**

**AGREEMENT FOR ENVIRONMENTAL STUDIES
FOR
NARMADA CANAL PROJECT, (RAJASTHAN PORTION)**

**WAPCOS CENTRE FOR ENVIRONMENT
WATER AND POWER CONSULTANCY
SERVICES (INDIA) LIMITED.
9, COMMUNITY CENTRE, SAKET, NEW DELHI - 110 017**

SEPTEMBER, 1993

10RS.



ARTICLE - 1

INTRODUCTION

This agreement entered into by and between Irrigation Department (hereinafter referred to as 'ID') acting for and on behalf of Govt. of Rajasthan (GOR) and Water and Power Consultancy Services (I) Ltd. (hereinafter referred to as (WAPCOS)). It provides that WAPCOS will conduct Environmental Studies for Narmada Canal Project (Rajasthan) (hereinafter referred as 'Project') Department according to terms and conditions set forth hereinafter.

Now therefore, in consideration of the above premises ID and WAPCOS enter into the agreement for the services subject to and in accordance with the terms and conditions herein contained and mutually agreed upon by the parties.

17 SEP 1993

$$\frac{10+5}{157}$$

Serial No. 13646 Date Rs. 107/-
 Sold to W. A. P. C. D. S. S. Indta Ltd.
 R/o 9. Community Center, Saket, N. Delhi
 In favour of
 R/o
 Purpose Agreement

Through Sign of Purchaser/Agent
 SUDIR KUMAR JAIN L. No. 326
 Tehsil N. DELHI

ARTICLE - 2

DEFINITIONS

1.1 DEFINITIONS

Unless the Agreement otherwise requires, the following terms wherever used in this Agreement shall have following meanings :

- a) 'Agreement' means the Agreement alongwith its annexures.
- b) 'Article' means the Article in the Agreement.
- c) Government means the Government of Rajasthan.
- d) 'ID' means Irrigation Department Government of Rajasthan.
- e) WAPCOS : Water and Power Consultancy Services (India) Limited, New Delhi.
- f) 'Consultant' means WAPCOS
- g) 'Agencies' means the two organisations participating in the project namely, WAPCOS and Irrigation Department, Govt. of Rajasthan.
- h) 'Project means' Narmada Canal Project (Rajasthan).

ARTICLE -3

SCOPE OF CONSULTANCY SERVICES

The following studies on the said project as mentioned vide letter from Executive Enginnerand TA to Chief Engineer ID&R (Irrg.) Unit Jaipur letter No.T\CE\IDR\CANAL\3\644 dated 17.6.93 (refer Annexure-I) will be conducted :

- 1) To prepare an Environmental Impact Assessment for the canal portion as is being done by Government of Gujarat. A copy of the TOR finalised by is enclosed (Annexure-II).

- ii) Monitoring and modelling the groundwater through out the command area.
- iii) Plan for surface and sub-surface drainage of the command area.
- iv) The WAPCOS will supply all the informations/clarifications needed by NCA from time to time and it will be their responsibility to get it cleared from NCA.

A copy of the index plan showing the main canal alignment and command area is enclosed (Annexure-III).

3.1 SCOPE OF WORK AND METHODOLOGY

The scope of work of the study to be performed by the consultant includes the description of project setting, appraisal of project activities and assessment of environmental impacts related to the location, design, construction and operation of the project, design of surface and subsurface drainage system and monitoring of groundwater in the command area.

The consultancy services will cover the following aspects :

- i) Project setting
- ii) Impact evaluation
 - a) Physical resources including soil, water and air
 - b) Biological resources
 - c) Socio-economic, cultural and quality of life values
 - d) Environmental Management Plans
- iii) Drainage systems
- iv) Cropping pattern study
- v) Landuse pattern study
- vi) Farmer's education system to be evolved

- vii) Use of fertilizers/pesticides
- viii) Fisheries
- ix) Groundwater monitoring and modelling in the command area
- x) Future growth centre requirements
- xi) Impact of future road development and plans

3.2 PROJECT SETTING

A concise description will be given of the existing environmental conditions in the project area. The plant species data economically important on the household level having medicinal or religious value shall be identified. Based on literature survey supplemented by field studies, a general description on the following parameters shall be covered :

- i) Population
- ii) Meteorology
- iii) Water resources
- iv) Floods and droughts
- v) Water quality
- vi) Water supply and sanitation
- vii) Drainage
- viii) Soil
- ix) Land use
- x) Use of agro-chemicals
- xi) Ecology
- xii) Forest
- xiii) Wildlife
- xiv) Fisheries
- xv) Seismology

- xvi) Air quality
- xvii) Noise
- xviii) Historical and cultural monuments
- xix) Public health
- xx) Tourism and
- xxi) Socio-economic factors

3.3 PROJECT IMPACT EVALUATION

A concise summary of planned project activities, the project's main objectives, the main beneficiaries and the expected regional effects shall be given. Concomitant factors such as transport, human settlements, services, industrialization and tourism will also be discussed. Maps to locate and depict the association between project infrastructure and background information shall be prepared. The impact evaluation will assess the impacts on the following aspects :

- a) Physical resources including soil, water and air
- b) Biological resources
- c) Socio-economic, cultural and quality of life values
- d) Environmental Management Plans

The effects due to the proposed will be summarized under the following headings :

- impacts due to project location;
- impacts due to project design;
- impacts due to project construction, and
- impacts due to project operation.

3.3.1 Impacts due to Project Location

a) Resettlement and Rehabilitation of Displaced Families

This issue will be addressed based on a thorough socio-economic survey of families displaced due to the construction of proposed canal and the area occupied by other project apurtenances.

Regarding social impact assessment about 10-15% canal affected persons should be interviewed for bringing out a scientifically acceptable social impact assessment. Salient features of Resettlement & Rehabilitation policy should also be presented in the EIA Report.

The integrated development of the command area shall also be planned incorporating major activities and recommend all measures required to be implemented in a phased manner blending with socio-economic and environmental needs.

The public, NGOs shall be involved at all stages of EIA for improving the public participation in government decision to achieve the goal of EIA.

b) Forest Lands

The studies on flora and fauna shall also include the special relationship aspects which include : relationship with vegetation to substrate, animal to substrate, animal to plant, human vs nature, livestock vs wild animals.

An assessment will be made of the loss of forest lands due to the canal alignment and it will be specified by the type of forest (plantation, village forests, natural forest etc., present conservation status, productivity and standing timber volume). Afforestation within the command areas and

along rights of way shall also be described in terms of extent, tree types, required human interventions and schedules.

c) Nature Reserves

It will cover assessment of :

- effects of the canal alignment on wildlife parks, reserves, sanctuaries and other protected areas within the project area, if any;
- impact on rare or endangered species of flora and fauna within and outside the project area, if any;
- impediments to wildlife movement, and
- positive and negative effects on the aquatic birds.

d) Historical and Cultural Monuments

An inventory will be made of historical, religious and cultural monuments of regional, national and international importance which will be affected by project operations.

e) Grazing Lands

deals with:

- an inventory of communal and other grazing land which will be lost or affected by the canal alignment;
- an assessment of possible conflicts in land use and effect on animal husbandry operations, and
- an assessment of impacts on livestock movement.

f) Water Resources Outside the Project Area

deals with:

- assessment of potential conflicts amongst water users downstream of the project area;
- assessment of risk of waterlogging and flooding outside the project area, and
- assessment of impact of changes in water quality outside the project area.

g) Water Resources Inside the Project Area and contiguous areas deals with:

- assessment of effect of changes in hydrological balance;
- analysis to quantify potential impacts of the project on inland and surface water quality. The analysis will be based on a realistic assessment of irrigation tailwater quantity and quality and M&I discharges. Possible effects from elevated salinity, pesticides, nutrients from fertilizers and M&I discharges, industrial pollutants shall be assessed;
- potential negative impacts on groundwater due to fertilizers and pesticides, salinity, soil parameters such as percolation and infiltration rates, lithology and proximity to saline surface water.
- expected changes in water quality in the project area as a result of upstream water-regulatory works (i.e. reduced flow, temperature, dissolved salts, sediment load etc.).

The quality of surface and groundwater resources will be analysed at representative sites in the project area. An illustrative list of parameters to be analysed is as follows :

- Temperature
- Taste and odour
- Turbidity and colour
- Hardness
- BOD/COD/TOC
- pH
- Conductivity
- Total solids/Dissolved solids
- Carbonates/Bicarbonates
- Chlorides/Sulphates/Nitrates/Fluorides/Phosphates
- Sodium/Potassium
- Calcium/Magnesium
- Manganese/Copper/Zinc/Chromium
- Cyanides
- Boron/Selenium
- SAR/RSC/SSP
- Oil and grease
- Coliform count (MPN)
- Bio-indicators

h) Erosion and Siltation

describes:

- an analysis of present sediment load of water entering the canals area and the risk of siltation of canals, and

- an assessment of erodibility, slope stability and scouring risk of the main soil types in the project area.

3.3.2 Impacts due to Project Design

a) Hydrological Balance

includes an assessment of:

- the effect of changes in the hydrological balance caused by the construction of the canals;
- expected rise in groundwater table, and
- impact on aquatic ecosystems including fish, aquatic birdlife, spawning areas and seasonal migration.

b) Drainage

deals with an assessment of:

- the risk of waterlogging/flooding, and
- siltation, eutrophication and salinization risks.

c) Canals and other Structures

includes:

- assessment of adequacy of planned provision to prevent excessive aquatic weed growth, erosion and seepage, and design of culverts, intakes and protective structures to prevent bank scouring, and
- assessment of roads and impacts due to communication facilities, infrastructure and market development requirements in command area will be assessed.

e) Passage-Way

review whether suitable and sufficient crossings for people, livestock and wildlife are included in the project design.

3.3.3 Impacts Due to Construction Works

a) Soil Erosion

Runoff during rains from excavated areas, can result in soil erosion. Adequate provisions for revegetation, dressing, resurfacing of borrow pits etc. should be ascertained.

b) Construction Spoils

- Adequacy of provisions for dumping of construction spoils, waste materials etc. should be reviewed.

c) Public Health

includes an assesment of:

- improvement in availability of water for various uses;
- the adequacy of sanitation in workers' camps, and
- the vectors that may transmit diseases from local carriers to immigrant labour and staff and vice-versa.

3.3.4 Impacts Due to Project Operation

a. Residues of Agro-Chemicals

include:

- an estimate of expected increase in the use of pesticides and fertilizers (type, dosage, application technique);
- an assessment of adequacy of provisions made in the project for ensuring proper and safe use of fertilizers and pesticides, and

- an assessment of the effects of runoff and drainage of residual fertilizers and pesticides on the water quality of the receiving body and on aquatic communities downstream.

b) Impact on Soils

The command area falls under arid to semi-arid climate condition and vulnerable to soil salinity problems after the introduction of canal irrigation. In view of this in-depth study should be made by selecting few bench marks profile in the command area for checking these problems. Impact on soils should include an assessment of:

- improvement of fertility and increase in agricultural production;
- the risk of waterlogging (maps with site indication), based on soil survey data, and
- of salinization and alkalization risks based on water quality data and soil characteristics.

c) Ground Water

The quality and quantity of ground water in the command area will be assessed based on field and model studies.

Areas where changes in groundwater level can be expected will be indicated. Both positive and negative effects will be described.

d) Changes in Surface Water Quality and Eutrophication

includes:

- The streams/rivers in command area shall be monitored at points upstream and downstream of major urban centres and industrial outfalls.

- An assessment of the risk of surface water pollution by effluents from agro-industries, factories and its effect on fisheries and aquatic ecosystem i.e. assessing biochemical oxygen demand, toxicity, and dissolved oxygen.
- An assessment of the adequacy of provisions for clearing of canals in the operation and maintenance programme and its cost estimates.
- Identify the aquatic and terrestrial weed problem in command area, suggest methods and action plan that are environmentally acceptable aquatic weed control in command area.

e) Water Related Diseases

includes the following aspects:

- the effect of changes in water quality, eutrophication, and growth and the increase in areas of stagnant water on the proliferation of insects or other vectors of water related human and livestock diseases;
- a study of the present (pre-project) incidence of main water related diseases in the project area from surveys and existing public health records;
- an assessment of the risk of introduction of pathogens and disease vectors;
- an assessment of required health care facilities especially in the project area, and
- an assessment of all ways of planned measures to reduce the spread of water related diseases.

- prevalence and incidence of pest and disease vectors shall also be studied.

f. Air Pollution and Micro-Meteorology

- The ambient air quality shall be assessed as using existing reports and field monitoring if necessary. The air quality shall be predicted due to the project operation.
- The wind energy potential in the area shall be assessed for its utilization to run the pumps at appropriate locations for conjunctive use of surface and ground water.
- Since most of the command area of the Rajasthan comes under arid to semi-arid climatic zone and hence, introduction of canal irrigation may change the micro-climatic conditions which in turn may effect vegetation pattern of the area. In view of above recommendation should be made for species. Measures shall be suggested for conservation of valuable species.

g. Cropping Pattern

At present Bajra is the main crop of the area. The consultant will review the proposed cropping pattern after introduction of canal system. Any modification if required in the cropping pattern will be suggested. Based on these drainage system will be designed.

3.4 ENVIRONMENTAL MANAGEMENT AND COST ESTIMATES

With a knowledge of the baseline conditions, the ongoing construction activities, the planned future development programmes and current critical conditions, projections are to be made of their influence on physical, chemical and ecological aspects of environment in the area. These projections will identify whether the pre-project critical environmental conditions will be further degraded and what additional environmental conditions are likely to become critical. An environmental management strategy will be developed to mitigate the adverse impacts. The strategy will include evaluation of alternative methods to reduce or eliminate adverse impacts of the most critical areas likely to contribute to the most significant environmental burdens. Similarly disaster management plans in the event of an emergency (including seismic hazard) will also be worked out. An Environmental weightage Study will be carried out and this would be integrated into Cost Benefit Ratio Study project as a whole. Cost estimates for each of the proposed mitigatory measures will be given.

3.4.1 Training

- The agricultural extension backup and training requirements of the personnel needs shall be given due emphasis.
- Assessment shall be made about the training needs of the farmers who switch over to canal irrigation from rain-fed agriculture and who have to work collectively to manage water in the village service area.

- Assessment shall be made to recommend measures for promoting or for establishing of appropriate agro-based processing unit, warehousing and connected support services with changed cropping patterns after introduction of canal irrigation.
- The integrated development of command area shall also be planned incorporating major activities with socio-economic and environmental needs.

3.5 ENVIRONMENTAL MONITORING

The Environmental Impact Assessment is basically an evaluation of future events. It is necessary to continue monitoring certain parameters identified as critical by relevant authorities under an Environmental Monitoring Plan. This would anticipate any environmental problem so as to take effective mitigative measures. WAPCOS will design a post-project environmental monitoring programme for implementation, and the various parameters will be monitored by relevant departments. The cost estimates and equipments necessary for the implementation of this programme shall be included.

3.6 DESIGN OF SURFACE AND SUB-SURFACE DRAINAGE SYSTEM

The scope of the study is as under :

- Data collection will be done for rainfall, climate, present water use, identification of areas of flooding, present cropping pattern and landuse, soil characteristics, ground water levels, topography, geology and lithology;

- Identification of levels of surface and sub-surface drains in the command area for different irrigation and water utilization scenarios;
- Preparation of plan for drainage showing existing major drains and incorporating their modification in them and construction of new water drains for various water utilization scenarios;
- Evaluation of design discharges for surface drains in each region of command area, and
- Preparation of cost estimate for surface and sub-surface drainage of the regions based on pilot studies.

Waterlogging occurs due to steady rise of groundwater due to the introduction of irrigated agriculture without appropriate drainage. Many factors contribute to waterlogging. Among these are improper and inefficient irrigation practices, permeability of soil, depth of groundwater and improper drainage. Waterlogging can be prevented by efficient use of water and proper drainage.

Keeping in view the soil conditions, geological conditions, cropping pattern, climatic conditions, etc. a drainage system will be designed. The design criteria are as follows:

A. Alignment

The drains should generally follow the drainage line. As far as possible the alignment of the main or of fall drain should be in the centre of the area to be drained.

- The drains should not pass through village habitation. In the forced reaches, embankments of the drains are not to be of an excessive height in order to minimize

the danger of flooding in case of breaching of embankments.

- The drains should be so aligned that the full supply level is below the natural surface level.

B. Capacity/Design Discharge of drains. Intensity of Rainfall - analysis of the storm rainfall throughout the country indicates that generally the duration of storm is about 3 days. Thus, for design of the drains, a storm rainfall of 3 days duration should be taken.

Design frequency of rainfall - in fixing the design capacity of a drain following factors are to be considered :

- Economics - drains are never designed for worst conditions; hence occurrence of damage at regular intervals is accepted.
- Performance - drains of smaller size are preferred as compared to bigger ones which deteriorate rapidly as they are not required to carry the design discharge frequently, and get silted when carrying smaller discharges.
- Land requirement - on account of small land holdings, bigger drains require larger land acquisition.
- Design frequency - studies carried out indicate that 5 year frequency gives optimum benefit cost ratio.

The drains are designed for three day rainfall of 5 year frequency.

- C. Period of Disposal - The period of disposal of the excess rainfall is dependent on the tolerance of individual crops. Based on experience the following periods of disposals are recommended :

Paddy	7 - 8 days
Maize, bajra and other similar crops	3 days
Sugarcane and banana	7 days
Cotton	3 days
Vegetables	1 day

- D. Run-Off - Until precise data becomes available, the following runoff coefficients for different soils are given below :

- Loam, lightly cultivated or covered	0.40
- Loam, largely cultivated and suburbs with gardens, lawns, macadamized roads	0.30
- Sandy soils, light growth	0.20
- Parks, lawns, meadows, gardens, cultivated area	0.05-0.20
- Plateaus, lightly covered	0.70
- Clayey soils stiff and bare and clayey soils lightly covered	0.55

- E. Design discharge for cross-drainage works These are designed for a higher discharge than the cut sections of the drains because in case of flows of higher intensity rainfall, they are more severely damaged. Besides, any remodelling of the structures at a later date for higher discharges is time consuming as well as expensive. Thus cross-drainage structures are designed for a 3 day rainfall of 50 year frequency. The time of

disposal remaining the same depending on the type of crop.

F. Design of drain sections

- i) Velocity - the velocity shall be non-silting, non-scouring as per Manning's formula. For earthen sections, coefficient of rugosity has a value of 0.025.
- ii) Side slopes - generally side slopes of 1.5H:1V are provided.
- iii) Cross-Section of the Drain - B/D ratio should be so selected that the section is both hydraulically efficient as well as economical in excavation.

For drains with embankments, the berm width equal to the depth of the drain, subject to a minimum of 1 m shall be provided between the toe of the embankment and the section of the drain.
- iv) Fixation of FSL at outfall - for drains outfalling into a river, the FSL should be slightly higher than the dominant flood level.
- v) Hydraulic Slope - The FSL of the drain should be at or below the ground level; if it is not possible, the FSL in no case should be more than 0.3 m above the average ground level at the starting point of the drain. The hydraulic slope should be such that it provides permissible velocities.

Keeping in view the soil conditions, geological conditions, cropping pattern, climatic conditions, etc. a surface and sub-surface drainage system will be designed. The design criteria will be as per the relevant Indian Standards.

