



स्थिति विवरण
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केवल सरकारी प्रयोग के लिए
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पर्यावरण प्रबन्धन
Environment Management
सरदार सरोवर परियोजनाएँ
Sardar Sarovar Projects



नर्मदा नियंत्रण प्राधिकरण
NARMADA CONTROL AUTHORITY

इन्दौर

Indore

अगस्त 2006

August, 2006



नर्मदा नियंत्रण प्राधिकरण NARMADA CONTROL AUTHORITY

स्पीड पोस्ट द्वारा

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महोदय,

इस पत्र के साथ, सरदार सरोवर परियोजना के पर्यावरण प्रबन्धन पर मार्च, 2006 तक की स्थिति विवरण की एक प्रति सादर अवलोकनार्थ एवम् आवश्यक सूचनार्थ संलग्न है।

संलग्नक: उपरोक्तानुसार।

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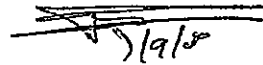
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**Environment Management
Sardar Sarovar Project
March 2006**

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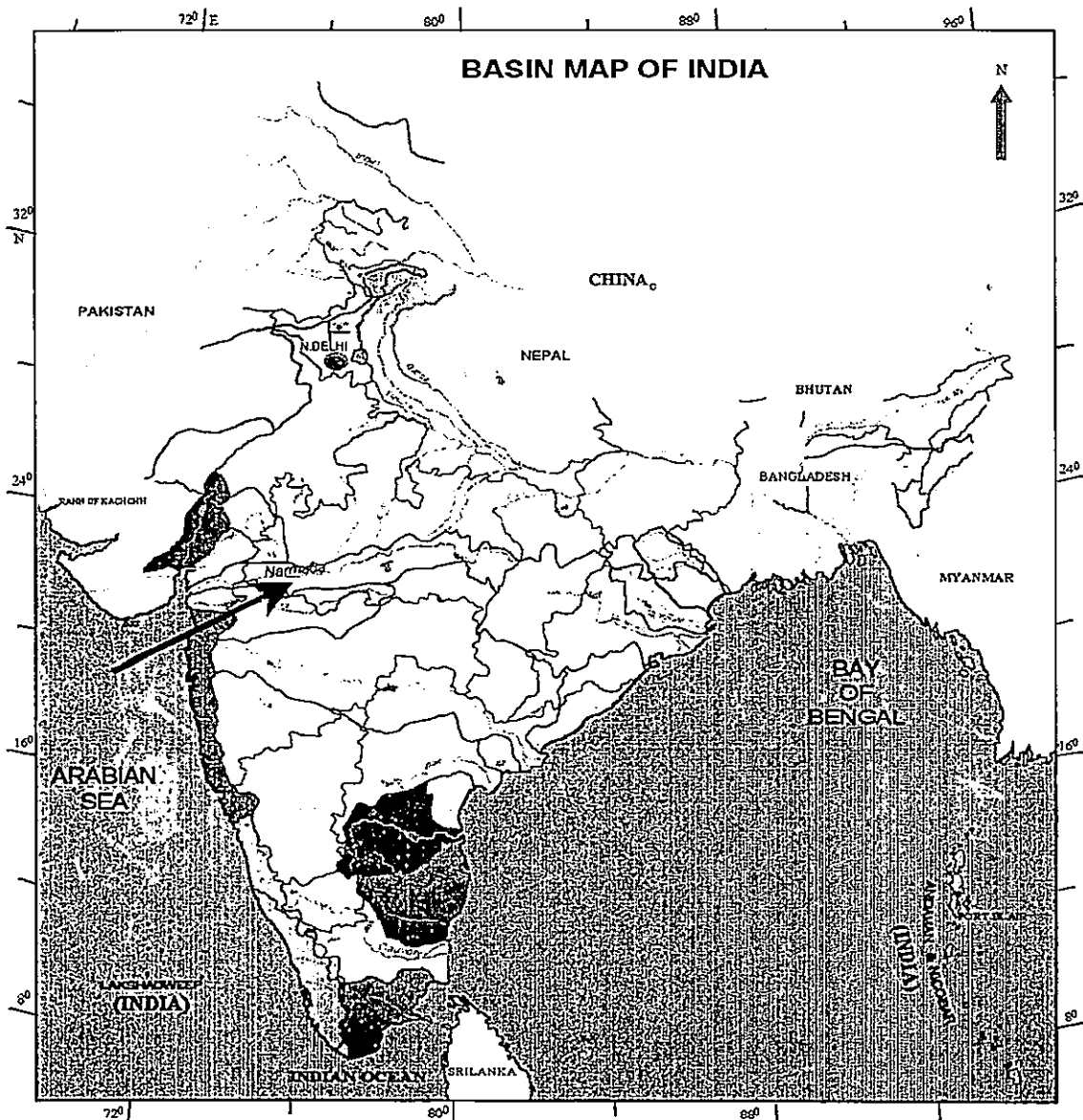
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Chapter - 1

ENVIRONMENT MANAGEMENT

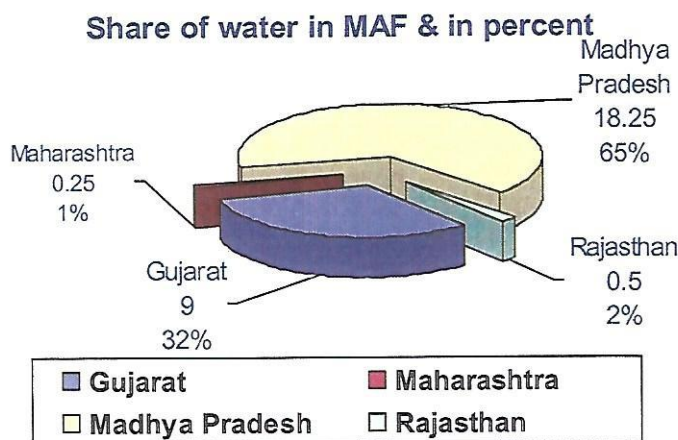
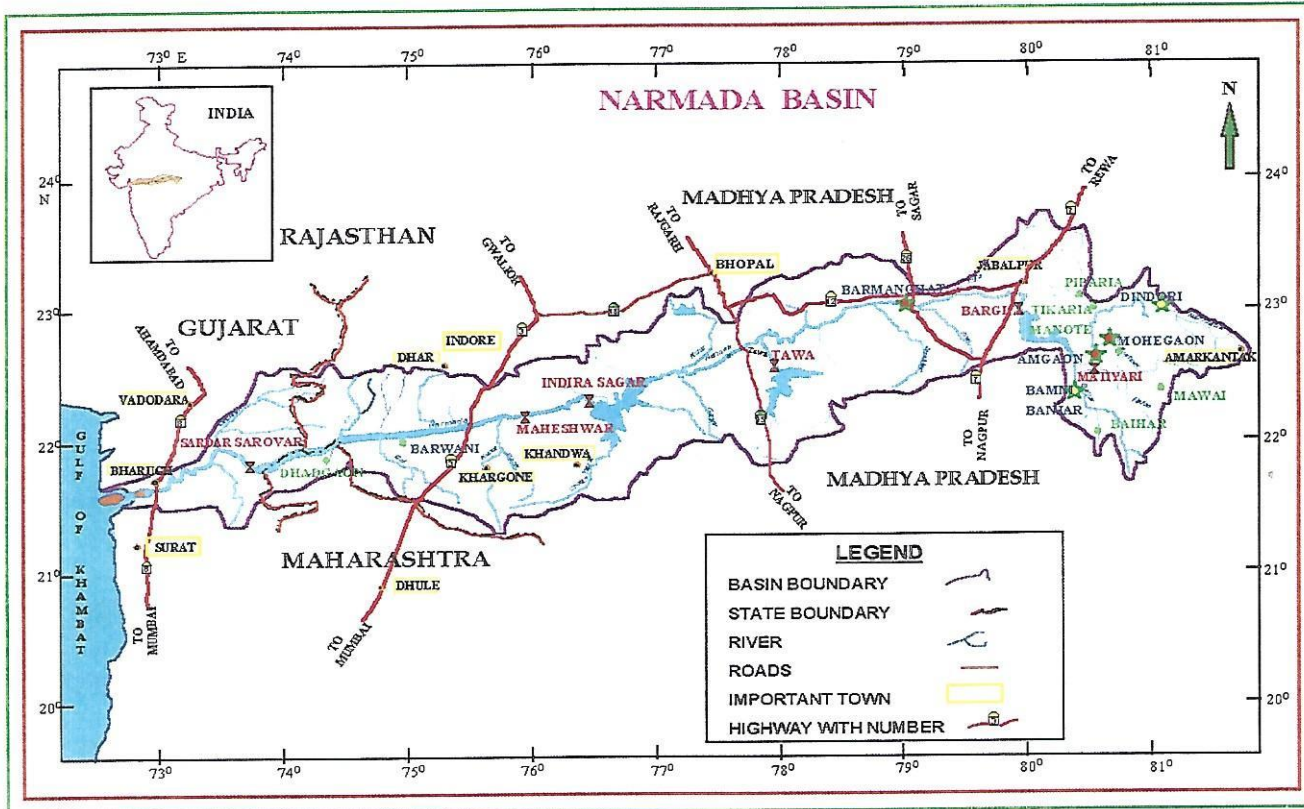
Narmada Basin :

Narmada is the fifth largest river of India. It is also the largest west flowing, least polluted river. Its length from Amarkantak to Arabian Sea is - 1312 Km. The mean Annual Rainfall in the basin is 1,180 mm (46.45 inches) and Average Annual Run-Off is 41,000 M.Cu.M (33.21 MAF). Its catchment area is about 98,000 Sq.Km, which is spread to the States of Madhya Pradesh, Maharashtra and Gujarat.



Master Plan For The Development Of Narmada River Basin: NWDTA

In 1965, Government of India appointed a committee to develop a master plan for the Narmada Basin. The committee's recommendations were not accepted by the riparian states. This impasse led to the constitution of the Narmada Water Disputes Tribunal in 1969 by Government of India under Inter State Water Dispute Act of 1956, for adjudication of water disputes of Narmada among riparian States. Its deliberations continued until 1979. The Tribunal considered the Sardar Sarovar Project and the Narmada Sagar Project together using the best hydrological, engineering, and other evidence available and passed the order which was notified in Gazette on December 12th, 1979.



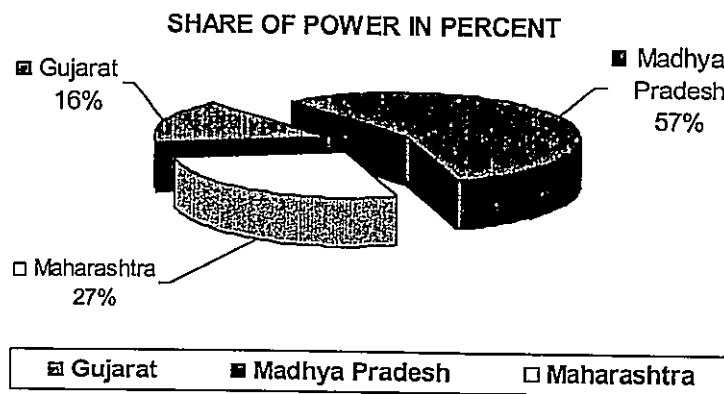
NWDT: Award

In its 1979 award, the Narmada Water Disputes Tribunal made many of the most fundamental decisions about the Projects. These included the dam location, regulation of flows, reservoir levels etc. There are points in the Tribunal award that bear on the environmental aspects of Sardar Sarovar Project which are summarised below:

+ The utilizable quantum of Narmada waters at the Sardar Sarovar dam site is specified at 28 million acre feet (MAF) on the basis of 75 per cent dependability.

- + Apportionment is to be 18.25 MAF for Madhya Pradesh, Gujarat 9,00 MAF, Rajasthan 0.50 MAF, and Maharashtra 0.25 or in that ratio.
- + The canal and dam water levels are fixed. Madhya Pradesh is to provide regulated releases of water from the Narmada Sagar Project to the Sardar Sarovar Project.

Sardar Sarovar Dam	Narmada Main Canal
Full Reservoir Level = + 138.68 M [+455']	Full Supply Level = + 91.44 M [+300]
Maximum Water Level=+ 141.21 M [+460']	
Indira Sagar Dam [M.P].	
Full Reservoir Level=+ 262.13 M[860']	



- the multi-purpose character of the project, including hydroelectric power, is affirmed.
- The apportionment /sharing of water are subject to review after 45 years.

Key Directives By The NWDT On Environment & Rehabilitation

NWDT has covered the issues of Environment & Rehabilitation in its final order. Such issues alongwith relevant clauses of NWDTA are detailed below.

- **Fisheries Development : Clause- XI (sub-clause-V).**

V(7) "Notwithstanding vesting in Gujarat of the lands coming under submergence, Madhya Pradesh and Maharashtra shall continue to enjoy all rights of sovereignty intact over the submerged area in the respective States".

V(8)"Madhya Pradesh and Maharashtra respectively shall be exclusively entitled to all rights of fishing, boating and water transportation over the part of lake over the submerged land within Madhya Pradesh and Maharashtra respectively provided, however, that such right is not exercised to the prejudice of any utilities of the legitimate performance of their duties by the project personnel".

- **Archaeology & Anthropology** Monitoring of the protection shifting/relocation/excavation of the monuments and mounds of archaeological significance being affected by the submergence of Sardar Sarovar, Narmada Sagar, (NWDT clause XI-sub-clause III (IV).
- **Downstream Environment:** Studies related to Downstream scenario for estimating impacts of project activities (NWDT clause IX (Vii) related to indenting of water for downstream by Gujarat.

- **Rehabilitation:** Clause XI {sub clause I to VI} deals with the provision for rehabilitation of oustees (PAFs) from submergence area of Sardar Sarovar Project who are likely to be resettled in Gujarat or in their home states.

Environmental Clearance by Govt. of India

It is recognised that the creation of reservoir will bring in environmental, social and economic impacts and that there will be changes in environmental regime in the upstream, downstream and in the command basically due to submergence and displacement of people and wildlife and irrigation in the command. Such changes are required to be assessed and evaluated for taking decision before proceeding with the project.

Ministry of Water Resources (the then Ministry of Irrigation & Power) had developed detailed guidelines framed during October, 1980 for project formulations which included a detailed check-list by the Ministry of Environment & Forests, the then department of Environment of the department of Science & Technology of the Govt. of India, for assessment of environmental impact of the projects and planning for Environmental Safeguard Measures.

In accordance with the requirement of the Department of Environment, project authorities submitted the detailed project report (DPR) along with the needed information on environmental issues during February to October 1980. Environmental Appraisal Committee of the Ministry of Environment & Forests approved the project in principle during its 12th meeting held in 1983 and sought more information & data on certain parameters of Environmental impact & management which were subsequently provided through additional documentations over a period of time in various stages of completeness by three states i.e. Maharashtra, Gujarat and Madhya Pradesh. The information provided was also updated from-time-to-time. The studies, action and data were considered and the Sardar Sarovar in Gujarat was formally cleared from environmental angle on 24th June 1987 by the Ministry of Environment & Forests, Govt. of India. Before a formal clearance by the Ministry of Environment & Forests, Narmada Control Authority was expanded and was entrusted with the increased responsibilities in the areas of environment and rehabilitation.

Permission for diversion of the forestland was also subsequently accorded by the MOEF during October, 1987. The Investment Clearance for the Sardar Sarovar Project was received from the Planning Commission during October, 1988, thus paving the way for implementation of this project. The clearances issued subsequent to the expansion of the NCA by the Central Government departments, contained certain conditions to be complied with during the course of project implementation.

The Narmada Control Authority was given the responsibilities to ensure that the environmental safeguard measures would be planned and implemented in depth and the pace of its implementation would be pari passu with the progress of the work on the Project. The four conditions of the clearance were:

- the Narmada Control Authority would ensure that the environmental safeguard measures are planned and implemented pari passu with the progress of the work on the project;
- the detailed surveys/studies would be done
- catchment area treatment and rehabilitation programs would be completed ahead of reservoir filling.
- The Department of Environment would be kept informed of progress.

Forest Clearance For SSP

In September 1987, under the Forest (Conservation) Act, 1980 the Central government gave approval for the diversion of over 13,386 hectares of forest land for the Sardar Sarovar Project. This approval was subject to eleven conditions in all three states, of which the following are especially relevant.

- detailed compensatory afforestation plans would be submitted.
- a proposal for non-forest areas for rehabilitation of oustees would be submitted.
- compensatory afforestation would be in double the area of degraded forest lands in addition to the afforestation of equivalent non-forest land, and a scheme for this would be submitted.
- a catchment area treatment plan will be prepared by November 30, 1987, failing which a central government team would be appointed at the cost of the project.

Investment Clearance for SSP

The Planning Commission, Govt. of India approved investment for an estimated cost of Rs. 6,406 crores for SSP in Gujarat vide their letter dated 5.10.88. The Planning Commission of the Government of India granted the investment clearance to the Sardar Sarovar Project subject to seven conditions that bear on the environment (as well as resettlement and rehabilitation).

- compliance with the 1987 environmental and forestry clearances;
- adequate funding to meet the construction schedule;
- submission of a detailed program for drainage and ground water balance studies beyond the Mahi River;
- adoption of measures to ensure project revenue from water rates to pay for annual operation and maintenance charges;
- setting up an expert group to study siltation in the main canal.
- drawing up a detailed schedule and plans for the micro-level irrigation network system; and an implementation schedule for completion of the canal network so that irrigation benefits do, in fact, start accruing from the financial investment.

Monitoring by the NCA.

Following the recommendations of the Ministry of Environment & Forest, the scope of the Narmada Control Authority was enlarged on 3th June, 1987 through amendment brought out by MOWR through gazette notification. The functions of NCA were modified to include major functions of coordination & direction of the implementation of all the projects including the environmental protection measures to ensure the faithful compliance of the conditions attached by GOI while granting clearance to these projects. The NCA, originally as envisioned by the NWDT, consisted of 7 nos., of high ranking Engineers as Members, was expanded and made Multidisciplinary by inducting Union Secretaries of the Ministries of Environment & Forests, Social Justice and Empowerment, Ministry of Power, Ministry of Tribal Welfare as Ex-officio Members. In addition, Chief Secretaries of the States of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan were also inducted as Members. One Full Time Member of the discipline Environment & Rehabilitation was added to the existing Full

Time Members of the discipline Civil and Power Engineering. The Union Secretary of the Ministry of water Resources was inducted as Ex-officio Chairman of the NCA.

Environment Sub-Group of NCA

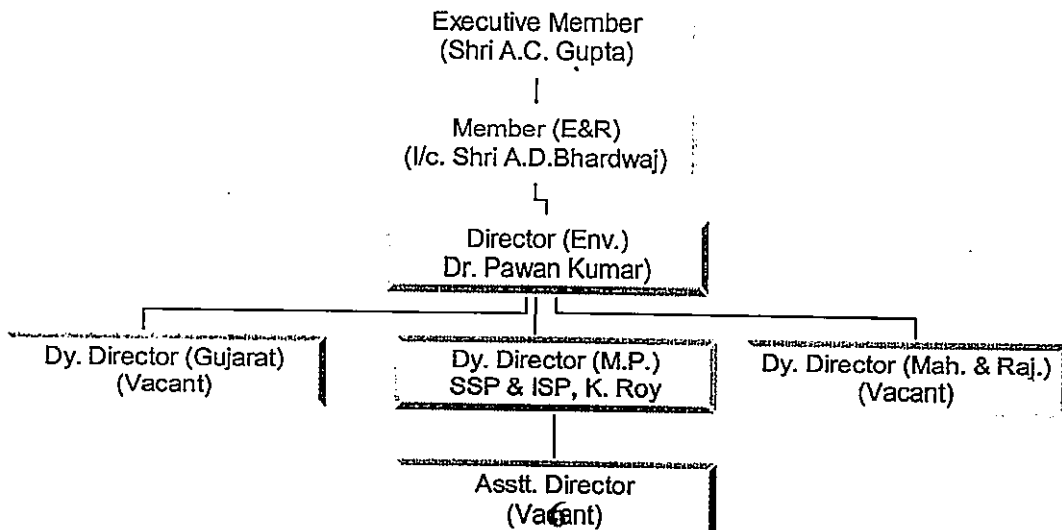
NCA had constituted among others, a sub-group namely Environment sub-group under the Chairmanship of Secretary, Ministry of Env.& Forests, GOI. Member (E&R), NCA is Member Secretary to this sub-group. The 41st and 42nd Meeting of the Subgroup were held on 06th Jan, 2005 and 07th April 2005 respectively.

Functions of the Environment Sub-Group.

- i) To work out the environmental safeguard measures to be planned and implemented for the entire Narmada Basin so that environmental safeguard measures are executed and remain fully in consonance with the clearance accorded to the Indira Sagar and Sardar Sarovar Projects.
- ii) To determine, the terms of reference of required surveys and studies necessary for implementation of environmental safeguard measures inclusive of data base required, the methods by which the data base is to be prepared and also to identify the institutions/individuals to undertake the preparation of such documents.
- iii) To get prepared, for clearance by the Ministries and NCA the action plans with regard to all environmental safeguard measures and the assessment criteria thereof.
- iv) To devise, a suitable monitoring and evaluation mechanism so that the action plans are effectively implemented in consonance with stipulations at the time of clearance of the projects.
- v) To assess the necessary organisation with management capability being set up for adequate implementation of environmental safeguard measures.
- vi) To undertake, all measures necessary to assist Narmada Control Authority in the planning and implementation of environmental safeguard measures.

Environment wing of the NCA

The Environment & Rehabilitation (E&R) wing of NCA is headed by Member (E&R), NCA, Indore. The organizational structures of the Environment unit of the E&R wing is as given here :



Important Sub-Groups and Sub-Committees On Environment

1. There is a Environment Committee headed by the Member (E&R), NCA. The Committee visits the impacted areas in all the three states from time to time for assessing compliance and submits its reports to the sub-group and necessary recommendations are forwarded to concerned State Governments for compliance.
2. High level expert group on fisheries development and conservation in Sardar Sarovar reservoir. This is chaired by the Joint Secretary, Ministry of Agriculture.
3. Committee on flora and fauna aspect of Sardar Sarovar and Indira Sagar Project. This committee is chaired by Member (E&R), NCA
4. Committee on archaeological and anthropological aspects. This committee is chaired by Member (E&R), NCA
5. Committee on Health aspects. This committee is chaired by Member (E&R), NCA
6. There are four high level expert multi disciplinary groups directing, coordinating and monitoring various studies commissioned by Govt. of Gujarat for the vast command area of SSP formed in pursuance of the directives of the Environment Sub-group for initiating such studies. Director (Env.) is a member of the committee. Meeting of the expert group are convened by Narmada Planning Group (NPG) from time to time to discuss the progress/interim reports of the studies commissioned by the Govt. of Gujarat.
7. The Govt. of M.P. had constituted Wild Life Committee to review the environmental issues related with the SSP and ISP including studies, action plans and implementations.

