

The Narmada Valley Project
A Critique

KALPAVRIKSH

April 1988

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Preface

This booklet is an effort to put together the major concerns that have been voiced about the massive development scheme that has recently been started in the Narmada Valley in central India. The Narmada Valley Development Project is one of the biggest river valley projects ever undertaken in the world, and as such involves the promise of enormous benefits as well as huge costs. A proper weighing of these benefits and costs can be done only on the basis of adequate knowledge of the various environmental and social impacts of the Project. This basis unfortunately does not exist. The Project is therefore sought to be imposed on the country without proof of its viability and desirability, and without resolving vexing questions about its massive economic, environmental, and socio-cultural costs.

While the Narmada Valley Development Project involves 30 major and thousands of minor and medium dams, this booklet mostly focuses on two major dams which are under construction at present, Narmada Sagar Project (NSP), and Sardar Sarovar Project (SSP). These are the dams which have recently been given clearance by the Central Government, after several years of delay; these are also the two biggest of the Narmada Project dams; further, these are the two dams about which public debate has been the most fierce; and finally, these are the dams about which something can still be done in terms of avoiding what may be a great environmental and social tragedy.

The concerns voiced herein have arisen out of several years of involvement of members of Kalpavriksh in the Narmada controversy. But they are not the concerns of Kalpavriksh alone. Indeed, at a recent meeting of various groups and individuals involved in this issue, organised by the World Wide Fund for Nature - India, the Narmada Dharangrast Samiti, and Kalpavriksh, there was a unanimous resolve to continue the struggle to have the dams re-evaluated. This booklet is thus being published on behalf of the Narmada Action Plan (NAP), which was evolved jointly at this meeting. However, the views expressed here are not necessarily the views of each of the organisations involved in the NAP. Details of the NAP are given in the chapter "What Can Be Done?". We gratefully acknowledge the contribution of all the constituents of the NAP to the making of this booklet, as also of several other groups and individuals who have been involved with us over the last few years, and who are too numerous to name here.

Access to official documents on the Narmada dams has not been easy. While an attempt has been made to examine all the relevant documents before producing this booklet, it is very likely that some official reports have not been accessible. The material in this booklet must be read with this in mind.

Ashish Kothari
Shekhar Singh

April 1988

Major Arguments Against the Narmada Project: A Summary

- Since the dams under the Narmada Project involve major environmental costs such as the submergence of thousands of hectares of forests, they require complete environmental impact assessments to be made before a decision on their viability can be taken. The existing assessments, by the admission of the Government of India itself, are quite inadequate. A number of major environmental impacts have been inadequately studied or not studied at all, including: the ecological loss due to submergence of forests; the loss of wildlife; the combined selenic impact of all the reservoirs; the impact on health due to the spread of water; the changes in downstream ecosystems; the damage due to backwaters; and others.
- Since the dams involve displacement of people on a huge scale, with the attendant social and cultural effects, they require a comprehensive scheme for rehabilitation which would ensure, at a minimum, that the oustees are not adversely affected. Such a scheme is still lacking, despite major improvements made in the last few years in the rehabilitation policies of the concerned state governments. A serious deficiency is the non-identification of adequate land on which the oustees could be relocated and rehabilitated. This and other shortcomings mean that nearly 2 lakh people face an uncertain and grim future.
- Since the dams involve a colossal expenditure from the public exchequer, they require thorough analyses of their various costs and benefits. However even a brief look at the existing cost-benefit analyses shows that benefits have been greatly exaggerated, while many costs underestimated or not computed at all. The financial viability of the dams has thus not been established.
- Since it is vital, especially in a country like India, to carefully utilise our limited financial and natural resources, any project must be established to be the best possible way of achieving the stated objectives. In other words, all the possible alternatives must be studied. But neither have alternatives to these projects been studied, nor have alternative dam designs been evaluated.
- Since the two dams under focus at present, Sardar Sarovar and Narmada Sagar, are only a part of a much larger river valley project, what is required is an assessment of the environmental and social impact of the whole project. This is especially true of those aspects where the combined effect of all the dams may be much greater than can be assessed by looking at each individual dam separately. Such a total assessment has not even been attempted.

For the reasons mentioned above, it is clear that the clearance recently given to Sardar Sarovar and Narmada Sagar Projects is quite unjustified.

Introduction

1.1. The River Valley

The Narmada is the largest west-flowing river in the Indian peninsula, arising on the plateau of Amarkantak in Shahdol district of Madhya Pradesh. Originating in a holy tank in the midst of Hindu temples, the Narmada winds its 1,312 kilometer course to the Arabian Sea through lush forested hills, rich agricultural plains and narrow rocky gorges in a series of falls, rapids twists and slack waters. As many as 41 major tributaries augment its waters along the way. Its basin, bounded on three sides by mountain ranges (Satpura, Vindhya and Maikal) and on the fourth by the Arabian Sea, covers an area of 98,796 square km. Moist and dry deciduous forests cover over one-fourth of this basin, and black agricultural soils about 60 per cent. Its climate is humid and tropical. There is a fairly high average rainfall of 1,178 millimeters, 65 per cent of which is received in July and August.

Some 21 million people reside in the basin, nearly 80 per cent of them in villages. Most are engaged in agriculture and related activities. There is a sizable tribal population, divided into several distinct tribes - Bhils, Gonds, Baigas and others. Most of these have now taken to settled agriculture (or been forced into it). The main crops grown in the valley are wheat, paddy, millets (mainly jowar, bajra, maize), pulses (mainly gram, tuar, teora), oilseeds (groundnut, sesamum, linseed, rapeseed, mustard and niger), cotton, and sugarcane. Culturally, the Narmada is one of the most important rivers of peninsular India. So deeply ingrained is the Narmada in the religious lives of the inhabitants of the valley, that each one of them is supposed to walk the entire length around the river at least once in a lifetime. Over the centuries, millions of pilgrims have devotedly undertaken this arduous, 2,600 km. long, 'parikrama', providing an important link between various regions and communities along the river.