3.7 GROUNDWATER QUALITY MONITORING AND MODELLING IN THE COMMAND AREA

The groundwater, water quality shall be monitored by designing a grid of monitoring points keeping in view the change in topography, slope, texture, landuse pattern. In general the groundwater quality shall be estimated at an interval of 2 km. The parameters to be monitored are detailed in 3.3.1 (g).

Ground water modelling will be carried out to assess the :

- Ground water potential,
- Risk of waterlogging and salinity,
- Operational plan for conjunctive use of surface/ground water along with drainage requirements.

Based on Ground water model studies, the drainage system will be designed for the effected areas.

ARTICLE -4

TIME OF COMPLETION AND TERMS OF PAYMENT

TIME OF COMPLETION

The time of completion of the project will be 11 (Eleven) months from the date of signing of the agreement (Refer Bar Chart in Annexure-IV).

TERMS OF PAYMENT

ID agrees to pay WAPCOS on the basis of estimated cost plus 15% (fifteen percent) charges upto a total cost of Rs.33.77 lakhs (Rupees thirty three lakhs seventy seven thousand only) for the services to be rendered by WAPCOS as per Article-3 of this Agreement. The fees shall be payable in instalments based on

raising of invoices duly certified by the Financial Advisor of WAPCOS as given below:

SNo.	Description	%age of contract value
1.	On signing of agreement	20
2.	On completion of field studies (after 4 months of signing of agreement).	20
3.	On submission of draft EIA report	10
4.	On submission of draft report of plan for drainage and sub-surface drainage	10
5.	On submission of draft report for groundwater quality monitoring	10
6.	On submission of final EIA report	10
7.	On submission of final report of plan for surface and sub-surface drainage	10
8.	On submission of final report for groundwater quality monitoring	10

Note :

The above fee of Rs.33.77 lakhs payable to WAPCOS is inclusive of salaries, social charges and overhead components such as computer charges, stationery, documentation, communications telex, fax postages, telephone), local transport at Hqrs, site visits of WAPCOS experts, and rentals for office accommodation etc. Expenditure incurred on the consultancy work would be duly certified by the Financial Adviser of WAPCOS.

ARTICLE -5**ARBITRATION**

If any question, differences or objection whatsoever shall arise in any way in connection with or arising out of this instrument or the meaning of operation of any part thereof or the rights, duties or liabilities of either party than save in so far as the decision of any such matter as herein before provided for and has been so decided, every such matter constituting a total claim of Rs.5000/- or above, whether its decision has been otherwise provided for and whether it has been finally decided accordingly, or whether the contract should be terminated or has been rightly terminated and as regards the rights or obligations of the parties as the result of such termination shall be referred for adjudication to a sole arbitrator to be appointed as hereinafter provided.

For the purpose of appointing the sole arbitrator, referred to above the Chief Engineer, Investigation, Design and Research Unit, Jaipur Irrigation Department, Government of Rajasthan will on receipt of notice and prescribed fee from the consultant send a panel of 3 names not below the rank of Superintending Engineer of the Rajasthan Government and who shall all be presently unconnected with the contract. The consultant shall on receipt of the names as abovesaid select any one of the persons named, to be appointed as a sole arbitrator and communicate his name to the Chief Engineer. The Chief Engineer shall thereupon appoint the said person as the sole arbitrator, without delay. The Arbitrator shall give reasons for award.

Subject as aforesaid the provisions of the Arbitration Act, 1940 or any statutory modification or re-enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceeding under the clause.

FORCE MAJEURE

Neither party shall be liable to each other for any loss or damage occasioned by or arising out of the acts of God such as unprecedented floods, volcanic eruptions, earthquake or other convulsion of nature and other acts.

In witness whereof, the parties hereto have caused this agreement to be executed in duplicate as of the day first written above.

ARTICLE -6

FORMAT OF EIA REPORT

The volume of EIA report should include :

- Executive summary (significant, findings and recommendations.
- Project descriptions.
- Scope of EIA
- Methodology used in conducting studies.
- Baseline environmental studies.
- Identification of impacts.
- Prediction of impacts.
- Evaluation of impacts (with environmental management plan and without environmental management plan).
- Environmental management plan (for all components of environment coming under impact).

- Monitoring and surveillance programmes, budgetary programmes, training needs, etc.

ARTICLE -7

7.0 OBLIGATIONS OF GRID

- 7.1 ID shall furnish to WAPCOS the available design data, drawings and all other information such as actual state of construction of the project at the time of signing of agreement and engineering reports etc. relating to the above work.
- 7.2 ID shall, also furnish all technical data, information and reports available with ID for WAPCOS reference and use in performing the services under this agreement.
- 7.3 ID shall render necessary assistance to WAPCOS in obtaining any other data required from other State Govt. or Central Govt. agencies/departments for the completion of work. Such assistance by ID shall be in the form of reference letter to the concerned department to provide WAPCOS required data and WAPCOS would complete the necessary follow up action.

On and behalf of
Government of Rajasthan,
Irrigation Department

On and behalf of
Water & Power Consultancy
Services (India) Limited

WITNESS

WITNESS

- 1.
- 2.

- 1.
- 2.

ANNEXURES

ANNEXURE - IGOVERNMENT OF RAJASTHAN
"IRRIGATION DEPARTMENT"

No: T/C E/IDR/4ME/3/664

Dated: 17.6.93

M/s. WARCOS Ltd.,
'KAILASH'
26, Kasturba Gandhi Marg,
NEW DELHI - 110 001

C/o Wapcos Jaipur

Sub: Environment Impact Assessment (EIA) Studies
of Narmada Canal Project (Rajasthan Portion)/

Ref: Your offer dated: 10.7.93

.....

Sir,

I am directed to convey the sanction of the Govt of Rajasthan to accept your single tender offer for consultancy services of Environment Impact Assessment (EIA) Studies of Narmada Canal Project (Rajasthan Portion). On the basis of estimated cost plus 15% charges upto a ceiling of total cost of Rs. 33.7. The consultancy services will cover the following aspects:

1. Project setting.
- ii. Impact evaluation.
 - a. Physical resources including soil, water & air.
 - b. Biological resources.
 - c. Social economic, cultural & quality of life value
 - d. Environmental management plans.

The payment worked out (by WAPCOS) would be made as under:

	<u>% of contract value</u>
1. On signing of agreement.	20%
2. On completion of field studies (after 4 months of signing of agreement).	20%
3. On submission of Draft EIA report.	10%
4. On submission of Draft report of plan for drainage & sub surface drainage.	10%
5. On submission of draft report for Ground Water Quality Monitoring.	10%
6. On submission of Final EIA report.	10%
7. On submission of Final report of plan for drainage & sub surface drainage.	10%
8. On submission of Final report for Ground Water Quality Monitoring.	10%

This bears the concurrence of F.D.III vide ID-116: dated 27.5.93.

42325/117
Executive Engineer & TA to,
Chief Engineer,
ID&R (Irrg.) Unit, Jaipur

ANNEXURE-II
TOR FOR EIA STUDIES IN COMMAND AREA
NADMADA CANAL PROJECT (RAJASTHAN)

I. GENERAL

A. SCOPE

The EIA shall be an in-depth investigation of factors described in this terms of reference (TOR) adequate to satisfy inquiries from international/ National scientific scrutiny. The detailed items of the scope are described under the remaining sections of this TOR. The consultant will supply all informations/clarifications needed by NCA from time to time and it will their responsibility to get the report cleared from NCA.

B. FORMAT OF EIA

The EIA shall contain three main sections, and within each section, a number of environmental topics shall be addressed. The main sections are : project setting, impact evaluation, and environmental management plan. The environmental topics addressed in these sections may vary however in general, they encompass physical resources, ecological resources, social and cultural resources and quality-of-life values. The emphasis within each main section is as follows :

- i) **Project Setting** : describes the existing conditions into which the project is being introduced the physical, ecological, social, cultural and quality-of-life (setting).

In practice it assists in review of the EIA to shift some of these data to the next major section dealing with impact analysis, in order to avoid repetition. Thus in this section, often the descriptions are more general and non-quantitative. For instance, a description of the elements making up the project would be provided here; however details may be withheld until they are necessary for analysis of impacts.

- ii) **Impact Evaluation :** This section provides the analysis of impacts (both positive and negative) and also presents the alternatives for mitigation of impacts, drawing initial conclusions concerning the preferred manner for mitigation, and setting for their further development in the environmental management plan.
- iii) **Environmental Management Plan (EMP) :** The EMP elaborates on the mitigation measures and presents various schemes for implementing these measures, monitoring results and redirects the EMP as a measure of assurance that in fact correct procedures will be followed. The active roles for all participating groups shall be spelled out in the EMP and project provisions identified.

C. SCHEDULE

The Consultant shall prepare the EIA in a period of 11 months, and during this period provide the following reports (Refer Annexure-IV):

- i) **Draft Reports:** the consultant shall submit the draft reports for the EIA study, groundwater quality monitoring and plan for surface and sub-surface drainage at the end of 5, 6 and 7 months respectively from the signing of the agreement.
- ii) **Final Reports :** the consultant shall submit the draft reports for the EIA study, groundwater quality monitoring and plan for surface and sub-surface drainage at the end of 9, 10 and 11 months respectively from the signing of the agreement.

The volume of EIA report shall include :

Executive summary (significant, findings and recommendations).

Project descriptions.

Scope of EIA.

- Methodology used in conducting studies.
- Baseline environmental studies.
- Identification of impacts.
- Prediction of impacts.
- Evaluation of impacts (with environmental management plan and without environmental management plan).
- Environmental management plan (for all components of environment coming under impact).
- Monitoring and surveillance programmes, budgetary programmes, training needs, etc.

II. PROJECT SETTING

The EIA shall describe the project setting by quantitative means, using primary data which skillfully reflect actual conditions in order to provide a sound basis for impact evaluation. The project setting involves (i) maps of the command area and contiguous area, prepared to adequate scales to depict land use, vegetation, drainage areas and infrastructure. The maps may also be used to superimpose information concerning soil types, groundwater conditions and other background data.

The project setting shall include the detail description of the project and its various appurtenances should be used to depict the project infrastructure and background.

The quantitative data concerning the setting and impacts such as tables and figures may best be withheld for use in environmental impact analysis. Decision in this regard may be taken during the formulation of EIA.

III. IMPACT EVALUATION

The EIA will address the impact of the project on the various types of resources.

A. Physical Resources, including soil, water and air.

1. Soil Resources

The command area falls under arid to semi-arid climatic condition and vulnerable to soil salinity problems after the introduction of canal irrigation. In view of this in-depth study should be made by selecting a few benchmark profile in the command area for checking these problems.

The EIA shall identify the range and extent of soil types in the command area and in contiguous area specifically in relation to their classification, elevation with respect to sea level and ground water level, texture and porosity, and representative values for percent organic matter, cation exchange capacity and sodium absorption ratio. The EIA will identify potentially critical soil types or zones, where waterlogging and soil salinity may become problematical. The EIA shall identify project operations to predict conditions under which soil content becomes excessive either due to high ground water levels, excessive surface application rates and /or inadequate local drainage and relate soil parameters to critical parameters for use in environmental management plan. Likewise increases in magnitude of soil salinity must be evaluated in relation to various scenarios and soil parameters in order to predict the conditions under which salinity in soils may be maintained within the limits or minimized followed by inclusion in the EMP.

2. Water Resources

The EIA shall provide quantitative data to describe the significant features of the surface and ground water resources in the command area and in contiguous areas.

2.1 Surface Water Resources

The surface water resources (including inland waters, rivers and estuaries, lakes and coastal zone such as gulfs and open coastlines).

Inland Water

i) **Configuration:** Drainage basins should be mapped and demarcated. Sufficient elements of hydrological cycle which provide an understanding of seasonal variations of drainage basins shall be explained. Current discharges from urban areas and industries shall be identified and their quantities estimated. Seasonal hydrographs for major drainages shall be prepared. Natural depressions which collect waters, shall be identified mapped and demarcated. The information at the reconnaissance level shall be conducted to identify the variation on the seasonal extent of water.

ii) **Quantity/Quality :** The study should assess the available quantity surface and ground waters based on available hydrological/hydro-geological data. The wind energy potential in the area shall also be assessed for its proper use at appropriate location in running the water pumps for conjunctive use of surface and ground water. Existing data on water quality shall be compiled and additional monitoring shall be done as and when necessary to define conditions during representative seasons of the year at illustrative locations. Seasonal streams may be dry during most of the year or may transport effluent discharge only. In the latter case some representative monitoring data shall be collected. Perennial rivers shall be monitored at locations in which depict the effect of human activity, primarily at points upstream and downstream of

major urban centres and industrial outfalls. Some representative water quality data on depressions, shall be provided as well. Parameters shall include calcium, sodium, potassium, carbonates, bicarbonates, sulphates, DO, BOD, COD, TSS, pH, alkalinity, TDS, conductivity and other selected parameters which relate to effluent discharges (phenol, heavy metals and ammonia), in appropriate combinations to fit the circumstances.

iii) **Impact evaluation:** The EIA shall provide adequate analysis to quantify potential impacts of project on inland surface water quality. The evaluation should be based on a realistic assessment of irrigated discharges (including groundwater seepage) quantity and quality, and M&I discharges; and should address possible effects from elevated salinity (high TDS), pesticides, nutrients from fertilisers and M&I discharges, industrial pollutants, and high TDS/BOD discharges from urban centers on rivers (both seasonal and perennial), depressions.

(b) Coastal Waters

The coastal zones include two Gulfs (Cambay and Kutch), inundation areas under tidal influence (the Rann) and coastline.

i) **Configuration:** The EIA shall provide information on the general configuration of the two Gulfs including depth profiles and sections for general conditions, and notations of anomalies. The areas adjacent to shorelines (+2 m elev) should be similarly described, in particular the inundation

areas and river outlets. The general coastal configuration should be done to represent movements within the Gulfs under seasonal effects and also the changes on the coastlines shall be defined.

ii) **Quality:** Water supply conditions shall be documented, using existing data supplemented by field monitoring. The monitoring plan shall be designed to provide insight into the general area as well as areas directly affected by human activity and riverine discharges. Water quality shall focus on critical areas (suitable parameters for urban areas and river mouths) and on salinity gradients in the gulfs.

iii) **Impact Assessment:** The EIA will evaluate the potential for irrigation return flows and/or drainage discharge which contain M&I effluents to adversely affect water quality in the gulf regions in particular. It is also important to attempt to distinguish between background (ambient) water quality and existing effects from human activity, upon which potential effects from the project would be superimposed. Various operational scenarios shall be considered in which the outcomes may reflect: 1) existing effects are reduced (due to better overall management at State level) and potential effects are minor enough to result in zero net degradation, or 2) existing effects continue and potential effects are nevertheless negligible by comparison, or the existing effects continue and potential effects are serious. The first scenario relies on an active state-wide water quality management plan as the outcome of the impact evaluation. This same approach is also applicable to the

analysis of inland waters (specifically the Sabarmathi river and others as well).

2.2 Groundwater Resources

The EIA shall assess the potential for negative impacts on groundwater in relation to fertilizers and pesticides, salinity in irrigation water and in soil pore-water, soil parameters, percolation and migration rates, lithology, and proximity to saline surface water.

- i) **Configuration** : Aquifers within the command area and contiguous areas shall be mapped and classified, and relevant parameters (including stratigraphic information) provided. This effort should utilize existing boring logs and surveys, and should provide usable summaries of information using accepted presentation methods (charts, graphs and figures). Relevant information concerning overlying soils, aquicludes, gradient and transmissibility should be provided in order to predict in general the propensity to transmit pollutants to and within the aquifer.
- ii) **Quality**: Groundwater quality parameters including pH, conductivity and TDS; and pollutant parameters such as TOC, nitrates, and specific pesticides, may be identified as necessary to establish background water quality levels. Groundwater salinity (TDS) contours should be constructed for areas with highly saline groundwater.
- iii) **Impact Evaluation**: The effects on groundwater quality parameters such as salinity, nitrates, organic carbon, trace chemicals, heavy metals shall be assessed. The assessment and background levels shall be used to identify and

ultimately to formulate a management plan for agricultural chemicals and waste management.

3. AIR RESOURCES

The project does not have a direct negative impact on air quality except during the construction stage. There are however indirect (second-order) negative impacts and both direct and indirect positive impacts. Indirect impacts on air quality items from increased urbanisation, industrialization, population growth and consumption. These cannot be accurately quantified and it is not necessary to do so. The EIA may describe potential scenarios and may also propose conditions within the EMP to manage air quality. A potential direct positive impact is the replacement of combustion fuels for pumping water. The EIA should explore this aspect, document policies and make forecasts where possible on long-term effects on future air quality within the region (specifically urban centers).

B. BIOLOGICAL RESOURCES

This category includes flora and fauna, forests, wildlife, fisheries and critical ecological systems.

1. Command Area Ecology

The major ecological systems represented in the command area shall be identified, mapped and their principal features noted. Any critical ecological systems should be described (i.e. those limited in areal extents dependent on limited external resource inputs, or necessary for support of endangered, threatened or regionally important animal or bird species). The EIA shall indicate the nature and extent

of changes in the make-up of the ecology of the region brought about the project. The extent to which extensive irrigation might threaten the existence of critical ecological systems should be evaluated in conjunction with alternative control measures.

2. Flora and Fauna

A detailed description of flora and fauna involving inventories is needed. The typical flora and fauna associated with specific ecological systems should be itemized, emphasizing species of plants that are economically important on the household level, have medicinal or religious value, or provide a list of domesticated animals and animals not covered under wildlife (see item 3 below), including insects, reptiles, birds and domesticated or semi-domesticated animals. The EIA shall attempt to identify plant and animals which are threatened with extinction or those upon which the life of humans depend. The EIA will evaluate and forecast the probability of these impacts and quantify or otherwise describe their extent.

The studies on flora and fauna shall also include the special relationship aspect which include: relationship with vegetation to substrate, animal to substrate, animal to plant, human vs. nature, livestock vs. wild animals.

3. Aquatic Weed

Detailed studies shall be made to identify the aquatic and terrestrial weed problem in the command area, with detailed action plan for their control.

B. WILDLIFE

The EIA shall provide quantitative data based on recent field information on the types, numbers, and extent of significant species of wildlife within the command area and in contiguous areas and shall evaluate the effects of the project on those species.

i) **Inventory:** A wildlife inventory shall be prepared on the existing information from the Department of Forests and Wildlife (and other sources) and providing additional field survey to obtain direct information to update and makeup the discrepancies in the current data base. The inventory should identify, classify and inventory all significant wildlife and bird species, those not covered in the general fauna inventory. The range of their habitats should be noted, and endangered, rare and regionally important species so indicated.

ii) **Sanctuaries:** The wildlife and bird sanctuaries shall be described their ecological characteristics, flora and fauna identified and the relation between wildlife species in each sanctuary and the ecological setting analysed in order to identify important linkages. The EIA will evaluate alternative operating scenarios to determine their relative impacts (beneficial or damaging) on the wildlife species. The preferred scenarios will be incorporated into the wildlife component of the EMP.

4. **FORESTS**

The existing forests within the command area or in contiguous areas will be identified, mapped and classified. These areas may include actual or degraded forest land and land under alternate ownership supporting forest, scrub, thorn, bush, or other desert ecosystems which in a broad sense may be classified as forest. The extent to which canal rights-of-way conflict with each of the forest types shall be determined. Afforestation within the command area, in contiguous areas, and along rights-of-way shall be described in terms of extent, tree types, required human interventions and schedule.