SARDAR SAROVAR PROJECT

The Sardar Sarovar Project in Gujarat is the terminal project on the river Narmada. The Salient features of the Project are given below :

Location	Near village Navagam, Distt. Narmada	
Height	163.00 m	
Length	1,210.00 m	
Gross storage	9.5 BCM (7.70 MAF)	
Live storage	5.8 BCM (4.73 MAF)	
Annual irrigation	19.80 lakh ha.	
Installed capacity	1,450 MW (1200 MW+ 250 MW)	
Cost of Project (Estimated)	Rs.6,406.00 crore (at 1986-87 price level) Rs.13,180.62 crore (at 1991-92 price level)	
Benefits :		
Irrigation	Gujarat	17.92 lac ha
	Rajasthan	1.51 lac ha.
	Maharashtra	0.375 lac ha
Hydropower	1450 MW	
Flood control	210 villages and Bharuch city 750,000 population	

THE PROJECT

The height of the dam, the supply level of the canal and other level (s) of the Sardar Sarovar and Indira Sagar projects were fixed by the Award of the Tribunal. Thus submergence of the land, displacement of the people and related impacts also got fixed. Once it was determined that no environmental concern is serious enough to threaten the viability of the project what remained to be done was to identify the source of impacts and the impacts, their evaluation, quantification and assessment with an objective of devising mitigatory measures. In the following chapters the salient features of the twin, projects have been briefly presented and the current status of the survey studies and implementation on the suggested parameters is briefly appraised. While resettlement & rehabilitation is dealt with separately other issues have been discussed in this report.

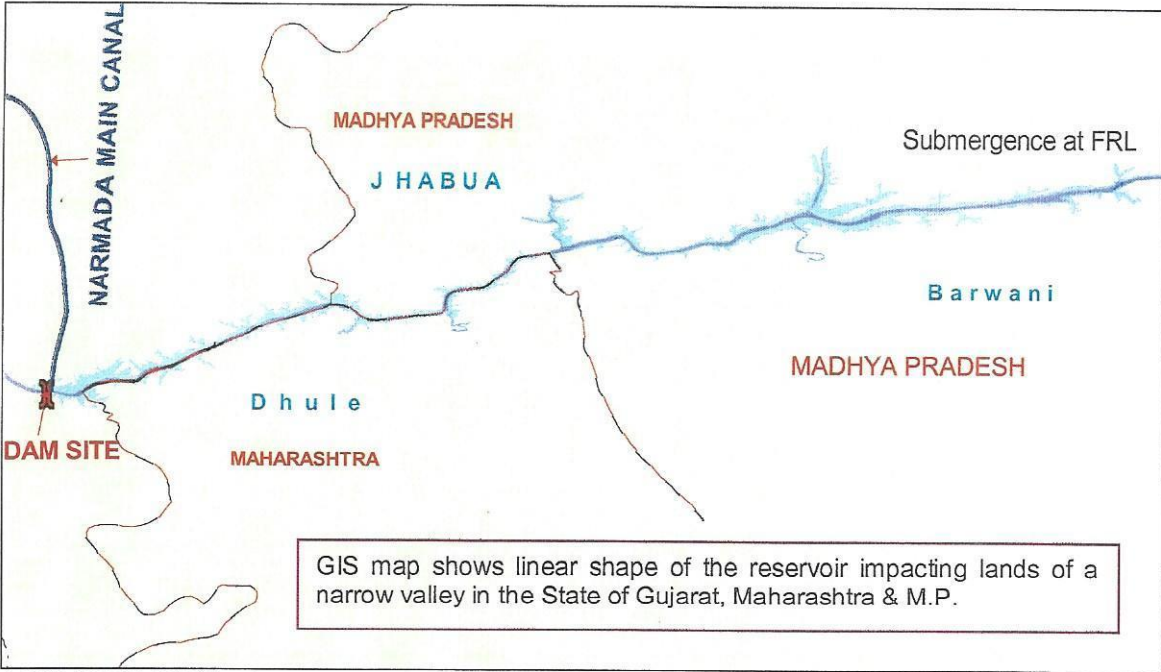
Additional benefits from the proposed project

- Drinking water supply to 135 urban centers and 8215 villages and Water supply for industries in Gujarat and drinking water supply to 518 villages of Jalore District & 589 villages of Barmer District of Rajasthan.
- Wild life sanctuaries development and Fisheries development

Source of Impacts: the submergence

The submergence zone of the project lies within the State of Maharashtra, Madhya Pradesh & Gujarat as depicted in the table & map below.

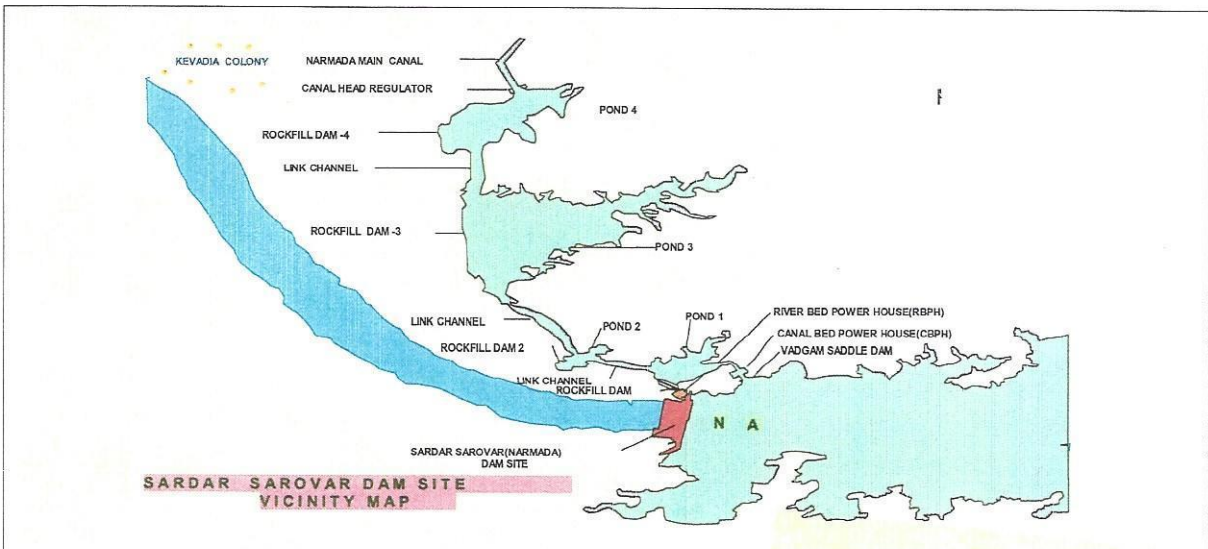
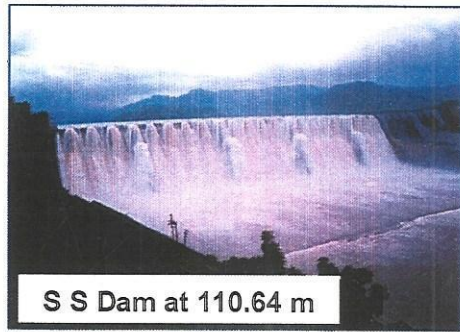
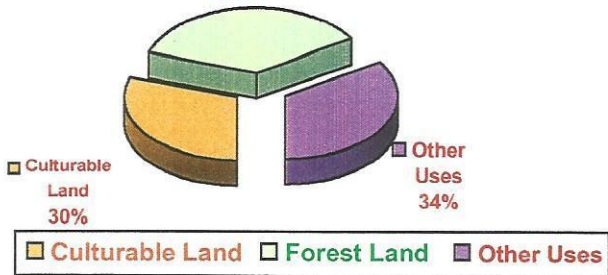
State	Culturable land (ha)	Forest land (ha)	Land under other uses (ha)	Total land (ha)	Affected number of villages
Madhya Pradesh	7,883	2,731	10,208	20,822	192
Maharashtra	1,519	6,488	1,592	9,599	33
Gujarat	1,877	4,166	1,069	7,112	19
Total	11,279	13,385	12,869	37,533	244



LAND USE PATTERN OF LAND UNDER

SUBMERGENCE

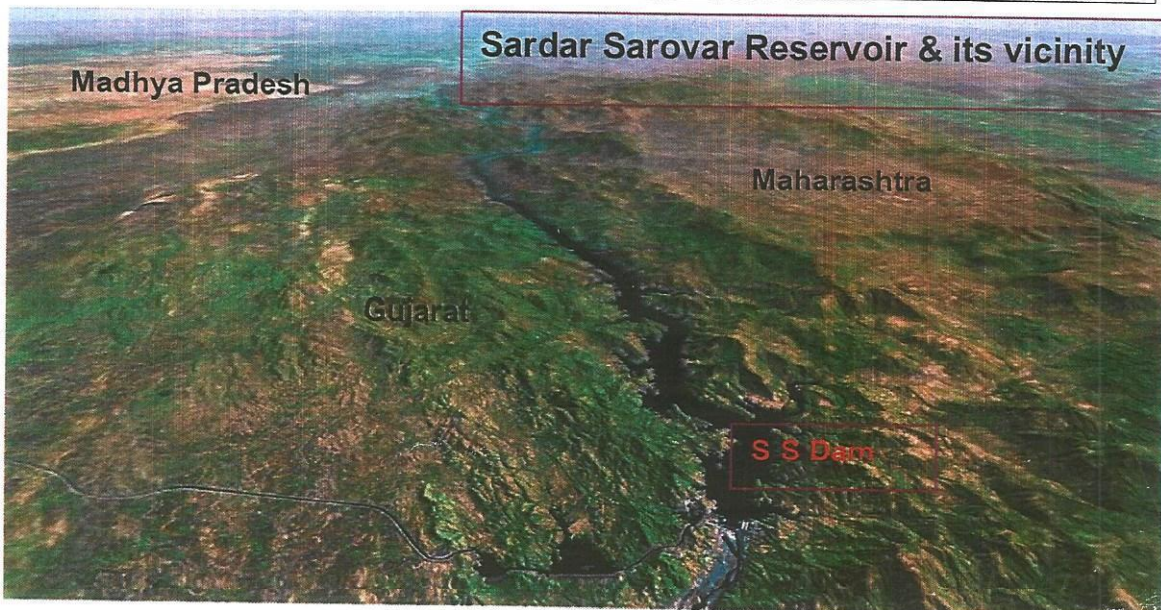
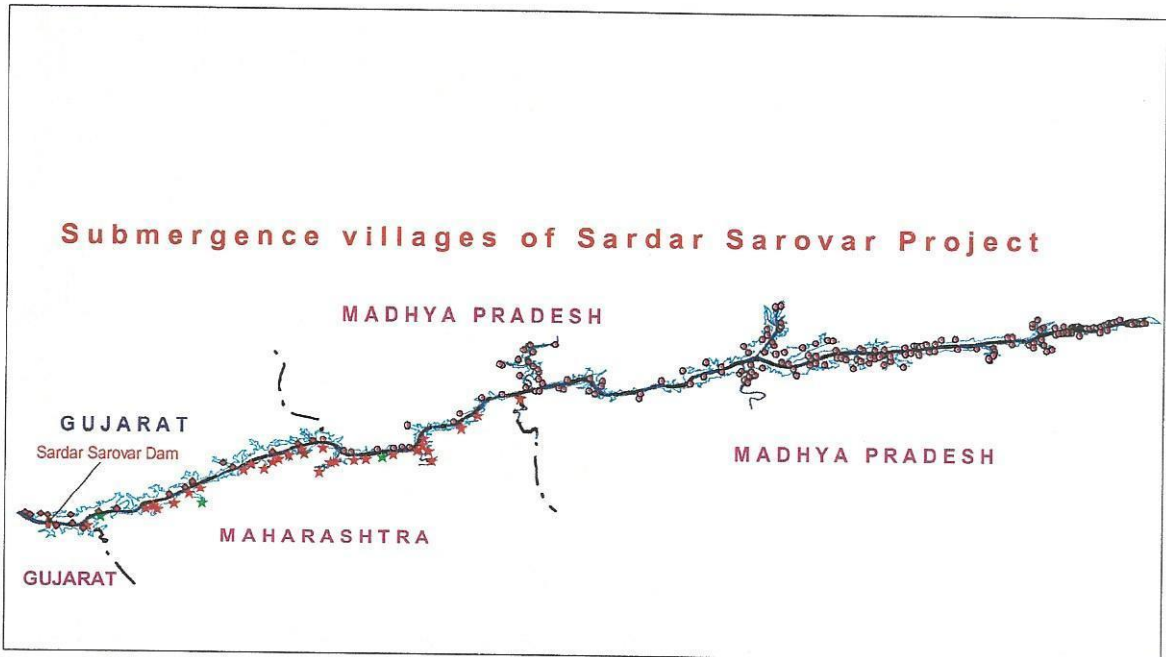
- Forest Land 36%
- Culturable Land 30%
- Other Uses 34%



Development and current status of the management of SSP environment

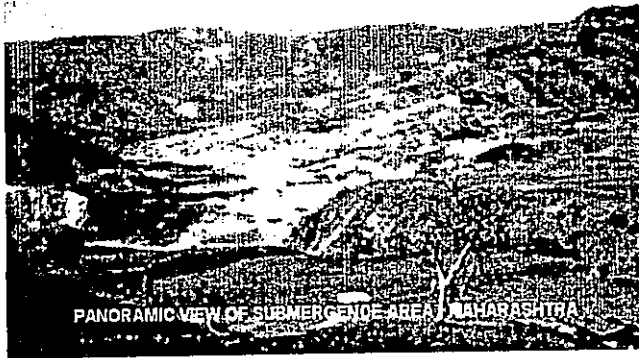
The environmental clearance had suggested the following parameters for Environmental Management.

- Resettlement & Rehabilitation.
- Catchment Area Treatment
- Compensatory Afforestation
- Command Area Development.
- Flora Fauna & Carrying Capacity of Surrounding area
- Seismicity
- Health
- Archaeology & Anthropological aspects



Chapter - 2

CATCHMENT AREA TREATMENT



Following the directives of the Planning Commission for including requirement of a catchment area treatment and command area development plan while granting clearance from environmental angle, based on the report of Inter-Departmental Committee on Soil Conservation and Afforestation, (the Dewan Committee Report), 1985, the MOEF considered and granted clearance in 1987 with two key conditions related to

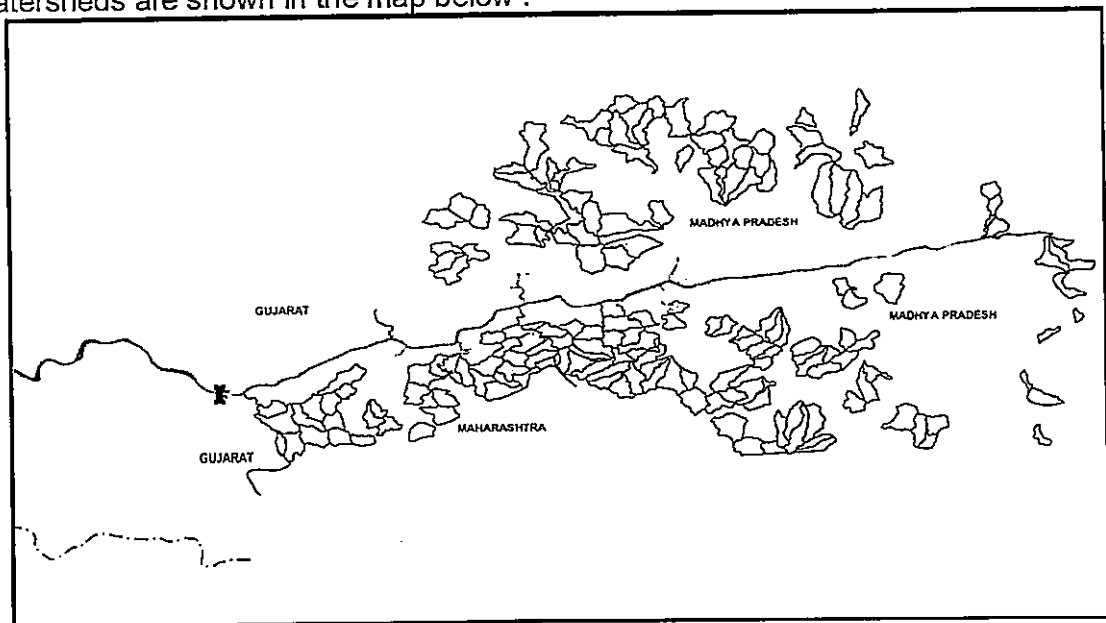
catchment area treatment attached as follows:

- 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.

Studies

In pursuance, surveys and studies have been done during 1989-91 by the All India Soil & Land Use Survey, organisation (AIS&LUS), New Delhi to aid the development of a management plan for CAT in the SSP catchment

According to the above studies, the total catchment area of Sardar Sarovar Project below Indira Sagar Dam is 24,42,440 ha. Out of this, 6,82,769 ha area spread to 500 sub-watersheds having silt yield index 1,200 and above was identified as critically degraded. The critically degraded sub-watersheds delineated by AISLUS(excluding directly draining sub watersheds are shown in the map below :



Out of total SSP catchment about 27.96% was found to be critically degraded and was required to be treated by the project authorities pari-passu with the construction works ahead of the reservoir filling. This was close to the estimation of Dewan Committee (1985) which estimated it to be 33%. Since the area requiring treatment was large, project authorities were of the opinion that such a large areas should not be loaded on the water resources project. Since this opinion was at variance with the conditions contained in the order of clearance, the issue was referred to the Govt. of India. This issue was finally resolved by the Govt. of India by issuing a directive in July 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 to be identified amongst those classified as either very high or high-priority categories by the All India Soil & Land Use Survey, organisation (AISLUS).

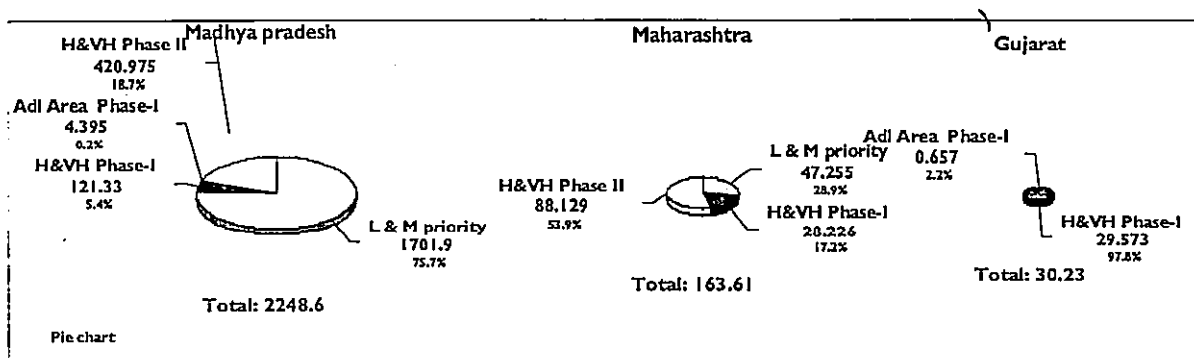
1. The project authority would also be responsible for the treatment of those areas of the catchment, which are directly damaged by the project activities.
2. The plans are required to be prepared for the treatment of the balance of the critically degraded sub-watersheds but the cost of this will be met from other ongoing schemes and in a timeframe to be determined in consultation with the Ministry of Environment & Forests.

I. PHASE-I: DIRECTLY DRAINING SUB-WATERSHEDS

In terms of the directives of the Gol, selecting the sub-watershed identified as critically degraded on the basis of their proximity to the reservoir, project authorities prepared the plans for treating 7.34% (area of 1,79,180 ha) area out of 27.96% identified critically degraded for treatment pari-passu with the project works. Whereas, the balance area of 20.62% (5,03,589 ha) was proposed to be treated during Phase-II, as shown in the table below :

Particulars			Madhya Pradesh	Gujarat	Maharashtra	Total
Very High & High	Planned to Treat	Phase-I	125725	29157	24298	179180
		Phase-II	349892	76129	77568	503589
		Total	475617	105286	101866	682769

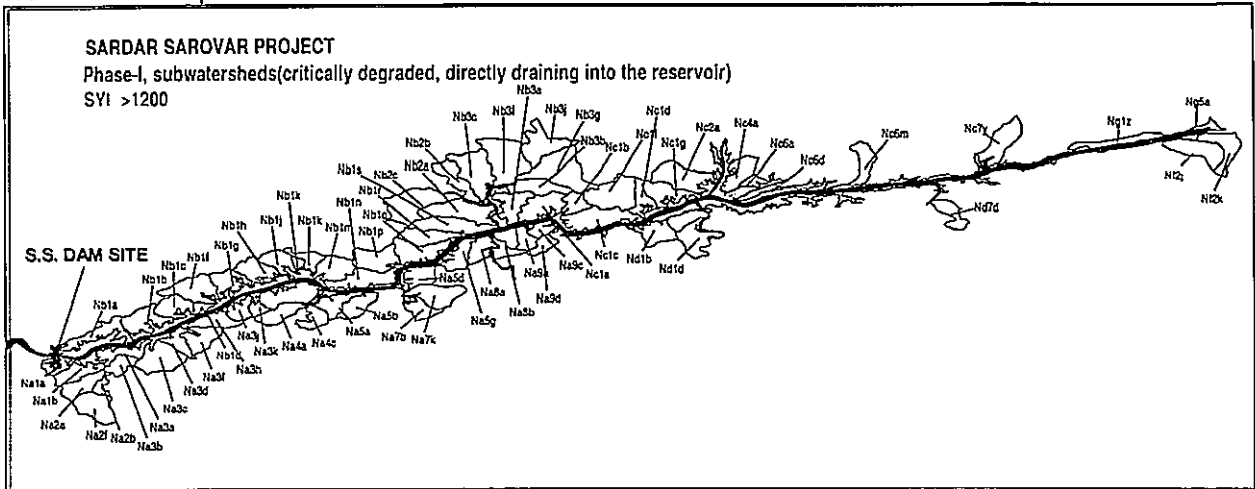
All figures are in hectare



ACTION PLANS:

The project authorities have submitted the Action Plans in varying stages of completeness. These plans contained information related to survey work, management options, monitoring & phased programme of treatment besides provisions for annual budget. The sub-

watersheds planned for treatment were delineated as shown below :



IMPLEMENTATION:

Project authorities have prepared the plans for treating 1,79,180 ha area in about 10 years time. Govt. of Gujarat started the treatment works w.e.f. monsoon of 1990 whereas Govt. of Maharashtra and Govt. of Madhya Pradesh could start the work in the year 1992. However, out of 1,79,180 ha area planned for treatment micro-watershed planning could identified only 163449 ha as balance area were not available, the targets were reduced by 10.5%, reducing the overall targets to about 6.3%. The progress of treatment work with new targets is detailed in the table – below:

Area under treatment 1,63,449 ha Progress 1,63,449 Balance 00

Table : Year wise progress of CAT Works

YEAR	GOG			GOM			GOMP		
	F A	N FA	TOTAL	FA	N FA	TOTAL	F A	N FA	TOTAL
TARGETS	27204	1953	29157	21122	3176	24298	51930	73795	1,25,725
1990-91	4,528	898	5,426	0	0	0	0	0	00
1991-92	4,770	230	5,000	0	0	0	0	0	0
1992-93	6,014	336	6,350	960	0	960	0	7,122	7,122
1993-94	6,000	286	6,286	6,514	322	6,836	966	6,001	6,967
1994-95	5,730	168	5,898	6,542	2,686	9,228	4,348	5,768	10,116
1995-96	0	35	35	4,735	4	4,739	4,390	9,351	13,741
1996-97	0	0	0	450	0	450	8,158	6,357	14,515
1997-98	0	0	0	1082	0	1082	4,441	3,732	8,173
1998-99	0	0	0	0	0	0	8,583	2,331	10,914
99-2000	162	0	162	0	0	0	2,830	3,247	6,077
2000-01	-	-	-	-	-	-	3,270	6,318	9,588
2001-02	-	-	-	-	-	-	2,233	4,221	6,454
2002-03	-	-	-	-	-	-	989	5,403	6,392
2003-04	-	-	-	-	-	-	1040	5657	6697
Total	27,204	1,953	29,157	20,283	3,012	23,295	41,248	65508	106,756
Work by other agency :							3,352	889	4241
Grand Total			29,157			23,295			110997

Govt. of Gujarat



As the Catchment area of Sardar Sarovar was little in Gujarat, GOG accepted the recommendations of Dewan Committee and commenced the work of treating entire catchment area in the year 1990. By the end of September 1995 forest area of 27,042 ha & non-forest area of 1953 ha were treated. Treatment work is almost completed. Govt. of Gujarat however revisited this area for maintenance under a programme referred to as Phase-II programme by Govt. of Gujarat. Under this programme casualty replacement were carried out besides other maintenance works. Thus by the end of March . 2006 a total area of 29,157 ha was treated at the cost of the project.