1.2. The Narmada Valley Development Project

The idea of tapping the Narmada waters was mooted way back in 1946 by the concerned provincial governments. But after extensive studies had been conducted, these provinces (later the states of Madhya Pradesh, Gujarat and Maharashtra) could not reach an agreement over issues like the sharing of water. After several years of stalemate, the Narmada Water Disputes

Tribunal was set up in 1969 to attempt a resolution. The Tribunal submitted its report in 1978. Final planning and work was started only then - over 30 years after the project was first conceived.

The Narmada Valley Project is the largest single river valley project in India to date. It envisages the construction of 30 major dams, 10 on the Narmada River and 20 on its tributaries. In addition, 135 medium and 3,000 minor dams are planned. The cost estimate for the whole Project is not available; unofficial sources put it at well over Rs. 25,000 crores. This is perhaps a serious underestimate, considering that the two major dams under construction at the moment have already reached a cost estimate of Rs. 14,000 crores! Since the Government of India and the State Governments cannot at one go make such a colossal investment, loans from the World Bank have been sought. Earlier projections put the date for completing the construction of all the dams at 1996, but this will have to be revised substantially since the first few dams have already been seriously delayed.

Almost 50 lakh hectares of land are expected to be irrigated, a part of this in the drought prone areas of Gujarat and Madhya Pradesh (and a little in Rajasthan). The Project will also create an installed power capacity of 2,700 Megawatts (MW) with an output of 800 MW at 100 per cent load factor. Some 1.15 crore people in villages and many more in cities are expected to benefit. In addition, the Project is expected to check floods; generate pisciculture in the huge reservoirs; give employment to hundreds of thousands of people; supply water for domestic and industrial use; and promote tourism. Overall, it is hoped that the Project will bring about an agricultural and industrial revolution which will usher in an 'era of prosperity' for the valley.

But this scenario of prosperity painted by the Narmada Project authorities seems flawed on a number of counts. The last few years have seen an increasing controversy about the environmental and social costs of these dams, as also about their economic viability.

Of the 30 major dams, two, Tawa and Barna, are complete. Another, Bargi, is nearing completion. But the ones which are the focus of controversy are Narmada Sagar in M.P. and Sardar Sarovar in Gujarat. Sardar Sarovar Project (SSP) is by far the largest in terms of expected benefits; it alone is expected to irrigate almost 19 lakh ha., and its cost is already put at over Rs. 9,000 crores. Narmada Sagar Project (NSP), on the other hand, has the largest submergence; it will create the biggest artificial reservoir in India.

Environmental Aspects

2.1. The Loss of Forests

Of all the environmental aspects of the Narmada Project that have evoked concern, perhaps the one that has gained the maximum attention has been the loss of forests. No official estimate seems to exist of the amount of forest to be submerged by the Narmada Project as a whole; the only estimate available is that of Shri SDN Tiwari, advisor to the M.P. Environmental Planning and Coordination Organisation (Tiwari, 1982). According to him, some 3.5 lakh ha. (3,500 sq.km.) of forests will be submerged by the 30 large and hundreds of small and minor dams. The basis of his estimate is unclear, but judging by the submergence figures officially given for NSP and SSP, just 2 of the 30 large dams, his figures may well be underestimates.

NSP has a total submergence of 90,820 ha. (908.2 sq.km.), or what will be the largest human-made lake in India. This colossal submergence includes over 40,000 ha. of forests, some of these the best deciduous teak forests in central India. The submergence zone of SSP is smaller, some 39,134 ha. (391.34 sq.km.), including 13,744 ha. of forests, mostly degraded. The total forest loss of these two projects is thus well over half a lakh hectares!

Such forest loss seems to be acceptable even to the Dept. of Environment provided plans are made to compensate for them in terms of adequate afforestation. To the credit of the NSP and SSP authorities, such plans have been submitted. It must however be made clear that this so-called 'compensatory afforestation' is hardly compensatory in the sense of replacing what is lost. A forest of the type to be submerged by NSP, having evolved over perhaps millions of years, contains a delicately integrated community of hundreds of thousands of species of plants and animals. Any plantation can contain only a fraction of this enormous diversity. Firstly, the dismal past record of plantations by the state governments does not inspire much confidence in their claims. Secondly, in such circumstances there is often a tendency to plant species which are commercially useful and not necessarily ecologically so. The NSP afforestation plan in fact includes some exotic, commercially useful species (Narmada Planning Agency, undated). Certainly there is no conscious attempt on part of either the NSP or the SSP authorities to replant exactly what is going to be lost. How could they, considering a complete flora listing of the submergence zones has till date not been done?

The issue of compensatory afforestation was what held up the environmental clearance

from the Govt of India for so long. Initially, the Gujarat Govt had submitted a plan to do compensatory afforestation in Kutch (Narmada Planning Group, Feb. 1986), an ecosystem entirely different from the one being lost! The MP Govt had proposed afforestation in several small pockets scattered over a wide area. Both these schemes were unacceptable to the Dept. of Environment. Only last year were satisfactory schemes submitted.

A point of particular significance here is the loss of these forests in financial terms. The project authorities had initially valued forests solely in terms of their timber, firewood and minor forest produce yield. This ignored the much more crucial ecological functions of a forest, including soil preservation, water replenishment, microclimatic stabilisation, and storage of genetic pools. According to the Dept. of Environment, in the case of NSP, "even if one were to assume that the forest to be destroyed do not contain genetic resources ... the simple loss of these forests would have an environmental cost estimated at several thousand crores of rupees as per norms developed by FRI. The environmental cost is thus colossal." (Dept. of Environment & Forests, 1987). The Dept. puts this cost at Rs. 30,923 crores for NSP and Rs. 8,190 crores for SSP. This of course has thrown the whole cost-benefit ratio of these dams out of gear; indeed, attempts by the project authorities to counter this border on the ludicrous (see Chapter 4).