C. **SOCIO-ECONOMIC, CULTURAL AND QUALITY-OF-LIFE VALUES**

The integrated development of the command area shall also be planned incorporating major activities and recommend all measures required to be implemented in a phased manner blending with socio-economic and economic needs. This category of impacts includes changes in economic livelihood, alternations social values as demonstrated by various indicators (public health, employment, education), cultural aspects in particular, physical aspects such as religious and historical monuments and changes in cultural values as well as quality of life (an aggregate of income, public health, education and other factors).

1. **ECONOMICS**

The EIA shall document current economic conditions for the people living within the command area; including distributions of wage and income, personal wealth and

ownership, sectors of employment, age/earnings relationships and other factors. The economic profile should be geared to illustrating essential changes among population/age/employment groups brought about by the project. The numbers of person within each cohort distribution group directly receiving irrigation as well as those benefiting via new employment and/or economic growth opportunities, and their increased levels of income should be identified.

2. SPECIAL TRENDS

This category focuses on dislocations and reorientation of social values as evidenced by social statistics such as public health, education, marriage, child birth, fertility, migration and other factors. Data from relevant state agencies may often be useful in depicting existing conditions. In addition field work will be necessary to augment existing data. In some areas it will be possible to forecast changes in social indicators as a result of the project. For instance, public health resources, improved water supply may be estimated based on reduction of people served and the expected reduced frequencies of disease that accompany such improvements; educational opportunities may be related to family income. Second order and tertiary impacts are more difficult to predict, and many are uncontrollable. The project objectives nevertheless should focus on these social indicators as being of primary importance for the real worth of the project it should stem or reverse urban migration, improve family support structure, augment public health and reduce mortality rates,

and result in similar improvements in social statistical indicators. The EIA should assess baseline values and to the extent possible forecast such changes.

3. PUBLIC HEALTH

A number of project-related factors may adversely affect health and will require engineering solutions for remedy. The EIA should identify baseline indicators for vector transmitted diseases including malaria, filariasis and schistosomiasis, determine any aspects of the project which could exacerbate the incidence of these diseases, and recommend alternative solutions for implementation during construction or operations phases, depending on the conditions responsible for the disease. Alternative solutions which appear to be justified shall be incorporated in the EMP. In addition measures shall be devised to give early warnings for the occurrences of the specific diseases within the project area.

4. CULTURAL AND HISTORICAL VALUES

On one hand the project should avoid disruption of monuments which preserve religious, cultural, and historical values. The EIA should indicate if and where conflicts exist in the location of cultural monuments and rights of way acquired under the project. On the other hand religious, cultural, social values, extending family groupings, religious groups that are sustained by life style and mutual support, transmission of attitudes and beliefs to successive generations and the life should also be preserved. However, these intangible impacts are difficult to observe measure

and forecast changes. The project should nevertheless preserve existing religious, cultural and historical values by providing direct benefits to the people already living in the area who are in need of these in order to sustain their livelihood.

5. MICRO-CLIMATE

Since most of the command area of the Rajasthan comes under arid to semi-arid climatic zone and hence represents ecological organisms adopted to this particular micro-climatic condition. The introduction of canal in this area will definitely change the micro-climatic condition and hence this anticipated change will affect vegetation pattern in the area and there is a great apprehension that certain hardy species adopted to drought condition will be affected adversely. In view of this, detailed study to predict the likely impact of these changes on adoption of drought tolerant species shall be made. Special measures shall also be planned for the conservation of these valuable species.

6. PEST AND DISEASE VECTOR

Prevalence and incidence of pest and disease vectors shall also be studied in detail.

IV ENVIRONMENTAL MANAGEMENT PLAN (EMP)

1. BASIS OF PLAN

The EMP is a binding proposal to monitor and control of environmental, operation and socio-economic aspects of the project to accomplish basic desirable objectives, and to monitor and regulate this control function to assure that it

is being carried out. The plan therefore involves numerous potential participants involved in implementation, monitoring, control/regulation and administration of the plan. The basis of the plan is to provide adequate checks to assure implementation, and thus to demonstrate a willingness to actually carry through or environmental improvements.

2. COMPONENTS

The environmental assessment identifies numerous preferred alternatives for reducing environmental impacts. These are to be developed into components of the EMP by (i) developing action items to bring about implementation (ii) identifying monitoring needs for the component (iii) identifying responsibilities and assigning them to specific groups. (iv) determining necessary resources to implement activities and (v) identifying strengthening needs. The EIA shall consider feasibility of plan implementation, required resources, schedules and checks. The plan shall provide all these elements for every component, and outline budget requirements, training needs, and implementation schedules for the work.

3. WIND ENERGY

The wind energy potential in the area shall be assessed for its proper use at appropriate location in running the water pump for conjunctive use of surface and ground water.

4. RESETTLEMENT AND REHABILITATION

Regarding social impact assessment about 10-15% canal affected persons should be interviewed for bringing out a scientifically acceptable social impact assessment. Salient

features of Resettlement & Rehabilitation policy should also be presented in the EIA Report.

The public, NGOs shall be involved at all stages of EIA for improving the public participation in government decision which is one of the important goal of EIA.

5. GROWTH CENTRES

The assessment of agricultural marketing facilities available in the area and future arrangements required to strengthen marketing yards, marketing unions their infrastructure, etc. shall also be provided and assessment shall also be made to recommend measures for promoting or for establishing of appropriate agro-based processing unit, warehousing and connected support services with changed cropping patterns after introduction of canal irrigation.

6. TRAINING PROGRAMMES

The agricultural extension backup and training requirements of the personnel needs shall be given due emphasis. And also assessment shall be made about the training needs of the farmers who switch over to canal irrigation from rain-fed agriculture and who have to work collectively to manage water in the village service area.

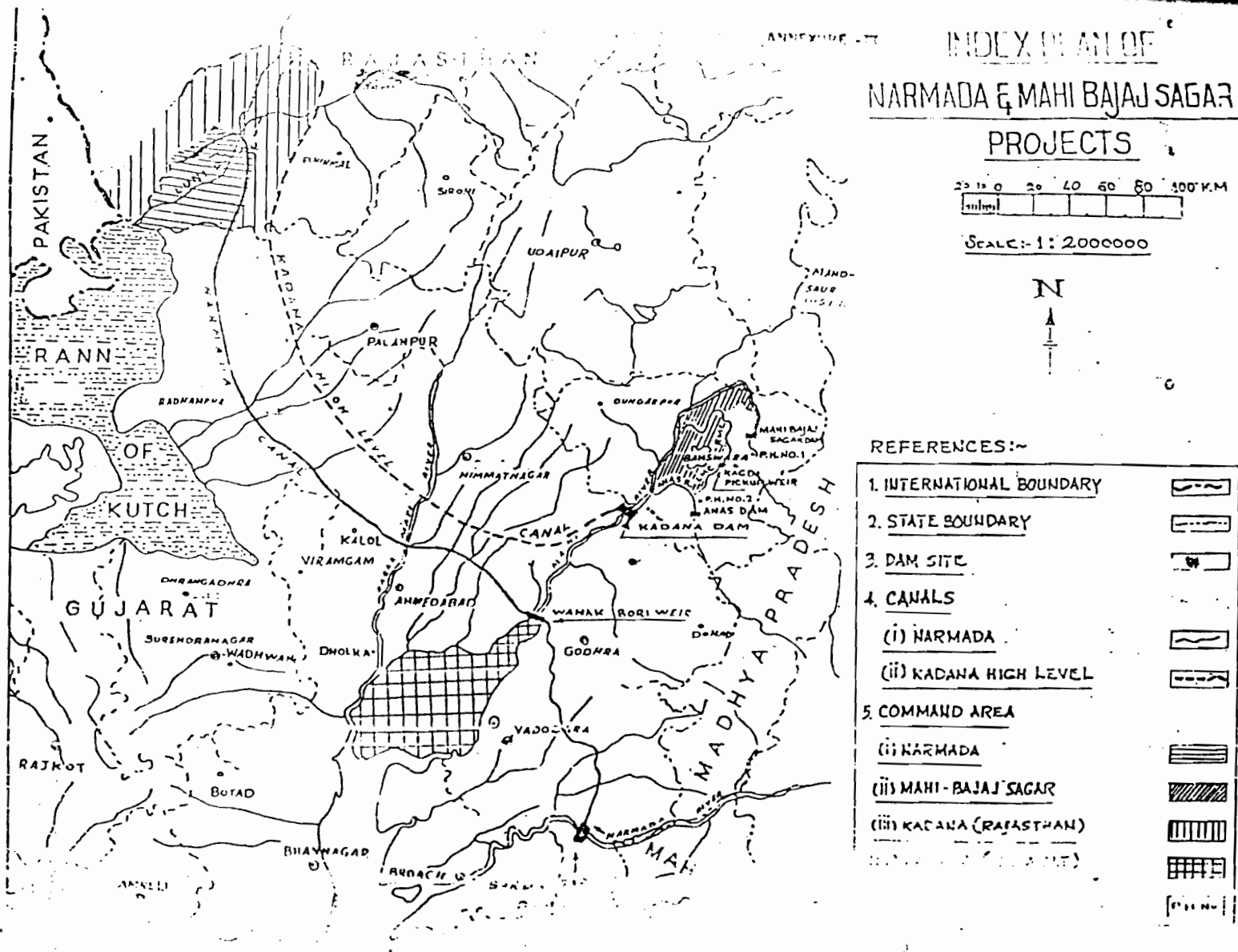
7. ROAD DETAILS

Detail assessment shall be made about the road connectivity of growth centres in the command area (minor and major towns are expected to grow) and recommended what standard road needs to be provided in terms of command infrastructure and market development needs.

DESIGN OF SURFACE AND SUB-SURFACE DRAINAGE SYSTEM

The scope of the study is as under :

- Data collection will be done for rainfall, climate, present water use, identification of areas of flooding, present cropping pattern and landuse, soil characteristics, ground water levels, topography, geology and lithology;
- Identification of levels of surface and sub-surface drains in the command area for different irrigation and water utilization scenarios;
- Preparation of master plan for drainage showing existing major drains and incorporating their modification in them, and construction of new water drains for various water utilization scenarios;
- Evaluation of design discharges for surface drains in each region of command area, and
- Preparation of cost estimate for surface and sub-surface drainage of the regions based on pilot studies.



SCHEDULE

SL NO.	ACTIVITIES	No of Months										
		1	2	3	4	5	6	7	8	9	10	11
1.	Reconnaissance, literature Survey	■										
2.	Field Studies for Environmental Impact Assessment Study		■	■								
3.	Field Studies for ground water quality monitoring		■	■	■	■						
4.	Field studies for design of drainage system			■	■	■						
5.	Submission of draft EIA report					■						
6.	Submission of draft report on ground water quality monitoring						■					
7.	Submission of draft report on design of drainage system						■	■				
8.	Comments of client on draft report								■			
9.	Submission of final EIA report									■		
10.	Submission of final report on ground water quality monitoring										■	
11.	Submission of final report on design of drainage system											■

ACTION PLAN

*Archaeology and Museums
for*

N.V.D.A.



*Commissioner, Archaeology & Museums
Madhya Pradesh*

1993

**Commissioner
Archaeology & Museums**

I.M. CHAHAL

Project Officer

Dipti Gargava

Survey Team

**A.K. Risbud
Archaeologist**

**Dr. O.P. Mishra
Publication Officer**

**M.K. Maheshwari
Archaeologist**

Assistance

**P.J. Abraham
Project Engineer**

**Shipra Som
Tech. Asstt.**

**Ahmed Ali
Tech. Asstt.**

**Pramod K. Sharma
Tech. Asstt.**

Sasankan M.K.

N.K. Saxena

*Commissioner, Archaeology & Museums
Madhya Pradesh
1993*

CONTENTS

1.	Introduction & Brief Description	1-24
2.	Sardar Sarovar Project	25-47
3.	Indira Sagar Project	48-57
4.	Omkareshwar Project	58-64
5.	Maheshwar Project	65-70
6.	Man Project	71-72
7.	Jobat Project	73-74

INTRODUCTION

River Valley cultures all over the world have been the cradle of ancient and powerful civilizations. Much of this had to do with the easy availability of water not only for personal use but as a means of trade as well. The cultures of the Tigris and Euphrates valleys, the civilizations which flourished by the Nile and the Tiber are known to every school child and need no elaboration.

India too had its ancient River Valley cultures which have been and still are the subject of intense scholarly debate and study.

In Madhya Pradesh the River Narmada, rising from Amarkantak in the Mehkal mountain range in Shahdol district, flowing through the Vindhyas and Satpuras, to the plains of Bharoch in Gujarat and merging into the Arabian Sea also has a rich history of dynamic cultures of both, prehistoric and relatively recent times. The Narmada is considered among the seven most sacred rivers of India. Its terrain figures repeatedly in the literary references of ancient India. The two great Epics of India, the Puranas and the early Sanskrit texts refer to the life giving power of this river.

ऐश्वर्यदात्री जनदुःख हन्त्री

पापान्विहन्त्री विमलार्चित श्रीः

॥ भवानी तन्त्र ॥

Innumerable dynasties flourished along its banks and hinterland: the Mauryas, the Guptas, the Chalukyas, Pushyabhutis, the Rashtrakutas, the Gurjara Pratiharas, the Paramaras, and the Kalachuris. It is therefore, a repository of historical and archaeological finds of incomparable value. Indeed whatever we have available by way of these finds is only a miniscule part of what remains to be yet discovered. It is because of this cultural potential that eminent scholars and archaeologists from India and abroad have undertaken research and survey projects in the Narmada Valley. Thus De Terra and Peterson under the Cambridge Expedition Scheme had surveyed the valley from Hoshangabad to Narsinghpur and spotted evidences of Lithic cultures. Surveys were also undertaken by the Archaeological Survey of India, Deccan College, Poona and Sagar and Vikram Universities of the State. Dr. A. Sonakia from the Geological Survey of India, Nagpur Division, had discovered a fossilized human skull cap from village Hatnora in Hoshangabad district. This discovery offers information in the reconstruction of human evolution theories.

..2..

The Dam Project has necessitated a fresh look at the archaeological and cultural heritage available in the Narmada Valley in Madhya Pradesh, so that a scheme for salvage and relocating can be drawn up. Broadly, this would involve :

1. Survey of antiquities to be salvaged.
2. Documentation for the purposes of record.
3. Shifting/ relocation of the sculptures and artefacts for which suitable sites and building would have to be located.
4. Setting up and display of the cultural and heritage artefacts thus retrieved.

The department has already completed the survey part of this project. A resume of work in the over all scheme is as follows. The activity under each phase is supported by details and financial estimates pertaining thereto, in the annexures.

The construction of six proposed dams over the river Narmada would affect some 566 villages of the State. In order to safeguard the archaeological treasures located in these villages, the staff of this office had undertaken survey work in the concerned regions and identified the sites and monuments. Besides survey work, we are also taking various steps to protect and document for posterity. Hence, we present a brief, action plan.

PHASE : I

(a) In Phase-I, the officers and staff of this department had undertaken village to village survey of the areas coming under these six proposed dams.

(b) After completion of this assigned survey work, district wise survey reports were prepared.

(c) While surveying the villages, besides noticing architectural monuments, stray scattered sculptures were also located. A list of these surface sculptures is at (Page No. 34-41 48-65, 53-60, 66-68, 72, 74)

(d) Following this listing of sculptures, arrangements will be made to shift them to a safer place. In this first phase, an estimate for shifting these sculptures was prepared.

PHASE : II

(a) Action Plan for Narmada Project prepared.

...3..

(b) Arrangement for documentation of these artefacts (both sculptures and monuments) would be done in Phase-II. Photographs would be taken insitu. Sketches would be done. Elaborate plans and maps of the artefacts and the location, would also be prepared in Phase-II. Also pictorial documentation would be undertaken in this phase.

(c) On the basis of these survey reports, heavy sculptures would be shifted to the proposed Narmada Park, which will comprise a museum building and a wooded park complex where these sculptures will be displayed in a specially re-created ecological ambience. Thirty acres of land available with the department in the environs of the Lalbagh Palace, will be utilised for this purpose. An estimate for shifting these monuments is at (Page No. 27-31, 61-62)

(d) An estimate for construction of a museum building in the Narmada park near Lalbagh Palace in Indore has been prepared.

The following points were borne in mind while planning the Narmada complex in this area :

One : This 30 acres of land is already in possession of the department. Hence, no extra effort need be made to obtain land nor would there be any extra financial burden on the government.

Two : Keeping in view the time limit, we should not have to waste any time looking for a suitable place. Thus, we can at once start shifting of antiquities. Also the construction work of the museum building could be started immediately, if funds are made available.

Three : The geographical situation of the place. Most of the regions coming under the submergence area are not far from Indore. Hence, cost for transportation of artefacts would be considerably reduced.

Four : The Lalbagh Palace complex is situated in Indore one of the important cities of India, and also of the State. Indore is also a place of tourist attraction hence it is expected that once built, the park would attract tourists from all over. It was also thought that the larger artefacts instead of being scattered around in different places and sites should be exhibited in one place, so that the general public could see, enjoy, learn and be aware of the rich cultural heritage that flourished on the banks of the Narmada. Smaller pieces of sculptures will be shifted to the local area museums, State Museum, Bhopal and monuments will be relocated as far as possible at the site to which the villages are shifted so that they continue to be part of the local heritage.

(e) An establishment setup and budget for Narmada Project is prepared in Phase-II.

..4..

(f) An estimate of equipments necessary for Project work is being prepared in Phase-II.

(g) Excavation work in Khedinema - an early Historic Mound in Hoshangabad will be taken up in the winter of 1993.

PHASE : III

(a) Actual building construction in Narmada Park area near Lalbagh Palace in Indore would be started in Phase-III. (subject to availability of funds)

(b) Actual shifting of sculptures from sites to this park would be done in this phase.

(c) Shifting of monuments would also be undertaken in Phase-III.

PHASE : IV

(a) Arrangements for display of the artefacts would be made in this last phase.

(b) Models of those monuments which cannot be shifted from the sites would be prepared.

(c) A 'Video Library' would be set up to house and safeguard the video documentation materials.

(d) Publication of catalogues of these valuable sculptures would be undertaken so as to make them available to the general public and the scholars alike.

(e) Excavation Reports, new findings etc. would also be published, to make them available to the public.

An abstract of the Phasewise activity is as follows :

PHASewise ACTIVITIES UNDER THE NVDA PROJECT FOR ARCHAEOLOGY

PHASE-I	PHASE-II	PHASE-III	PHASE-IV
Survey work	Action Plan	Building construction	Display arrangement
Survey Report		Shifting of Sculptures	Models preparation
Listing of Monuments	Documentation	Shifting of Monuments	Video Library

..5..

PHASE - I	PHASE - II Estimates	PHASE - III	PHASE - IV Publications
Listing of Sculptures	1. Shifting of Monuments		
Estimate for Shifting	2. Office Building, Museum and park complex		
	3. Setup & Budget		
	4. Equipment		
	5. Excavation work		

MAJOR SITES REQUIRING TRANSLOCATION

The dam project wise breakup of the affected villages is as follows :

1. The Narmada Sagar dam	254 villages
2. Sardar Sarovar dam	193 ..
3. Omkareshwar dam	30 ..
4. Maheshwar dam	59 ..
5. Gobat dam	13 ..
6. Man Project	17 ..

Detailed survey work was undertaken by the archaeological experts in all these villages.