Govt. of Maharashtra:

Treatment works in Maharashtra could commence in the year 1992. By the end of September, 1998 forest area of 20,283 ha and non-forest area 3,012 ha were treated. Thereby, almost completing the Phase-I work, in Maharashtra. Thus by the end of March 2006 an area of 23,295 ha was treated at the cost of the project against a target of 24298 ha.

Govt. of Madhya Pradesh

Treatment works in Madhya Pradesh could commence after submission of the revised work plan in 1992. By the end of December 2005 against a target of 1,08,757 ha planned, a total of 1,10,997 ha area including both, forest & non-forest areas, actually available was treated. This included treatment of 4241 ha. area by other agencies previously. Thus an area of 1,06756 ha was treated at the cost of the project

Sardar Sarovar Project: Current Status.

1. For the areas in Gujarat & Maharashtra, works are completed in the treatable areas. For the SSP as a whole, against the planned target of 179,180 ha of CAT works, an area of - 1,63,449 ha was completed by the end of March,2004 and since the remaining areas in Maharashtra and M.P. are not available for CAT, this activity has been considered to be completed. Detail of the work completed are given in table above. It was reported by Govt. of M.P. & Maharashtra that the balance areas were not available on account of being rocky / un productive / under development / litigation and thus the targets of the CAT works chargeable to SSP were revised to 1,63,449 ha.

2. Outstanding works :

- a. Assessment of the efficacy of the treatment works and consequential maintenance of the works till handed over to regular formations for regular upkeep & maintenance.

b. Preparation of plan and implementation of the planned targets for the Phase-II areas

a) Assessment of the efficacy of the treatment works

To assess the success or failure of the CAT measures implemented at the cost of huge investments and for ensuring that structures were maintained and remained functional monitoring through establishment of silt studies stations / remote sensing was directed by the Sub-group. During the 40th meeting, while reviewing the progress and arrangements made for the purpose, it was directed that dedicated and focused monitoring for assessment of the CAT works should be a continuous process and arrangements made for the same should be continued.

Govt. of Gujarat :

Catchment Area Treatment works was started by Govt. of Gujarat from 1990. However the results of analysis conducted by ISRO, Ahmedabad compared data of 1986 with that of 1994. By 1994 more than 90% of the work was completed by the GoG. Updating of this data was suggested by the Environment Sub-group.

For Non-forest areas work was entrusted to CSRS&TI, Valsad. Interim report 2004-2005 was submitted. Final report is awaited. Part view of the sub-watershed where observations are under progress (Kokam) is shown in this photograph.



Govt. of Maharashtra :

The result of the studies carried out jointly by the Maharashtra State Forest Department Dhule, for the period 1993 to 1998 indicated the increase in dense forest and decrease in blanks. Updating of this data was suggested by the Environment Sub-group.

For non forest areas GoM have addressed Central Soil Research and Training Institute for taking up assessment works for SSP catchment in Maharashtra. Two stations have been established and were expected to be in the operation from June, 2005/2006 with the help of WCR&TI located in Gujarat, a Govt. of India agency, at an estimated cost of Rs.16.56 lakhs which includes consultancy charges of Rs.13.56 lakhs.

Govt. of Madhya Pradesh :

GoMP is making arrangements for dedicated focused monitoring for the areas treated and has addressed Forest Survey of India for its periodical reports and Central Soil and Training Research Institute for forest / non forest areas respectively.

Current status of qualitative assessment is summarized in the table below:-

	Silt Monitoring Stations (Non forest / Forest areas)	Assessment through Remote Sensing (forest areas)
Govt., of Gujarat	Final Report awaited	Updation under progress.
Govt., of Maharashtra	Non forest areas: 2 Stations were established. Progress awaited	Forest areas: FSI Nagpur was updating the previous work.
Govt., of Madhya Pradesh	Central Soil Research and Training Institute was being requested	Not initiated

b) PHASE-II: Indirectly Draining Sub watersheds:

Project authorities were required to prepare plans for treating balance of the critically degraded sub-watersheds. The funds for treating these areas have been promised by the RVP Scheme of Planning Commission, National Afforestation and Eco-development Board etc. In Gujarat entire area was treated, whereas state Govts. of Maharashtra and Madhya Pradesh have submitted the plans. The plans are being revised in a phased manner in accordance with the guidelines of the funding agencies. Some of these plans have been approved under River Valley Project Scheme / National Afforestation & Eco-Development Board etc. Work commenced on 6 schemes in Maharashtra & a few others in Madhya Pradesh.

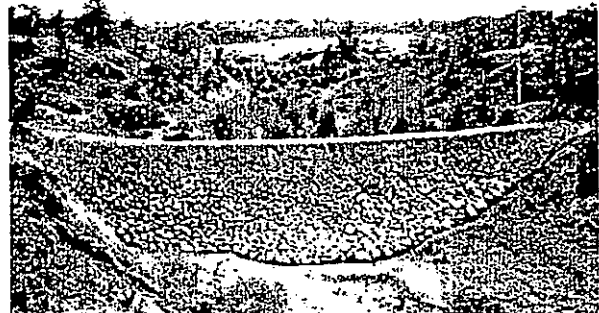
Maharashtra

Govt. of Maharashtra have prepared a macro-watershed plan for 77,568 hectare in Phase-II of CAT works, out of total 80,881 hectare in 35 sub-watersheds. Apart from this separate micro-watersheds plans are prepared for forestland and non-forestland. Micro-watershed plans for forestland in all 35 watersheds have been submitted, which covers 42,867 hectare area. Progress on such schemes is 7,050 hectare. In case of non-forestland, the schemes are not available with NCA but the progress of 7,854 hectare. is reported on 13 micro-watershed schemes covering an area of 15,656 hectare.

		Estimated cost (in lakhs)	Expenditure incurred
Works completed	5 sub watersheds	1527.37	985.88
Work progressing	21 sub watersheds		
Yet to be taken up	9 sub watersheds		

Madhya Pradesh:

Catchment area of Sardar Sarovar Project below Indira Sagar in Madhya Pradesh is 5,44,505 ha. This area includes the freely draining area attributable to Jobat, Man, Maheshwar, and Omkareshwar Projects also as per the details given in the table-below. After subtracting such areas, the gross area of critically degraded sub-watersheds is 4,75,617 ha. Out of this, Govt. of Madhya Pradesh has prepared plans for treating 1,25,725 ha area, as Phase-I already described above, under directly draining category at the cost of the



project. Therefore, the gross area for which plans are required to be submitted for Phase-II programme was 3,49,892 ha.

Total Area of Freely Draining Critically Degraded Sub-watersheds = 5,44,505 ha

Project	Phase-I (Directly Draining)	Phase-II (Balance area)	Total Area
Jobat			28,211
Man			12,720
Maheshwar			13,209
Omkareshwar			14,748
SSP	1,25,725	3,49,892	4,75,617
		Total :	5,44,505

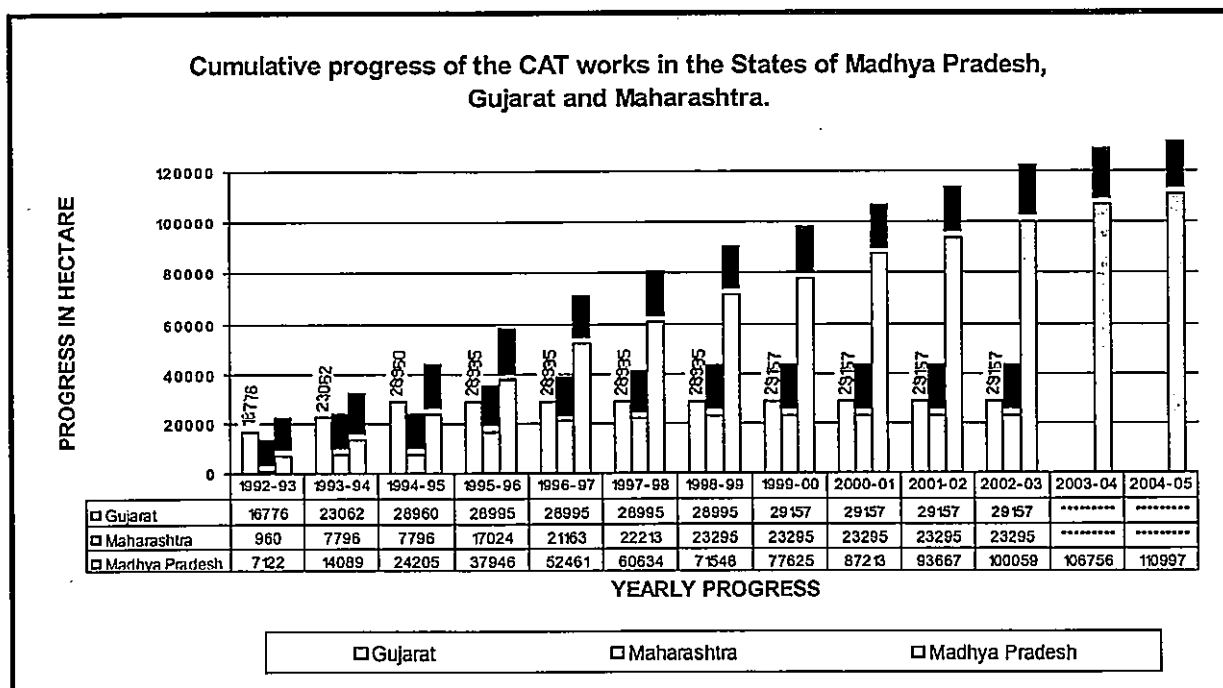
Schedule of Treatment

Project authorities have prepared the plans for treating the 3,49,892 ha of catchment in 139 sub-watersheds of Phase-II areas by the end of year 2011.

Progress of Implementation:

Under River Valley Project Schemes 43 schemes covering an area of 87884 ha had been approved by the GOI. Out of these, 30 schemes pertain to SSP. These 30 schemes envisage CAT over an area of 59566 ha of which 35312 ha area has been treated.

In this total area of 35312 ha, the progress in forest area is 7473 ha and progress in non-forest area is 27839 ha.



GIS Generated Map showing sub-watersheds other than directly draining being treated as Phase-II programme of Catchment area treatment in terms of the Govt. of India directives of July 1992. The progress is dependent upon availability of manpower and resources available at the disposal of the State Govt. concern.

Chapter-3 COMPENSATORY PLANTATIONS

Examination of the project proposal for granting clearance from environmental consideration by the MoEF revealed that diversion of forest land was also required. Accordingly the order of clearance directed MOWR to seek permission for diversion of forest land separately, from the Forest Division of the MOEF in accordance with the provisions of the FCA 1980.



Subsequently on the request received, approval for the diversion of forestland for the SSP was also granted by the MOEF in 1987 (for submergence), in 1990 & 1994 (for R&R works in Maharashtra) but several conditions were attached relating to the planning and implementation of CAF. Principals amongst these are the following stipulations.

- For every hectare of forestland 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.
- For the 4,200.00 hectares of forestland 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.

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 Kachchh, 1986.
- Project for Afforestation in Sardar Sarovar Project Impact Areas due to Diversion of forestlands 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 Multipurpose River Valley Project (1989).

this order that plantations shall be carried out in equal non forest land in addition to the plantations on degraded forest land double in extent of the area diverted. Thus for every ha of the area diverted three ha of plantations were to be carried out by the project authorities. In addition to the area diverted by the MOEF in 1987 an area of 357 ha was diverted by GOG earlier.

State Govts. have prepared the plans for plantations of 46,358 ha besides reforestation of 28,830 ha area including plantations over 4,200 ha of non-forest land in lieu of the land released for R&R works in Maharashtra.

In Maharashtra State 4200 ha forest land was released for R&R works in two phases. In 1990 an area of 2700 ha was released in Taloda taluka. Further 1500 ha was released during 1993 in the same taluka. State Govt. was required to carry out plantations on equal non-forestland. Detailed programme and progress of plantations is given in the table below :

Compensatory Afforestation against 4200 ha forest land released for R&R works in Maharashtra vide MOEF order dated 1990 (2700ha) and 1993 (1500 ha.)

Year	Land released	Progress 1993-94	Progress 1994-95	Progress 1995-96	Progress 2000-01	Cumulative Progress	Balance targets
1990	2,700.00	2,192.37	311.00	184.50	9.63	2697.5	2.5
1993	1,500.00	0.00	0.00	896.00	604	1500.00	00
TOTAL	4,200.00	2,192.37	311.00	1,080.50	613.63	4197.5	2.5

Detailed progress of CAF, against the target area of 42,155 ha. in lieu of 13,386 ha. diverted for submergence of SSP vide MOEF order dated December 1987. (Area in ha)

Monsoon year	GUJARAT		MAHARASHTRA		MADHYA PRADESH	
	Degraded forest	Non-forest	Degraded forest	Non-forest	Degraded forest	Non-forest
90-91	-	2,150.00	-	-	132.00	716.00
91-92	2,834.00	350.00	8,383.00	-	1,200.00	373.00
92-93	2,450.00	847.00	4,552.00	2,276.00	2,532.00	-
93-94	2,500.00	460.00	20.00	1,156.00	1,623.00	86.00
94-95	1,516.00	843.00	-	2,894.00	827.00	200.00
95-96	Completed	Completed	22.00	NIL	60.00	-
96-97	-	-	-	NIL	-	-
97-98	-	-	-	NIL	178.00	506.00
98-99	-	-	-	75.00	-	277.00
99-2000	-	-	-	-	-	26.00
Sub-total	9,300.00	4,650.00	12,977.00	6,401.00	6,552.00	2184.00
Total	13,950.00	19,378.00	8,736.00			

After care & maintenance

Regulatory Regime

In terms of the order of clearance the non forest areas planted up by the project authorities are required to be handed over to the regular territorial forest divisions for regular upkeep & maintenance and till such time these were to be handed over Plantations were required to be maintained with watch & ward as per the planned programme.

Environment Sub-Group also directed Impact Assessment Studies for the new eco-system that developed in the areas planted up under the compensatory afforestation programme specially for the areas in Gujarat being away from the Narmada Ecological

zone. Sub-Group also directed that survival count along with species composition, year of count and the areas under each category should be regularly monitored

Progress

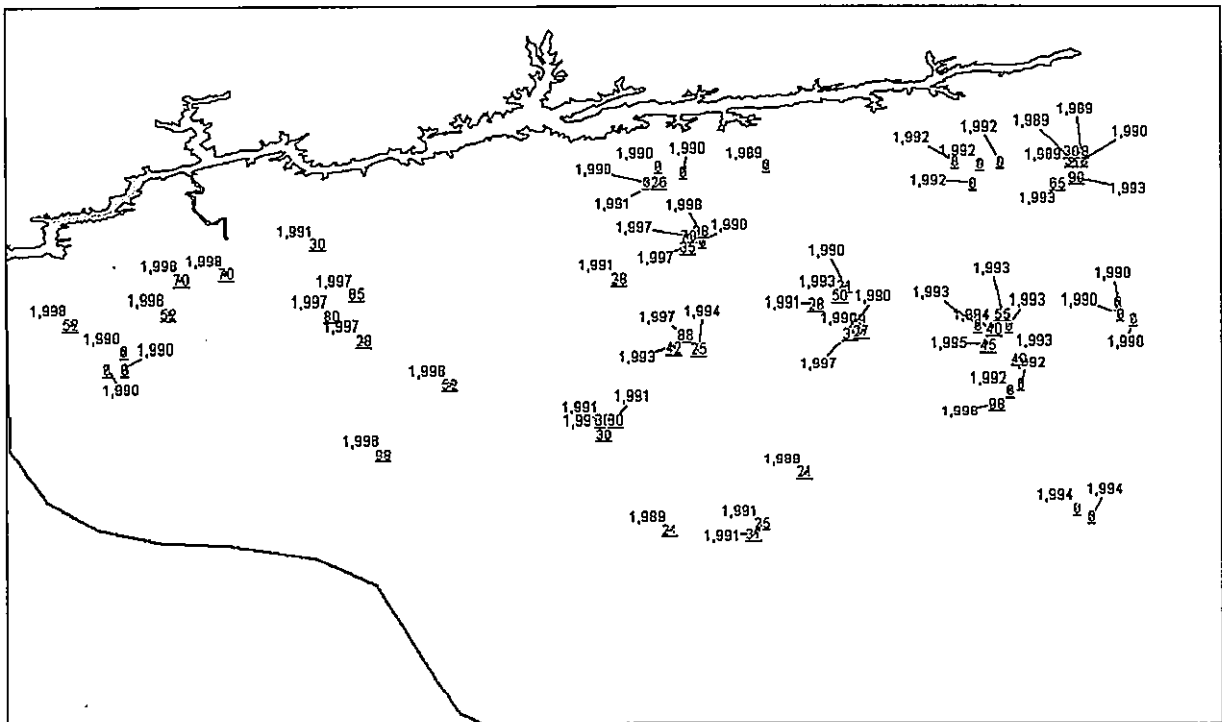
Progress achieved by each state was as under

Gujarat

- Govt. of Gujarat initiated ecological studies for the Neo-ecosystem under Compensatory Afforestation accomplished in district Bhuj and a preliminary report was submitted during 1998.
- Process of declaring the non forest areas as forest land was initiated for the entire plantations of 4650 ha. . Accordingly the process of placing the afforested areas was initiated
- Govt. of Gujarat made available reports on survival count and species composition for some of the areas planted up in both the forest & non forest areas.

Madhya Pradesh

Process of declaring the non forest areas as forest land was initiated for the entire plantations of 2732 ha.



- Govt. of M.P. made available reports on survival count and species composition for some of the areas planted up in both the forest & non forest areas. Year of plantation in distt Barwani and Khargone along with location is given in GIS generated map above(figure in red indicates survival percentage. "0" value indicates that data was not available).

Govt. of Maharashtra

- Process of declaring the non forest areas as forest land was initiated for the entire plantations of 6500 ha.
- Govt. of Maharashtra made available reports on survival count and species composition for some of the areas planted up in both the forest & non forest areas.

Summary of the status of after care/maintenance of plantations in MP, Gujarat and Maharashtra

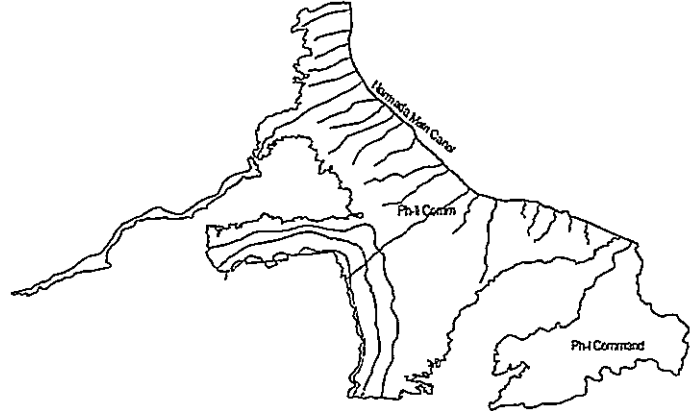
STATE	Studies on neo ecosystem	Success rate		Transfer to territorial forest divisions
		survival %	Area	
Gujarat As per GOG's letter dated 23.06.04	Report awaited	Non Forest Area in Kuchchh.4,650 ha.		Reported to be progressing. But details of notification etc are awaited
		> 50%	50% area	
		30to50%	38% area	
		below 30%	12% area	
		Forest Area (9,300 ha.)		
		Awaited	Awaited	
Maharashtra GOM letter 5 th July 1995 & 27 th Jan2003	Not relevant	In most of the areas survival < 50% as per information of 1995 and 2003		Complete. Copies of notification available for Amrawati Circle. About 6420 ha. Reportedly notified out of 10,599 ha.
Madhya Pradesh As per GoMP's letter dated 21.06.04	Not relevant	survival %		Out of the 2184 ha plantations on revenue land 1832.979 ha has been notified as protected forest. Remaining area is under process of transfer at different stages
		Area		
		> 50%	3966 ha	
		30to50%	480 ha	
		below 30%	3901 ha	
fodder	390 ha			



Chapter-4

COMMAND AREA DEVELOPMENT

The command area of the project is fixed based on the areas included by NWDT for purposes of considering requirement of Narmada water for irrigation in Gujarat & Rajasthan. Accordingly, the GCA of the project is 3.43 million hectares in Gujarat of which Culturable command is estimated to be 1.869 million hectares. In Rajasthan as per revised estimate the GCA of the project is 2.46 million ha. The command area in Rajasthan & Gujarat is characterized by wide diversity in agro-climatic and socio-economic conditions.



- ❖ The Narmada Main Canal also known as Navagam Main Canal off-takes from Sardar Sarovar Dam in Gujarat at a full supply level (FSL) of 91.44 m (300 ft.) and traverses through a distance of about 458 km before entering Rajasthan near village Silu, Tehsil Sanchore, district Jalore.
- ❖ In Rajasthan, the Canal runs for a distance of 74 km. The Topography of the area is suitable for a contour canal upto 54.00 km as such in this reach irrigation has been restricted to portion of command on river side only. From Km 54.00 onwards up-to the tail end (km 74.00) the canal has been aligned as a ridge canal to irrigate areas on either side.