2.2. The Loss of Wildlife

The loss of forests will inevitably lead to a loss of wildlife residing in these forests. Unfortunately this seems to be one of the most neglected aspects of the Narmada dams. The SSP authorities had in an answer to a query of the Dept. of Environment stated in 1983 that "at present there is no wildlife in the reservoir area of the proposed Sardar Sarovar dam and its vicinity." The NSP authorities claimed in 1982 that "impact of the project on wildlife shall be nil, since wildlife has got natural characteristics of shifting to nearby jungles whenever it is felt suitable for them." (Chief Engineer, NSP, 1982)

The SSP submergence zone does indeed have very few large mammals left, if this is what the authorities mean by there being "no wildlife". But surely wildlife is not just tigers and deer? What about wild plants and insects and reptiles and amphibians and birds? Even a forest as degraded as the one to be submerged by SSP would have thousands of species of these. Yet, in the recent 'Workplan on Forests and Wildlife' for SSP, there is no mention even of the word wildlife, except on the cover, much less a strategy for saving it! (Narmada Planning Group, Feb. 1986).

It would be much more difficult for the NSP authorities to dismiss the loss of wildlife in a similar manner, if nothing else because of the presence, in its submergence zone, of rare and endangered species like the Wolf and the Tiger. In the words of the DOEn, "The forest area especially affected by the NSP represents areas harbouring a rich heritage of genetic resources as well as wildlife." (Department of Environment and Forests, 1987). In their 1982 Detailed Project Report, the NSP authorities stated that the wildlife will "relocate itself". (Chief Engineer, NSP, 1982). They have maintained this stand for the wildlife which inhabits the northern part of the submergence zone, for here there are

contiguous forests to which the animals can migrate. There is of course no study on the carrying capacity of these adjoining forests, and therefore no assessment of whether they can support the sudden influx of wildlife from the submergence zone. There is however a plan to convert these forests to the north into a sanctuary. But the greater worry is about the wildlife in the southern part of the forests to be submerged, for here the nearest forest area is 40 to 100 km. away, with agricultural fields in between. The NSP authorities plan to have 'squads' of trained staff to drive the animals through these fields into the forests beyond. There is no assessment of whether such a task is at all possible.

In any case, what of the wildlife that is tied down to its localised habitat and cannot be expected to "relocate itself" or be driven out? These plants and animals will simply be left to perish, unless translocated, one by one. But the translocation of millions of creatures is beyond human capacity. There will thus be an inevitable loss of wildlife.

The most alarming fact is that we do not yet even know the dimensions of this loss. To date there is no detailed listing of the flora and fauna found in the submergence zones of SSP and NSP. Studies on this have been initiated, but will take a few years to be completed. As the DOE points out, "under the circumstances, it is not possible to assess the impact of the loss of habitat on the wildlife, and the overall loss of biological diversity and genetic reserves." (Department of Environment and Forests, 1987). Nor, of course, would it be possible to develop alternative habitats for rare and threatened species, if any are found to be present in the submergence zones.

2.3. Catchment Area Treatment

The catchment area of a river is an extremely important factor in the design and maintenance of a river valley project. The life span of a dam depends upon its storage capacity which, in turn, depends upon the silt load and water flow pattern of the river. If, due to destruction of the catchment ecosystem, the silt load exceeds the amount calculated during the planning stage, the storage capacity is quickly diminished, thus reducing the life-span of the dam. Simultaneously, in such a situation, there is excess water inflow into the river during the monsoons, and the reservoir is in danger of overflowing, leading to the necessity of releasing excess water and causing floods downstream. In the dry season, on the other hand, water flow falls below anticipated levels since the underground aquifers have not been recharged due to excess run-off in the monsoons. Thus when water and electricity are most required, they are not available. It is imperative therefore that the catchment area forests are properly conserved.

Till recently, the catchment area of the Narmada Valley was by and large well-forested, but of late there have been a number of factors leading to its rapid destruction. These include a number of paper mills and other industries, agricultural extension, grazing, and firewood collection (Kalpavriksh and Hindu College Nature Club, 1984). Satellite imagery shows that since the early 1970's, huge areas in the Narmada Valley have been deforested, though figures on the exact extent of the decline are not available.

The concern that has been voiced by environmentalists is therefore the following: given

that there is rapid deforestation in the Narmada catchment areas, the rate of siltation of the river, and consequent sedimentation of the dam reservoirs, may well in the future be higher than presently estimated, thereby cutting the lifespan of the dams. Simultaneously increasingly erratic water flow in the river would affect the performance of the dams. The assumption of a 100 year lifespan, may thus be unrealistic. It would be realistic only if the deforestation was arrested and reversed; in other words, if there is a *comprehensive and workable* catchment treatment plan.

It is to the credit of the Govt of India and the Narmada Project authorities that an attempt has been made to produce such a plan, perhaps for the first time in India. A special committee was set up by the Govt of India in 1984 to look into the matter. Headed by Dr. M.L. Dewan of the National Land Use and Conservation Board, this committee submitted a Rs. 520 crore plan to treat the catchment areas of NSP and SSP (Ministry of Agriculture, Govt of India, 1985). Subsequently the project authorities of these two dams have prepared plans for implementing the recommendations of the Dewan Committee (e.g. Narmada Valley Development Authority, Jan. 1986-I and Mar. 1986-I).

The preparation of catchment area treatment plans is a crucial step towards better planning of river valley projects. Unfortunately the plan for the Narmada Projects just does not go far enough towards a *comprehensive and workable* scheme. This is indirectly admitted by the Dewan Committee itself. It admits that its study was based on "limited surveys and local knowledge", since "no specific surveys have been carried out to map areas of different erosion intensities, problems, and needs for different treatments for checking soil erosion, water conservation, increased productivity of soil, land for agriculture, forest, grasses, horticulture, etc." (Min. of Agriculture, Govt of India, 1985). The Department of Environment, Govt of India, has recently stated that the plans for catchment treatment are quite inadequate, and that "today we have an Intention Plan which can be converted into an Action Plan only on the basis of field survey data which is not available. Considering the accelerated deforestation during the last few years, the total area in the catchment needing treatment is sure to be much larger than that proposed by the Dewan Committee." (Dept. of Environment and Forests, 1987).