While surveying the 254 villages coming under the Indira Sagar Project, 30 monuments, 240 sculptures and 4 archaeological mounds were spotted out by the teams. Besides, 193 villages under Sardar Sarovar, and 30 villages under Omkareshwar project were also surveyed. Villages belonging to the Sardar Sarovar project area have yielded 36 monuments, 88 images and 33 archaeological mounds. The villages to be affected in the Maheshwar dam area also contain archaeological treasures. 16 monuments, 20 sculptures and a site of archaeological importance have been located in these areas. The first stage of the work viz. undertaking of an elaborate survey work, identifying the remains of ancient heritage has already been done. Listing of these historical monuments and stray scattered sculptures located in different villages has been done. The following are the monuments to be affected by the Sardar Sarovar Project :

..6..

Shiva temple, Roligaon	District Jhabua
Kalanjeshwar temple, Semalda	District Dhar
Shankar temple, Barda	District Dhar
Jalaleshwar temple, Khujawa	District Dhar
Rockcut caves, Khujawa	District Dhar
Bhawani Mata Mandir, Khujawa	District Dhar
Shiva temple, Nagajhiri	District Dhar
Ratneshwar temple, Dharpuri	District Dhar
Ganesha temple, Dharpuri	District Dhar
Venkata Bihari temple, Dharpuri	District Dhar
Vilpankeshwar Mahadeva temple, Dharpuri	District Dhar

Protection/ Relocation where possible of these will be attempted. A brief description of these monuments follows :

SHIYA TEMPLE AT ROLIGAON JHABUA (SSP)
(Alirajpur Sub-division)
Circa - 11th-12th A.D.

The magnificent Shiva temple standing in the out skirts of the village Roligaon in Alirajpur Sub-division of District Jhabua is the central focal point of the picturesque landscape. The river Ankhad, a tributary of Narmada flows upto the raised terrace where the divine abode, constructed exactly in the Bhumiya style of Architecture propounded by the famous Paramara king Bhojadeva is standing. The temple consists of a porch, a big assembly hall supported by four pillars and two pilasters and the rectangular sanctum with Shiva lingam as main deity. In vertical plan the Pyramidal spire crowns the main shrine, while the rest of the roof is covered by loosely placed stone slabs and bricks. At present the whole structure is some what dilapidated.

The facade is simple in appearance having the geometrically decorated balustrade on the platform encircling the porch and assembly hall. The pillars are rectangular and the base having a square shaft intertwined by circular bars and crowned by the bracket capitals having bhavahaka.

The entrance to the sanctum is flanked by the richly covered pilasters having two decorative bands on the jambs and lintel, of which the inner one is profusely carved with creeper design having intertwined loops while the outer band, has floral motifs with some dancing figures. The canopy of the lintel has the Trinity, Brahma, Shiva and Vishnu in the three successive brackets. The sculptures studded in the walls are the various dispositions of Lord Shiva of which the Tripurantaka and dancing Bhairava are important. The twelve armed dancing Chanda Bhairava is the peculiarity of the temple as he is shown in Tandava dance (a fearful or terror inducing dance). The left leg of Bhairava is lifted and positioned in dancing attitude. He

..7..

holds all those attributes ascribed to him in the iconographic texts. On the pedestal, attendants are shown playing flutes and drum gazing at the expression displayed on the face of the god. Another Chanda Bhairava is shown standing in dvibhanga posture. The twelve armed nude Shiva displays clockwise, a dagger, ankusha hand in dancing pose serpent, drum, Khatvanga, hand in dancing pose and the head of a parrot. The Chanda Bhairava is drinking wine in a skull cup. The blood shot protruding eyes and gnashing teeth enhance the fearful expressions of the image.

Among other sculptures, the dancing Chamunda is also eye-catching. The twelve armed goddess is shown standing on apasmarpurusa holding all the ascribed attributes. The two skeletonised attendants are shown on the pedestal of which one is holding a dagger while the other drinking blood in a skull cup.

An unusual image of a twelve armed Ganesha, shown in dancing posture is displayed on the southern wall of the sanctum. He is holding his own tusk, wood apple, sweet meat, elephant goad, noose, snake, rosary and lotus. On the pedestal, two musicians are shown playing on flute. Apparently this grotesque type of Unmatta-Uchista Ganapati must be associated with the Vamachara-Tantric variety of worship. This image is comparable to the eight armed dancing image from Orissa and with mediaeval Bengal. The tantrik text ' Sarada Tilak ' makes mention of such images.

A remarkable image of headless ' Lajja Gauri ' carved out in the mouldings of the plinth is another important sculpture which perhaps was associated with tantric worship. The Nayaka-Nayikas, amorous couples, abhisarikas, and sub-deities are part of the sculptural decoration of the temple.

This temple, was perhaps constructed in the late 11th or early 12th century A.D.. The sculptural treasure of this temple explicitly indicates its association with Tantric vestiges of the time. The monument has been selected for shifting.

KALANJESHWAR TEMPLE, SEMALDA (SS)
(District - Dhar)
Circa 15th A.D.

The village Semalda is situated in Manavar Sub-division of District Dhar where a temple, locally known as Kalanjeshwar Temple is dedicated to Lord Shiva.

The 48th chapter of the Rewa Khanda of Markandeya Purana refers to this place. Here, it is mentioned as a sacred place of

..8..

Diptikeshwar caused to be formed by Brahma, Vishnu and Mahesha. The Shiva lingams which were installed here were adorned in the name of Diptikeshwar, Narbadeshwar, Amareshwar, Sukleshwar. The temple Kalanjeshwar is standing on the northern bank of the Narmada. On the basis of its plan and architectural style, we can assume that it belonged to the 15th Century A.D.. Likewise the sculptures discovered from this village belonged to the 17th-18th Century A.D. The temple was constructed on a simple plan of porch and sanctum. The perspective of the temple is also very simple. The spire of the temple in its rudimentary form shows only three rectangular steps. While the rest of the roof is flat the outer wall, sanctum door, and the pillars are almost plain but the base stone of pillars have some geometrical decorative carvings. The figures of Nandis are placed in the porch of which one is mutilated.

The temple can be considered as an example of diminishing Indian temple architecture.

SHANKAR TEMPLE BARA BARADA (SSP)

(District - Dhar)

Circa - 15th Cent. A.D.

The village Barada is situated in the Manavar sub-division of District Dhar. The Shankar Temple located here is another example of diminishing temple architectural form which consists of porch and sanctum. Interestingly, out of two pillars supporting the roof of the porch, only one is decorated, and fitted in the temple. In later period, the temple was renovated. This temple belongs to 15th Century A.D.

JALALESHWAR TEMPLE, KHUJAWA (SSP)

(District - Dhar)

Circa - 17th Cent. A.D.

Village Khujawa in Manavar sub-division of District Dhar and the suburb of village Dharampuri in the tehsil headquarter of District Dhar. According to legend the sage king Dadhichi performed penance here and offered his skeleton to the Gods for use as a thunderbolt. The place is also important as Goddess Parvati did penance here and offered mango leaves to the Lord Shiva. The river Kubja joins Narmada here and this confluence is known as Vilvaramaka tirtha.

The temple of Jalaleshwara is a sixteenth, (16th-17th) Century A.D. construction having the main entrance in muslim architectural design. The main entrance looks like a gate of

..9..

Mughal country palace, the squinche arch is flanked by lotus medallions and the top bears a row of arched parapets (Kangures). The massive door-jambs are interrupted in the centre with the rectangular bands having inverted triangular motifs.

The site of the main gate which forms an alley to the main sanctum is dilapidated.

The plan of the temple is very typical : the sanctum is arranged to the lateral side of the main entrance and rectangular in the plan.

The images of Mahisasurmardini and Ganesha are placed in the niches while the main deity is a Shivalingam.

The sanctum-door has a river-goddess on the base of the door-jambs while the lintel has the figures of Brahma, Vishnu and Mahesha. Looking at its plan and magnificent entrance, only the entrance door is proposed for shifting.

BHAWANI MATA TEMPLE, KHUJAWA (SSP)
(District - Dhar)
Circa 13th Cent. A.D.

The Bhawani Mata temple in the village Khujawa also known as Durga temple, is built over the debris of a Paramara temple. Present temple belongs to Maratha period. The remains of Paramara temple are intact from base to Jangha portion in the outer walls of the sanctum. The sculptures have been studded in the plain and dressed stone block walls of renovation work. These evidences are enough to presume about the total temple plan and elevation. The temple was designed in pancha ratha fashion of Bhumiya style of temple architecture consisting of a porch, assembly hall and sanctum. The jagati has adhithana mouldings with geometrical decorations. The temple is at present dedicated to Goddess Mahishasurmardini of which a modern image is installed in the sanctum.

Beyond the porch, the assembly hall has 16 rectangular pillars bearing the images of human couples and the other divine images in the niches. Among the sculptures, Yoga Narayana, Vareshwar Shiva, Uma-Maheshwar, Ganesha are inter related in the niches without any order. The sanctum is rectangular in plan with the roof, fashioned in the 18th century's architectural trend and, decorated with bhavahaka carved out in 12 Century A.D

The main entrance has guardian deities holding bow and arrows with attendants at the base.

..10..

Although the roof looks flat now, in the original temple it must have been a magnificent pyramidal spire having five vertical bands running from base to top with all the architectural components.

ROCK - CUT CAVES, KHUJAWA (SSP)
(District - Dhar)
Circa 17th-18th Cent. A.D.

At a meeting point of the river Kubja with Narmada, the steps of a raised terrace have been cut in to the rectangular shrines dedicated to Shiva in His phallous form with profusely decorated facades.

In all these seven shrines, the porch and the door-jambs and lintels are decorated with flower designs in rectangular blocks. The fenestrations are flanked by niches having decorated fringe and arches having lotus medallions on either side.

Following the trends of Hindu temple architecture, the lintel contains tutelary images in small niches. The pilasters of the porch are almost plain having rectangular shaft and decorated abacus crowned with bracket capital.

Looking at the architecture, we may presume that the stone incising was done in 17-18th century A.D. under the renovation work. These decorated facades have been proposed for shifting and the rest of the shrines could be prepared in model at the Narmada valley culture park.

SHANKAR TEMPLE, BODHWARA (SSP)
(District - Dhar)
Circa 18th Cent. A.D.

The village of Bodhwara, situated in the District of Dhar is reached by the Chikhinda Sindhana road via Narmada Nagar. This temple was perhaps originally built in the 11th-12th century A.D. A new temple was constructed over the ruins of the earlier one in 18th century A.D. but the sculptural wealth of the older temple was utilised in the present one, built of yellow sand stone.

th
It
th
coCh
ar
42
wh
ovvi
stF
t
cl
1
a

o

1

2

3

...11...

SHANKAR TEMPLE, KATNERA (SSP)
 (District - Dhar)
 Circa 16th-19th Cent. A.D.

The village of Katnera is 2 km. away from Nisarpura in the north and situated on the eastern bank of the river Baghini. It appears that this Shankar temple was built sometime between the 16th and 19th centuries A.D.. The decoration over the cornice closely resembles that of the Mughal and Maratha styles.

HARAHARESHWAR TEMPLE, CHIKHALDA (SSP)
 (District - Dhar)
 Circa 17th Cent. A.D.

This temple, facing east and situated in the village of Chikhalda dates back to the 17th century A.D.. In its architectural layout, it possesses a garbhagriha and a mandapa. 42 pillars support the mandapa. While entering the garbhagriha where reside the main deity, one comes across an image of Ganesha over the Lalata of the entrance door.

Besides Harahreshwar, three more temples exist in this village. They are Nilkantheshwar, Pashupatishwar and another Shiva temple.

DHARAMRAI TEMPLE (SSP)
 (District - Dhar)
 Circa 14th Cent. A.D.

This temple, situated in the village of Dharamrai is primarily a Paramara temple. The bricks scattered around the temple suggest that the original temple was built in 11th-12th century A.D. but it seems that it was rebuilt sometime in the 14th century A.D. in close resemblance of Indo-Islamic architecture.

The other monuments which come under the submergence area of the Omkareshwar Project are as follows :

1. Shiva Temple, Panthia, District Khandwa
2. Sapta Matrika (Sata Mata) Temple-Selani, Distt. Khandwa
3. Shiva Temple, Selani, District Khandwa

..12..

4. Kuver Bhandari Temple, Godarpura (Omkar-Mandhata)
District Khandwa
5. Dilapidated Shiva Temple, Barhi Richphal, District
Khandwa
6. Shiva Temple, Premgarh, District Dewas
7. Renuka Temple, Ghoghalgaon, District Khandwa
8. Pashupatinath Temple, Panthia, District Khandwa

S
W
Md.
tl
C.

SHIVA TEMPLE, PANTHIA (OMKARESHWAR PROJECT)
(District Khandwa)
12th Cent. A.D.

Pantniya is the village, where, the dam of Omkareshwara Project is proposed. The village contains considerable antiquarian remains of the Paramara period.

wa
fr
te

Of these, the Chaubis Avatar temple (or the 24 Avatar temple) and a ruined Shiva temple are most important. The Chaubis Avatar temple is under the protection of the Archaeological Survey of India who will look after this monument. The Shiva temple is under the care of the Directorate of Archaeology and Museums, Madhya Pradesh, and is proposed for shifting.

This Shiva temple stands on the slope of a shallow hill near the village. It faces west and contains front portico, mandapa, vestibule and sanctum, but only the vestibule and sanctum are in situ in ruined condition. The decorative stone boulders are scattered around the temple. The temple dates to 12th century A.D. and is proposed for shifting.

It

SAPTA MATRIKA (SATA MATA) TEMPLE, SAILANI
(Omkareshwar Project, District - Khandwa)
Circa 18th Cent. A.D.

The Sapta Matrika temple is situated at the southern bank of the river Narmada at a distance of about 5 km. to the south east of Omkareshwar. The place can be reached by road.

The main temple at site is locally known as Sata Mata. It faces east though the temple is of circa 18th century A.D. but

..13..

ta)

ict

some loose sculptures of the earlier temple are fixed in the wall. In plan it contains only the square sanctum and open mandapa is supported on 20 pillars, and plain wall.

Two other temples at the site are also in situ but in a deteriorated condition. One of them was being renovated while the other one is seriously damaged. The ruins of a huge temple complex are visible at the site.

KUVERA BHANDARI TEMPLE, GORARPUR
(Omkareshwar Project, District - Khandwa)
(Omkar-Mandhata)
Circa 13th Cent. A.D. to 19th Cent. A.D.

Originally belonging to the Paramara period this temple was rebuilt in 19th century A.D. With lime and mortar, the fragments of earlier sculptures were also utilised in this temple.

REMAINS OF A DILAPIDATED SHIVA TEMPLE
(Omkareshwar Project District - Khandwa)
(Barhi Richhphal)
Circa 13th Cent. A.D.

This temple too is the example of Paramara architecture. It perhaps was built in 12th-13th century A.D.

SHIVA TEMPLE OF PREMGARH DISTRICT DEWAS
(Omkareshwar Project)
Circa 18th Cent. A.D.

RENUKA TEMPLE, GHOGHALGAON DISTRICT KHANDWA
(Omkareshwar Project)
Circa 18th Cent. A.D.

This temple is a work of late Maratha period.

..14..

PASHUPATINATH TEMPLE, PANTHIYA
 (Omkareshwar Project)
 Circa 13th to 17th Cent. A.D.

Around 13th century A.D. the original temple was built but, perhaps in course of time, it got destroyed. With the fragments of the earlier temple, this present temple was constructed in 19th century A.D.

The major monuments coming under the submergence area of the Maheshwar Project are as follows :

CHANDRASHEKHAR TEMPLE, BELSAR, DISTRICT KHARGONE
 (Maheshwar Project)
 Circa 17-18th Cent. A.D.

Village Belsar is situated by the side of the river Narmada in the Barbaha tehsil of Khargone district. This temple dates to 17-18th century A.D.

KALESHWAR SHIVA TEMPLE, Mardana, is a 17th century A.D. temple. Besides there is Makbara in the village of Teli Bhatyara in the district of Khargone, belonging to the 18th-19th century A.D.

Apart from these, there is in village Rawerkhera the tomb of ruler Bajirao now being protected by the Archaeological Survey of India.

Archaeological mounds in Sardar Sarovar submergence area :

In the course of archaeological explorations and surveys conducted in 76 villages of the district Khargone (undertaken by the State Archaeology and Museums, Madhya Pradesh) a good number of mounds with much archaeological importance have been identified. Of these, 7 mounds have yielded Chalcolithic potteries whereas 2 mounds show the remains of early Historic settlements. After a close examination of the survey reports, a few of these important sites have been selected for excavation. These sites being to the Sardar Sarovar Project area. They are :

1. Brahmanaon, District Khargone - Chalcolithic mound
2. Utawad, District Khargone - Chalcolithic mound
3. Kirmohi, District Khargone - Historical mound

..15..

BRAHMANGAON

The village Brahmanaon in the Thikari tehsil of Khargone district is located 5 km. to the north of village Dabana on Indore-Barwani highway. The archaeological mound is on the lower bank of Narmada covering an area of 9000 sq.mtr. and rising up to a height of 15 ft., at a distance of about 1 km. north of the village. The mound contains several rain gullies and a big erosion due to flood water. In the preliminary survey, the potsherds picked up are Painted Black and Red ware, painted Black on Red ware (black figures pertaining to the Malwa culture). Kayatha ware, Red Incised ware, Lustrous red ware and corrugated grey ware.

The potteries are kiln burnt, having zig-zag, oblique line designs. The potsherds of painted black and red ware are important in view of their association with Harappan potteries at Lothal, Malwa Chalcolithic potteries at Maheshwar and Navadatoli and in isolation at Manoti. The decorations on the potteries are mostly both geometrical and non-geometrical. Among the pot shapes bowls, dishes and mugs are prominent.

The situation of the village Brahmanaon is near Gujrat and Maharashtra and at a short distance from Maheshwar and Navadatoli.

The excavation of this mound may throw light on the pattern of cultural migration and the relation of Malwa Chalcolithic culture with the Harappan culture of Gujrat and Chalcolithic culture of Maharashtra. Since it is coming under the submergence area of Sardar Sarovar dam, it has been proposed to undertake excavation here.

CHALCOLITHIC MOUND AT UTAWAD

The village of Utawad is situated at a distance of 13 km. to the east of Barwani on the right bank of the river Narmada. The Chalcolithic mound covers an area of about 318 sq.ft. with the deposition of 10 mt. in height. The potsherds picked up from the mound are painted black and red ware, coarse red ware, black or red ware, Kayatha ware and Incised ware, painted red ware, black and buff ware. Generally they are painted with parallel and oblong lines. Among the incised designs, geometrical patterns and parallel lines are prominent. Along with the pottery, the microliths discovered are points, blades, scrappers and cores. Like Brahmanaon, the village Utawad may also yield some evidence to ascertain the analogy of the place with Gujrat and Maharashtra. The excavation of this mound is proposed.

..16..

HISTORICAL MOUND KIRMOHI

The village Kirmohi is situated in the Thikari tehsil of District Khargone at a distance of 7 km. to the north of village Mandavada on Thikari-Barwani road. The village has two mounds at Bangalkot and Mandyapura, of which, the former one is 1 km. to the west of the village having 30 ft. height deposition covering an area of 2500 sq.mtrs.. The important potsherds discovered from the mound are of black and red ware, grey ware etc.. These potsherds suggest the use of bowls, dishes, and lids etc. in the prevalent society. Among other findings, ~~A~~Mauryan bricks and ivory bangle pieces are important which date the antiquity of the mound to the 6th century B.C..