Command Area Development Planning

The Canal system would command a gross area of 3.43 M ha, and cultivable area of 1.84 M ha. in Gujarat. It is envisaged to irrigate annually 1.792 M ha. with the availability of 9 MAF of surface water from the project. From management point of view, for laying down a set of prescriptions for crop pattern, water allocation and management, conjunctive use etc., the command has been divided into regions based on the following factors:

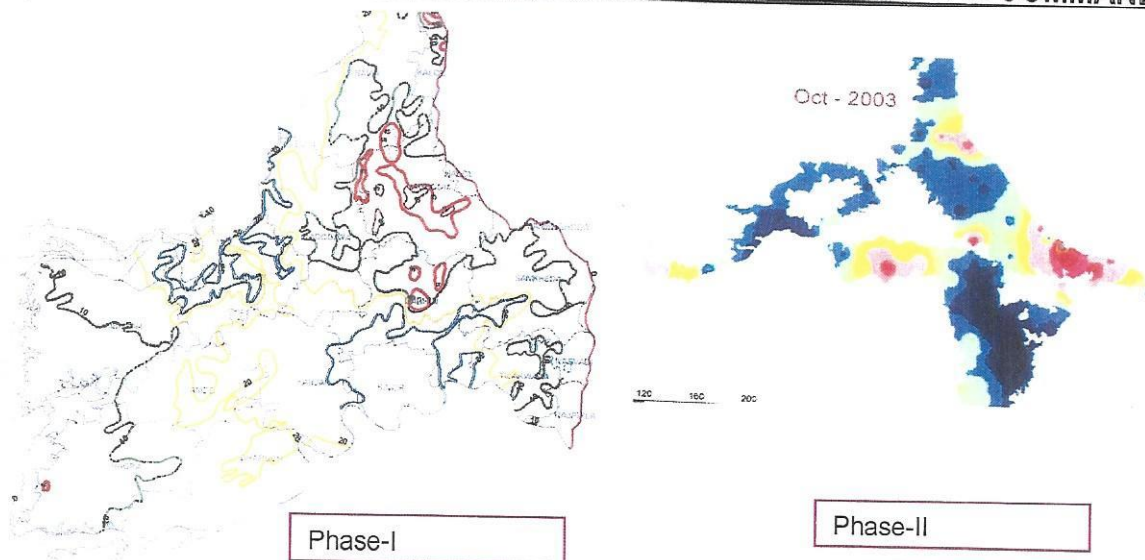
- (a) Annual rainfall
- (b) Land irrigability class including drainage characteristics
- (c) Ground water quantity and quality in terms of ground water table and salinity of water in the upper aquifers
- (d) Alignment and the command of major branches.

Annual rainfall in Phase-I & Phase-II command.

Sl.No.	Phases :-	Annual Rainfall
1.	Phase-I areas (Vadodara Taluka)	892 to 1056 mm. (35+ to 41+ inches)
2.	Phase-I Region-3 & 4	700 to 800mm. (27+ to 31+ inches)

3.	Phase-II (Region 5 & 6)	700 to 800mm. (27+ to 31+ inches)
4.	Phase-II (region 7 to 10)	600 to 700 (23+ to 27+ inches)
5.	Phase-II (region 11 to 13)	400 to 600 (15+ to 23+ inches)

GROUND WATER TABLE CONTOURS/DEPTH IN PHASE-I & II OF THE COMMAND

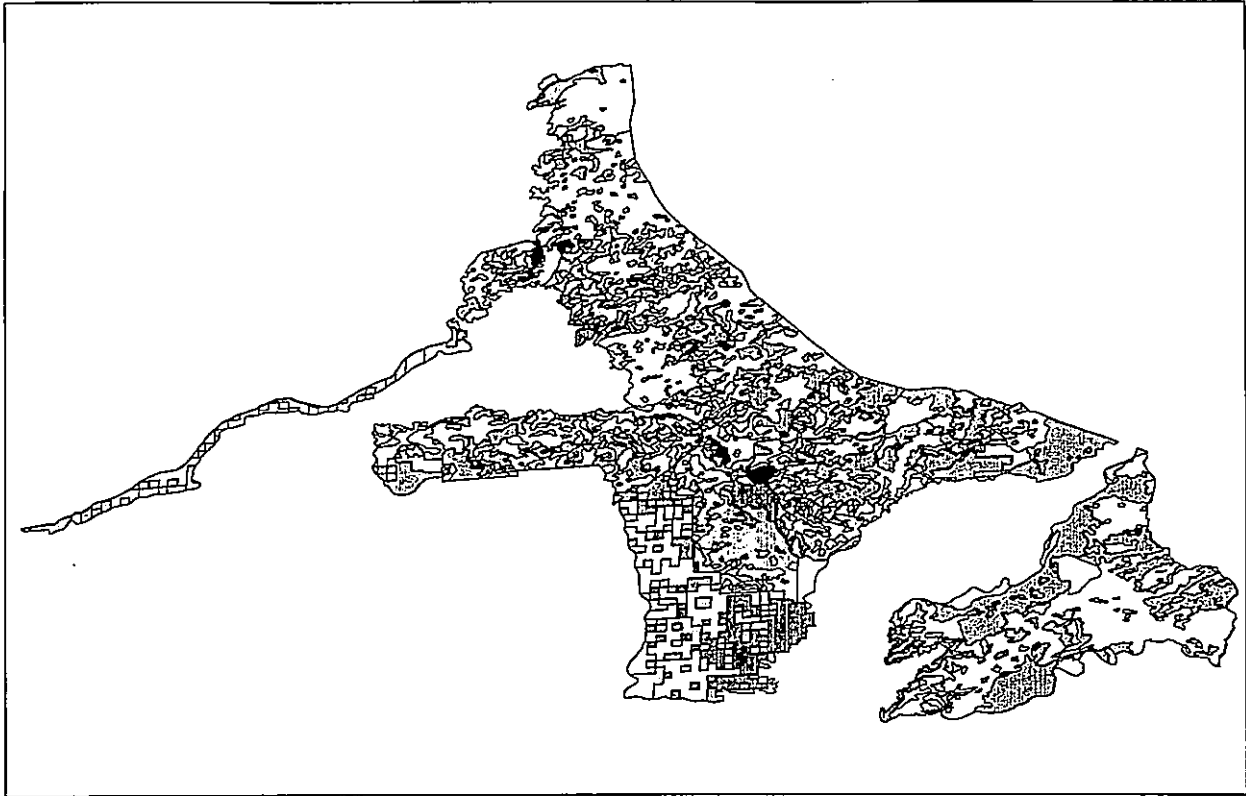


In Phase-I map red contours are for water depth of less than 5 m. and green colour contours are for depth of water level from 5 to 10 m (data of 2002). In Phase-II map light blue colors indicates less than 5m depth & deep blue indicates water depth of upto 10m. Where as green colour indicate water depth upto 20 mts.. Red and pink colour indicates areas where water depth is upto 40 to 70 mt. but such areas are very little in extent.

Land irrigability classification

The Soil Survey Manual (IARI 1970) recognises six irrigability classes.

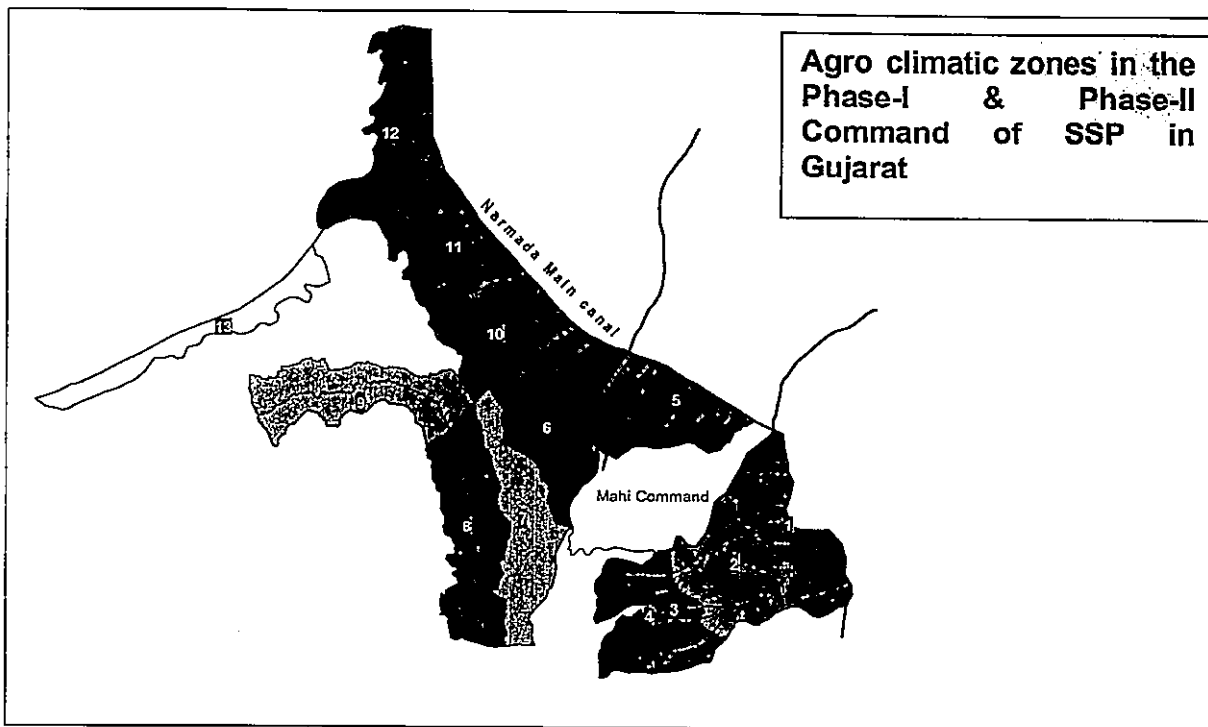
- Class 1 : Lands that have few limitations for sustained use under irrigation.
- Class 2 : Lands that have moderate limitations for sustained use under irrigation.
- Class 3 : Lands that have severe limitations for sustained use under irrigation.
- Class 4 : Lands that are marginal for sustained use under irrigation because of very severe limitations.
- Class 5 : Lands that are temporarily classified as not suitable for sustained use under irrigation pending further investigations.
- Class 6 : Land not suitable for sustained use under irrigation.



Source of Impacts: Land irrigability classes in the Command area of SSP in Gujarat (different colour indicates different soil types) Bottle green is class2 while lemon yellow is class3 land. Purple and peach indicates problem areas

Considering these factors, the command has been divided into 13 regions. The main regions, their names, GCA and CCA are as follows:

Sl.No.	Name of the region	Region No.	GCA	CCA (Macro Plan)	Revised CCA (000 ha)
1.	Sankheda-Savli	1	253100	161900	131.0
2.	Sinor-Vadodara	2	273100	187600	142.7
3.	Bharuch-Amod	3	153200	84900	95.5
4.	Vagra-Jambusar	4	111300	36800	58.9
5.	Mehmedabad-Daskroi	5	295700	192300	166.0
6.	Sanand-Kadi	6	181700	125700	93.5
7.	Dholka-Dhandhuka	7	476000	264300	222.3
8.	Limdi-Botad	8	294000	182600	198.4
9.	Halvad-Malia	9	268400	168000	146.4
10.	Viramgam-Dasada	10	344600	242100	187.3
11.	Sami-Harij	11	191700	115200	115.1
12.	Radhanpur-Vav	12	462800	319700	255.0
13.	Rapar-Mundra	13	122900	42800	57.3
	Total of all regions		3428500	2123900	1869.4



Environmental Management :

To safeguard development of irrigation in the vast command, it is important to ensure that the transfer of water to the Command Area does not give rise to the environmental problems, which have been experienced by some irrigation projects in the past. In view of the potentially far-reaching effects of water distribution in the SSP command area, mitigating measures have been determined requiring, control and monitoring.

To determine, these impacts the project authorities have undertaken a large number of studies and most of these studies are now complete. The results of many studies available by the end of 1993 were used to prepare an assessment report for the development of the Command Area by the H.R. Wallingford . This report recommended a series of actions and completion of the remaining studies before preparation of an integrated plan for the development of the command area. The key features brought out in the report included the following.

1. Socio economic factors
2. On farm/ off farm development works
3. Municipal and Industrial supply
4. Public Health
5. Water quality
6. Chemical used in Agriculture
7. Drainage, water logging and salinity
8. Natural fisheries and aquaculture
9. Forest loss and afforestation
10. Flora & fauna
11. Archaeology

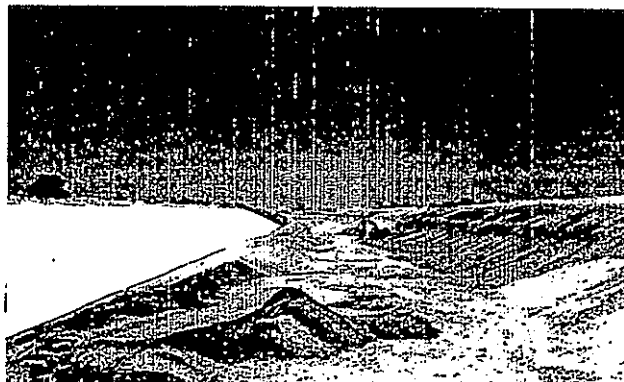
Proposed Measures

The Sardar Sarovar Project service area has been classified into 13 agro climatic regions based on broad topographical, hydro meteorological and soil surveys. The drainage density is good in most of the regions except in regions 4, 7, and 11. Outfall conditions are sluggish in regions 4 and 7, parts of which are also affected by salinity. Sub areas or pockets likely to get waterlogged or saline due to irrigation in future have been identified for planning special measures to prevent development of such a situation.

The following are the proposed measures to prevent environmental degradation.

Water logging and salinity:

- **Mechanised, well-controlled canal lining:** All the canals right down to the 8 ha blocks would be carefully lined to reduce the seepage losses. The main canals and branches will be concrete lined with mechanical pavers. The distribution system will be brick lined with a sandwiched rich mortar layer. Use of polyethylene membranes is also contemplated.

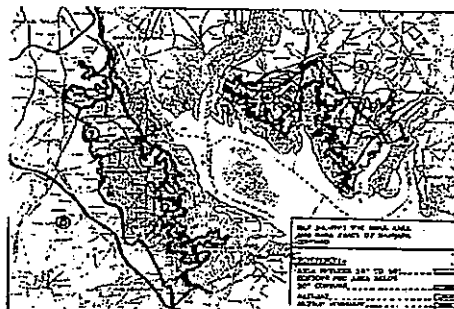


- **Provision of surface drains.** The drainage for excess rainfall, storm water from agricultural land for better crop productivity has been proposed at farm levels as well as at regional level. Whole of command has been divided into two regions in respect of preparation of operational design and layout of surface drainage network commencing from 40 ha chak. The construction of the drainage system shall go on concurrently with the canals.



- **Conjunctive utilisation of surface and ground water, limited water delta.** The amount of water supplied per unit of area in the SSP command will be amongst the lowest in the country. The average depth of surface water supplies for the entire year measured at the main canal head will be only about 53 cm over the command area as compared to 75 to 100 cm per crop season on most of the projects in the country. This will naturally call for very judicious and economical use of water. If the farmers want to grow water intensive crops, they will have to supplement the canal water with well waters or reduce the area of their crops under irrigation. The project authorities have contemplated, conjunctive use of surface and ground waters. In the existing irrigated areas of other projects where well irrigation is concurrently practiced, the problem of water logging has reduced.

- **Better water management, Automated canal regulation, Rotational water supply on volumetric basis, and active participation of farmers.** A draft legislation has been prepared to regulate the distribution and use of canal and ground water by Govt. of Gujarat. On the Sardar Sarovar Project volumetric supply of water through a computerized semi-automated operation system is planned. Under this system, the discharge from the canals down to 8.5 cumecs (300 cusecs) capacity is planned to be regulated through automatic computer control. According to Govt. of Gujarat these measures will not allow the canals to draw more water than planned. As the tariff for the water will be on the basis of the quantity supplied, the farmers will try to use it most economically. This will be further ensured through better water management through farmers' associations and rotational water supply. The irrigation water depths actually required would be worked out through a system of soil moisture sensors and observations of hydro meteorological and climatological parameters as related to crop growth stages and the supplies will be regulated accordingly by the Govt. of Gujarat. Wherever possible drip and sprinkler methods of water application is planned to be encouraged.
- **Carrying out water balance and salt balance studies and the necessary monitoring.** During monsoon, when surplus waters are likely to be available in the canal, such waters will be used for flooding and leaching the saline soils. Continuous monitoring of salt and water balance has also been planned for such marginal soils.
- **Bhal and Bara Tract :** Special problematic areas of Bhal and Bara are difficult for irrigation in view of high water table and salinity. A possible way of developing this area can be through suitable forest development programme. Salt loving plants, having a high evapo-transpiration rate can be preferred. These plants can help in controlling the water table. In the initial stage of development of irrigation in the command, there will be excess water available. This can be used over this area for initial leaching by way of surface diffusion. This can promote initial growth till the plants develop some resistance. Species like *Prosopis juliflora*, *Eucalyptus Artiplex* and other suitable plants can be tried. No irrigation system can be thought of for this area.



Biological resources and issues in the command

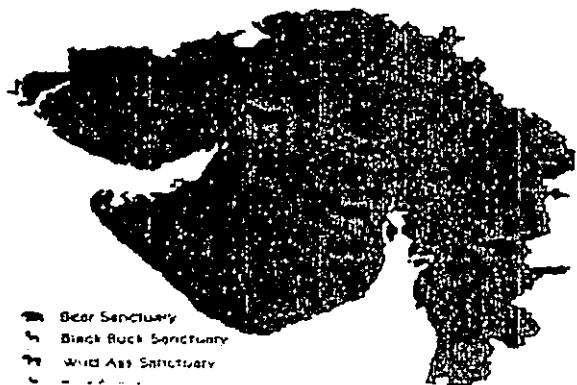
- In Gujarat forests constitutes only 6.92% of the geographical area. According to estimates of 1980-81, about 1.3% of the total command i.e. about 44,500 ha of the command area was forest of this about 200 ha shall be required for construction of canal net works.
- The diversification of agro based plants and animals is crucial for the State's ecological security. Its present status changes therein and future trends are, therefore, important for biodiversity conservation. Despite the domestication in the agricultural crops, various land varieties have existed in different types of crops. Over a period of time their cultivation and propagation has been affected due to the

availability of high yield varieties. The relevant information pertaining to, these now depleted land varieties with reference to its number, area of occurrence and distribution is not readily available. This information, which is very relevant in the overall conservation of agro-biodiversity, is a serious constraint.

- Heavy use of chemical fertilizers and pesticides has led to a drop in the productivity of the soil, bio-accumulation of toxic substances and disruption of food chains of the agricultural ecosystem (by direct and indirect effects). These have contributed to crop failure, steady decline in production and long-term health hazards all the way to the end users, i.e., humans.
- The old native varieties (land races) are fast giving way to new hybrid / high yield varieties in a majority of crops. This is leading to impoverishment of the gene pool of native varieties of crops. In several cases, such native races have been lost forever. Relative least use of organic and natural farming is leading to continued reduction in land fertility and production.

Sanctuaries in the command

According to the Biogeography zonation, the following zones would be impacted by the waters of the Narmada due to the Sardar Sarovar Project. The consequential ecological shift and a plan to mitigate the negative consequences was required. These zones includes 3 main habitats viz. Nal Sarovar, Black Buck and Wild Ass sanctuary of the endangered wildlife.

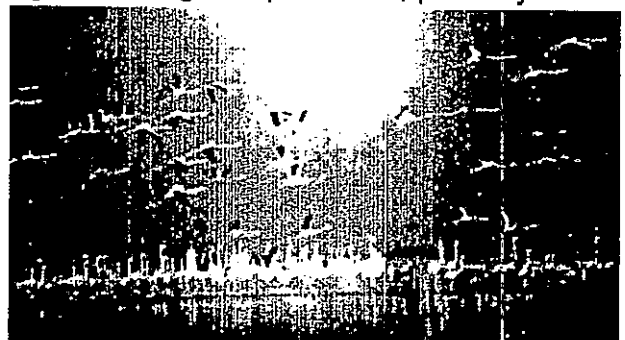


- The Indian Desert (3) in Kuchchh (3 A) and
- Semi Arid (4) region in Gujarat – Rajwara (4 B)

Nal Sarovar Bird Sanctuary (area 115 sq.kms).

Floral & Faunal composition of the **unique wetland** may change besides changes in physico-chemical properties of the lake environment, changes in the cropping pattern in the command, changes in micro-climate, anthropogenic changes & pressures, primarily due to following :

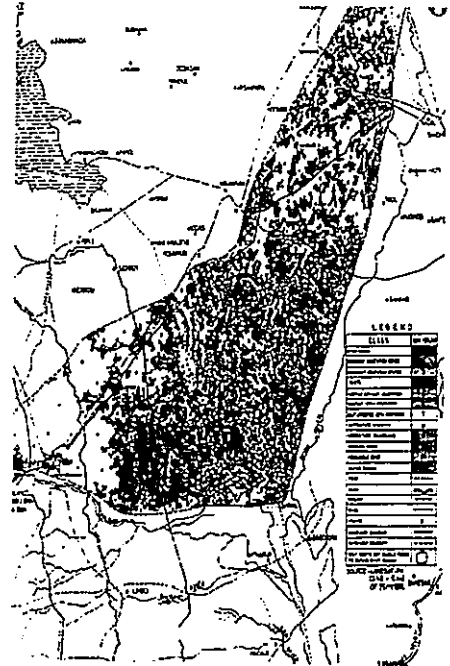
- Quality of agricultural run off laden with pesticides / insecticides or fertilizers to Nal Sarovar from the catchment area (which will be irrigated) shall impact the sanctuary.
- Water may also be drained (in flow of Namada Water) in the lake through tail distributaries of the Command Area.
- Risk of flooding the lake from excess



water may also result from escape of the Saurashtra Branch Canal, in case of sudden failure of pumps and electricity.

The identified impacts are outlined below :

- Entire flora can be washed out altering the food and other resources available to water fowl in case of failure of the planned irrigation system.
- Waders, surface feeders and herbivores bird species shall be adversely impacted due to release of water in the lake between November to March as entire eco-system of the lake would experience negative changes.
- In case capacity of the lake is increased beyond RL 9.4 this would adversely impact the shallow lake eco-system representing unique wetland.
- Due to absence of drying of the lake eco-system might metamorphose into some other degenerated wetland.
- Any fishing activities beyond practice today would disturb the peace of the wetland.
- Due to additive property of the agriculture chemicals and their non degradable nature will be enter the food chain and web poisoning the entire fauna of the wetland.
- This wetland being near to the metropolitan town of Ahmedabad would experienced increased industrialization and resulting increase in pollution loads and consequently toxicity of the soil, besides impact of urbanization, industrialization and shift in land use pattern due to increased value of the land.
- Increased unregulated tourism and other allied activities.