A number of other problems can be pointed out in relation to the plans for catchment treatment:

- There seems to have been no estimation made of the present and future demands on the catchment forests from industries, urban areas, and villages, and therefore no recommendations on how to meet this demand to avoid further deterioration of the catchment. The fact that the proposed dams will themselves lead to a rise in this demand, by accelerating urban and industrial growth, by decreasing the total amount of forest available due to submergence, and by displacing human and cattle population into the catchment, has been completely ignored.
- Treatment of catchment areas will require closing off of areas, i.e. denying local people access to fuel and fodder sources. There seems to be no plan to provide them with alternative sources; in such a situation either the villagers will face tremendous hardships or the treatment measures will fail as the villagers continue to use the area forcibly.

2.4. Health Impacts

The impounding of water and the spread of surface irrigation inevitably generates conditions which are favourable for water-borne disease vectors. It is now well-established that diseases like malaria have been greatly aggravated due to dams in India (Kondrashin, Nov.-Dec. 1987), and the same is likely to happen in the case of NSP and SSP.

A preliminary study of NSP states that while schistosomiasis and guinea-worm diseases are not likely to increase significantly, the incidence of malaria, filaria, cholera, gastroenteritis, viral encephalitis, goitre, and some other water-borne and water-based diseases will go up. (M.P. Council of Science and Technology, 1984). How the M.P. Government intends to cope with this is unclear, especially since no funds have been allotted for health measures. With respect to malaria, the Environmental Impact Assessment report of NSP states that "it may not be possible to take preventive action through spraying, etc., over such a large area (i.e. the command). It can only be hoped that medical facilities will be adequate to deal with cases of malaria." (Environmental Planning and Coordination Organisation, 1984)

For SSP, on the other hand, the authorities propose to deal with potential health problems by using pesticides against the vectors. This statement seems unacceptable as it is clear by now that many insects in India have acquired immunity to DDT and other commonly used pesticides. Pesticide-based vector control is getting less effective and more costly. In addition, the pesticides that will be used would themselves have a significant negative impact on the health of human beings and animals and on the ecosystem.

The costs of human suffering and deaths, directly due to the increase in diseases and indirectly due to pesticide poisoning, has not been assessed by the NSP and SSP authorities.

2.5. Waterlogging and Salinity

It is well accepted today that due to seepage from canals and reservoirs, absence of drainage and land-shaping measures, and over-utilisation of water, many of our irrigation schemes have resulted in significant water logging and salinity in the command areas. Millions of hectares of irrigated land in India are reported to be suffering from this problem.

Interestingly, several agricultural experts had in the early part of this century issued clear warnings against large-scale canal irrigation in the Narmada basin, due to the propensity of black soils to become waterlogged (Environmental Services Group, Sept. 1986). Their fears have come true in the first two major projects to be completed in the Narmada basin, Tawa Dam in Hoshangabad District, and Barna Dam in Raisen District. In the case of Tawa, the Comptroller & Auditor General of India has in his 1979-80 report noted that crop yields in Hoshangabad District had actually declined after introduction of irrigation (Comptroller & Auditor-General of India, 1979-80). He observed that, "According to the scientific and technical opinion now available, because of the soil and weather conditions in the command area of the Tawa Project agricultural operations in both Kharif and rabi seasons with the help of irrigation could not have been productive, but on the other hand, irrigation could be even harmful."

A similar situation could arise in the NSP and SSP commands. A study on the waterlogging potential of NSP, done by the Indian Institute of Science (IISc), Bangalore, and sponsored by the Narmada Planning Agency, notes that a very large part (perhaps about 40%) of the command area will become water-logged given the surface/ground water use pattern proposed in the original design of the project (Sridharan and Vedula, Mar. 1985). This report has suggested a different surface-groundwater use ratio, viz. predominantly 70:30 instead of 80:20 as now proposed, to avoid waterlogging. This would necessitate the sinking in of a tube well every 6.3 ha with a 3 bhp motor to prevent water logging. The cost of doing this has been computed at Rs. 54 crores (Narmada Valley Development Authority, Jan. 1986-II), but it is not clear if this cost has now been included in the cost-benefit ratio (it had not been in the original ratio). One estimate puts the power requirement for the wells at 45 MW, which is one-third of the firm power generation of NSP! (Alvares and Billorey, Nov. 1987).

Even the IISc study, critical as it is, does not take into consideration the reservoir of the SSP which will intrude into or border the NSP command area over a long stretch. If the reservoir is taken into consideration, the problem of water logging could become much more severe and the sinking of additional wells would not solve the problem as the wells, in effect, would be attempting to drain the reservoir. This scenario has not been studied.

For SSP, the project authorities claim that lining of canals, conjunctive use of groundwater, and a much more limited supply of water per unit of land than given in previous irrigation projects, will greatly reduce the possibility of waterlogging (Narmada Planning Group, 1983). However, of the huge command area of over 18 lakh ha, only a small portion of 4.7 lakh ha - the Narmada-Mahi Doab - has actually been studied for drainage and potential waterlogging (Core Consultants Pvt. Ltd., 1982). The remaining over 13 lakh hectares has not yet been studied. Much of this is semi-arid land which is known to be prone to salinisation problems. This is because the hot climate causes rapid evaporation of irrigation water from the surface of fields, leaving an encrustation of salts behind. Besides, it is also known that the sub-surface water in this region is saline and, therefore, salinisation could be aggravated even further.

2.6. Seismicity

It is well known that large storage of water, like in reservoirs, can be a cause for triggering off earthquakes. The project authorities of NSP and SSP claim to have done studies to assess the potential seismic impact of each of these dams separately (Environmental Planning & Coordination Organisation, Jan. 1984, and M.S. University, July 1983). They claim that there will be no adverse impact. However, the National Geophysical Research Institute, Hyderabad, has stated that the dams may trigger off seismic activity (Anon., 1987). The basis of its statement is unclear, and this remains an issue with a great lack of clarity, with little evidence on which to counter the official claims.