The mound of Mandyapura is situated 3 km. east of the village Kirmohi measuring to 15 ft. high deposition with an area of about 100 sq.mtrs. This mound has also yielded the same type of pottery as the former one. Looking at the early historic findings and keeping in view its submergence, the excavation is proposed.

While surveying 80 villages of the District of Dhar which are coming under the Sardar Sarovar Dam catchment area, five Chalcolithic, two early Historic and one Historic mounds have been discovered. Out of these, three mounds have yielded middle Palaeolithic and Microlithic tools. Considering the importance of these findings, excavation in the following two sites, could be undertaken :

1. Khapar-Kheda,
2. Kheda

KHAPARKHEDA

The village of Khaparkheda is situated in Kukshi sub-division of district Dhar, at a distance of 8 km. to the north of Kukshi on Kukshi-Barwani road on the bank of Narmada. This Chalcolithic mound has a deposition of 25 mtr. high covering the area of about 200 mts. In preliminary survey, the potsherds of Chalcolithic period in association with microliths have been discovered. The potsherds discovered are black and red ware, lustrous red ware, lustrous black ware, painted black on red ware and red ware are prominent.

The microliths collected are chiselled on chalcedony stone having the variety of parallel-blades, one sided blades, point cum blade and lunates.

..17..

The excavation of the mound may give a lead to the analogous, migration and interrelation of Malwa- Chalcolithic culture with that of Gujrat and Maharashtra.

KHEDA

The village of Kheda in Kukshi sub-division had remains of habitation at a distance of about 35 kms. to the east of Kukshi on the bank of Narmada. The inhabitants of the village had migrated, in the year 1970, away from the Narmada bank, due to some natural crisis. The mound is located at a distance of about 70 mts. away from the present water level measuring 100 mts. area in circumference having a deposition of 20 ft. high. The potsherds discovered are black and red ware lustrous red ware, red ware and black ware. Thus, the mound seems to bear an evidence of historic habitation.

Besides the above mentioned mounds, we can also refer to the early mounds of Katnera, and Bhawariya, both situated in district Dhar.

KATNERA MOUND - Situated in the village of Katnera, this mound stands near the banks of the river Baghini. During survey work, fragments of black and red ware, red glazed ware and red ware potteries were recovered. On the basis of these surface finds, it seems that the mound would yield artefacts of the Chalcolithic period.

The mound at **BHAWARIYA** - district Dhar. This mound, spread over an estimated area of 200x200 mtrs. is located in the eastern side of the village of Bhawariya. Situated on the banks of Narmada, this mound possesses 3 mtrs. of habitation deposits. The fragments of artefacts recovered from this site tend to point to a Chalcolithic date. The pottery fragments closely resemble those recovered from Maheshwar, Navadatoli, Nagada and Dangawada.

Apart from these, the villages of Kawari, Semalda, Gopalpur, Katnera, Khalkhurd, Bhavgaon and others also contain remains of Chalcolithic period. This suggests that Chalcolithic life bustled in this region - hence an enquiry should be made, to safeguard them from submergence, and register them for posterity.

MOUNDS IN MAHESHWAR DAM AREA

The mound at Pitnagar, district Khargone - situated in the village of Pitnagar on the left bank of the river Narmada spreads roughly over an area of 2500 sq.mtr.

..18..

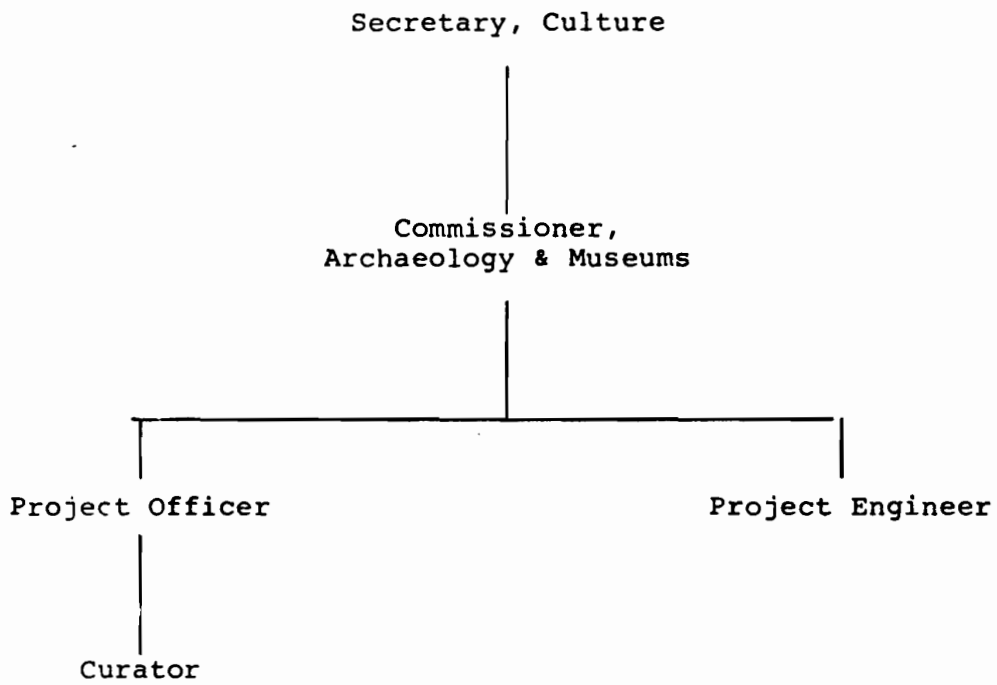
MOUND INDIRA SAGAR DAM AREA**EARLY HISTORIC MOUND, KHEDINEMA**

The mound of Khedinema in Hoshangabad district is situated on the bank of the Narmada. It has 15 ft. high deposition extended about 100 sq.m., The pottery picked up from the site belongs to the period between early historical to Gupta period. The potteries are of black and red ware, black burnished ware, Northern black polished ware and red washed and coarse ware. These potteries seem to be the fragments of big jars, bowls, dishes etc.. Besides pottery, traces of a wall of Mauryan bricks is also visible. A few pieces of bangles and beads have also been picked up. These findings may be dated to the 6th century B.C. It is important from archaeological point of view. The mound is coming under the submergence area. Hence archaeological excavation is being proposed which may reveal the Cultural sequence of the place. Co-relation of excavated materials will also be done with other sites of Madhya Pradesh.

Likewise, the other archaeologically important places too, situated in the submergence areas of the five other would-be constructed dam sites, too, could be excavated so that the historical importance of these regions could be ascertained and the obtained materials and artefacts could be studied properly to throw light on the cultural sequences and development of these regions around the river Narmada.

..19..

ADMINISTRATIVE SET UP



..20..

**FINANCIAL STATEMENT SHOWING THE ACTION PLAN FOR VARIOUS PROJECTS
COMING UNDER N.V.D.A. ARCHAEOLOGY**

(in Rupees)

Sr. No.	Name of the projects	Transplan- tation shifting of monument	Documenta- tion	Shifting of loose sculptures	T & Plant Amount	Development of land and construction of Museum building	Establish- ment	Excavation	Total
1.	Sardar Sarovar Project	9690000.00	2012500.00	43960.00	1560000.00	21789400.00	4433000.00	500000.00	40028860.00
2.	Indira Sagar Project		2501250.00	3' 0.00	-	-	-	100000.00	2635750.00
3.	Omkareshwar Project	3640000.00	779700.00	25500.00	-	-	-	-	4445200.00
4.	Maheshwar Project	-	779700.00	-	-	-	-	-	779700.00
5.	Man project	-	-	-	-	-	-	-	-
6.	Jobat Project	-	-	-	-	-	-	-	-
Grand Total ;		13330000.00	6073150.00	103960.00	1560000.00	21789400.00	4433000.00	600000.00	47889510.00

..21..

BE

STATEMENT SHOWING YEARWISE DETAILS OF WORKS WHICH ARE TO TAKEN UP
IN THE VARIOUS PROJECTS COMING UNDER N.V.D.A. - ARCHAEOLOGY

Year 1993-94

Sr. No.	Name of the project	Transplantation shifting of Monuments	Documentation	Shifting of loose sculptures	T & Plant Amount	Development of land and construction of Museum building	Establishment Expenditure	Excavation Amount	Total
1	2	3	4	5	6	7	8	9	10
1.	Sardar Sarovar Project	3030000.00	2012500.00	43960.00	1560000.00	3000000.00	955000.00	200000.00	10801460.00
2.	Indira Sagar Project	-	-	-	-	-	-	100000.00	100000.00
3.	Omkareshwar Project	-	-	-	-	-	-	-	-
4.	Maheshwar Project	-	-	-	-	-	-	-	-
5.	Man Project	-	-	-	-	-	-	-	-
6.	Jobat Project	-	-	-	-	-	-	-	-

OF
STATEMENT SHOWING YEARWISE DETAILS OF WORKS WHICH ARE TO/TAKEN UP
IN THE VARIOUS PROJECTS COMING UNDER N.V.D.A. - ARCHAEOLOGY

Year 1994-95

Sr. No.	Name of the Project	Transplantation shifting of Monuments	Documentation	Shifting of loose sculptures	T & Plant Amount	Development of land and Construction of Museum building	Establishment Expenditure	Excavation Amount	Total
1	2	3	4	5	6	7	8	9	10
1.	Sardar Sarovar Project	2420000.00	-	-	-	9000000.00	1051000.00	100000.00	12571000.00
2.	Indira Sagar Project	-	2501250.00	34500.00	-	-	-	-	2535750.00
3.	Omkareshwar Project	-	-	-	-	-	-	-	-
4.	Maheshwar Project	-	-	-	-	-	-	-	-
5.	Man Project	-	-	-	-	-	-	-	-
6.	Jobat Project	-	-	-	-	-	-	-	-

..23..

RE
STATEMENT SHOWING YEARWISE DETAILS OF WORKS WHICH ARE TO BE TAKEN UP
IN THE VARIOUS PROJECTS COMING UNDER N.V.D.A. - ARCHAEOLOGY

Year 1995-96

Sr. No.	Name of the Project	Transplantation shifting of Monuments	Documentation	Shifting of loose sculptures	T & Plant Amount	Development of land and Construction of Museum building	Establishment Expenditure	Excavation Amount	Total
1	2	3	4	5	6	7	8	9	10
1.	Sardar Sarovar Project	1210000.00	-	-	-	5000000.00	1156000.00	100000.00	7466000.00
2.	Indira Sagar Project	3640000.00	-	-	-	-	-	-	3640000.00
3.	Omkareshwar Project	-	779700.00	25500.00	-	-	-	-	805200.00
4.	Maheshwar Project	-	-	-	-	-	-	-	-
5.	Man Project	-	-	-	-	-	-	-	-
6.	Jobat Project	-	-	-	-	-	-	-	-

..24..

OF
STATEMENT SHOWING YEARWISE DETAILS OF WORKS WHICH ARE TO TAKEN UP
IN THE VARIOUS PROJECTS COMING UNDER N.V.D.A. - ARCHAEOLOGY

Year 1996-97

Sr. No.	Name of the Project	Transplantation shifting of Monuments	Documentation	Shifting of loose sculptures	T & Plant Amount	Development of land and Construction of Museum building	Establishment Expenditure	Excavation Amount	Total
1	2	3	4	5	6	7	8	9	10
1.	Sardar Sarovar Project	3030000.00	-	-	-	4789400.00	1271000.00	100000.00	9190400.00
2.	Indira Sagar Project	-	-	-	-	-	-	-	-
3.	Omkareshwar Project	-	-	-	-	-	-	-	-
4.	Maheshwar Project	-	779700.00	-	-	-	-	-	779700.00
5.	Man Project	-	-	-	-	-	-	-	-
6.	Jobat Project	-	-	-	-	-	-	-	-

..25..

SARDAR SAROVAR PROJECT

(1) The Sardar Sarovar Dam proposed to be built in Baroda district of Gujarat will submerge a good number of villages in and around the region. As many as 193 villages, situated in the three bordering districts of M.P. e.g. Jhabua, Dhar and Khargone would be affected by this submergence.

It is expected that the village of Jalsindhi in district Jhabua will be the first village to be affected by the submergence in 1994.

The villages to be submerged in the second phase (1995) are ;

- (a) Dabhani, Silkada, Sakarja, Akadiya, Jhandana, Anjanwara, Bhitada, Kakrana, Kakarsela, Bada Amba and Dubkhadda in Jhabua district.
- (b) Katarkheda and Dashana of Dhar, and
- (c) Borkhedi and Bhavati in District Khargone

The third phase of submergence will take place in 1996. The following villages would be affected :

- (a) Roligaon, Kukadiya, Khundi and Kulwat in Jhabua district.
- (b) Khalkhurda, Khalbujurga, Utawad, Pipari, Panya, Dhajara, Ghughasi, Tuwarkheda, Kuli, Kothandhani, Kari, Babultad, Rijasan, Soundul in district Khargone.

Shariqpura, Ekalara, Morkatta, Ambli, Awalda, Kukara, villages too will be submerged in 1996.

- (2) The rest of the villages would come under submergence in 1997.

Prior to the submergence of these villages, necessary steps would be taken to safeguard the antiquities located in these villages- so that they would not get lost for ever.

To locate, save and protect the archaeological treasures, situated in these villages a team of experts were sent by this department. They identified some 188 scattered sculptures and as many as 37 important monuments. Listed at Annexure :

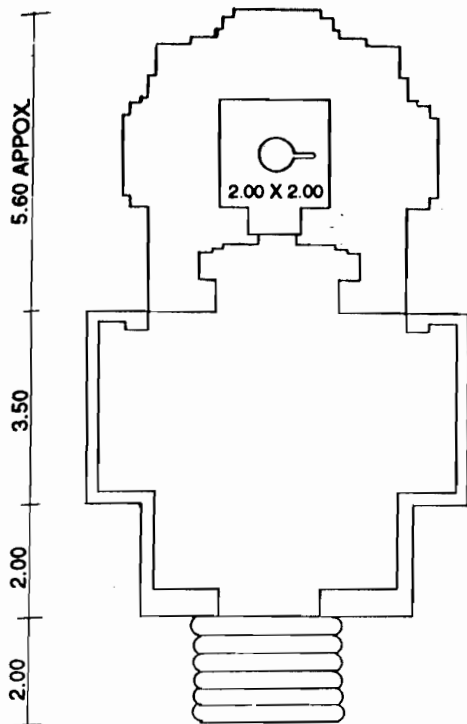
..26..

Since the actual submergence will begin in stages from 1994 onwards, it was decided to collect all the 188 sculptures from these villages and transfer them to the museums where they will be housed.

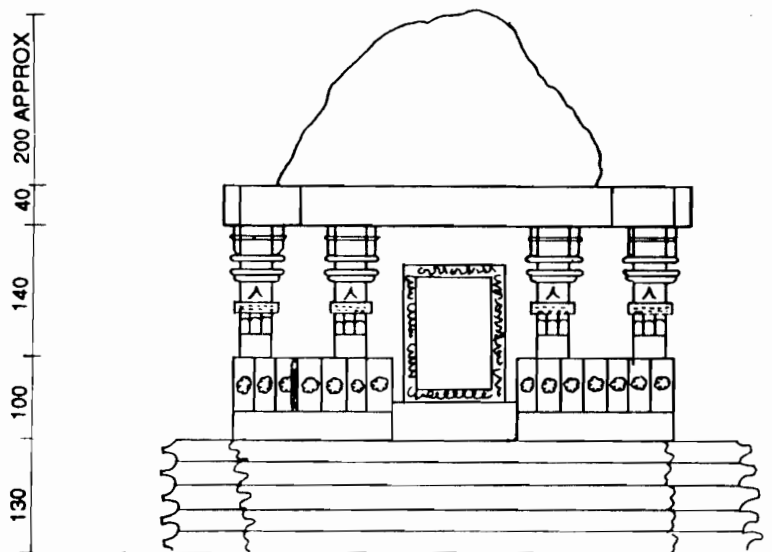
Likewise, out of these 37 monuments, only the 7 very important monuments would be removed and transplanted to a suitable place. But before doing so, video recording, photography in situ as well as line drawings of all these 37 monuments will be done for a visual documentation for posterity.

rom
res
ere

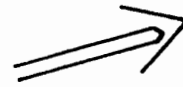
ery
a
ig,
37
or



PLAN



FRONT ELEVATION



PLAN OF THE SHIV TEMPLE
AT VILLAGE - ROLIGAON
TEHSIL - ALIRAJPUR
DISTT. - JHABUA

TRANSPLANTATION OF MONUMENTS

(S. S. PROJECT)

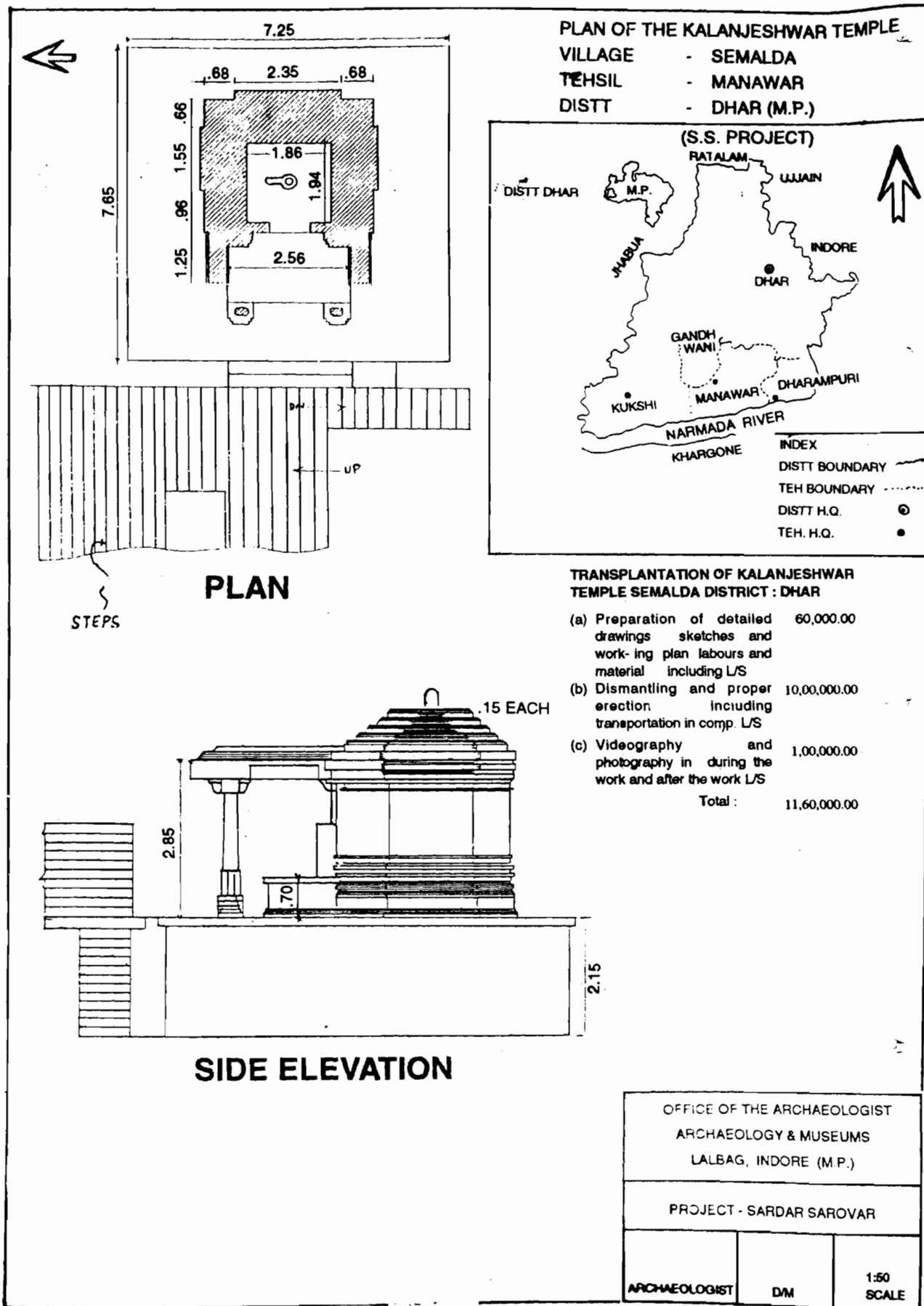
Shiv Temple Roligaon District Jhabua :