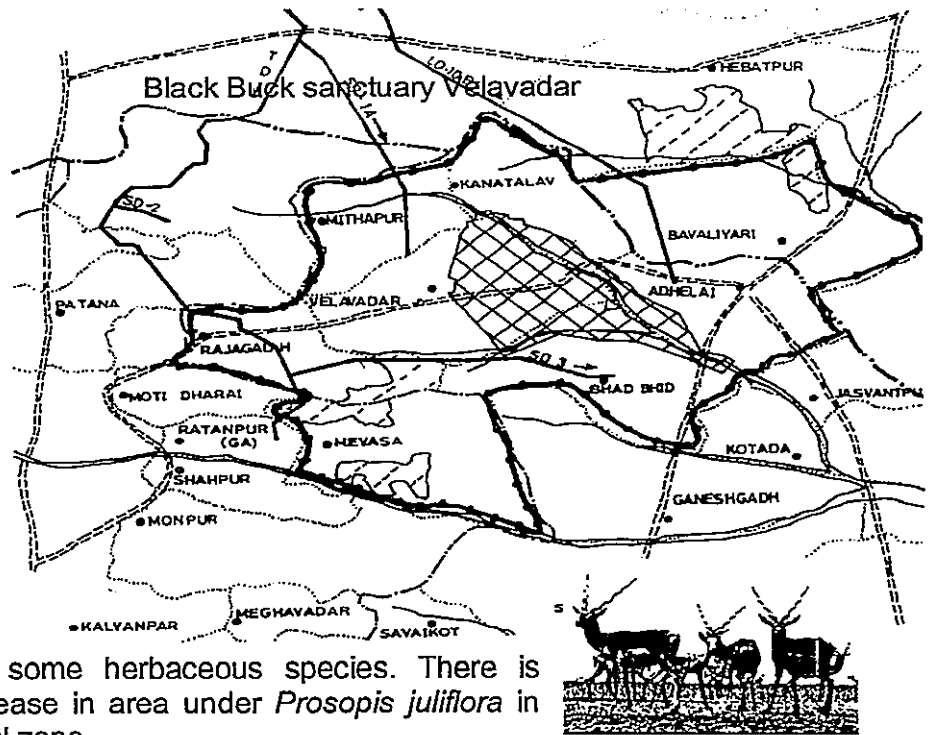
Wildlife Protection Act prevents any activity which is harmful to animal or its habitat. Govt. of Gujarat vide their letter dated 1-12-04 submitted a copy of the action plan for Nal Sarovar Bird Sanctuary. The plan is under scrutiny. The features of the plan, however places reliance on :

- Efficiency of the irrigation system, as planned
- Reliability of the irrigational operational mechanism
- Training and education to farmers.
- Development and setting up of a system of monitoring based on proposed programme
- Conjunctive use
- Mechanism for removing drainage congestion during monsoon
- Monitoring network of piezometers
- Present fertilizer consumption is 69 kg./ha for an average productivity 1644 kg/ha of the food grains which is much low and provides some room for the time being. Gujarat has much lower level 1/3 of fertilizer consumption as compared to Punjab. However use of bio-fertiliser is proposed to be encouraged.
- Maintaining of the water level in the wetland
- Monitoring of water quality of surface and ground water
- Promoting fisheries outside the lake areas.

- Promoting awareness, demonstration (7.5 lacs) regarding use of organic manure (22.5 lacs), integrated pest management (30 lacs), drip irrigation system (90 lacs), farmers meeting, training at levels and publicity material at an estimate cost of Rs.36 lacs besides contingencies of Rs.10 lacs. This totals upto 196 lacs for five years (39 lacs per annum) towards recurring and 25 lacs (i.e. 5 lacs per annum) for non recurring.

Black Buck Sanctuary (area 34 sq kms), The identified negative impacts are listed below

- Wildlife habitat may be reduced in ecological zone due to the change in the land use and cropping pattern.
- With increase in agricultural production, Blackbuck may start frequenting the fields, thus possibly increasing human/animal conflict.
- Through there is very little likelihood of water logging in ecological zone; some patches may face water logging creating small patches of saline marshes for short period.
- Likely increase of pesticides and insecticides may affect migratory harriers and some other avi-fauna in ecological zone.
- There is very little likelihood of a change in the microclimate in or around the park area.
- Possibility of increase in water/moisture content in the soil may bring some change in plant communities especially Cyperaceae, Gramineae and some herbaceous species. There is likelihood of increase in area under *Prosopis juliflora* in parts of ecological zone.
- There may be some increase in human activity, disturbing some wildlife in the ecological zone.
- Increase in Blue bull population, due to the changed circumstances may cause problems of crop damage in surrounding areas of the National Park.



Govt. of Gujarat submitted a copy of the Action Plan for the park prepared by Dr. S.A.Chavan which included following mitigatory measures. However Phased action programme for the incremental measures, provision of budget and monitoring mechanism is not yet in place.

- Increase in the area of park
- Lining of the canal surrounding the park

- Two corridors of 50 m width on canal SD-3 for movement of Black Buck across the canal
- Removal of prosopis species and development of grass land
- Plantations of Salvadora species
- Denning area of the wolves outside the park should be protected both inside & outside the park
- Devalia-Paliyad zone should be managed as satellite core & brought under the management of Park Authorities.
- Existing salt pans should be rehabilitated at alternate sites and no further permission should be given.
- Bio-gas plant, Cattle vaccination, immunization programme, increase in gauchars, fuel wood and fodder
- Agro-forestry would be encouraged
- Conservation awareness programme through audio & video
- Control of blue bull
- Limiting the use of insecticides and promoting bio-fertilisers
- Cropping pattern should be managed to prevent animal human conflict over the resource during summers.

Little Rann of Kachchh (LRK) (area 4,953 sq kms)

Wild Ass Sanctuary

This is one of the **unique desert ecosystems** and most fascinating wilderness areas in the world. True saline desert of the LRK is **last abode for Indian wild ass, Equus hemionus khur, only gene pool in the world**. LRK has been identified by the GOI as an **important site for Biosphere Reserve due to uniqueness of the area** and its support to rich biodiversity including some of the rare and endangered species (11 species listed in Schedule-I) of the Wildlife (Protection) Act, 1972). LRK is known for very high scientific research and wilderness values with high potential for nature & environmental education and wildlife tourism.

- Five branch canals viz Maliya, Jhunjuwada branch, Rampura branch with two distributories viz Jayanagar and Taranager, Amarpura branch and Kachchh branch which (pass through the Narrow neck at the Northern tip of LRK joining with GRK sanctuary) will with their command shall impact the sanctuary.
- The Kachchh Branch crosses the neck dividing the Little Rann and the Great Rann. This is likely to impede the movement of Wild Ass, Chinkara and other animals between the two runs specially during the winters. This is required to be resolved.
- It has mangrove vegetation in Hadakiya creek near south west direction. The mangroves are regenerating in these areas. Besides Marsh vegetation is also improving.
- The sanctuary is under pressure because of salt industries and intrusion of cattle besides invasion of Prosopis species.

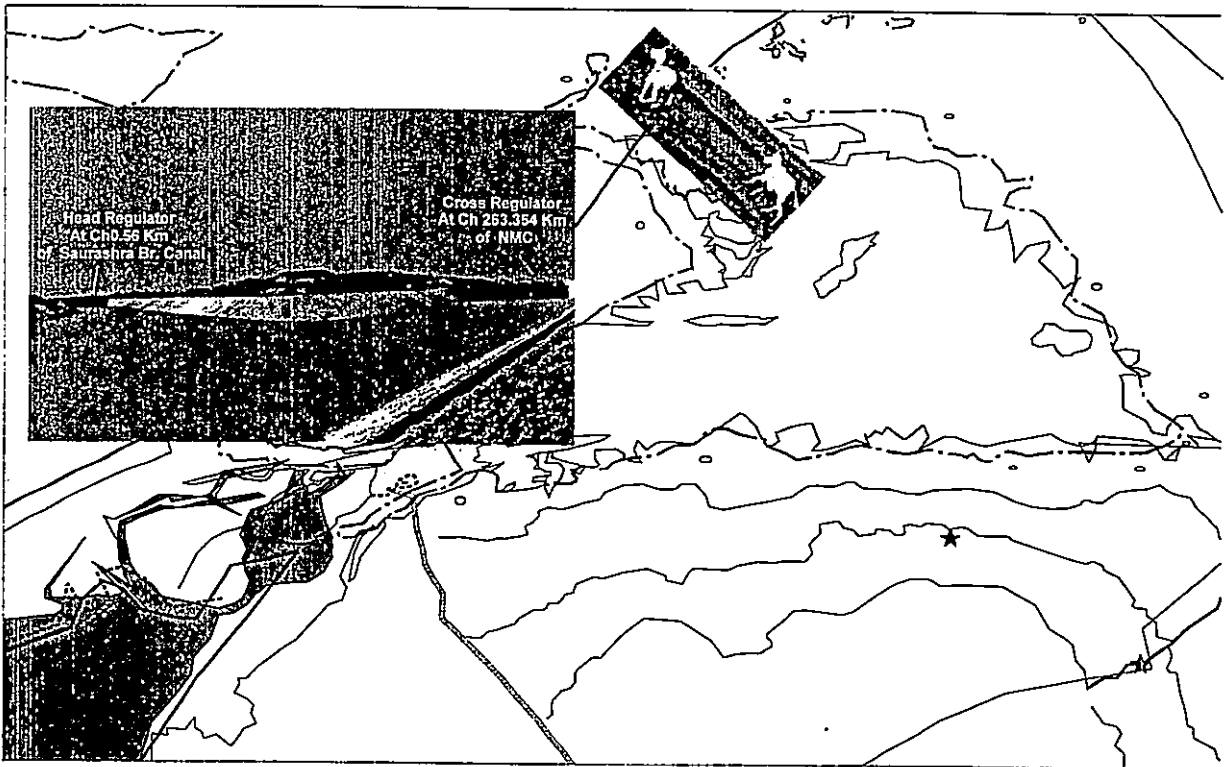
The suggested mitigatory measures included structures facilitating the movement of Wild Ass, regulation of salt works, Conservation and change in legal status of bet, habitat conservation, control of Prosopis, identification of salinity ingress and periodical monitoring. The EIA report suggested further studies on movement of Wild Ass and recommended that

the most appropriate structure for the crossing is required to be worked out in consultation with Equus specialists so as not to impede the movements of Wild Ass. The macro plan submitted by GoG suggested that

- Canal could be laid underground at four identified places; to facilitate the movement of wild asses at ground level with natural light between the Little Rann and Great Rann.
- Besides the above passage, there could be passages over the canal at intervals of 1.5 km for movement of people and animals which can also help migration of wild ass.

Considering the importance of the Sanctuary, these suggestions are subject to scrutiny of Equus specialist and are required to be supported through further studies as suggested by the EIA study group.

Management Plan required for mitigating the identified negative impacts is not yet in place.



Public Health

- Major environmental apprehensions are with reference to the water-related diseases of malaria, filaria and schistosomiasis.
- Malaria is found to occur naturally in epidemic cycles in Gujarat, partly influenced by climatic factors. Two of the three mosquito species are considered as principal vectors responsible for transmission, viz. Anopheles stephensi in urban areas and A. culicifacies in rural areas.

- Filaria caused by the mosquito species of *Culex quinquefasciatus* (fatigan) is confined to coastal areas of Saurashtra and South Gujarat
- Other water related diseases like dysentery, typhoid, hepatitis, gastroenteritis etc. and major factors like sewage disposals, septic tank discharges, overall hygiene of the rural population and quality of domestic water supply under cities and towns are the key issues.

ACTION PLANS

Integration of all developmental activities related to irrigation, drainage, agriculture, co-operatives, roads, marketing, forests, rural electrification etc. is considered as a basic requirement for the command area development programme targeted for SSP. Action Plans are required to be firmed up the key issues like water logging, drainage, health, fisheries, flora fauna etc. for the Command Area.

Macro plan for development of the Phase-I area of the project Covering the command between the Narmada and the Mahi rivers was submitted by Gujarat during 2004-05. The essential component of this plan included the following measures.

Flora and Fauna

- Plantation Programme
- Existing Plantation Programme in the Command
- Irrigated plantation
- Community forestry
- Farm forestry
- Programme of the works on SSP command
- Development of botanical garden for ex-situ and in-situ conservation of key flora of the SSP command
- Bio-diversity Conservation plan including Agro bio-diversity Conservation, Domestic animal diversity conservation
- Financial Outlay

Fisheries Conservation and Development

- Project Planning
- Project Cost
- Management and Operation

Prevention Of Soil Salinity and Water Logging

- Conjunctive use of water
- Environmental impacts & related observations
- Usefulness of groundwater monitoring in mitigating the impacts on environment
- Action taken on recommendations by the study group.

Agriculture

- Water courses and field channels
- Land leveling,
- Field Drains
- Support and Assistance to Farmers

- Network of approach road
- Marketing and Warehousing
- Establishment of Agricultural Research *cum* Demonstration centre
- Consolidation of land holding where possible
- Extension of Agricultural Activities
- Agro-Industries
- Problem area: Bara Tract Area (Region 4)

Public Health

- Development Planning
- Policy Prescription
- Strategic Planning
- Existing Health Programme
- Health Infrastructure in command area
- Health Infrastructure at Project Site
- Health Infrastructure at R& R Sites
- Phased Programme Phase-I
- Project Implementation and Operation
- Financial Implication

Water Quality

- Surface Water
- Ground Water
- Agricultural chemical use
- Industrial waste and Effluent discharge

Development of delivery system v/s. implementation of Environmental Safeguards.

Construction of Canal Phase -1 Ch 0.00 Km to 144.500 Km (Mahi crossing) along with the distributaries have been completed in all respects. Construction works in the reach between kms., 144.500 and kms., 263.165 i.e., NMC Phase-II-A have been completed in all respect. The construction works in the canal reach between kms., 263.165 and kms., 357.196 i.e., NMC Phase-II-B are in advance stage of completion. Surface drainage is being provided up to 40 ha chaks concurrently with the construction of canals. The command coming under Phase - 1 extends up to Narmada-Mahi doab and areas coming under this belongs to agro-climatic zone no 1 to 4. By now, almost all the major studies have been completed and impacts are known. Action points have also been determined. The status of the command area development activities and environmental safeguard measures is presented below.

Status of Implementation of Environment Safeguard Measures for Command Area & downstream of SSP.

It was reported that an area of 40 to 50,000 ha was irrigated annually for the last two years.

Table indicating the targets and the progress on implementation of environment safeguard measures for the Phase-I of the command.

S. No.	Suggested actions	Incremental Planning	Annual Targets		Achievements	
			Phy	Fin.	Phy.	Fin.
1.	Agriculture Development <ul style="list-style-type: none"> • Water course and field channel • Land leveling and shaping • Field drains and chak drains • Support and assistance to farms in development of ground water in conjunction with the surface water. • Network of approach roads and eventually farm roads • Marketing and warehousing. • Establishment of agricultural, research-cum-demonstration farms. • Co-operatives or farmer-friendly structures for inputs and credit facilities. • Provision for supply of seeds, fertilizers, pesticides etc., • Incremental Communication facilities • Incremental Municipal & civil facilities • Consolidation of land holdings . • Agricultural extension activities: Educating & Training to farmers : a) Programme arranged • Problems areas of Bhal and Bara track. 		5 Nos	Rs. 56.32 Lac	5 Nos	Rs. 56.32 Lac
			66 Nos.	Rs. 21.07 Lacs	66 Nos	Rs. 21.07 Lacs
2.	Public Health		Arrangement for volumetric supply considering greater duty is not yet in place			
	• Strict control on supply of water.(Volumetric supply)					
	• Lining of canals (Lined Canal up to sub minor level)		116800 ha.	Rs. 14680 Lacs	29830 ha.	Rs. 5401.81 Lacs
	• Surface drains (Link drains)					
	• Drainage of borrow areas.					
	• Training at levels					
	• Presumptive treatment and					
	• Curative treatment					
• NMCP		20 lacs	NIL			
• Strengthening of CHCs		325 lacs	NIL			
• Strengthening of PHCs		420 lacs	NIL			

	<ul style="list-style-type: none"> Strengthening of Sub Centers 			4 lacs	NIL															
	Strengthening of Urban Health Services			6 lacs	NIL															
3.	<p>Water quality : (State PCB is monitoring the water quality)</p> <ul style="list-style-type: none"> Water quality monitoring wells. Institutional arrangement for monitoring of surface water quality. Ensuring releases of fresh water for diluting the pollutants. Regulatory control for prevention of downstream environment by Municipal & Industrial sewage. Surface & Sub-surface drainage in region -1 to 4. 	<p>i) Already available 36 Nos. sub stations (GOG). ii) 20 Nos. of coastal zone station established.</p>																		
	<ul style="list-style-type: none"> Regulation for pesticides control. o Research Centers for Biological control. Integrated pest management. 	<p>Minor drains for linking are taken up. Remodeling of existing channel is also to be taken up.</p> <p><u>Sub surface Drainage :</u></p> <table border="1"> <thead> <tr> <th>Region No</th> <th>No. of existing tube wells</th> <th>% of ground water utilised</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>647</td> <td>6.7</td> </tr> <tr> <td>2.</td> <td>2112</td> <td>25.17</td> </tr> <tr> <td>3.</td> <td>263</td> <td>4.77</td> </tr> <tr> <td>4.</td> <td>42</td> <td>1.52</td> </tr> </tbody> </table>	Region No	No. of existing tube wells	% of ground water utilised	1.	647	6.7	2.	2112	25.17	3.	263	4.77	4.	42	1.52			
Region No	No. of existing tube wells	% of ground water utilised																		
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2.	2112	25.17																		
3.	263	4.77																		
4.	42	1.52																		
4.	<p>Water logging & salinity</p> <ul style="list-style-type: none"> Improving the quality of the soil maps Volumetric supply of water through computrised system Improving the design of drainage system. Re-use plan Ground Water Modelling with new data. Modelling of regions with rocky strata. Operationalisation of the drainage studies 																			

	<ul style="list-style-type: none"> • Special works on coastal zone. • Location of Peizometric / well • Integration of GWRDC wells in the command. • Institutional mechanism for monitoring water table / quality. • Legal/Financial frame work for utilization of ground water by the WUA for conjunctive use.(included in the cost estimates of the SSP). 					<p>78 Nos of well previously existed in phase I</p> <p>Legal & financial planning, for Utilization to include operation of private wells, not yet available.</p>
5.	<p>Downstream Environment</p> <ul style="list-style-type: none"> • Provisions for complimentary flows for mitigating pollutions in the downstream, • Restoration and sustainable development of mangrove and forest vegetation on Aliabet and Tawara Islands, addressing of the Socio-Economics of the fisheries development downstream zone, • Operational procedures for dam to facilitate survival of downstream biota, adequate monitoring of water quality. • Developing of mathematical modeling for prediction of likely impacts of different operational scenarios for mitigation, • Studies on ecology and resources for the downstream environment, narrowing of river channel, • Legal agreement between the party states for regulated releases to ensure that project works as planned. 					<p>For water requirement at the downstream of Sardar Sarovar Dam, GoG placed the requirement of a flow of 600 cusecs which was agreed by the sub-Group. As reported currently, efforts are being made to the extent possible to ensure 600 cusec of flow at the downstream of Sardar Sarovar Dam.</p>
6.	<p>Fisheries and Aqua culture :</p> <ul style="list-style-type: none"> • Linking village tanks to distribution system in about 4,000 ha village pond. And other works from the budget of FFDA and Loan from Bank. • CAD plan on cost of SSP. 					

	o Status paper	9.0 lacs				
	o Modification in capacity of ponds	9.0 lacs				
	o Major carp hatchery	15.0 lac				
	o Project cells.	9.0 lacs				
	• Control fouling from saline aquifers and agricultural chemicals.					
	• Monitoring responsibilities.	FFDA				
	• Arrangements for analysis of Monitored information	Commissioner(F)GOG				
7.	Plantations in the command : Existing schemes. (1980-1992)		Annual Targets		Cumulative achievements	
			Phy.	Fin.	Phy.	Finan.
	• Strip plantations	10,304 ha	Departmental work prior to SSP			
	• Common lands	12,213 ha				
	• Degraded forests	5,904 ha				
	• Degraded non forest	460 ha				
	• Community forest	29,000 ha				
	Incremental programme (after SSP)					
	• Canal banks	15,000 ha			2,900 ha	
	• Borrow areas	3,000 ha			Nil	
• Community forest	40,000 ha			Nil		
• Non culturable land	40,000 ha			Nil		
• Field bunds	1,00,000 ha			Nil		
• Farm Forestry	1,00,000 ha			Nil		
8.	Flora and Fauna:		Not yet reported			
	• Development of Botanical Garden					
	• Tree Preservation programme					
	• Bio-Diversity Conservation Plan.					
	o Environmental stability					
	o Coastal zone Eco-system					
	o Denuded areas in the Command					
	o Increase in tree cover by 5% (outside the forest).		Nil	Nil	Nil	Nil
	o Measures for meeting MFP requirements.					

	<ul style="list-style-type: none"> ○ Awareness programme for people's participation ● Incremental Management of Nal Sarovar Environment ● Incremental Management Valvador Environment ● Incremental Management of Wild Ass sanctuary Environment. 					
		Not yet reported				

(B) Current Scenario : Government of Rajasthan

Source of Impacts

Narmada Main Canal

Rajasthan has been allocated 0.5 MAF (616 MCM) of Narmada water under the final award of NWDT. To utilise its share of the Narmada water, Govt. of Rajasthan had planned a 74 km long main canal to run along contour and 9 distributaries to irrigate 73,157 ha. of land in the drought prone districts of Jalore and Barmer.

The scheme has since been revised to cover a C.C.A. of 2.46 lacs ha through lift and flow schemes. Besides irrigation benefit to 89 villages(74 in Jalore & 15 in Barmer), the project also envisages to provide drinking water to villagers of the District of Jalore & Barmer.

The construction of Main Canal in the first 48.0 Km reach was taken up and the earthwork and masonry structures between 0 and 30 kms., were completed, except in few chainages due to land acquisition problem. Concrete lining was completed in the initial reach of 7.88 kms. Service road (W.B.M.) parallel to main canal was constructed. The entire Narmada Main Canal works in Rajasthan was scheduled for completion by 2005-2006.

Water Delivery Network

The water delivery system will cater to irrigation needs of the vast areas through irrigation units. Each unit of irrigation service area, called Village Service Area (VSA), has been planned to be served through a single outlet from the distributary. This outlet will remain fully open for a fixed period during irrigation water demand and will be closed during periods of no water demand and no water availability. Water will be delivered only on the basis of the demand to a group of organised cultivators on a volumetric basis at the head of VSA, and not to individual cultivators.

In the VSAs, network for water distribution is planned through minors and sub-minors feeding different chaks and sub-chaks. For the entire system below VSA outlets, water will be supplied in proportion to the area served. Within the chak, the water will be distributed through Warabandi and Osarabandi system.