In the whole controversy about seismicity, one essential point seems to have been ignored.

Considering that the various dams of the Narmada Project are coming up in the same valley, it would be essential to study the seismic potential of the total project, and not of each reservoir separately. Whereas any one reservoir might not trigger off an earth quake, the combined weight of two or more reservoirs might. This, however, has not been studied.

2.7. Effects on Downstream Ecosystems

Dams inevitably cause a reduction in the flow of water, sediments, and silt downstream. This has a major impact on downstream ecosystems, both riverine as well marine (where the river meets the sea). Thus for instance the dam may impede the migration of fish or aquatic mammals, and upset the delicate balance that exists between the myriad lifeforms in the river. Reduced silt and sediment flow may affect the fertility of the downstream ecosystem, as also deplete food availability to aquatic animals. The reduced water flow at the mouth of the river could also lead to ingress of salt-water, with potential disastrous effects not only on natural ecosystems but also on fisherfolk and other people whose livelihood is dependent on these ecosystems. While various official documents have mentioned some of these potential impacts, there is no proper assessment of their nature, extent, and cost implications.

The only aspect of downstream impact which has been studied to some extent is the effect on commercial fisheries. It has been stated that there will be no overall negative impact since the loss of some species of commercially valuable fish will be more than made up by the increase of other species in the reservoir. This may be a valid argument in purely short-run economic terms, but it cannot be said to be ecologically sound. The overall changes in the ecosystem of the river will sooner or later affect the viability of commercial fisheries, and must thus be studied before a conclusive statement can be made.

2.8. Impact of Backwaters

It is well recognised that artificial blockages to the free flow of water, like in dams, can aggravate the build-up of backwaters in the river and its tributaries. During heavy rainfall such backwater build-up can be many metres high and can cause heavy destruction in its wake. The Narmada Valley Development Authority was to have started studies on this in 1986. But the expected date of completion of these studies is "one year prior to filling up" (of the reservoir) (Narmada Valley Development Authority, Mar. 1986-II), which means that the impact of backwaters and the cost of mitigatory measures are nowhere as yet included in the environmental assessment or the cost-benefit analysis of the projects.

2.9. Other Environmental Costs

NSP and SSP will have a number of other environmental costs which have been inadequately assessed or not assessed at all. These include the impact of water impoundment on microclimate, the possibility of growth of weeds around the reservoir and along the canals, the effect of loss of pastures and other non-forest land under submergence, and the impact of the reservoirs on surrounding forests.

Social and Cultural Costs

3.1. Displacement and Rehabilitation

Submergence of land inevitably entails the displacement of people living on that land. There exist no official figures on the extent of displacement to be caused by the Narmada Project as a whole. The National Institute of Urban Affairs, New Delhi, estimates that about 1 million people in all will be displaced, but the basis of their estimate is unclear. (National Institute of Urban Affairs, 1982). Judging by the displacement figures of NSP and SSP, 1 million may well be an underestimate. For just these two projects will together oust nearly 2 lakh people over the next 10-12 years. Even if one considers the fact that these two dams are the largest of the 30 major dams of the Project, the net displacement is likely to be far in excess of 1 million, if and when the Project is completed. For the time being, attention has been focused on NSP and SSP.

NSP and SSP are together expected to displace over 2 lakh people, most of these in the state of Madhya Pradesh, some in the states of Gujarat and Maharashtra (see details in Annexure A). This displacement will take place in the next 10 to 12 years if the dams go on schedule. SSP has already caused displacement of 6 villages which have been submerged under rockfilled dykes or removed for other reasons.

As in the case of catchment treatment and compensatory afforestation, the Narmada Project has taken a vital step forward in the issue of the rehabilitation of those to be displaced. In 1979 the Narmada Water Disputes Tribunal put forward a set of directives on rehabilitation which were a distinct improvement over past policies in India. (Government of India, 1978). Perhaps the most crucial of these directives was that those oustees losing 25 % or more of their land must be allotted as much land as is lost, with a minimum of 5 acres (2 ha.). In addition, resettlement grants, civic amenities in the rehabilitation villages and other such support was to be provided to each oustee. Though these directives referred only to people in M.P. and Maharashtra being displaced by SSP, they also became the model for policies relating to the oustees of SSP in Gujarat, and of NSP in M.P.

The Centre for Social Studies, Surat, which is monitoring the resettlement and rehabilitation programme in Gujarat at the behest of the Gujarat Government, has reported that the resettlement of the first 5 villages has been far from satisfactory (Centre for Social Studies, 1986). The people who have been displaced are facing all sorts of difficulties at their resettlement sites, including severe shortages of fuelwood, fodder, and employment

opportunities, fragmentation of families, conflicts with host populations, and in some cases inferior land and shortage of water. Many have also complained of receiving compensation very late, or of receiving less compensation than promised. Recently many oustees of Maharashtra who had been resettled in Gujarat have reportedly moved back to their old villages due to the lack of facilities like water, fuel and fodder at their resettlement sites.

The DOEn had the following to say about the rehabilitation schemes for NSP and SSP, just before clearance was given to these dams:

"Status of Readiness: Narmada Sagar

1. Total land requirement of 40,000 ha. for rehabilitation has not yet been identified, let alone surveyed, for its capability etc ...
4. Phase-I oustees are proposed to be resettled on land clear-felled in 1976 for Bangladesh refugees which was not fully utilised. About 13,000 ha. of this land is to be utilised for rehabilitation and pasture development. A total of 2268 ha. of land is proposed to be reclaimed for agriculture by 1989.
5. The land identified have not yet been surveyed for:
 - Land capability
 - Actual water availability
 - Nature and quantum of reclamation works i.e. leveling, grading, terracing, gully plugging, retaining structures, etc.
6. The lands identified are reported to be:
 - Severely eroded and gullied;
 - infertile with low water holding capacity;
 - Suffering from general scarcity of water.
7. Social desirability of tagging on the Adivasis to the Bangladesh refugee villages has not been examined and prima-facie is questionable.
8. The Rehabilitation Plan even for phase-I is not, therefore, really ready. The M.P. authorities have stated that basic surveys would be completed earliest in about a year to provide the needed data. No additional information on rehabilitation is likely to become available in the short run.