(a) Preparation of detailed at drawing for the documenta tion including labour charges and stationery.	60,000.00
(b) T & P like scaffolding and other equipmets	4,80,000.00
(c) Shifting and proper erection	10,00,000.00
(d) Videography & photography during and after work.	2,00,000.00
(e) Development of the site after the work.	80,000.00
Total	18,20,000.00

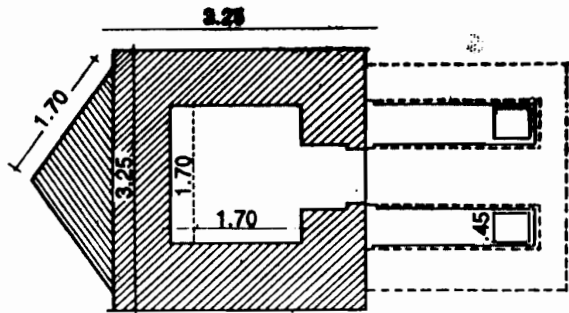
OFFICE OF THE COMMISSIONER
ARCHAEOLOGY & MUSEUMS
(M.P.) BHOPAL

PROJECT - SARDAR SAROVAR

PUBLICATION OFFICER | D.MAN | SCALE 1:50



IPLE

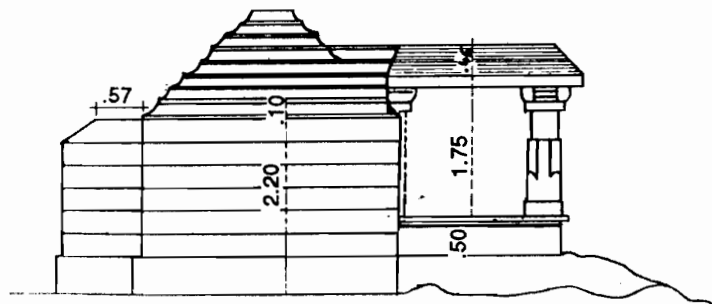
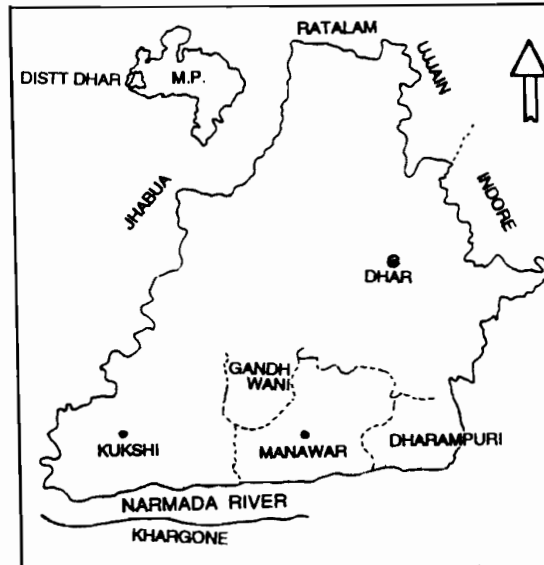


PLAN

PLAN OF SHIV TEMPLE AT
 VILLAGE - BARA BARDA
 TEHSIL - MANAWAR
 DISTT - DHAR (M.P.)

SHIVA TEMPLE BARDA DISTRICT - DHAR

(a) Preparation of detailed drawing of plan including labours and material L/S	60,000.00
(b) Removal and erection complete L/S	10,00,000.00
(c) Videography and photography during the work and after the work L/S	1,00,000.00
Total :	11,60,000.00



SIDE ELEVATION

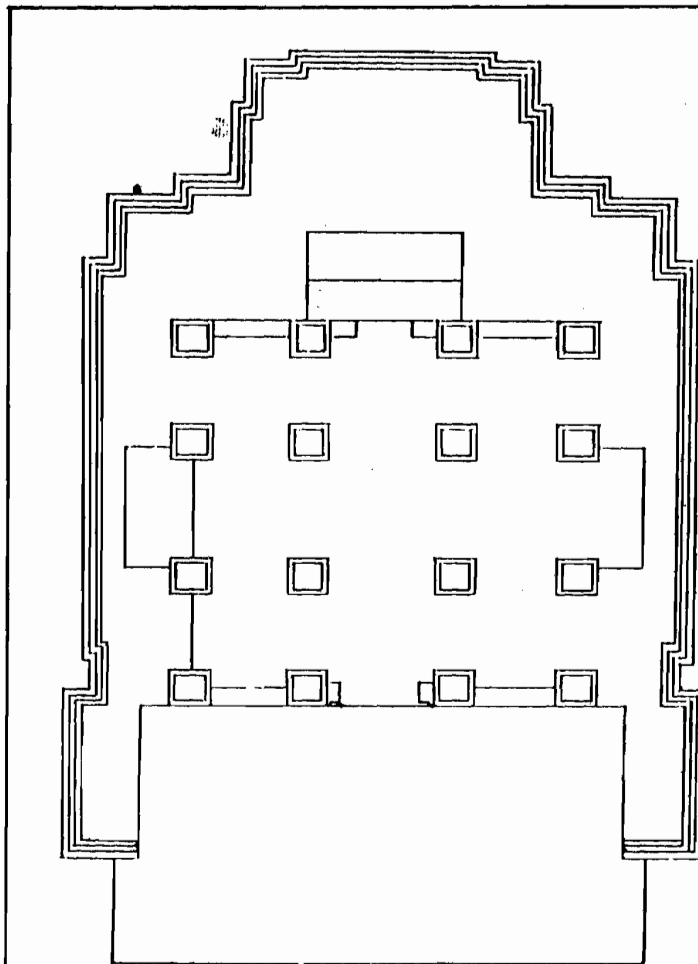
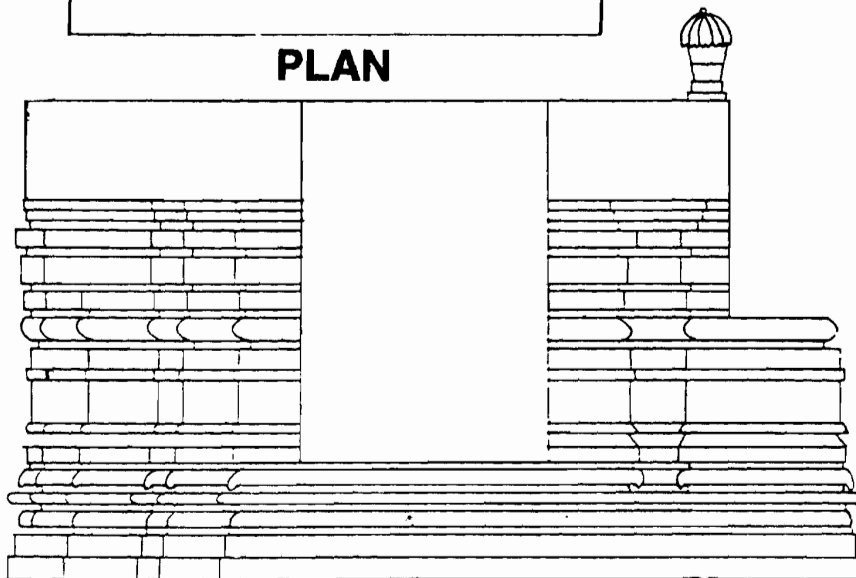
OFFICE OF THE ARCHAEOLOGIST
 ARCHAEOLOGY & MUSEUMS
 LALBAG INDORE (M.P.)

PROJECT - SARDAR SAROVAR

ARCHAEOLOGIST

DM

1:50
SCALE

**PLAN****SIDE ELEVATION**

PLAN OF BHAWANIMATA TEMPLE AT
VILLAGE - KHUJANWA
TEHSIL - DHARAMPURI
DISTT - DHAR (M.P.)

(a) Preparation of detailed drawings for the documentation including labour charges and stationery.	60,000.00
(b) T & P like scaffolding and other equipments.	4,80,000.00
(c) Shifting and proper erection.	10,00,000.00
(d) Videography & photography during and after work	2,00,000.00
(e) Dev. of the site after the work.	80,000.00
Total	18,20,000.00

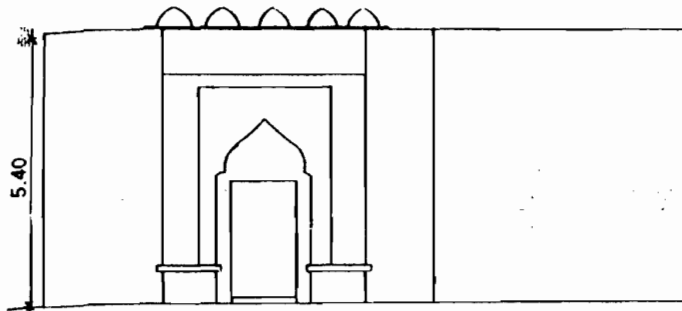
OFFICE OF THE ARCHAEOLOGIST
 ARCHAEOLOGY & MUSEUMS
 LALBAG INDORE (M.P.)
 PROJECT - SARDAR SAROVAR

ARCHAEOLOGIST

DM

1:50
SCALE

LE AT

**ELEVATION**

PLAN OF JALESHWAR TEMPLE AT
VILLAGE - KHUJAWANA
TEHSIL - DHARAMPURI
DISTT - DHAR (M.P.)

0.00

1.00

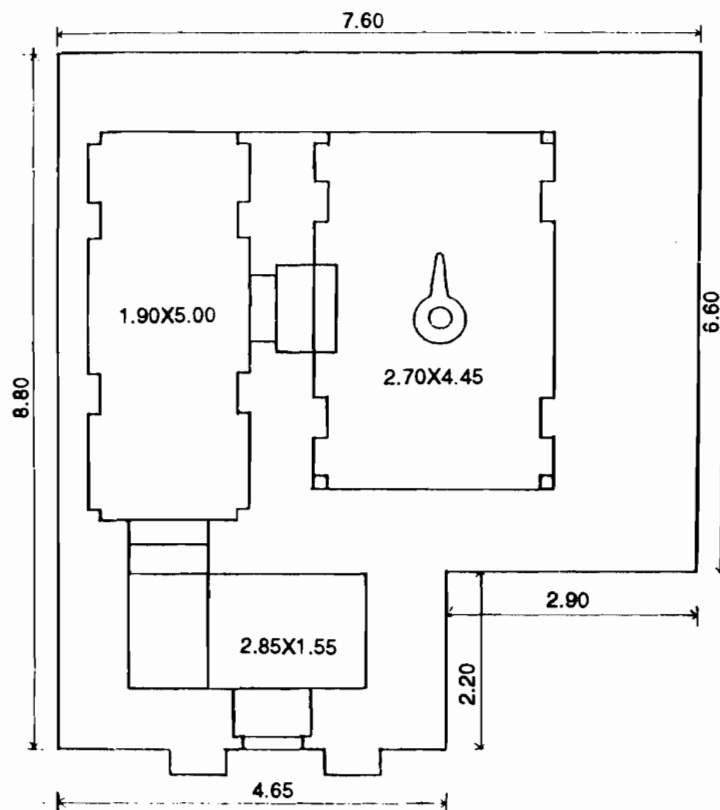
2.00

3.00

4.00

5.00

6.00

**PLAN****Jaleshwar Temple Khujawana District - Dhar**

(a) Preparation of detailed drawings plan including labour and materials L/S	60,000.00
(b) Removal and erection complete L/S	10,00,000.00
(c) Videography & photography during the work and after the work	1,00,000.00
Total :	11,60,000.00

OFFICE OF THE ARCHAEOLOGIST
 ARCHAEOLOGY & MUSEUMS
 LALBAG INDORE (M.P.)

PROJECT - SARDAR SAROVAR

ARCHAEOLOGIST

DM

1:50
SCALE

..32..

EQUIPMENT PROPOSALS FOR ARCHAEOLOGY AND MUSEUMS

		B.in lakhs	Purpose
1.	Air Cooler	0.30	For office use
2.	Electronic Typewriter Hindi & English	0.30	-do-
3.	Photocopier (Modi)	1.75	-do-
4.	V.C.R.	0.75	For Video
5.	Colour T.V.	0.21	documentation
6.	Telephone	0.30	cassettes
7.	2 Trucks & 3 Jeeps	15.00	-do-
			For collection/ Transplantation works
Total :		18.11	

SARDAR SAROVAR PROJECT

SARDAR SAROVAR PROJECT

Name of the Project	No. of Vill-ages	Name of the Village	Name of Monuments site	Proposed Work / Cost				Monuments for Transplantation & Cost	Excavation	Remarks	
				Documentation		Sculpture for Collections					
				Survey 1991-92	Visual 1993-94	1993-94	No. of Sculptures				
1	2	3	4	5	6	7	8	9	10	11	12
Sardar Sarovar Project	193	District Jhabua						1	1993-94	200000	
		Badihatvi									
		Roligaon	Shiv Temple		2012500.00	43960.00			3030000		
		Unhala									
		Choti hatvi							1994-95	1994-95	
		Sugat							2420000	100000	
		Khundi							1995-96	1995-96	
		Temla							1210000	100000	
		Behdwa									
		Kakrana	Shiv								
		Kuklat	temple						1996-97	1996-97	
									3030000	100000	
		Tikhola									
		Chameli									
		Silkada (hilkada)									
		Sakarja									
		Kulwat									
		Sirkhedi(Chhoti)									
		Akadiya									
		Jalsindhi									
		Jhandana									
		Anjanawara									
		Bhitada									
		Kukdiya									
		Kakarsela									
		Bada Amba									
		Dubkhadda									
		Mahalagaon									

..34..

SARDAR SAROVAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Proposed work/ Cost				Monuments for Transplantation & Cost		Excavation Remarks	
				Documentation		Sculpture for Collections		No. of	Sculptures		
				Survey 1991-92	Visual 1993-94	1993-94					
1	2	3	4	5	6	7	8	9	10	11	12
		District Dhar									
		Nagjhiri									
		Jalkheda Shiva Temple					23				
							2				
		Jhargaoon					7				
		Jaitpur									
		Narayanpura									
		Kalyanapura									
		Rajpura									
		Mahapura					4				
		Ekalwara					4				
		Sarasgaon									
		Anchhada									
		Dangarapura									
		Gogawan					7				
		Semalda	Kalanjeshwar temple					1			
		Malangaon					8				
		Katnera									
		Patwar					6				
		Gopalpura									
		Barada					6				
		Kawathi									
		Perkhada					7				
		Uradana									
		Khaparkheda					1				
		Raswa									
		Gangali					13				

..35..

SARDAR SAROVAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Documentation		Proposed work / Cost		Monuments for Transplantation & Cost	Excavation	Remarks	
				Survey 1991-92	Visual 1993-94	Sculpture for Collections 1993-94	No. of Sculptures				
1	2	3	4	5	6	7	8	9	10	11	12
		Shariapura									
		Kothara	Shankar Temple								
		Kharjana					5				
		Kolagaon					5				
		kawada									
		Malwada	Shankar temple								
		Rekati									
		Badhwada					5				
		shavareya					13				
		Bajadi									
		Katnera	Mukteshwar temple				8				
		Kadmala									
		Babulgaon									
		Nawadpura									
		Rohana									
		Amala Baodi									
		Kheda									
		Dashani									
		Katar Kheda									
		Dasana									
		Bhilsur									
		Dehar	Narmadeshwar temple								
		Kikarwas									
		Dharamaraj	Incomplete temple								

153

..36..

SARDAR SAROVAR PROJECT

Name of the Project	No. of village	Name of village	Name of Monuments site	Documentation		Proposed work / Cast		Monuments for Transplantation Cast	Excavation Remarks		
				Survey 1991-92	Visual 1993-94	Sculpture for Collections 1993-94	No. of Sculptures				
1	2	3	4	5	6	7	8	9	10	11	12
154		Kasta									
		Chhachhakuwan									
		Khapar Kheda									
		Kathora									
		Gehalgaon									
		Karondiya									
		Batgaon									
		Sisgaon									
		Malwadi									
		Malakhada						3			
		Chandana Khedi						4			
		Nisarpur						1			
		Chikhilada	Harahreshwar, Nilkantneshwar Pasupateshwar and Shiva temple					8			
		Khal Bujurga									
		Lunhera						5			
		Morgarhi						2			
		Shahpura									
		Uchawad									
		Shala									
		Gajipura									
	Balwada										
	Kathora										
	Bhavagaon										
	ripaldagarhi	Rock cut sculpture (9)					4 9				

154

..37..

SARDAR SAROVAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Proposed work		Sculpture for Collections		Monuments for Transplantation	Excavation	Remarks	
				Documentation		No. of					
				Survey 1991 92	Visual 1993 94	1993 94	No. of				
1	2	3	4	5	6	7	8	9	10	11	12
		Guleti									
		Beganda									
		Khalkhurd									
		Dharampuri									
		Sulgaon									
		Khatadgaon									
		Nimbola									
		Hatnawar									
		Khujawa	Rockcut cave Shiv temple Bhawanimata Jalaleshwar Somesva Nilkantheshwar temple life size sculptures				22	3			
		Lakhangaon					4				
		District Khargone									
		Gajnera									
		Piplaj									
		Ghugasi									
		Jamada									
		Kalyanpura									
		Chhipakhedi									
		Badwani (Town)									
		Dehalda									
		Utawad									

[illegible]

..39..

SARDAR SAROVAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Proposed work / Cost				Monuments for Transplantation & Cost		Excavation Remarks	
				Documentation		Sculpture for Collections		No. of	Cost		
				Survey 1991-92	Visual 1993-94	1993-94	No. of Sculptures				
1	2	3	4	5	6	7	8	9	10	11	12
		Sagaon									
		Piplod									
		Pendra									
		Nandgaon									
		Bhilkheda	Cenotaph of Uday Singh								
		Bagud									
		Sandera									
		Mandwada									
		Rahedakota									
		lakhangao									
		Pipalya									
		Takyapur									
		Chichli									
		Nimlay									
		Barada									
		Gawala									
		Nawadatoli									
		Khedi Khurd									
		Mehgaon									
		Nandgaon									
		Raswa									
		Chainpura									
		Mohipura	Shiv temple								
		Panya									
		Brahmangaon	Shiv temple Shukleshwar temple							Excavation	

..40..