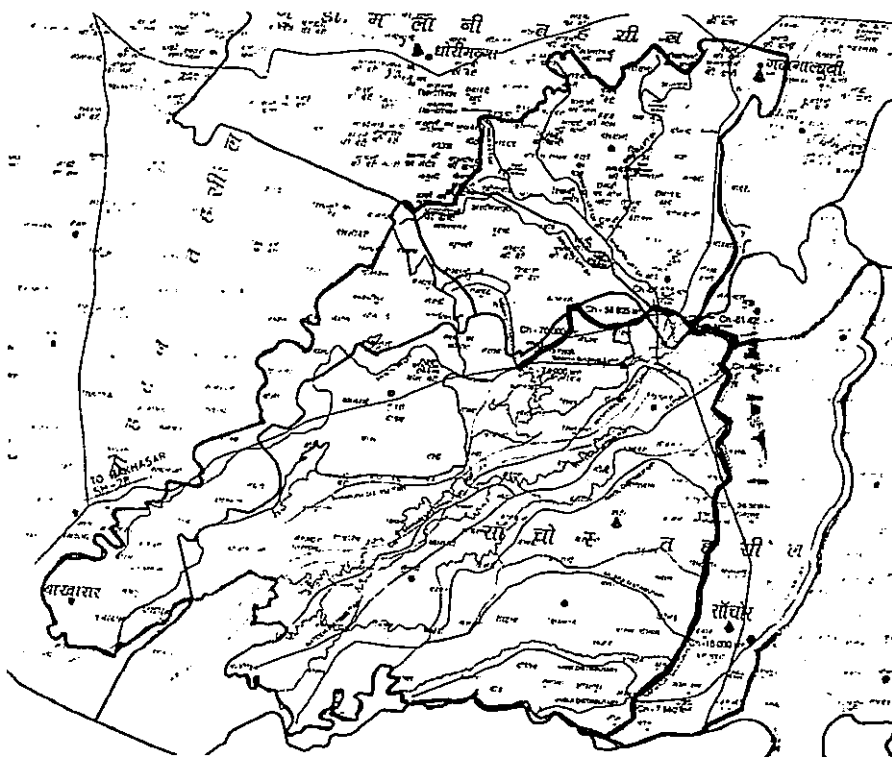
The Distribution System Under Village Service Areas

A Village Service Area (VSA) will generally constitute an area between 300-500 ha. of a village under command. For villages extending over areas larger than 500 ha. or if required on the basis of topography or other physical features, the VSA may cover a larger area. The VSA is planned to be divided into chaks of 30 to 60 ha.. In a chak there will be 4 to 6 sub chaks. A minor will lead the water from the VSA outlets to the heads of chaks. A sub minor will convey water into the chak up to heads of sub chaks. Field channels will carry water from heads of sub-chaks to individual fields. The chaks will be ungated and water will be rotated into sub-chaks through turnouts. In a sub chak, water will be rotated to individual farms.

The VSA outlets will either be 'on' or 'off'. A constant discharge will be released. The flow will be divided proportionately at each chak head, by fixed proportional devices. Within the chak, the flow will be rotated. The flow will continue over a fixed continuous period during a week. Generally, it will run over a period of one week. The schedule of rotation among farmers during the period of supply to the service area will be fixed for each season so that each farmer will know the day of the week and precise hours during which he is required to draw. Prior to the commencement of each crop season, the schedule may be altered so that night operations can be rotated among all farmers.

The water will flow in the VSA when demanded. Depending upon water availability, the number of waterings will be made available, at intervals, to the entire VSA. Each watering will start on a prefixed day of a week every time. During periods of peak demand, water can be supplied for consecutive weeks also. The periods between the irrigation will generally be in increments of seven days. Irrigation water will be delivered at an approximate rate of around 30 litres/sec to farmers. The actual stream size will be

proportional to the area of the chak.



The farmers within a service area will, in association with the agricultural extension staff, collectively determine their common schedule for delivery of allocated water to the VSA in terms of size and number of irrigation waterings and dates of delivery. Any changes in the schedule during a cycle will be likewise determined. Short term altering of the delivery schedule to a VSA as a sequel to the rainfall, will be carried out under codes/procedures agreed upon between the agency and the VSA Committee.

Drainage System

Surface drainage would be an integral part of irrigation net work and is being provided for to cover 40 ha. chak unit in all the areas needing surface drainage. The vertical drainage as required will be through Tube Wells and Open Wells. The drainage system would consist of surface network of open channels and ground water control wells. The natural drainage shall be suitably modified and additional drainage will be provided where ever necessary to take care of excess water during monsoon to ensure that the flood water gets drained out in a reasonable period and there is no spill over and choking of drainage. The sub-surface water drainage control will be through judicious ground water exploitation and with adequate planning so that there is no water logging in the areas. The drainage system shall be constructed and maintained up to 40 ha. block synchronising in general with a chak distribution unit. The maintenance of drainage within the chak will be left to the farmers. The construction of the drainage network will be completed simultaneously with the construction of major distribution network and completed on block-to-block basis so that it is ready for use by the farmers by which time the surface water becomes available for irrigation.

Environmental Planning

The Government of Rajasthan had submitted a report on Environmental and Ecological aspects and remedial measures for Narmada Canal Project. Copy of the report was submitted to Ministry of Environment and Forests during 1990. Ministry of Environment & Forests directed that since Command area in Rajasthan was a part of the Sardar Sarovar Project being monitored by the Narmada Control Authority for compliances of the conditions imposed by the MoEF they should submit this plan to the NCA for scrutiny & further advice. Environment Sub-group of Narmada Control Authority suggested further studies on detailed EIA. In follow up Government of Rajasthan assigned certain studies on Command area in Rajasthan portion to WAPCOS. The WAPCOS submitted its final report during 1998. The key recommendations were as follows :

Negative Impacts

- About 990 persons in 23 villages are likely to be displaced.
- Major water related diseases in the project area is malaria with API being as high as 11.0 in some areas. Thus there is a probability of increased incidence of malaria in project operation stage.
- 867 ha of land would be acquired of which 52.8% is B-I, 21.1% is B-II and 26.1% is B-III category.
- Increased irrigation impact and associated seepage and infiltration losses can lead to problem of water logging and soil salinization.
- Continuous irrigation can lead to reduction in permeability, which along with rise in groundwater levels can result in water logging.
- Increased cropping intensity can cause change in soil fertility, soil structure and texture.
- Introduction of irrigation replaces the xerophytic plants by new plants which become weeds in irrigated areas. The weeds likely to proliferate are *Asphodelus tennifolius* (Pyazi), *Carthamum oxycantha* (Piliphuki), *Fumasia indica* (Kilano), etc.
- Introduction of irrigation increases the runoff. The agro-chemicals are also transported along with runoff. This can create problem of Eutrophication in the post project phase.

Positive Impacts

- No impacts is anticipated on the forest lands, historical and cultural monuments.
- Project proposes provision of sustained irrigation over an area of 75,157 ha. The irrigation intensity would increased by 54%.
- Estimated net value of agricultural production would increase from Rs.303.7 million (pre-project) to Rs.1,022.85 million (post-project) at 1992-93 price levels;
- About 47,487.6 ha (31.09% of the GCA comes under the category of wastelands which can be utilized under social forestry and pasture development programmes.
- Commissioning of the project would lead to industrizilisation and urbanization of the area. Many agro based units such as oil extraction and flour mills are likely to come up in the area.
- Construction of the project would increase the fodder production by 84,500 tonnes/year which can satisfy the fodder requirements of about 9,260 cattles /year.
- Project will provide drinking water facilities to 124 villages in the command area. The population served will be about 3.20 lakhs (in the year 2030-31).
- Increased water availability will lead to domination of trees like *Prosopis juliflora* *Zizyphus sp.* and *Acacia sp.*
- Introduction of irrigation will raise the moisture content from 0-7% to 15-22%. Under such conditions, there will be increase in the population of earthworms.
- Amongst the, microorganisms the dominant species would be *Aspergillus*, *Fusarium*, *Pencillum* and *Rhizopus*.
- Introduction of irrigation will increase the soil moisture, vegetal cover, and improve the land grading conditions. This will reduce the soil erosion by about 75%. Hence, the pre-project soil loss of 0.16 million tones / year will reduce to 0.04 million tones / year.

This report was approved by the Govt. of Rajasthan. The State Govt. initiated actions related to the recommendations contained in the report. The action taken by the State Govts. on the recommendations of the WAPCOS included the following :

- To review the technical, operational and management parameters so as to make the Project sustainable and environment friendly.
- It is proposed to extend the command through lift irrigation,
- Increase in running days of the canal, differential reduction in duty,
- Increasing irrigation intensity,
- Conjunctive use of water,
- Participatory irrigation management,
- Volumetric delivery of water into storage tanks to water user.
- Setting up of the associations,
- Use of pressure irrigation captive power generation
- The use of unconventional source of power for pumping.

The revised project proposal, was estimated to cost Rs.1446.88 crores, the gross command area was increased to 3.0 lacs ha and the cultural command area to 2.46 lacs ha. This project proposal was approved by the Cabinet Committee vide dated 20.9.1999.

Salient features of Narmada Main Canal in Rajasthan

1.	Gross command area	3.00 lakh ha (Revised)
2.	Culturable command area	2.46 lakh ha (Revised)
3.	Area under irrigation (breakup (a) Kharif	Nil

	(b) Rabi (c) Intensity of Irrigation (d) Capacity Factor	2.46 lakh ha. 70% 0.456
4.	Cost per hectare of gross irrigation area	Rs.48,233
5.	Cost per 1000 cum of water delivered at the head of canal is	Rs.8099

This plan under scrutiny of the Environment Subgroup/ Unit of NCA. 1st phase of discussion for clearing the revised project proposal was held on 17th Aug, 2005. The discussions remained inconclusive for the want of required data. It was suggested by Experts of Narmada Control Authority that corrections in the plan would be required to prevent large scale salinisation of the command area.

IMPLEMENTATION

Construction of Canal Network

For preparation of a detailed revised project report Govt. of Rajasthan invited International competitive bidding during January, 2001 and M/s. TAHAL Engineering Consultant was short listed for the work of framing detailed project report considering all factors including observations / suggestions made by WAPCOS.

However, construction activities for the Narmada Main Canal in Rajasthan were started in the year 1993-94. Construction work (Earth work and Masonry works only) were taken up. The entire work is scheduled for completion by 2009-2010.

Distributories namely Vanak, Jaisla, Balera, Isrol, Ratoda, Kerla, Manki and Bhimguda are taking off from Narmada canal in Rajasthan. Total length of these distributaries is 341.31 km. The earthwork on five distributaries Vanak, Jaisla, Isrol, Ratoda, and Manki has been taken up and during reporting period 297684 Cum earthwork has been done.

The abstract of progress of works in Rajasthan :

Description	Unit	Estd. Quantity (Revised)	Progress upto 3/2005	Progress	% progress
				upto 9/2005	
Nrmada Canal (km 0 to km 74)					
Earth Work	Lm ³	62.27	61.85	63.79	100.76
Lining	Km	74	72.49	72.74	98.30
Structures	Nos.	64	44	46	71.88

Environmental Concerns

As per direction of the Subgroup, the environmental concerns brought out by the studies carried out for the Gujarat area shall also be addressed by the Rajasthan to the extent relevant for the areas in Rajasthan. A revised detailed plan from the GOR on the concerns brought out above such as detailed inventory of the Flora & Fauna, baseline data on Health, Fisheries, Water quality, and consequential detailed Health Plan, Fisheries Development Plan, Water quality monitoring plan, Plan on containing agricultural chemical use etc. with budget provision and monitoring mechanism for the areas in Rajasthan is awaited. Detailed plan for providing drinking water supplies to the areas in Rajasthan and

report on impact management is also awaited. First phase discussion regarding the matter has been held on 17-08-2005.

Clearance given by the MoEF as well as Planning Commission required plantations along the canal bank. As per the communication received GOR dated 13.12.2004 have expressed intention to raise plantations along the canal banks at an estimated cost of Rs.30.56 crores out of which Rs.9 crores is provided for plantation to commence from 2006-07. Detailed plan containing Khasra No., village, the available areas, plantation models, suitability of the sites, choice of species, Nurseries, locations, distances, manpower requirement, delegation of responsibilities etc. is yet to be provided by the State Govt.

It is planned to commence irrigation from June 2006.

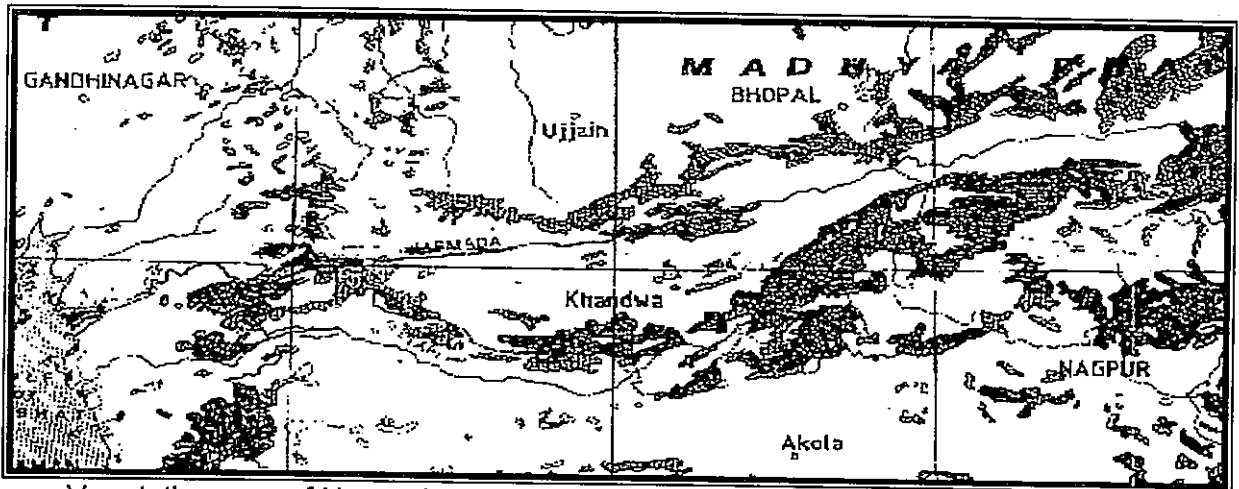
Chapter-5

FLORA, FAUNA, WILDLIFE & CARRYING CAPACITY

The guidelines of the MOEF required 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 by the various states, MOEF issued clearance. A condition of this clearance, as far as it related specifically to the Flora & Fauna, was that the Narmada Control Authority would ensure in-depth studies on flora & fauna needed for implementation of Environmental Safeguard measures. The issues identified with respect to submergence area were identification of endangered species, rare & habitat sufficiency. Accordingly, the rehabilitation of flora fauna action plans were expected to cover the Surveys of flora & fauna in the region going to be affected due to implementation of the SSP with reference to the following

- 1) Gene pool, if any, likely to be affected.
- 2) Details of wildlife habitat in the region
- 3) Measures proposed to rehabilitate endangered species of flora fauna, if any.
- 4) Assessment of the carrying capacity of the neighbouring areas wherein the wildlife would dispose if the scheme were implemented.
- 5) Plan for rehabilitation of endangered flora & fauna.



Vegetation map of Narmada Basin as published by Forest Survey of India

STUDIES / SURVEYS

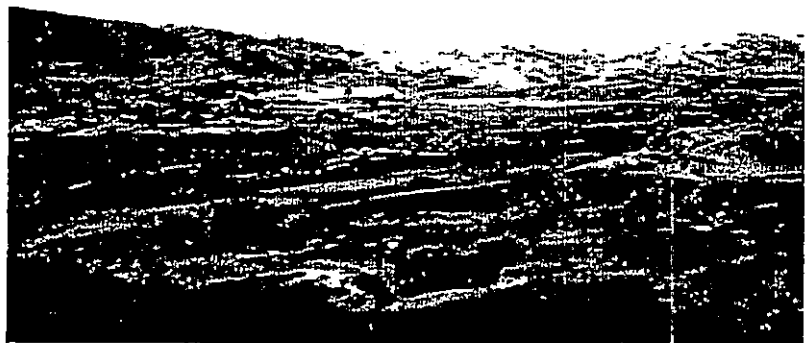
Important survey work included the following:

- 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 studied by the University of Pune (1992-94). Final report is received in NCA.
- 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. The study was conducted by the State Forest Research Institute (SFRI) in Jabalpur and financed by the NVDA. This study was completed & report was submitted in 1994.
- 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 Bhopal, Vikram and Rani Durgavati Universities for GOMP.
- The Central Pollution Control Board, Central Water Commission, the State Pollution Control Boards and the National Institute of Oceanography have collected water quality data.
- 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, by three universities coordinated by Barkatullah University for the NVDA. (1989-92) Study report was available in 1994.
- Studies on Fish Conservation in Narmada Sagar, Sardar Sarovar and it's 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.

RECOMMENDATIONS OF THE KEY STUDIES

Several aspects of the SSP have potential to cause adverse effects on the terrestrial ecology of areas upstream of the dam, principal amongst these were related to changes in the land and water



Narmada during lean flow carries least polluted water

environment including the following :

- Changes in land use pattern including submergence
- Changes in the Micro-climate
- Changes in the aquatic environment in upstream, downstream & also in the command area

Govt. of Gujarat

For areas in Gujarat, the study was conducted by the Department of Botany & Zoology M.S. University, Vadodara. The study concentrates upon ecology & environmental aspects of the submergence & catchment area. The study is actually an extension of the earlier bench-mark study conducted during 1983 which highlighted the positive & negative aspects in the upstream, downstream & command of the Dam and environmental impact statement". The study concentrated upon the study area was about 20 km. On each side of Sardar Sarovar in Gujarat & extended Shoolpaneshwar sanctuary encompassing about 1599 sq.km. area. A chapter of this study contains suggested "Management strategies & action plans to mitigate the adverse impacts. M.S. University, Vadodara conducted EIA & recommended several measures for preparation of Environmental Management plan for the upstream environment. Key recommendations focused amongst others on the following issues.

- Rehabilitation plan for the identified animals and plants
- An independent monitoring and evaluating infrastructure is an absolute necessity for successful execution of these strategies and action plans.
- To undertake development programmes in rural areas in natural watershed unit.
- Institute rational land use planning,
- Undertake reseedling programmes
- Training the manpower for necessary industrial skills and establishing interactive relationships among different units of the state.
- During 4th field visit of ESG it has noticed that project authorities have undertaken various activities in Shoolpaneshwar sanctuary. 25% of plantations within the sanctuary shall include 11 species of local variant and also includes yellow variants of *Butea monosperma*. Eco-development works are also taken up in the buffer zone. Development of medicinal plants have also been introduced.

Govt. of Maharashtra

- For areas in Maharashtra, the study was conducted by Deptt. Of Environment Sciences, University of Pune at the instance of Deptt. Of Environment, Govt. of Maharashtra. The study encompasses the SSP impact areas in Maharashtra only. The study was conducted by School of Environmental Sciences, University of Pune at the instance



of Department of Environment, Govt. of Maharashtra. The study was conducted along the Maharashtra border for a period of 18 months (1992-1994). The area covers roughly 70 Km long and 20 Km wide belt along the southern bank of Narmada River in Maharashtra. The survey was carried out in the submergence and catchment areas of Sardar Sarovar Project. The key recommendations were as follows.

- Management of corridors for shifting of wildlife, several corridors, passing through moderate to good ($0 > 3$) vegetation cover.
- Tree species with high diversity in the region (e.g. *Buchanania lanzan*) should be conserved on large scale, in the form of multi-region seed banks. Some of these seeds from each variety, should be planted in iso-climate regions, with care, if such regions fall in degraded areas.
- Seed bank of the surface soils from low-lying (e.g. valley bottoms) areas were to be used for developing vegetation (natural) in degraded catchment.
- Conservation of soil on slopes and crests and restore adequate soil cover on undulating grounds, through deposition of soil, restoration of degraded lands, formation and retention of plant cover ,improvement of high diversity vegetation cover and soil potential should be exploited and encouraged.

Govt. of Madhya Pradesh

For areas in Madhya Pradesh, the study was conducted by the State Forest Research Institute, Jabalpur ,Madhya Pradesh. The MOU for the study was signed in June 1990 and study was submitted in 1994. The object of the study was to suggest compensatory conservation measures with particular reference to the floral & faunal status. Main focus of attention was to investigate into the impacts of the project on the flora & fauna of the impact area of SSP falling in the state of Madhya Pradesh. The submergence(impact) areas were mainly falling in the three districts called Dhar, Jhabua and Khargone."The study indicate that the forests in the impact area were highly under stocked and their distribution by girth class very erratic the condition of impact area is not conducive to support good wildlife and as such it appears less likely that some corridor would be needed to act as escape route for wild animals. However to provide alternate habitat for the wildlife two sactuaries namely Mathwad (34659 sq. km.) in Jhabua district and Bokrata (3559 sq. km.) in Khargone district were proposed. In the study the carrying capacity of forests of the impact area can not be estimated with any accuracy.The key recommendations included the following:



1. Catchment protection work both engineering and biological coupled with joint forest management. Reestablishment of indigenous forest ecosystem and local diversity.
2. Production of fodder through agro-forestry or silvi-pastoral system through management of village wastelands. Production of bamboo through agro-forestry.
3. Using state-of-the-art technology for devising the management plans for the forests under study area with special reference to protection from fire and stringent control of grazing in the development area.
4. Intensive campaign for forestry-cum-environment awareness, peoples participation backed by development legislation should also be launched.
5. Introduction of quick growing exotics in interest of soil stabilization and meeting the requirement of people in short time.
6. 60 islands which will be found in the reservoir varying in extent from 1 ha to 75 ha should be left undisturbed for study of the process of natural succession and to provide refuge to bird life in the area.
7. The area is stated comparatively scarce in wildlife with no species that was endemic but to provide alternate habitat for the wildlife two sanctuaries namely Mathwad (346.59 sq. km.) in Jhabua district and Bokrata (35.59 sq. km.) in Khargone district were proposed.

ACTION PLANS : Wildlife (Terrestrial)

To ensure that the wildlife conservation measures were implemented effectively in consonance with the requirement of Environmental control in terms of the order of clearance and the relevant acts and statutes, action Plans for the three states were required.

Most of the studies related to flora & fauna were completed only by 1994. State Govts. / project authorities were required to translate the recommendations into action plans. However due to uncertainty that prevailed during 1994 – 2000, until historic judgment by the Hon'ble Supreme Court the submission / revision and implementation of the action plan got delayed. Current status of the submission of the action plan is as follows.

Govt. of Maharashtra :

GoM prepared plan for buffer zone plantations to provide shelters to the Wildlife. It was planned to take-up plantations in 1500 ha. area. However programme could not start in time due to lack of resources, but submergence commenced during 1994, generating impacts. Recently it was reported that plantations were started and during 2005-06 an area of 218 ha. was planted up.