Sardar Sarovar

The problem of rehabilitation is not as severe in the case of Sardar Sarovar Project as the number of fully submerged villages is only 3 but, the rehabilitation has to be taken in three states. Preliminary data has been furnished on lands identified by Maharashtra and Gujarat where suitability and acceptability to farmers is yet to be ascertained by the Sardar Sarovar Project authorities." (Department of Environment and Forests, 1987).

After a long and protracted battle with the SSP authorities, the oustees of Gujarat, with the help of groups like the Chattra Yuva Sangharsh Vahini, have finally managed to obtain

most of their major demands. Whether the promises made by the Gujarat Govt. will be fulfilled remains to be seen. In any case, the primary displacement due to SSP is in M.P., and both here as well as in Maharashtra, the situation is far more bleak. As regards NSP, the situation can be gauged from the above note of the DOEn. Groups in Maharashtra and M.P. like the Narmada Dharangrast Samiti and the Narmada Navnirman Samiti are actively trying to get a better deal for the oustees of these states.

3.2. Other Cultural Costs

Apart from the social and cultural impact of displacement, the dams will also cause socio-cultural disruption in other ways. A cultural phenomenon of great significance which will be affected is the 'Parikrama', an age-old practice in which residents of the Narmada Valley circumambulate the whole river on foot. With the creation of huge reservoirs the route of the parikrama will be severely disrupted, the impact of which has not been studied or evaluated. The NSP authorities have merely stated that the perikrama will be re-routed; how this will be done, what the impact will be on this practice, how acceptable this will be to the residents of the Valley -- these and other questions have not been answered by them. There will also be submergence of many temples and spots of religious or cultural significance. The Narmada Project authorities plan to relocate the major ones, like the Singhajiki Samadhi (Environmental Planning & Coordination Organisation, Jan. 1984). But it will not be possible to relocate every single structure, and thus there would be inevitable archaeological and cultural loss, the dimensions of which have not been assessed.

Costs vs. Benefits: Which Are Greater?

The Planning Commission requires that all river valley projects must have a minimum cost-benefit ratio of 1:1.5, i.e. for every rupee spent there must be a return of at least one-and-one-half rupees.

Two points have emerged in the last few years which are related to the above method of evaluating a project's economic viability. One is the fact that being a purely economic evaluation, it does not tell much about the social desirability of the project. In other words, there is no 'class-benefit analysis', no evaluation of who will be benefited by the project and who will bear the cost. Secondly, questions have been raised about how realistic even the purely economic analyses are, i.e. whether they truly reflect the costs and benefits of the project.

Both these points are relevant to the cost-benefit analyses of NSP and SSP. A 'class-benefit' analysis has not been done at all, and the purely economic analysis is patently unrealistic, with highly exaggerated benefits and seriously underestimated costs. The analysis done for SSP by the Tata Economic Consultancy Services, for instance, is based on totally unrealistic projections of increase in agricultural yields due to the Project. (Singh, Mar. 1988, Annexure). The projected yields for wheat, cotton, tobacco, rice, and other crops are *higher than achieved anywhere else in the country*, even in the most heavy-input Green Revolution areas. Indeed in many cases such yields have been projected even for those parts of SSP command which are already heavily irrigated, yet have far lower yields. An example is the Ahmedabad District of Gujarat, which has 91% of its paddy land under irrigation, and produces an average of 1673 kg/ha. Production of paddy here has been projected to shoot up to 2730 to 3710 kg/ha. after SSP's completion! No basis has been given for these quantum jumps in production.

Many other examples of overestimation of benefits can be cited. Simultaneously, many costs have been inadequately assessed or not included at all. Costs of preventing water-logging, of health measures, of catchment area treatment, of the environmental loss of forest submergence, and many other such major aspects of the projects were not even included in the original cost-benefit analyses presented to the Planning Commission. Many of these are missing even from the latest revised estimates. Since knowledge on the environmental impact of the dams is still very scanty (as detailed in other

chapters here), many inevitable costs are never likely to be included in the cost-benefit analyses.

Recent estimates of the economic loss of forest submergence, given by the DOEn (see Chapter 1 Section 1.1.), threatened to completely turn over the cost-benefit ratio of NSP and SSP. Attempts by the project authorities to counter this have been severely criticised as being mere jugglery of figures (Alvares and Billorey, Nov. 1987). For NSP, for instance, new benefits have mysteriously appeared, like 'savings in various costs because they have a hydel instead of a thermal plant' (Rs. 17,000 crores). Revenue from power of Rs. 13,000 crores has suddenly been added to by benefits from 'increased industrial production', amounting to Rs. 14,441 crores (Alvares and Billorey, Nov. 1987). Overall benefits from NSP have been shown to be Rs. 50,000-crores, the basis of which is patently questionable.

Even on a purely economic ground, therefore, the viability and desirability of NSP and SSP has not been established. This, remember, is without even raising questions about the less tangible environmental and socio-cultural impacts of the dams.

Water Flow and the Question of Alternatives

The Narmada Project has been designed with the assumption of a 75% dependable run-off of 27.2 Million Acre Feet (MAF). This estimate was however based on 'generated series', since actual data for 35 years was not available when the original design was made. Since then, however, this data has become available, and the 75% dependable run-off has now been estimated to be only 23 MAF (Department of Environment and Forests, 1987).

The fact that the total water availability in the Narmada River may be much less than originally estimated has a significant bearing on the design of the dams. It is obvious that many of the present parameters of the design would no longer be valid, and that major changes may be required. However, no effort has been made to modify the design, or to recalculate the costs and benefits.