SARDAR SAROVAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Proposed work		Cost-	Monuments for Transplantation	Excavation	Remarks		
				Documentation		Sculpture for Collections					
				Survey 1991-92	Visual 1993-94	1993-94 No. of Sculptures					
1	2	3	4	5	6	7	8	9	10	11	12
		Lohara									
		Viswanathkheda	Memorial of Mohan Singh								
		Gawla									
		Pichhola									
		Datwada									
		Golata									
		Kesharpura									
		Kirmohi									
		Bhatbadya								Excavation	
		Awali									
		Rahmanpura									
		Bhoyend.									
		Khal Khurd									
		Khal bujurga									
		Akbarpura									
		Balgaon									
		Chichali									
		Dhalkheda									
		Adalpura	Shiv (7) Siddeshwar templ								
		Jalanpura									
		Nawadatodi	Daneswar temple								
		Kathora									
		Ghatbadya									

..41..

Stage I : Estimate for Excavation in villages which are coming under submergence area in

SARDAR SAROVAR PROJECT

Sr. No.	Details of work	No.	LxBxH	Qty.	Unit	Rate	Amount	Remarks
1	2.	3.	4.	5.	6.	7.	8.	9.

1.	Excavation in village	5	L.S.	5 Nos	No.	100000	500000.00	
----	-----------------------	---	------	-------	-----	--------	-----------	--

Total : 5,00,000.00

Rupees Five Lakh only

..42..

Abstract of the estimate for the shifting of sculptures and transplantation of monuments which are coming under submergence area in the Sardar Sarovar Project.

Sr.No.	Sub-head of work/item	Amount
1.	Development of land, where sculptures to be shifted I/C construction of museum buildings	2,17,89,400.00
2.	Shifting of loose sculptures	43.960.00
3.	Transplantation of monuments (7)	96,90,000.00
4.	Documentation (Videography)	20,12,500.00
5.	Tools and plants like scaffolding and other equipments	15,60,000.00
6.	Establishment Expenditure	44,33,000.00
7.	Excavation in villages	5,00,000.00
Total :		4,00,02,860.00

(Rupees Three Crore Sixty Five lakh Thirty three thousand Five hundred and Sixty only)

Estimate for Documentation & Transplantation of monuments and sculptures which are coming under submergence area in Sardar Sarovar project

Sr. No.	Sculpture shifting amount Rs.	Transplan- tation amount Rs.	Documen- tation amount Rs.	T & Plant amount Rs.	Develop- ment of land & cost of museum building Rs.	Establish- ment Expendi- ture Rs.	Excavatio- amount Rs.
1.	43960.00	9690000.00	2012500.00	1560000.00	21789400.00	4433000.00	500000.00
G. Total						4,00,28,860.00	

..43..

**Estimate for Film Documentation under
Sardar Sarovar Project**

(Through M.P.Film Development Corporation)

Sr.No.	Particulars	Amount
1.	Stock	3,50,000.00
2.	Equipments	2,00,000.00
3.	Daily expenses, Wages, Food, Travel, Transports etc.	4,00,000.00
4.	Sets, Locations, etc.	Nil
5.	Personnel, Scripts, Cameraman, Narrator etc.	4,00,000.00
6.	Music	1,00,000.00
7.	Post production charges (Editing, Special, Affect etc.)	2,25,000.00
8.	Casual Expenses	75,000.00
9.	Supervision charges of Corporation	2,62,500.00
	Total :	20,12,500.00

(Rupees Twenty lakh Tweleve Thousand and Five Hundred only)

..44..

ESTABLISHMENT UNDER SARDAR SAROVAR PROJECT**CLASS - I**

1.	Project Officer	1
2.	Project Engineer	1

CLASS - II

1.	Curator	1
----	---------	---

CLASS - III

1.	Technical Assistant	5
2.	Video Librarian	1
3.	Accountant	1
4.	Upper Division Clerk	1
5.	Lower Division Clerk	1
6.	Driver (Heavy Vehicle)	1
7.	Driver (Light Vehicle)	5

CLASS - IV

1.	Cleaner	2
2.	Peon	10
3.	Care Taker	4
4.	Sweeper	1

Total : 35 Posts

..45..

**ESTIMATE OF OFFICE EQUIPMENT FOR
ARCHAEOLOGY UNDER SARDAR SAROVAR PROJECT**

1. Desk Top publishing unit comprising of.
 - (a) PCL chise PC/AT -386
 - CPU - 80386 EX
 - Clock Speed - 25 MHh
 - RAM - 2 MR
 - FDD - 1x1.2 MR
 - HDD - 1x4 MR
 - Monitor - 14" Softwhite GGA - MGA with Card
 - Keyboard - 101 keys
 - Ports - 2 serial and parallel
 - MOUSE - Witty Mouse
 - MS DDS Ver 5.0
 - (b) LASER printer (Non Post script)
Hewlett packard HP Series IV p
2 MB RAM, 300 DPT, 4 PPM Rs. 97,000.00
 - (c) Hindi DTP Software Rs. 22,500.00
 - (d) VENTURE Publishing Software 3.0 Rs. 45,000.00

..46..

ESTIMATE FOR SALARY OF STAFF OF NARMADA PROJECT FOR THE YEAR 1993-94

Name of Post	Scale	No. of post	Pay (in Rs.)	D.A.	H.R.	C.C.A.	C.A.	Total	Qualification	Purpose
CLASS I										
Project Officer	3000-4500	1	36000.00	29880.00	4680.00	300.00	180.00	71040.00	M.A. in Ancient Ind. His. Cul. & Archaeology with experience of 10 years	To handle all the project work of project
Project Engineer	3000-4500	1	36000.00	29880.00	4680.00	300.00	180.00	71040.00	Degree in Eng. with experience of 10 years	For technical control over the work in transplanting the monuments preparing the models & building up the museum building and display work.
CLASS II										
Curator	2200-4000	1	26400.00	21912.00	3516.00	300.00	180.00	52308.00	M.A. Ancient Indian History, Culture and Archaeology	To control the Museum activities and display of sculptures there in
CLASS III										
Upper Div. Clerk	1150-1800	1	13800.00	11454.00	1956.00	300.00	180.00	27690	H.S. and Hindi typing passed or Graduate	To conduct the office work
Upper Div. Clerk	950-1530	1	11400.00	9462.00	1956.00	300.00	180.00	23298.00	H.S. and Hindi Typing passed	To conduct the official work i.e. correspondence filing etc.
Video Librarian	1400-2340	1	16800.00	13944.00	1956.00	300.00	180.00	33180.00		For Video Library

..47..

Name of Post	Scale	No. of post	Pay (in R.)	D.A.	H.R.	C.C.A.	C.A.	Total	Qualification	Purpose
Accountant	1200-2040	1	14400.00	11952.00	1956.00	300.00	180.00	28788.00	H.S.S. Accounts Training passed with 3 year experience	To look after the account of the project work.
Technical Asstt.	1600-2720	5	96000.00	79680.00	17580.00	1500.00	900.00	195660.00	M.A.(Ancient Indian History and Archaeology	To prepare the reports of the project and studying of monument. Sculp- tures and display etc.
Driver (Heavy)	1150-1800	1	13800.00	11454.00	1956.00	300.00	180.00	27690.00	8th Pass with licence	To drive the heavy vehicle like truck
Driver (Light)	950-1530	5	57000.00	47310.00	9780.00	1500.00	900.00	116490.00	8th pass with licence	To drive the light vehicle like jeeps
Cleaner	750-945	2	18000.00	14940.00	2352.00	600.00	360.00	36252.00	Vth passed	To assist the Driver of heavy vehicle
Peon	750-945	10	90000.00	74700.00	11760.00	3000.00	1800.00	181260.00	Vth passed	For official work
Care Taker	750-945	4	36000.00	29880.00	4704.00	1200.00	720.00	72504.00	Vth passed	To look after the museums
Sweeper	750-945	1	9000.00	7470.00	1176.00	300.00	100.00	18046.00	Vth passed	For museums work
Grand Total			474600.00	393918.00	70008.00	10500.00	6220.00	-		

..48..

INDIRA SAGAR PROJECT

Under this project, the Indira Sagar Dam would be constructed at a place called Punasa in district Khandwa. As a result of the construction of this dam, as many as 254 villages, situated in Khandwa, Dewas and Hoshangabad districts of Madhya Pradesh would be affected and come under submergence.

Since all these villages contain various antiquities, a team of officials was sent by this department to survey the region thoroughly. A good number of stray sculptures, monuments and archaeological sites were noticed by this team.

It was decided that as many as 132 sculptures would be collected from this region and would be kept and exhibited in the proposed Narmada Park, local museums and State museum, Bhopal.

The team had spotted out some 35 monuments, but a careful scrutiny reveals that the monuments as they stand in partial submergence zone would not be affected by water, yet steps have been taken to record these monuments. Thus, video filming along with photography and line drawings of all these monuments would be undertaken.

Apart from this, the prominent archaeological site of Khedinema, situated in Hoshangabad district would be excavated by this department.

A list of villages that would be affected and the plan of action is appended herewith.

..46..

ESTIMATE FOR SALARY OF STAFF OF NARMADA PROJECT FOR THE YEAR 1993-94

Name of Post	Scale	No. of post	Pay (in Rs.)	D.A.	H.R.	C.C.A.	C.A.	Total	Qualification	Purpose
CLASS I										
Project Officer	3000-4500	1	36000.00	29880.00	4680.00	300.00	180.00	71040.00	M.A. in Ancient Ind. His. Cul. & Archaeology with experience of 10 years	To handle all the project work of project
Project Engineer	3000-4500	1	36000.00	29880.00	4680.00	300.00	180.00	71040.00	Degree in Eng. with experience of 10 years	For technical control over the work in transplanting the monuments preparing the models & building up the museum building and display work.
CLASS II										
Curator	2200-4000	1	26400.00	21912.00	3516.00	300.00	180.00	52308.00	M.A. Ancient Indian History, Culture and Archaeology	To control the Museum activities and display of sculptures there in
CLASS III										
Upper Div. Clerk	1150-1800	1	13800.00	11454.00	1956.00	300.00	180.00	27690	H.S. and Hindi typing passed or Graduate	To conduct the office work
Upper Div. Clerk	950-1530	1	11400.00	9462.00	1956.00	300.00	180.00	23298.00	H.S. and Hindi Typing passed	To conduct the official work i.e. correspondence filing etc.
Video Librarian	1400-2340	1	16800.00	13944.00	1956.00	300.00	180.00	33180.00		For Video Library

..47..

Name of Post	Scale	No. of post	Pay (in R.)	D.A.	H.R.	C.C.A.	C.A.	Total	Qualification	Purpose
Accountant	1200-2040	1	14400.00	11952.00	1956.00	300.00	180.00	28788.00	H.S.S. Accounts Training passed with 3 year experience	To look after the account of the project work.
Technical Asstt.	1600-2720	5	96000.00	79680.00	17580.00	1500.00	900.00	195660.00	M.A.(Ancient Indian History and Archaeology	To prepare the reports of the project and studying of monument. Sculptures and display etc.
Driver (Heavy)	1150-1800	1	13800.00	11454.00	1956.00	300.00	180.00	27690.00	8th Pass with licence	To drive the heavy vehicle like truck
Driver (Light)	950-1530	5	57000.00	47310.00	9780.00	1500.00	900.00	116490.00	8th pass with licence	To drive the light vehicle like jeeps
Cleaner	750-945	2	18000.00	14940.00	2352.00	600.00	360.00	36252.00	Vth passed	To assist the Driver of heavy vehicle
Peon	750-945	10	90000.00	74700.00	11760.00	3000.00	1800.00	181260.00	Vth passed	For official work
Care Taker	750-945	4	36000.00	29880.00	4704.00	1200.00	720.00	72504.00	Vth passed	To look after the museums
Sweeper	750-945	1	9000.00	7470.00	1176.00	300.00	100.00	18046.00	Vth passed	For museums work
Grand Total			474600.00	393918.00	70008.00	10500.00	6220.00	-		

..49..

INDIRA SAGAR PROJECT

Name of the village Project	No. of village	Name of the village	Name of Monuments site	Proposed work / Cost		Monuments for Transplantation	Excavation Cost	Remarks				
				Documentation	Sculpture for Collections							
				Survey 1991-92	Visual 1993-94				No. of Sculptures			
1	2	3	4	5	6	7	8	9	10	11	12	
Indira Sagar Project	254	Handiya	Riddeshara temple Tombs (6)	1991-92	1994-95 2501250.00		18			1993-94 100000.00		
		Goyat	Ram Temple									
		Badakeshar	Shiv Temple Ghat Dharmashala			1994-95 34500.00	4					
		Lharanpuri	Shiv Temple Thakur Temple Memorial of a Saint, Ghat	1995-96								
		Kundagaon	Ram Temple				14					
		Chandel	Ruined Temple									
		Khudiyamal	Ruined Temple									
		Dharikotla	Shiv Temple									
		Singajimafi	Memorial of Singaji									
		Dangarkhedi	Tomb									
		Khedinama					3			Excavation		
		Hirapur					7					
		Nagawan					18					
		Uchan					2					
		Uddhal					5					
		Nimkheda					1					
		Jhangari					1					
		Karanpura					1					
		Pokharni					5					
		khardana					3					
		Jahlwa					2					
		Kakarda					2					
		Bichhola Shukla					3					
		Idarba					6					
		Turnal					3					
		Ga janpur							17			
		Nimnapur							1			
		Niwada							5			
		Mandleshwar							4			
							5					

[illegible]

..51..

INDIRA SAGAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Proposed work		Sculpture for Collections 1993-94	No. of sculptures	Monuments for Transplantation	Excavation	Remarks	
				Documentation							
				Survey 1991-92	Visual 1993-94						
1	2	3	4	5	6	7	8	9	10	11	12
		Borkhera (Khurd)									
		Tipras					2				
		Pipliachor					4				
		Surlaya					5				
		Magardi					3				
		Karandamafi					5				
		Daiyat					10				
		Jamoti					3				
		Amoda									
		Gulgaon (R)									
		Gulgaon (Mafi)									
		Chiktikhal									
		Jamkota									
		Baldawa-Dongari									
		Balwada (M)									
		Bangarada									
		Banjari									
		Bhogani									
		Bedni									
		Bijora (Mafi)									
		Junapani									
		Khamkheda									
		Purni									
		Richimafi									
		Surgaon									
		Piplani									
		Harsud (Town)									
		Anjania									
		Abhawa									
		Undawa									
		Borkhera (Mafi)									
		Maula									
		Regwan									
		Sektapur									
		Subhanpura									
		Segwan									
		Songpura (Mal									
		songpura (Khurd)									
		Somapura									

..52..

INDIRA SAGAR PROJECT

Name of the village Project	No. of village	Name of the village	Name of Monuments site	Proposed work / Cost		Monuments for Transplantation	Excavation Remarks				
				Documentation				Sculpture for Collections			
				Survey 1991-92	Visual 1993-94	1993-94 No. of Sculptures					
1	2	3	4	5	6	7	8	9	10	11	12
		Amakhal									
		Igaria									
		Imlani									
		Undel (Mafi)									
		Karoli									
		Kasrawad									
		Kashipura									
		Kuksi									
		Kukdal									
		Khutia									
		Gurawan									
		Gehalgaon									
		Gondikhera									
		Gambhir (Cir)									
		Charkhera									
		Chandgarh									
		Chich(R)									
		Chhalpa (khurd)									
		Jatam									
		Jaitpur (Kala)									
		Jogibera									
		Jhagaria (R)									
		Jhagaria(R)									
		Jhingadarh									
		Titwas									
		Dantha									
		Dabri									
		Dong									
		Darkhera									
		Tornia									
		Dagarkheri									
		Dinkarpura									
		Dewlan									
		Dhanwani (Theka)									
		Dhanoria									
		Dhanwani (Mafi)									
		Nawalpura									
		Nandgaon (R)									
		Nandgaon (Khurd)									
		Nandgaon (Loharpur)									
		Palani (Mal)									
		pratappura									

..53..

INDIRA SAGAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Proposed work / Cost		Sculpture for Collections	Monuments for Transplantation	Excavation	Remarks		
				Documentation							
				Survey 1991-92	Visual 1993-94						
1	2	3	4	5	6	7	8	9	10	11	12
		Pamakheri									
		Piplani									
		Fefria (kala)									
		Bargaon (R)									
		Barkhalia									
		Bargaon (Mal)									
		Bawangaon									
		Barur									
		Bedia									
		Bori									
		Boribandri									
		Bathia (khurd)									
		ohagwanpura									
		Bharadi									
		Bhawarli									
		Moload									
		Mugal									
		Mohania (khurd)									
		Mohania (kala)									
		Rewapur									
		Lachhora									
		Loharpur (Mal)									
		Santri									
		Sindhkhera									
		Sirwadia									
		Semrur									
		Seldha									
		Sodia									
		Sonpura (Khurd)									
		Somgaon									
		Seewar									
		Hatnoria									
		Darkali									
		Bakapalas									
		Morud									
		Mathni									
		Durjanpur									
		Unwan									
		Kachbedi									
		Kalisaray									

54
INDIRA SAGAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Proposed work / Cost			Monuments for Transplantation	Excavation Cost	Remarks		
				Documentation		Sculpture for Collections					
				Survey 1991-92	Visual 1993-94						
1	2	3	4	5	6	7	8	9	10	11	12
		Gola									
		Joga khurd									
		Jhana									
		Deopur									
		Dhanwada									
		Nagawa									
		Neemkheda (Mal)									
		Pachola									
		Bamangaon									
		Bichpuri Seth									
		Bithpuri Chauki									
		Bichola (R)									
		Bichola (S)									
		Bichola (T0									
		Bichola (M)									
		Bhamari									
		Bhortar									
		Bhimpur									
		Bhaiswara									
		Manoharpura									
		Mohandgaon									
		Malpani									
		Ratalatai									
		Latia									
		Saktia									
		Salyakhedi									
		Siralia									
		Sigon									
		Surjana									
		Hunifabad									
		Joga Kala									
		Jinwani									
		Banasa									
		Bhomer									
		Dhali									
		Fategarh									
		Golpura									
		Harja									
		Khapras									
		Kharia									
		Kitia									
		Kothara									

..55..

INDIRA SAGAR PROJECT

Name of the Project	No. of the village	Name of the village	Name of Monuments site	Proposed work / Cost			Monuments for Transplantation	Excavation Cost	Remarks		
				Documentation		Sculpture for Collections					
				Survey 1991-92	Visual 1993.94					No. of Sculptures	
1	2	3	4	5	6	7	8	9	10	11	12
		Mangardi									
		Namanpur									
		Nimlaya									
		Pokhar khurd									
		Rohania									
		Sullar									
		Gajanpur									
		Tamar khan									
		Dalet									
		Nayapura									
		Nawada									
		Mail Piplya									
		Bijwada									
		Mirjapur									
		Surnal									

..56..

**Estimate for Film Documentation under
Indira Sagar project
(Through Film Development Corporation)**

Sr.No.	Particulars	Amount
1.	Stock	4,30,00.00
2.	Equipments	2,45,000.00
3.	Daily Expenses, Wages, Food Travel, Transports etc.	5,00,000.00
4.	Sets, Locations, etc.	NIL
5.	Personnel, Scripts, Cameraman, Narrator etc.	5,00,000.00
6.	Music	1,25,000.00
7.	Post production charges (Editing, Special, Affect etc.)	2,75,000.00
8.	Casual Expenses	1,00,000.00
8.	Supervision charges of Corporation	3,26,250.00
Total :		25,01,250.00

(Rs. Twenty Five Lakh One Thousand and Two Hundred Fifty only)

..57-..