Govt. of Gujarat

Following the preliminary report of M.S. University, Vadodara 1992 GoG enlarged the Shoolpaneshwar sanctuary located near the dam site in Gujarat. This sanctuary was earlier known as Dhumkhal Sloth Bear Sanctuary whose area was 153 sq.kms. The area of the sanctuary was



enlarged initially up to the shore line of the reservoir to enable animals of the sanctuary to have access to the fresh water. Later the area of the sanctuary was further enlarged to cover up a total area of about 607 sq.kms. GoG was expected to draw-up a plan for management of sanctuary in line with recommendations of the study groups. This is awaited. However GoG is reporting the progress of works undertaken under normal programme of the sanctuary management. Implementation of the recommendations made by the Committee which visited the sanctuary areas is awaited.

A detailed action plan on other recommendations of the study groups is awaited from the Govt. of Gujarat.

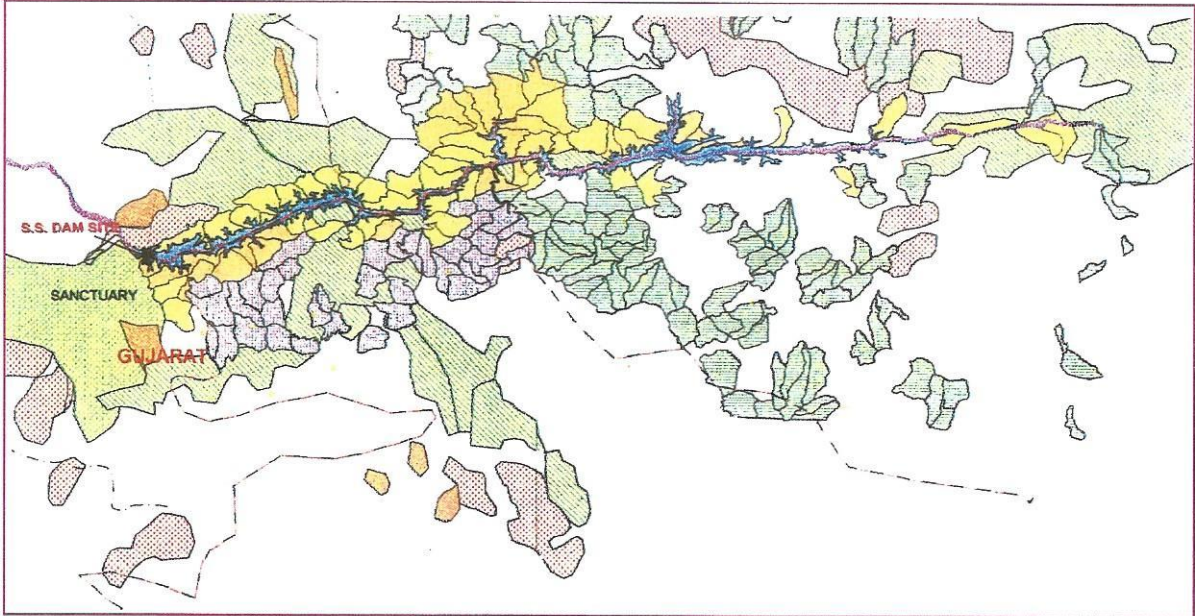
Govt. of Madhya Pradesh

Following the recommendations of the EIA study report and by the Wildlife Committee constituted by the Govt. of M.P. GoMP proposed Social Forestry Plantations for absorbing the impact of submergence and notification of two sanctuaries in the vicinity of the impact zone of the Sardar Sarovar Project for rehabilitation of the Wildlife as per details given below:

1. To cater to increase requirement of timber, fuel-wood etc., social forestry programme at an estimated cost of Rs.5.0945 crores chargeable to SSP (price level of 1999-2000) with escalation of 9% pre annum was approved by the State Wildlife Committee. It was reported that plantations have been taken up mostly on the private land. Implementation of the recommendations made by the Committee which visited the areas are awaited.
2. Declaring the Island being formed during progressive filling of the reservoir as wildlife habitat. Progress is awaited.
3. Studies recommended creation of two wildlife sanctuaries namely Mathwad (34.659 sq. km.) in Jhabua district and Bokrata (35.59 sq. km.) in Khargone district. The State Wildlife Committee had not accepted these recommendations during its earlier meeting (July, 2000). However, during its meeting convened recently (November, 2002) reconsidered its decision and recommended creation of Mathwad sanctuary (at an estimated cost of Rs.21.76 crores) as per recommendation of SFRI but instead of Bokrata Sanctuary recommended Kathiwada Sanctuary (at an estimated cost of Rs.13.97 crores) a little away but within the same ecological zone.

GoMP also proposed formulae for sharing of the cost of the development of all the sanctuaries and National parks, proposed to be developed in the basin from ISP to SSP, in the same proportion as agreed for dam and appurtenant works for ISP and SSP. Environment Sub-group recommended that proper EIA should be conducted before taking up suggested measures. In pursuance, it was reported that NVDA is in touch with Wildlife Institute of India, Dehradun and TOR is being negotiated.

The Management map of the SSP showing status of SSP Environment is presented below . Light Yellow and green colored subwatersheds (high and very high priority)were treated under Phase-1 ,The blue (Maharashtra) and green(Madhya Pradesh) coloured subwatershed of high and very high priority categories are being treated under Phase-II programme. Degraded forest areas within the impact zone are shown with purple and forests of density above 0.3 in green colour.



Aquatic Environment :Fisheries

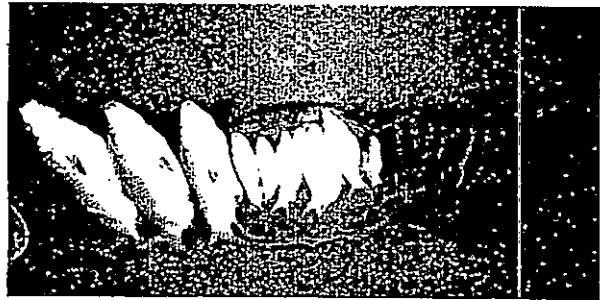
Action plans

Three State Govt.(s) submitted the fisheries development plans, which are 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 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 was 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 hydro-biological 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. This plan was again revised by GOG in August 1997 & resubmitted to NCA during November 1997.
- A Note on SSP: Preparation of Environmental Work Plan for Fisheries Development in Maharashtra, revised plan of 2004 was submitted by the Govt. of Maharashtra. This plan lacked the concerns raised by the Environment Sub-group from time to time. A

detailed revised plan addressing the concern raised by the Environment Sub-group and the guidelines on conservation & development of fisheries is awaited .

- The original 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. Some more studies have been proposed by GOM through CICFRI. Subsequently, the state governments have revised their plans with a view to address to 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.
- GOG also revised their plan by end 1994.



The plan contained four volumes covering upstream, downstream & command areas. In view of the progressive impoundment which commenced in March 1994. NCA has constituted an expert group to lay down the guidelines for conservation & development of fisheries & its ecosystem. The plans submitted by state governments are under scrutiny of this expert group. According to 41st meeting of ESG, a concept paper on fisheries development is being prepared by IIM(4) for its implementation.

Implementation

Guideline have been approved for development and conservation of Aquatic Ecosystem and to advise the state executive agencies for follow-up action. Test fishing in the dyke of SSP was carried out. The results were as follows :

Particulars	Sarovar
Craft	18 ft. LOA tin Boat Five Units
Gear	Gill Nets 9 Kg/ Unit of 8, 10 & 12" Mesh Size. 30 Ft. deep and 250 Ft. long
Duration	13 days
Catch (Kg)	142 Nos - 685 kg.
Species Composition	Catla - 586.0 kg. (85.5%) Rohu - 46.5 kg. (7.0%) Mrigal - 10.5 kg. (1.5%) Mahseer - 0.0 Kg. (0.0%) Silver Carp - 21.0 kg. (3.0%) Misc. - 21.0 kg. (3.0%)
Average catch per boat per day	10.54 Kg / boat / day
Average Landing price @ Rs.25/Kg.	Rs.263.46 / boat / day
Average income to fishermen	Rs.87.82/ person / day

On-going Fisheries Activities in the Sardar Sarovar - Gujarat

Some fisheries development activities are already going in the Sardar Sarovar from the year 1992 onwards. From 1993-94, these programme received the financial support from the Sardar Sarovar projects. These activities were as follows:

- Seed Stocking in the Sardar Sarovar
- Development of Rearing space for Fish Seed Production
- Mangrove Plantation Programme.

Till the December, 2004 State Fisheries Department and other Fisheries Development Agencies have stocked 421.08 lacs fingerlings / yearlings in the main reservoir as well as dykes of the Sardar Sarovar as detailed below :

Year	Fingerling (lacs)	Yearlings (Lacs)	Stocked in
1990-91	2.02	0.00	Dyke 3 / 4
1991-92	2.38	0.00	
1992-93	1.69	0.00	
1993-94	2.40	0.00	
1995-96	230.66	11.48	Reservoir
1996-97	53.92	0.00	Reservoir
1997-98	59.36	0.00	Reservoir
1998-99	12.61	0.00	Reservoir
1999-00	0.00	5.80	Reservoir
2000-01	0.00	2.93	Reservoir
2001-02	0.00	12.81	Reservoir
2002-03	0.00	23.02	Reservoir
Total (90 – 91 to 02-03)	365.04	56.04	Total = 421.08 Lakh

There is a provision to create rearing space for seed rearing in the Sardar Sarovar and the funds have been provided by the SSP.

The total amount for the rearing ponds is at present Rs.64.36 lakh. The site selected for the rearing ponds initially in the reservoir premises was found to be unsuitable on account of greater permeability of the soil. Hence, another site has been located in the village of Timbi (Nanded Taluk) of Bharuch district, in the Survey No.303. The soil samples have been sent for analysis to decide the suitability.

The project affected persons on the periphery of the Dykes / Reservoir were being trained for capture fisheries by the SSNNL, by providing fishing implements (like small tin boats and gill nets) through appropriate funding agencies, with the support of the SSNNL. A fisheries co-operative was registered at Panchmuli (Nadod Taluka) in 1998, under the title, Panchmuli Narmada Jalashay Vistar Adivasi Matsyodyog Limited of 102 fishermen with a share capital of Rs.17,000. The membership generally consisted of the project affected people of Panchmuli and nearby areas. Accordingly 26 persons were identified by the Asst. Director of Fisheries, Narmada District and they were trained in the fishing methodology/ capture fisheries by the Fisheries Department. The cost of the training was borne by the Fisheries Commissionerate under the ongoing training schemes.

Impoundment in SSP commenced with the closure of construction sluices during Feb 1994. The impoundment has progressed with the attainment of height of E.L. 110.64m resulting in much larger water spread, requiring a number of sequential actions, in accordance with pre & post impoundment action plan suggested by the CICFRI to safeguard the aquatic environment is awaited

Felling of the Forest from the submergence area

Plans for felling of trees in the forest area coming under submergence to avoid the possibility of animals being trapped in the submergence area, prevention of Eutrophication, degradation of water quality, proliferation of disease vectors etc. were required for the areas in Gujarat, Maharashtra & Madhya Pradesh. Forest areas were required to be taken up for felling in a systematic manner to avoid any possibility of the trapping of the wildlife. Forest areas were taken up for felling in a systematic manner to avoid possibility of animals getting trapped during progressive filling of the reservoir and for prevention of Eutrophication and degradation of water quality.

Madhya Pradesh

Felling in entire forest area coming under submergence is completed except 23,318 trees in non-forest area up to FRL as shown below. In addition, coppice crop in the forest area felled earlier shall also require felling

Districts	Forest Area			Non Forest Area		
	Total No. of trees to be felled	No. of trees felled	Balance	Total No. of Trees	No. of Trees Felled	Balance (No. of trees to be felled)
Jhabua	38,234	38234	Nil	3112	3112	Nil
Dhar	Nil	Nil	Nil	11,296	4380	6,916
Badwani	14,771	14,771	Nil	16,530	15,287	1243

Govt. of Gujarat

In Gujarat the forest area diverted was 4165.91 ha in addition 356.78 ha was diverted earlier. Thus in all 4522.69 was utilized for the SSP. Of this 4152.68 ha of the Distt. Vadodara and Bharuch required felling. The felling in Gujarat was reported to be completed much earlier. However coppice crop in the forest area also required felling. The committee of the subgroup which visited the area observed that felling of only 30% of the teak coppice was completed and that secondary species awaited felling. Felling from the balance areas is yet to be taken-up.

Govt. of Maharashtra

In Maharashtra the forest area of 6,488 ha was diverted for submergence, of which 3,157.03 ha was forest and the balance area was under river bed, nallah etc. Out of this 2288.63 ha is lying between 90 m & up to four meter below the FRL. The progress of felling of Trees upto FRL 134.68 m. is as follows:

	Akkalkua Tehsil		Akrani Tehsil		Total		
	Submergence Area (ha.)	Progress (ha.)	Submergence Area (ha.)	Progress (ha.)	Submergence Area (ha.)	Progress (ha.)	Balance (ha)
Between 90-100 m	220.14	140.74	232.53	232.53	452.67	373.27	-

Between 100-110 m	239.72	157.10	515.73	14.11	755.45	728.45	27
Between 110 – 110.64m	Areas not marked						Completed
Between 110-121 m	153.25	completed	460.05	completed	613.30	613.3	completed
Between 121-134.68m	117.82	Awaited	349.39	Awaited	467.21	432.96	34.25ha. is being felled.

Summary of Status of Environmental Planning: Wildlife

	Gujarat	Maharashtra	Madhya Pradesh
▪ Preliminary Surveys	Completed	Completed	Completed
▪ in-depth Studies / surveys	<ul style="list-style-type: none"> ▪ Completed , ▪ no endemic endangered species. ▪ Habitat detailed 	<ul style="list-style-type: none"> ▪ Completed, ▪ no endemic endangered species ▪ Habitat detailed 	<ul style="list-style-type: none"> ▪ Completed, ▪ no endemic endangered species ▪ Habitat detailed
Action Plans :			
• Migratory corridors	<ul style="list-style-type: none"> • Not relevant • Degraded areas contained little or no wildlife of significance / migratory in nature. • Coppice crop is to be removed. 	<ul style="list-style-type: none"> • Local migration corridors suggested. Plantations initiated. 	<ul style="list-style-type: none"> • Not relevant • Local migration in search of shelter & food requiring no specialized corridors.
• Sanctuary(s) within submergence zone	No	No	No
• Wildlife conservation measures (improvement in carrying capacity) in adjoining forest(s)	Implementation of the recommendations of the study group awaited.	Buffer zone plantation proposed. 218 ha. plantations carried out during 2005-06.	Creation of two sanctuaries proposed, besides social forestry plantations. TOR for EIA is under negotiations.
• Implementation	<ul style="list-style-type: none"> • Awaited. 	<ul style="list-style-type: none"> • Felling of trees progressing • Rehabilitation measures awaited 	<ul style="list-style-type: none"> • Social forestry plantation under implementation by the State Forest department under its programme. Funds are to be provided by the project authority. • Felling of trees progressing

Summary of Status of Environmental Planning: Fisheries

Requirement by MoEF / Sub-Group	Recommendation by CICFRI	Gujarat	Maharashtra	Madhya Pradesh
Gene pool, if any, likely to be affected.	8 species considered vulnerable	Plan included Measures for vulnerable species like Hilsa ilisha, Macrobrachium rosenbergii etc, taken	Revised plan received required revision .	Plan to be revised to include measures for vulnerable species like Mahaseer, Rita pavementata etc
Details of wildlife habitat in the region	Breeding and habitation places to be identified.	Existing plan included this aspect		Yet to be initiated.

<i>Measures proposed to rehabilitate endangered species of flora fauna, if any.</i>	<i>Measures for rehabilitation of endangered fauna delineated</i>	<i>Hatcheries established & reservoir was being stocked</i>	<i>Stocking of the reservoir initiated</i>	<i>To be included in the revised plan , it is awaited.</i>
<i>Assessment of the carrying capacity of the neighboring areas wherein the wildlife would disperse if the scheme were implemented</i>	<i>Certain studies on water quality, prey predator relation, carbon nitrogen ratio etc were suggested</i>	<i>Results of water quality studies upstream, downstream & estuary available with CICFRI & Pollution Control Board were to be compiled .Implementation of recommendations awaited.</i>	<i>Studies entrusted to CICFRI yet to be completed and required to be translated into action plan.</i>	<i>Limnological studies were completed. Long term hydro biological monitoring was to cover, identified parameters for water quality monitoring. This is expected to be cover in the revised action plan.</i>
<i>Plan for rehabilitation of endangered flora & fauna.</i>	<i>Draft Guidelines are proposed to be finalized during the meeting scheduled to be convened on 8.11.2004 under the Chairmanship of Jt. Secretary, Fisheries, MoA, Gol</i>	<i>Existing plan to be revised</i>	<i>Existing plan to be revised</i>	<i>Existing plan to be revised</i>

Most of the suggested actions as presented in the table above awaited implementation.

Summary of the status of felling

	Requirement	Govt. of Gujarat	Govt. of Maharashtra	Govt. of M.P.
Felling of trees	Entire tree growth including coppice crop from the submergence area should be removed before commencement of impoundment Final reports assured for submission by March, 2005.	30% of primary species removed. Removal of secondary species and balance growth yet to be removed. Completion reports awaited.	Completed upto 110 MRL except 27 ha. work progressing for 121.92m RL. Completion reports received..	Completed in Forest areas Reports on non forest area assured. Completion reports awaited.

Chapter - 6 SEISMICITY & RIM STABILITY

The NWDT Report Vol.II, 1978 discussed the Geological and Seismological Aspects of Sardar Sarovar Dam. The Environmental Appraisal Committee had also examined 'seismicity' as one of the issues, based on the details supplied by project authorities. The environmental appraisal of SSP was in context of the MoEF guidelines for EIA of RVP, in existence since January 1985. These guidelines, included 'likely impact of reservoir loading on seismicity'. Accordingly, while describing the non-forestry activities the impacts expected on geological factors (e.g. seismic impact of reservoir loading) are required. The subject 'seismicity' was considered under environmental concerns related to 'likely impact of reservoir loading on seismicity'.

Seismo-tectonics at the Sardar Sarovar Dam(SSD) location

The seismo-tectonic set up in the Narmada basin in the vicinity of SSP and Reservoir comprises a crustal area in Deccan-Trap province. The area lies within the Indian peninsular plateau, where tectonic stresses/strains are not significantly large and which is considered as a stable continental region (SCR) within the Indian plate. The Indian plate boundary lies near Himalaya, where subduction of Indian plate is continuing under the Eurasian plate. Due to this postulated plate boundary movement, large earthquakes can occur there. Intra-plate discontinuities do exist in the Indian plate, like all plates. Due to the north-eastwards continental drift, strain build-up caused within a plate gets dissipated on such discontinuities, causing intra-plate earthquakes, which are of relatively smaller size. Conventionally in SCR, a value of magnitude 6.5 has been considered as the upper limit of even the 'native' earthquake. Following large events have taken place in the SCR during the last 10 years.

The Latur earthquake of 30 September, 1993 with magnitude of 6.4 was a significant intra-plate event within the postulated range of events in the geo-tectonic set up. The Lower Tema dam located about 15 km from the epicentre, did not suffer any damage due to the earthquake. The Jabalpur earthquake of 22nd May, 1997 with magnitude 6.0 was similarly within the probable range of events. Bargi masonry dam of 69 metres height, located 25 to 30 km away from the Jabalpur earthquake epicentre, did not suffer any damage due to it. The Bhuj earthquake of 26th January, 2001 with magnitude of 6.9 located much closer to the western limb of the plate edge, was disastrous from loss of life point of view. But it was located about 400 km away from the SSD.

Reservoir Induced Seismicity

RIS is caused by waters seeping into lower discontinuous rock features, lubricates the clayey or weak material occurring in such features and makes them prone to slip or slide against each other, triggering release of accumulated strains, simulating relatively small magnitude earthquakes. their magnitude is smaller than that considered in design, which takes care of the native seismicity, dictated by the geo-tectonic set up. Loads imposed and stresses caused on foundations even by very large dams and reservoirs are relatively insignificant as compared to the seismo-tectonic strains that cause earthquakes and the

released forces and stresses that cause ruptures in rock-mass at the deep underground focal locations of the earthquakes.

STUDIES

The likelihood of occurrence of earthquakes; their duration, magnitude, intensity; and vibrations; destabilising forces, accelerations caused by them are studied probabilistically and deterministically both, by applying scientific processes laid down in sciences/applied sciences of geology, tectonics and seismology. They together indicate the seismic status or 'seismicity' at the location of a dam and the reservoir area to be created behind it. Structural and civil engineering design methods take into account such forces and ensure design and construction of dams and reservoirs to withstand them without significant distress, for their life time.

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. Volume 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.

The data on earthquake occurrence in peninsular India show that the MCE can have a maximum magnitude of 6.5. The fault and tectonic lineaments of relevance for SSP are as follows:

i)	Rajpardi and associated faults forming the Eastern boundary of Cambay-basin West Coast seismotectonic province.	shortest distance to the lineament from dam site is 55 km towards West.
ii)	Barkhadi-Barwani fault.	Shortest distance from site is 110 Km East.
ii)	Piplod fault.	Shortest distance 12 Km South of dam site.
iii)	Tilakwada-Bardoli fault.	Shortest distance 17 Km North of dam.

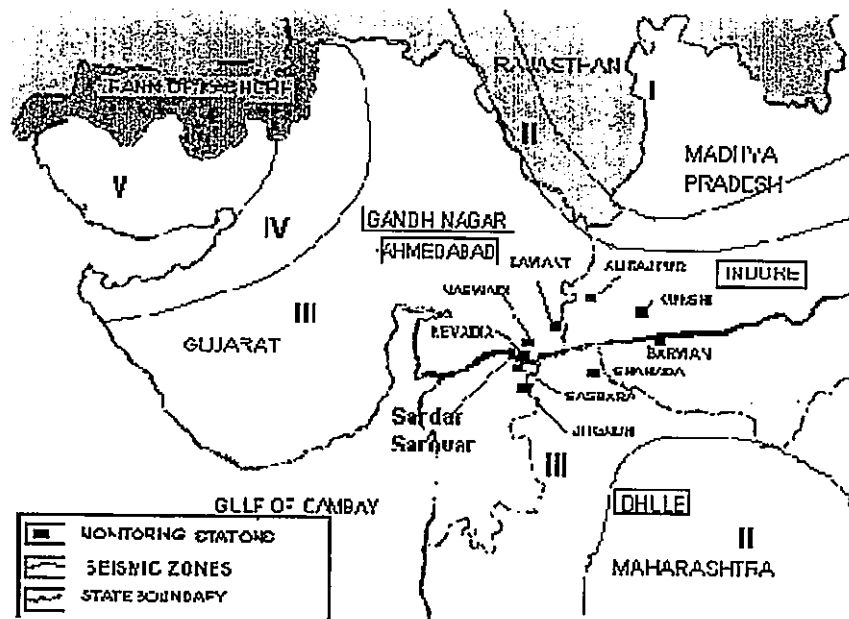
While It is plausible to apply the earthquake with Richter magnitude 6.5 only to cases (i) & (ii) above which are the only seismogenic lineaments that are capable/active, a 'worst case scenario' of a Richter magnitude 6.5 earthquake has been postulated at a epicentral distance of 12 Km with a depth of focus of 18 Km in order to have conservative estimates of ground motion characteristics for design purposes. It has been concluded that reservoir impoundments may in some cases, trigger earthquakes where tectonic deformations already exist in the geological structures.