The issue of changes in dam design is relevant from another viewpoint also. It seems that even with relatively minor changes, a considerable amount of damage can be reduced while not sacrificing much of the benefits. The DOEn has the following to say about this:

"The Narmada Sagar FRL has been fixed at 860 ft. to provide a live storage of 8.8 MAF ... There is reason to believe that even with variations in dam height down to FRL of 814 ft. the irrigation potential in Narmada Command will not be affected at all. The adverse impact would be on generation of firm power which would become 22 MW instead of 118 MW eventually ... The positive impacts of fixing the FRL at 814 ft. are that the forest submergence gets dramatically reduced to 8075 ha. total land submergence is reduced to 35,628 ha. and the number of villages affected becomes 77 with a population of 20,200 only ... The Mean Draw Down Level (MDDL) of the Sardar Sarovar Project can be modified to provide an additional live capacity. A rough estimation is that the MDDL can be lowered by about 50 ft.

"In the overall interest of natural resources optimisation, reducing to the minimum impact on human beings, and for minimising the ecological damage, an objective review of the design parameters seems desirable" (Department of Environment and Forests, 1987).

Finally, apart from alternative dam designs, there is the issue of alternatives to the dams themselves. The objectives of the Narmada Project, mainly irrigation and power generation,

can be achieved by several other means also. What is necessary is to examine each available alternative, so as to obtain the best possible way of achieving these objectives, i.e. the one which is (a) the least costly in economic, environmental, and social terms, (b) the most beneficial, and (c) the most equitable in its distribution of benefits. This process is all the more necessary in a country like India, with limited resources. It is apparent, however, that the Narmada Project is being pushed without a consideration of all the available alternatives.

Action

6.1. What Can Be Done?

With clearance having been given to the Narmada Sagar and Sardar Sarovar Projects, there is widespread feeling that "the battle has been lost." This is not true. There is a lot that can still be done, and must be done. It is still possible to:

- stop the dams from being built, if they are established to be unviable or undesirable from an environmental, social, or economic viewpoint; or,
- obtain modifications in the design of the dams so as to considerably reduce the displacement and submergence costs, while retaining most of the benefits; or
- ensure that if the dams are to be built with the existing designs, their costs are minimised by preventive measures (e.g. against waterlogging), and compensatory schemes (e.g. a comprehensive rehabilitation)

It is important to realise that even if the struggle against the destruction to be caused by the Narmada dams is lost, the way in which we carry out the struggle and degree to which we can sustain it, will set a valuable precedent. We will have shown that we are no longer willing to be taken for granted; most important, we will have made the point that no project should be given the green signal until it is fully established to be economically viable, socially desirable, and environmentally sustainable.

But to do so several specific things need to be done. At a meeting of groups and individuals working on Narmada, organised in December 1987, a joint action plan was evolved. This *Narmada Action Plan* comprised of the following activities:

Research and Monitoring: Since many of the official studies and assessments of NSP and SSP are inadequate, independent research is urgently required on the various environmental, social, and economic aspects of these dams. Simultaneously, NGOs need to gear themselves up for monitoring the various aspects of environmental and human rehabilitation in the event of the dams being built, i.e. to ensure that the authorities actually do all they can to minimise the environmental and social losses.

Mobilisation: Potential oustees have to be mobilised to demand an adequate rehabilitation in the event of the dams being built; this is already being done, and needs to be stepped up, especially with respect to the oustees of Sardar Sarovar and Narmada Sagar Projects in Madhya Pradesh.

Litigation: Legal redress at all levels may be one of the most effective ways of achieving our objectives.

Media, Awareness, and Lobbying: Public opinion needs to be built up against the destructive aspects of the Narmada projects.

Documentation: To support all of the above activities, collection and dissemination of information is absolutely necessary; this includes collection of all the relevant material, its access to those groups and individuals who need it, and regular information exchange between all these groups and individuals.

6.2. What You Can Do

A number of groups and individuals are already involved in various ways in the Narmada issue - some of these have been listed in Appendix B. Here is how you can contribute to this struggle:

Research and Monitoring:

Studies and assessments of the following are needed:

(a) The impact on forests and wildlife, including a listing of the flora and fauna found in the submergence zones of SSP and NSP, the potential genetic loss, the possibility of relocation.

(b) The state of the catchment areas and the effect of its destruction on the viability of the dams, including an assessment of their expected lifespan and the measures needed to ensure a full lifespan.

(c) The social and cultural impact of human displacement, including the effect on the oustees economy, social structure, and cultural life. (Since displacement has already started, this is most urgent).

(d) The combined effect of many reservoirs on the seismic stability of the Valley.

(e) The potential of waterlogging and salinisation in the command areas of NSP and SSP, including a review of existing studies, and consideration of additional factors, such as the effect of SSP's reservoir on NSP's command area.

(f) The impact of water impoundment and irrigation on human and livestock health, including the potential spread of water-based and water-borne diseases as opposed to the reduction of water-shortage related diseases, and measures needed to avoid the former.

(g) The impact on downstream ecosystems, including the effect on riverine life and ingress of saltwater at the rivers mouth.

(h) The impact of the backwaters of the reservoirs, including the potential loss of land, forests, and settlements.

(i) Various issues related to water flow, including the possibility of much less water availability than originally calculated, and the impact of these on benefits of the dams.

(j) The impact on cultural aspects like the 'parikrama'.

(k) The financial viability of NSP and SSP, including a review of the existing official cost-benefit analyses as well the production of an independent cost-benefit analysis.

(1) The various alternatives available to the projects as they are now, including changes in the design of the dams themselves, as well as methods of achieving the same benefits without building the dams at all.

As would be obvious, many of the above studies would require the help of trained civil engineers, doctors, economists, seismologists, anthropologists and sociologists, hydrologists, and various other technically proficient persons, who are not afraid of speaking out. Identifying such people is urgently needed. If you can help with such skills, or know of people who can, please write to the address given below.

Mobilisation:

The individuals and groups who have been involved in mobilising the potential oustees of SSP and NSP are too few in number considering the magnitude of the displacement. Mobilisation is especially weak among the oustees of SSP and NSP in Madhya Pradesh, who constitute over 90% of the total oustees. In the case of both dams, the tribal oustees as well as poor peasants are the ones in special need of help in organising themselves. People who can move in the submergence zones of these dams, communicate and build up a rapport with the potential oustees, and express their interests to the outside world, are urgently required.