ESTIMATE FOR INDIRA SAGAR PROJECT

Sr.No.	Particulars	Amount
1.	Transplantations shifting of Monument	
2.	Documentation	25,01,250.00
3.	Shifting of Sculptures	34,500.00
4.	Tools and Plant Amount	
5.	Development of land and construction Museum building	
6.	Establishment expenditure	
7.	Excavation Amount	1,00,000.00
Total :		26,35,750.00

Transplan- tation shifting of monument	Documentation	Shifting of Scul- ptures	Tools and Plant Amt.	Dev.of land and cons- truction Museum building	Estab- lishment expen- diture	Excavation Amt.
1.	2.	3.	4.	5.	6.	7.
	25,01,250.00	34,500.00				1,00,000.00
Total : 26,35,750.00						

..58..

OMKARESHWAR PROJECT

The proposed Omkareshwar Dam would be built at a place called Omkareshwar in Khandwa district of Madhya Pradesh.

After the completion of this dam, some 30 villages, situated in the districts of Khandwa and Dewas, would be submerged. The list of these villages is attached herewith.

During archaeological survey of the concerned region, the team had noticed some 85 stray sculptures and 11 important monuments.

It was decided that a complete collection of all these sculptures would be done by March, 1994. They would be housed in the proposed Narmada Park, local museums and State Museum, Bhopal.

Out of these 11, 2 monuments have been identified for shifting and transplantation to a suitable place. But, before doing so, all the monuments would be properly photographed, their line drawings would be prepared and for keeping a live record for the future, the video shooting of all these monuments would be undertaken.

..59..

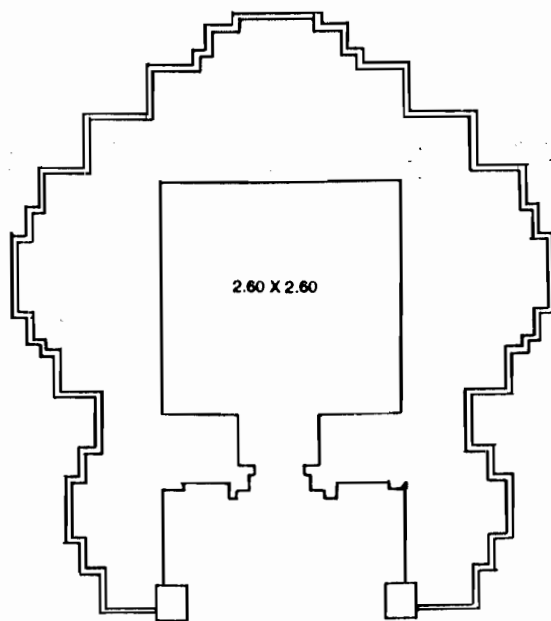
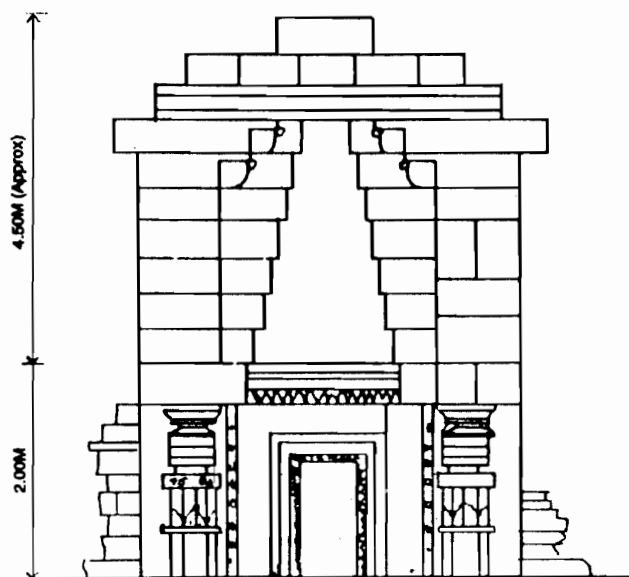
OMKARESHWAR PROJECT

Name of the village Project	No. of village	Name of the village	Name of Monuments site	Proposed work / Cost				Monuments for Transplantation	Excavation Cost	Remarks	
				Documentation		Sculpture for Collections					
				Survey 1991-92	Visual 1993-94	1993-94	No. of Sculptures				
1	2	3	4	5	6	7	8	9	10	11	12
Omkareshwar Project		Richphhal (Badi)	Shiv Temple	1991-92	1995-96	25500.00	12		1		
		Tonki	Renuka temple		779700.00				1		
		Godarpura	Kuber Bhandari temple				6		1		
		Sailani	Satmata temple				38		1		
		Cenotaph	Cenotaph						1		
			Cenotaph								
			Shiv temple on hillock						1		
		Panthiya (Sailani)	Pashupathinath Temple Shiva Temple Garhi				11		1		
									1		
		Premgarh	Shiva Temple						1		
		Ekhand					2				
		Ghoghalgaon					10				
		Kelwa Khurd					2				
		Sukwa					4				
		Gunjari									
		Bhilaya									
		Paladi									
		Indhawadi									
		Gola									
		Shaktapur									
		Kelwa Buzurg									
		Harbanshpura									
		Temacha									
	Takari										

..60..

OMKARESHWAR PROJECT

of village ect	No. of village	Name of the village	Name of Monuments site	Proposed work		Sculpture for Collections 1993-94	No. of Sculptures	Monuments for Transplantation		Excavation Cost	Remarks
				Documentation							
				Survey 1991-92	Visual 1993-94						
2	3	4	5	6	7	8	9	10	11	12	
		Rampura									
		Devagniri									
		Kothneer									
		Dharadi									
		Nayapura									
		Guwadi									
		Semali									
		Kamankheda									
		Karoli									
		Bhetkheda									

**PLAN****ELEVATION**

PLAN OF THE SHIV MANDIR AT
VILLAGE - PANTHIYA
TEHSIL - KHANDWA
DISTT. - KHANDWA

TRANSPLANTATION OF MOMUMENTS

(a) Preparation of detailed drawings for the documentation including labour charges and stationery.	60,000.00
(b) T & P like scaffolding and other equipments.	4,80,000.00
(c) Shifting and proper erection.	10,00,000.00
(d) Videography & Photography during and after work.	2,00,000.00
(e) Dev. of the site after the work.	80,000.00
Total	18,20,000.00

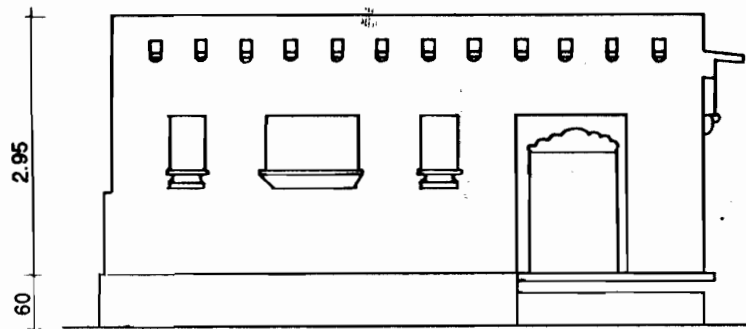
OFFICE OF THE ARCHAEOLOGIST
 ARCHAEOLOGY & MUSEUMS
 INDORE DIVISION (M.P.)

OMKARESHAWER - PROJECT

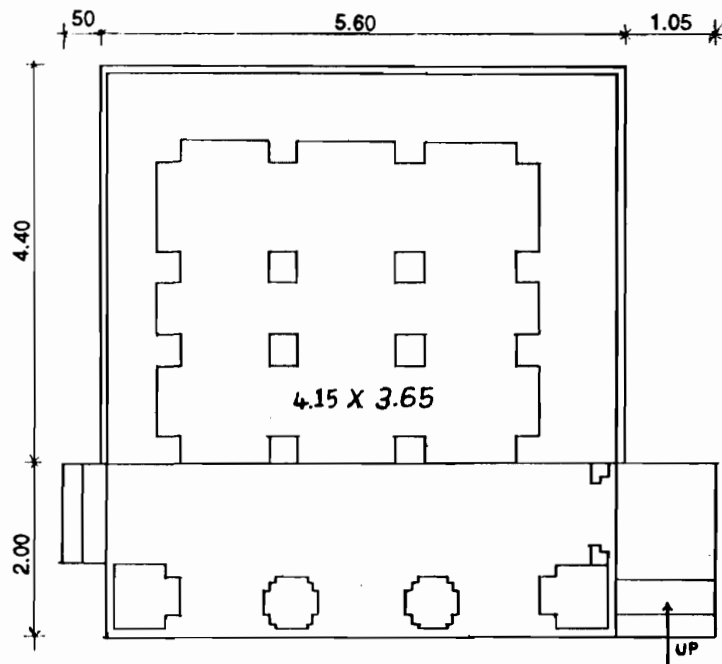
ARCHAEOLOGIST

DRAUGHTSMAN

SCALE : 1:50

**SIDE - ELEVATION**

PLAN OF THE SAAT MATRA MINDIR AT
 VILLAGE - SAILANI
 TEHSIL - KHANDWA
 DISTT. - KHANDWA

**PLAN****Satmata Temple, Sailani, District - Khandwa**

(a) Preparation of detailed drawings for the documentation including labour charges and stationery.	60,000.00
(b) T & P like scaffolding and other equipments.	4,80,000.00
(c) Shifting and proper erection.	10,00,000.00
(d) Videography & photography during and after work.	2,00,000.00
(e) Dev. of the site after the work.	80,000.00
Total	18,20,000.00

OFFICE OF THE ARCHAEOLOGIST
 ARCHAEOLOGY & MUSEUMS
 INDORE - DIVISION (M.P.)

OMKARESHAWER - PROJECT

ARCHAEOLOGIST	DRAUGHTSMAN	SCALE - 1:50
---------------	-------------	--------------

..63..

**Estimate for Film Documentation under
Omkareshwar Project
(Through M.P. Film Development Corporation)**

Sr.No.	Particulars	Amount
1.	Stock	1,35,000.00
2.	Equipments	0,77,000.00
3.	Daily Expenses, Wages, Food Travel, Transports etc.	1,54,000.00
4.	Sets, Locations, etc.	NIL
5.	Personnel, Scripts, Cameraman, Narrator etc.	1,54,000.00
6.	Music	0,38,000.00
7.	Post production charges (Editing, Special, Affect etc.)	0,90,000.00
8.	Casual Expenses	0,30,000.00
9.	Supervision charges of Corporation	1,01,700.00
Total :		7,79,700.00

Rs. Seven lakh Seventy Nine Thousand and Seven Hundred only)

..64..

ESTIMATE FOR OMKARESHWAR PROJECT

Transplantation shifting of monument	36,40,000.00
Documentation	7,79,700.00
Shifting of sculpture	25,500.00
Tools and Plant Amount	
Development of land and construction Museum building	
Establishment expenditure	
Excavation Amount	

Total ; 44,45,200.00

Transplantation shifting of monument	Documenta- tion	Shifting of sculptures	Tools & Amt.	Dev.of land and const- ruction Museum building	Estab- lish- ment Expen- diture	Excavation Amt.
1.	2.	3.	4.	5.	6.	7.
36,40,000.00	7,79,700.00	25,500.00				
Total : 44,45,200.00						

..65..

MAHESHWAR DAM PROJECT

The Maheshwar Dam would be constructed at Maheshwar in the district of Khargone.

An estimated 54 villages would be affected by this dam. .

A survey of all these villages was undertaken by the officials of this department.

In the course of the survey, they have noticed some stray sculptures and 11 monuments.

On the basis of the survey report it was decided that though few all these sculptures would be collected by this department.

It was also decided that no shifting of any of monuments would be undertaken, but for keeping a permanent record for future, video recording of these monuments would be undertaken. Also general photography and line drawing of these monuments too would be prepared.

An annexure of the villages to be affected by the construction of the dam, and plan of action, is attached herewith.

..66..

MAHESHWAR PROJECT

Name of the Project	No.of village	Name of the village	Name of Monuments site	Documentation		Proposed work / Cost		Monuments for Transplantation	Excavation	Remarks		
				Survey 1991-92	Visual 1993-94	Sculpture for Collections 1993-94	No.of sculptures					
1	2	3	4	5	6	7	8	9	10	11	12	
Maheshwar Project	59	Peet Nagar		1991-92	1996-97							
		Belsar	Chandreshvara Temple		779700.00							
		Vimaleshwar										
		Raver	Temple									
		Mardana	Ram Mandi Kaleshwar Temple runis of the palace									
		Teli Bhatiyana	Tomb									
		Bakawa	Shiv temple									
		Nagawan	Memorials of 3 saints									
		Bhamipura	Tomb									
		Chirakhan										
		Bahegaon										
		Khegaon	Shiv temple Ancient temple									
		Sejagaon										
		Peetamali										
		Amlaya										
		Saravatta										
		Telyan										
		Sitoka										
		Lalpura										
		Teemar										
		Masuda										
		Ramgarh										
		Moralla										

..67..

MAHESHWAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Proposed work / Cost				Monuments for Transplantation	Excavation Cost	Remarks	
				Documentation		Sculpture for Collections					
				Survey 1991-92	Visual 1993-94	1993-94	No. of Sculptures				
1	2	3	4	5	6	7	8	9	10	11	12
		Katghada									
		Chandipura									
		Fatepur									
		Khedi									
		Kunda									
		Kundya									
		Nimgul									
		Bhaggapura									
		Shivarampura									
		Lecha									
		Malgaon									
		Naharkheda									
		Kayatkhedi									
		Taksar									
		Navaghatkhedi									
		Semarla									
		Kathar									
		Pandhale									
		Umatti									
		Mehtakhedi									
		Dhamparia									
		Kapasthal									
		Badi Ali									
		Mortakka									
		Jalkheda									

..68..

MAHESHWAR PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Documentation		Proposed work / Cost		Monuments for Transplantation	Excavation Cost	Remarks	
				Survey 1991-92	Visual 1993-94	Sculpture for Collections 1993-94	No. of Sculptures				
1	2	3	4	5	6	7	8	9	10	11	12
		Kakariya									
		Khedi.									
		Mustiya									
		Jalud									
		Sulgaon									
		Pagharad									
		Patharod buzurg									
		Ghuvtya									
		Gangathkhedi									

..69..

**Estimate for Film Documentation under
Maheshwar Project**

(Through M.P. Film Development Corporation)

Sr.No.	Particulars	Amount
1.	Stock	1,35,00.00
2.	Equipments	0,77,000.00
3.	Daily Expenses, Wages, Food, Travel, Transports etc	1,54,000.00
4.	Sets, Locations, etc.	NIL
5.	Personnel, Scripts, Cameraman, Narrator etc.	1,54,000.00
6.	Music	0,38,000.00
7.	Post production charges (Editing, Special, Effects etc.)	0,90,000.00
8.	Casual Expenses	0,30,000.00
9.	Supervision charges of Corporation	1,01,700.00
Total :		7,79,700.00

(Rs. Seven Lakh Seventy Nine Thousand and Seven Hundred only)

..70..

ESTIMATE FOR MAHESHWAR PROJECTTransplantation shifting of
monument

Documentation

7,79,700.00

Shifting of sculpture

Tools and Plant
AmountDevelopment of land and
construction Museum building

Establishment expenditure

Excavation Amount

Total : 7,79,700.00

Transplan- tation shifting of monument	Documentation	Shifting of sculp- ture	Tool & plant Amt.	Dev. of land and const- ruction Museum building	Estab- lishment expendi- ture	Excavation Amount
1.	2.	3.	4.	5.	6.	7.
	7,79,000.00					
Total : 7,79,700.00						

..71..

MAN PROJECT

It was decided to construct the dam of Man in the village of Jeerabad in Dhar district of Madhya Pradesh. When completed, this dam would affect 17 villages situated in the district of Dhar. Though none of these villages would be wholly submerged, an archaeological team was sent by the department to assess the archaeological treasure. But except the memorial pillar stones related to the life of the local tribals no other archaeological treasures have been located. We enclose a list of the villages coming under this project.

..72..

MAN PROJECT

Name of the Project	No. of village	Name of the village	Name of Monument site	Proposed work / Cost		Monuments for Transplantation	Excavation Cost	Remarks			
				Documentation	Sculpture for Collections						
				Survey 1991-92	Visual 1993-94				No. of Sculptures		
1	2	3	4	5	6	7	8	9	10	11	12

Man Project

District - Dhar

Bhuwada
 Devipura
 Bhurkuwan
 Khanpura
 Kachhawada
 Rehatia
 Sangavi khurd
 Sangavi
 Golapura
 Gadaghat
 Badalipura kalan
 Meena khedi
 Guwadi
 Jeerabad
 Khedi Balwari
 Jeeran
 Roza Bahediya

.73..

JOBAT PROJECT

The proposed Jobat Dam would be constructed in the village of Waskal in the district of Jhabua.

Being a medium sized dam, it would cover 13 villages only. It is understood that none of these villages would be fully submerged- they would only come under partial submergence. Yet, in order to save the cultural heritage of the region as well as to enlist the archaeological wealth - a team of experts was sent to survey the area. Since these villages are mostly inhabited by the tribal groups like the Bhils and Bhilalas, besides some interesting objects related to their daily life no antiquities of archaeological importance have been recorded. A list of the names of these villages is appended herewith.

..74..

JOBAT PROJECT

Name of the Project	No. of village	Name of the village	Name of Monuments site	Proposed work / Cost				Monuments for Transplantation	Excavation Cost	Remarks	
				Documentation		Sculpture for Collections					
				Survey 1991-92	Visual 1993-94	1993-94	No. of Sculptures				
1	2	3	4	5	6	7	8	9	10	11	12

Jobat
Project

District - Jhabua

Waskal

Machani

Palasada

Machalia

Urda

Chhoti Khattali

Badi Khattal

Bagadi

Bhiti

Sindi

Bhanpura

Indvan

Dawadi

ANNEX.XX-MIN.VI.RIM STABILITY SURVEY FOR SARDAR SAROVAR PROJECT

Reservoir Competency Survey have been completed by Geological Survey of India. In a meeting taken by the Executive Member, NCA to review the progress achieved and the findings of the GSI on the Rim Stability and Reservoir Competency, the following aspect have been brought out :

Master Gradient System of the entire basin is towards the main Stem of river, which is a clear indication that no transbasin diversion of water is possible.

All the lineament & fractures are linear and confined within the basin and the cross faults present at some locations are also quite shallow. These also rule-out any possibility of seepage of water out side of the basin. The joints & fractures, which are reasonably tight and impersistant at depth are unlikely to conduct water away from the reservoir.

Seepage observed between Mandleshwar & Rajghat in 2 short streaches have also been studies. These are at the fag end of the reservoir and are confined within the alluvial depth of the reservoir. Further studies have been entrusted to CWPRS to confirm the views expressed by GSI that there is no seepage.

The basaltic tarrain is generally devoid of significant minerals deposits. Carbonate rich rock along the left bank of Narmada River in Dhule Distt was examined. The results indicates that the rock is not corbonatit type and has no significant economic implications with the direct bearing on the progressive filling & dam construction.

The Seismic Tectonic setting of the area and the possibility of reservoir seismicity have been adequately taken care of in the design of the Dam and the NCA publication of March, 1993 clearly brings out the seismicity aspects in its correct prospective. The Micro Earthquake Net work proposed to be established in the reservoir area has also substantially progressed. Six out of Nite sites have since been established and monitoring has started.