Litigation:

There is already on-going litigation in the Gujarat High Court and the Supreme Court regarding displacement of the oustees of Maharashtra and Gujarat. Another petition which deals with the environmental and financial aspects of the projects also, is almost ready to be filed in the Supreme Court. Further legal action, either independently at various levels, or as interventions in the above writs, could be very effective. This is especially so in the proposed petition in the Supreme Court, since this attempts to deal with all the aspects of the projects and would require evidence from a cross-section of people. Lawyers or social activists who can help the affected parties in getting legal redress are urgently required.

Media, Awareness, Lobbying:

Reporting in the press, awareness programmes in educational institutions and among the public, letters and memoranda to governmental officials at various levels, and other such methods are increasingly needed to generate public opinion about the Narmada projects. Some efforts at this, as well as at building some audio-visual material, are already being made. These need to be augmented, especially at the level of local media. Translations of existing material (written and audio-visual) are urgently required.

For further details, contact: Narmada Action Plan
c/o Shekhar Singh
C/17A Munirka
New Delhi - 110067

APPENDIX A: Vital Statistics of the Narmada Project

Narmada Valley Development Project

No. of dams:	30 major (CCA over 10,000 ha.) 135 medium (CCA between 400 & 10,000 ha.) 3000 minor (CCA under 400 ha.)
Major dams:	5 hydel, 6 multi-purpose, 19 irrigation 10 on Narmada River, 20 on tributaries
Cost:	Over Rs. 25,000 crores (no official estimate available)
Benefits:	Irrigation - 48 lakh ha. CCA Power - 2700 MW Installed Capacity
Submergence:	Over 6 lakh ha. (no official estimate available) Forests: 3.5 lakh ha. Agricultural and other land: 2 lakh ha.
Displacement:	Over 10 lakhs (no official estimate available)

Narmada Sagar Project

Location:	Punasa, District Khandwa, Madhya Pradesh
Cost:	Rs. 6,000 crores (1987) (Excluding environmental cost of forest submergence, Rs. 30,923 crores)
Benefits:	Irrigation - 1.23 lakh ha. Power - 1000 MW Installed Capacity - 140-256 MW. Firm Power Flood control, Pisciculture, Tourism, Urban Water Supply
Submergence:	91,348 ha. Forests: 40,332 ha. Culturable Land: 44,363 ha.
Displacement:	1,29,396 (1981 census) - all in M.P. Tribals: 30,948

Sardar Sarovar Project

Location:	Vadgam, District Bharuch, Gujarat
Cost:	Rs. 9,000 crores (1987) (Excluding environmental cost of forest submergence, Rs. 8,190 crores)
Benefits:	Irrigation - 18.7 lakh ha. Power - 1450 MW Flood Control, Pisciculture, Tourism, Urban Water Supply
Submergence:	39,134 ha. Forests: 13,744 ha. Culturable Land: 11,318 ha.
Displacement:	66,675 SC/ST: 48,250

(Sources: Department of Environment and Forests, 1987; Environmental Services Group, Sept. 1986-II; Tiwari, Nov. 1982)

APPENDIX B

Some Groups and Individuals Active on the Narmada Issue

Anupam Mishra, Gandhi Peace Foundation, 221 Deen Dayal Upadhyay Marg, N. Delhi - 110002
Activities: Documentation, Networking

Dagdulal Sand/Gaya Prasad Diwan, Narmada Sagar Sangharsh Samiti, Harrod - 450116, Madhya Pradesh
Activities: Mobilisation

Medha Patkar, Narmada Dharangrast Samiti, c/o P.D. Dalal, Post Box 52, Dhule - 424001, Maharashtra
Activities: Mobilisation, Litigation

Anil Patel, Chhatra Yuva Sangharsh Vahini, P.O. Mangrol, Tal: Rajpipla, Gujarat -393150
Activities: Mobilisation

Ghanshyam Shah, Centre for Social Studies, South Gujarat University Campus, Surat, Gujarat
Activities: Research

Achryut Yagnik, SETU, 4 Niharika, Opp. Himmatal Park, Ahmedabad - 380015
Activities: Research

Smita Kothari/Nalini Kant, Lokayan, 13 Alipur Road, Delhi - 110054
Activities: Research, Networking

Arun Kumar Singh, Quarter No. 169, A-sector Inderpuri, (Opp. BHEL), Bhopal, Madhya Pradesh
Activities: Research

Nitin/Dipa Donde, 20 SFS, Hauz Khas, N. Delhi - 110015
Activities: Awareness

N.D. Jayal, INTACH, 71 Lodhi Estate, N. Delhi - 110003
Activities: Lobbying

Thomas Mathew, Environmental Services Group (WWF-I), B/1 L.S.C., J-Block Saket, N. Delhi - 110017
Activities: Documentation, Research

Vasudha Dhagamwar, Multiple Action Research Group, BII/104B Safdarjung Enclave, N. Delhi - 110029,
Activities: Research

P.V. Mandlik, Narmada Ghati Navnirman Samiti, Gram Bharti Ashram, Tawlai (Manawar), District Dhar - 454446, Madhya Pradesh
Activities: Mobilisation

Ashish Kothari/Shekhar Singh, Kalpavriksh, 1 Court Road, Delhi - 110054
Activities: Research, Documentation, Litigation

Vijay Pannigye, 92/2 Durga, Erandwane, Pune - 411004

Activities: Research (Cost-benefit)

**Rameah Billorey/Satinath Sarangi, c/o Bhopal Group for Information and Action, D-40 Firdaus Nagar,
Bhopal, Madhya Pradesh**

Activities: Mobilisation

**Banwarilal Choudhari/Suresh Diwan, Mitli Bachao Abhiyan, P.O. Raisalpur,
District Hoshangabad - 461001, Madhya Pradesh**

Activities: Mobilisation

Sarosh Bana, POWU, c/o K. More, 92 Mistry Park, B. Desai Road, Bombay - 400036

Activities: Awareness

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