IMPLEMENTATION

The threat of reservoir-induced seismic activity by the SSP is extremely low. The dam has been designed to accommodate the Maximum Credible Earthquake (MCE) Richter Mag. 6.50 and as it is established that the levels of Reservoir Induced Seismicity have never exceeded 6.3.

The SSP is located In a zone where moderate seismic activity has been recorded in the past. The adoption of earthquake resistant design parameters has, therefore, been an essential part of the project design. These parameters are governed by a national standard which applies to all new dam and engineering structures and classifies the country into different zones according to the frequency and magnitude of seismic events.

To minimise risks to the dam, seismic design coefficients have been adopted for preliminary design followed by dynamic analysis to withstand the maximum predicted earthquake in the seismic zone occupied by the proposed dam structure. Further all the nine seismic monitoring stations have been established to provide R&D Inputs for future design philosophy.



Rim stability refers

to the competency of reservoir base rocks to hold water. Under stable conditions, there should be no significant water loss to ground water within or out of basin. The Geological Survey of India carried out an in-depth study of the reservoir rim in Madhya Pradesh and Maharashtra which concluded that the reservoir rim is stable.

The various recommendations for modification of the dam design which have all been implemented 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 riverbed.

The Government of Gujarat has identified 9 locations for the installation of seismic monitoring stations, 4 each on either side and one at the downstream of the Sardar Sarovar reservoir, out of a total of 9 stations, 3 are in M.P (Alirajpur, Kukshi and Badwani 1 in Maharashtra (Shahada) and 5 are in Gujarat (Kawant, Naswadi, Kevadia, Jitgaon and Sagbara). Construction and instrumentation installation work is completed at all the 9 seismic monitoring stations.

The seismological observatory at Kevadia Colony is in operation since 1973. The data of Kevadia Colony seismograph station for the period from 1973 to 1984 was analysed by CWPRS, Pune and GEAR, Vadodara. Also, Micro-earthquake surveys around Navagam Dam were carried out in the year 1980 by Dept. of Earthquake Engineering, University of Roorkee. The Micro-earthquake activity was found to be of low level and was generally scattered in the Narmada basin.

The seismological network with latest instruments was established in the year 1989. After the installation of new seismic instruments at new sites, local micro-earthquakes as well as global earthquakes are being recorded. The events which are recorded at network are analysed and located using the computer program 'FASTHYPO' incorporated with seismic Data processing and Analysis Computer (DAC - 300). The progress of implementation is illustrated in Table below:

Status of implementation of seismicity aspects

ACTION	STATUS
▪ Dam design modifications	Completed
▪ GSI (Nagpur Division) Rim Stability studies	Completed
▪ Tracer Studies by CWPRS	Reports submitted.
▪ Monitoring stations	Rim stability studies have completed and well equipped 9 monitoring stations along the periphery of the reservoir are functioning.
▪ Results of analysis of data from monitoring stations.	Received, analysed by the dam safety review panel of the SSP during October, 2001. To be updated periodical.

Summary of the remaining works :

o

The project organisation is modernising the monitoring equipment for natural seismicity at the SSD and around the reservoir area. It was suggested by the Environment Sub-Group that

1. In order to carry out monitoring of the earthquake activity before, during and after the reservoir is created, around the reservoir for identification and projection of RIS for future, a network of nine seismographic stations was set up in the year 1989-90. As the instruments have become old, a set up to modernise them was to be expedited as per control measures in place.
2. It was to be ensured that data was collected by the experts and analysed for appropriate action regularly.
3. Periodical reports on seismic activity prepared by the field formations and submitted to the design organisation should be considered by the Dam Safety Review Panel. Recommendations of the Dam Safety Panel should be acted upon under intimation to the Environment Sub-Group. Last review by the Dam Safety Review Panel as reported was during 2001. Further updates are awaited.

Chapter - 7

HEALTH ASPECTS

The environment clearance order by MoEF refers to Health Aspects of project area people as one of the issues addressed by the Environmental Appraisal Committee (EAC) of River Valley Project (RVP). The EAC and NCA advised control of malaria and potential breeding sites for malaria vectors, besides monitoring the incidence of other water-related and waterborne diseases, with a view to prevent their establishment. Accordingly, each State was expected to take necessary measures to minimize the risk of these diseases that may result from implementation of the project.

- The availability of adequate water for drinking, washing, domestic, agricultural and industrial use will contribute to improve the health of people, due to better hygiene and nutrition.
- Drinking water drawn from very deep wells in water scarce area, may have high content of fluorides which is known to cause dental and skeletal fluorosis. The rise of water tables and also provision of safer water to such communities after better availability may prevent this disease.
- There are however, health risks resulting from improper control, transport and storage of water resulting in the occurrence of pools of standing water, during construction and operation of the reservoir. This may provide breeding sites for disease vectors.
- The epidemiological imbalance resulting from altered ecology and migrant labor and the diseases carried by them, may adversely affect the local population, which may have low immunity to such diseases.

Plans and their meticulous implementation are needed to provide health facilities and for controlling the disease vectors. These plans were not in place at the time of grant of clearance. Therefore states were directed by the statutory provisions for survey / studies, preparation and implementation of these plans.

Health Provisions for the SSP:

Health provision in India is defined by the National Health Policy (NHP) and national disease programme such as the National Malaria Eradication Programme (NMEP). The NHP entitles access to medical facilities to all Indians, the number and distribution of which is determined by the local population density. The NMEP was developed, as a nation-wide strategy to combat the spread of malaria with regard to SSP all the three State Governments will integrate development of new facilities with proposals already made under the NHP and NMEP. Such integration will avoid duplication, maintain parity within the project area and provide better access to health care than would otherwise be achieved.

In addition to the general obligations of the State under national policy, a specific requirement for the SSP contained in the environment clearance order of GOI was that, that plans for the provision of health facilities to workers and residents of the affected areas should be prepared. Each State should take necessary measures to minimise the risk of malaria, filarial, schistosomiasis and other diseases associated with water that may result

from implementation of the project Preparation of an Action Plan for the surveillance and control of malaria was also stipulated.

STUDIES & ACTION PLANS

The two main potential sources of health impact associated with the reservoir and Irrigation projects are as follows:

- The occurrence of pools of standing water, during construction and operation of the reservoir, may provide breeding areas for disease vectors:
- Immigrant construction workers may bring with them diseases or parasites, to which the local population may have low immunity.

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 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 Commissionerate of Health, Medical Services and Medical Education (SCHMS), 1986.
- Health Statistics< GOM, 1987. The State Department of Health, Report on the health profile of 33 project-affected villages in Dhule district, Maharashtra.
- Health Statistics 1982-84, GOMP. This study published by GOMP in 1985 & updated in 1994.
- 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 incidence of malaria in India, amongst others, by the Malaria Research Center (MRC).
- Revised Plan by GOM, 1995.
- Revised Health Plan by GOG, 1996.
- Draft Health Management Plan by GOG, 1997.
- Epidemiological Surveillance Studies Phase-I by GOM, 1996.
- Epidemiological Surveillance Studies by Gandhi Medical College, Bhopal
- Epidemiological Surveillance Studies Phase-II by GOM, progressing.

Status of Implementation of Actions for Public Health

Studies on the disease profile in the SSP region and past experience with major water resources projects suggested that health Action Plans for the project should focus on the following:

- + Provision of health care for displaced people and immigrant workers;
- + Control of malaria and potential breeding sites for malarial vectors;

- + Monitoring for the incidence of other water-related and waterborne diseases with a view of preventing their establishment.

Management of the potential health impacts of the SSP will focus on the exclusion and/or control of the disease vectors which spread 'water-based' and 'water-related' diseases.

- The available information and studies undertaken reveal that the common diseases in the Narmada Basin are malaria, scabies, dysentery and diarrhoea. Schistosomiasis will not constitute a serious health issue in the area. Filarial though has been reported in Surat, about 100 km from the dam site, was unlikely to spread to the project area.
- The incidence of hygiene-related diseases like scabies would be reduced by better water availability. Similarly fluorosis may also decline with availability of safe water to areas having drinking water with high fluoride content
- Drinking water proposed to be made available will need adequate treatment and bacteriological monitoring to ensure that the incidence of gastroenteritis, diarrhoea or other water borne diseases remains under control.
- Malaria and other mosquito vector borne diseases, which are at present declining may be adversely influenced due to flow and spread of water in larger area. To avoid this, appropriate management of water and continuous vector and disease surveillance has to be maintained.
- The studies so far indicate the morbidity as point / period prevalent which may serve at best as a baseline . Distinct disease trends vis a vis the impact of the project in its various stages, can not be precisely arrived at from the available information. The induction of epidemiological variables (agent, host and environmental) after commissioning of the project will depend on multiplicity of factors which will influence the disease patterns from time to time. This clearly highlights the need of continuous surveillance of the diseases and epidemiological variables, rather than short-term studies.
- The study by MP is deficient on status of Malaria and other vector borne diseases.

Gujarat

An Initial work Plan for Environmental Effects: Sector Public Health for the Command Area of Gujarat was drawn up in 1986 by the NPG . This plan covers villages within a 10 km radius of the reservoir including resettled populations and makes provision for the monitoring, surveillance and control of malaria. The 1986 plan is under implementation with certain modifications and additions.

The principal objectives of the work plan are:

- To provide for systematic and continuous monitoring of the health profile of the project area;
- To provide suitable Infrastructure for health provision in the project area.

The plan also outlines actions for the surveillance and control of malaria. The main components of the plan area summarised below.

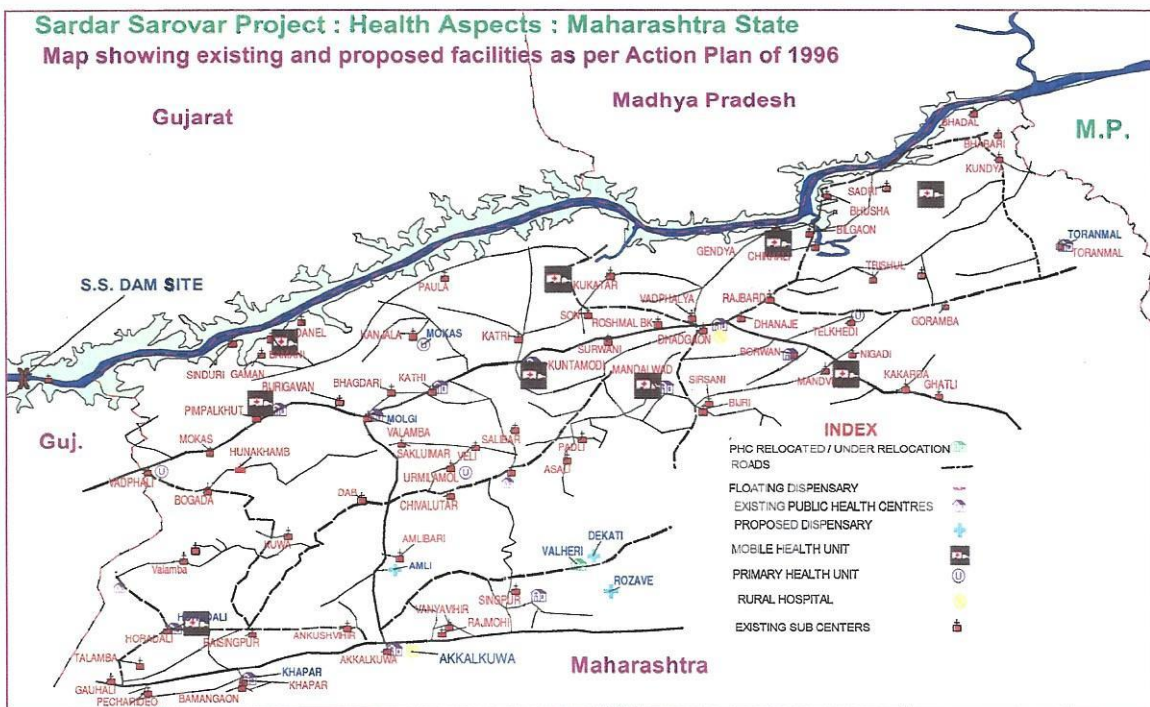
- ✦ Establishment of hospital at Kevadia.
- ✦ Strengthening of laboratory facilities including establishment of mobile unit.
- ✦ Provision for laboratory technicians in existing public health centers (PHC's).
- ✦ Expansion of malaria treatment depots.

Proposal to establish Urban Malaria Scheme for centres over 40,000 (anti- larval operations) not currently covered. Strengthening of state level health organisations to ensure monitoring of malaria, filaria, dengue and encephalitis, strengthening of district level health organisations for monitoring or implementation, residual insecticidal spraying operations are included in the plan.

Maharashtra

GOM submitted an Initial Work Plan for Public Health Sector In 1987, which was modified and resubmitted for consideration in 1991 and further and updated in 1992 & 1993. The work plan was based on the state health department survey of Dhule District. The principal objectives of the plan were as

- ❖ To monitor closely health conditions in Dhule district
- ❖ To provide facilities for carrying out this monitoring
- ❖ To adopt precautionary measures against the spread of diseases
- ❖ To be prepared to combat epidemics that might arise.



GIS Map of the impact areas district Dhule, Maharashtra showing health facilities to be provided to mitigate negative impacts arising out of submergence caused by SSP.

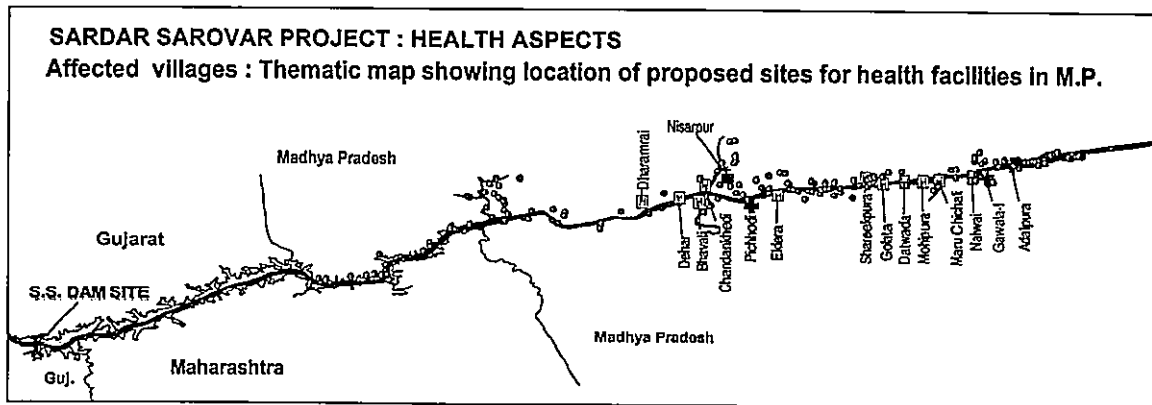
The work plan also contained provisions for the strengthening of state and district health facilities in existing villages and in resettlement areas. The provisions included the establishment of a monitoring and laboratory cell at the Rural Hospital and strengthening of

the existing Primary Health Centre. It contained full descriptions of the likely costs and staffing requirements of these measures. District Health Officer, Nandurbar Distt. In Maharashtra submitted a copy of the activities during March 2006, undertaken towards general obligations of the health department within and outside impact areas.

Madhya Pradesh

An initial Work Plan for the Public Sector was submitted to the NVDA by the state health department in 1988. This plan included a summary of existing health profile in the submergence villages and discussed the likely impacts of the SSP. The plan contains specific provisions for:

- ❖ Strengthening of health facilities already in place under the NHP and Minimum needs programme of the Seventh Five Year Plan;
- ❖ Establishment of a Health Monitoring Cell;
- ❖ Strengthening of health centers for construction workers;
- ❖ Establishment of district organizations for malaria control established of the NMEP.



An extension to the MP Health Plan was published by the NVDA in January 1990 and was revised and re-submitted in 1991. This report provides additional detail concerning the provision and training of health care staff, numbers of specialist staff required, funding and responsibilities for management.

In addition to the State Health Plan, a Memorandum of Understanding was signed between Gandhi Medical College, Bhopal and the NVDA to provide further arrangements for the monitoring of malaria and other diseases. This memorandum included provisions for the following:

- ❖ Study of mosquito vectors in the Narmada area:
- ❖ Comparison of SSP with other similar project situations and analysis of lessons learned:
- ❖ Collection and analysis of time-series-data on disease incidence:
- ❖ Recommendation of health promotion and disease preventative measures in the SSP area.

GOMP has submitted revised Health Action Plan of August 2003. In addition to earlier provision major emphasis is given on :

- Problems of communicable diseases.
- General Public Health Problems for settlement.
- Monitoring, supervision and executing the actions (forming monitoring cell).
- Provision of preventive and curative services & strengthening of existing facilities.

The plan mainly includes :

Establishment & monitoring cell at NVDA, Water testing, training for water sampling, mobile Public Health Laboratory & its operation, time frame and financial implications, Action by P.H.C. Department, promotional activities on Health Education etc.

Recommendations of the Expert Committee on Health which examined the adequacy of the proposed action and their implementation on the ground are required to be implemented at the earliest. The current status of the implementation of recommendations is as follows.

	Mitigation measures	Gujarat	Maharashtra	Madhya Pradesh
1.	Present status of the waterborne disease in the areas	Completed	Completed	Completed
2.	Screening arrangements proposed for the work force;	Completed	Not relevant	Not relevant
3.	Epidemiological Surveillance studies	Completed	Phase-II study entrusted to Govt. Medical College, Dhule.	Completed
4.	Present status of the health delivery system Preventive measures proposed to control the incidence of water-borne diseases	Action plan under implementation	Revised Action plan awaited	Action plan revised Aug. 2003
5.	Reinforcement proposed to the existing health delivery system			
	• At project site	Completed	Not relevant	Not relevant
	• On periphery of the reservoir	Awaited	As per existing Action Plan incomplete.	As per existing Action Plan incomplete.
	• At RR sites.	Progressing	Progressing	Progressing
	• In the command area.	No progress reported.	Not relevant	Not relevant
6.	Surveillance of diseases	Progressing	Inadequate and weak.	No progress reported.
7.	Standard formats available with the NICD to be used for diseases surveillance purpose.	Progressing		Inadequate and weak.
8.	District health Authorities should be enlisted to monitor compliance with	Progressing	Awaited, two water quality labs working , four	Details Awaited

	guidelines for malaria control and drinking water supply areas under the national directives.		being operationalised. 77 Pada Workers appointed to perform house to house disinfections with the help of Chlorination.	
9.	Progress and Status of the National Programmes under implementation should also be reflected in the reports on the general status of the diseases surveillance and health delivery system in the Project areas.	Progressing	Awaited	Details Awaited
10	Regular Entomological monitoring is suggested for alterations in ecology of the area due to irrigation / impoundment.	Progressing	Awaited, preventive measures planned.	Being carried out with the help of MRC. Reports awaited.
11.	It is suggested that sanitary latrines be established at the R&R sites and Villagers may be educated to use these to keep the cases of Gastro diseases in check.	Progressing	Awaited Health Department is performing IEC activities to educate the people. Details awaited.	Progress Awaited
12.	It was observed that at many places the norms prescribed by the Ministry of Environment & Forests for disposal of the hospital waste were not being adhered to and therefore it was suggested to follow the prescribed norms.	Progressing. Implementation awaited	Awaited	Details Awaited

Implementation

A) Govt. of Gujarat:

At Project Site:

There is a dispensary at SSP dam site run by M/s Jai Prakash Associates. It has regular Medical Officer and other staff to diagnose and treat the malaria patient. It was reported that an expenditure of Rs. 32.48 lacs was incurred on repair and maintenance of the Kevadia Hospitals during 2005-06 by the SSNNL.

At RR Sites :

A medical cell with 20 mobile unit's and 61 dispensaries are working in R&R sites. The cell consists of physician, pediatrician and Gynecologist. The cell is also provided with two ambulances. The main functions includes :

- Regular visiting of sites
- Providing specialized services at the door steps of PAFs
- Medical check-up
- Pot chlorination through distribution of chlorine tablets.
- Providing nutritional supplements to children's, pregnant and lactic mothers.
- Other preventive and curative health measures

Summary of the implementation of Health safeguards for the SSP in Gujarat:

Action	Gujarat		
❖ Baseline studies	Initially conducted in 1986 subsequently EIA was conducted in 1993.		
❖ Preparation of state Action Plan – Health Aspects.	❖ Action plan updated for 2000-2001 prepared by Commissionerate of Health & Medical Services, Gandhinagar.		
❖ Health Survey	Routine surveillance activities for early diagnostic and prompt treatment of malaria cases are carried out.		
❖ Establishment of health facilities at Dam site/ RR sites/Peripheral villages	❖ 50 bed hospital at Kevadia including a malaria unit. ❖ Medical laboratory and 20 mobile unit's. ❖ 61 dispensaries. ❖ 75 medical dispensaries are functioning at various R&R sites.		
❖ Vector control measures at RR sites.	❖ Insecticidal spray. ❖ Distribution of impregnated mosquito nets for all members of resettled families.		
❖ Appointment of staff	❖ Designation	❖ Nos.	❖ Place of Posting
	Dy. Director	1	Medical Cell
	Physician	1	Medical Cell
	Pediatrician	1	Medical Cell
	Gyneacologist	1	Medical Cell
	Medical Officer	21	Mobile Medical Unit
	MPW (Male)	20	Mobile Medical Unit
	MPW (Female)	75	Medical Dispensaries
	Pharmacist	1	Medical Cell
	Lab technician	1	Mobile hospital van
	X-Ray technician	1	Mobile hospital van
	Staff Nurse	2	Mobile hospital van
	I.E.C. Officer	1	Medical Cell
Statistical Asstt.	1	Medical Cell	
Ministerial Staff	8	Medical Cell	
Vehicle with Driver	23	Mobile + SSPA	
❖ Disease monitoring and responsibility	❖ Has been entrusted to State Council of Health & Medical Services and EIA report has been submitted by SCHMS. ❖ Bi-weekly visits of 182 R&R sites by 20 mobile medical units. ❖ Referral services by expert team consisting of three medical specialist.		

Works remaining:

Progress on health provisions on peripheral villages is awaited.

Health issues in the command area of SSP in Gujarat:

The height of the dam has reached 110.64 meters and two by pass tunnels have been constructed. Water has already started flowing into the canal for generation of power. Besides this water shall also be used for supply to Gujarat Water Supply Infrastructure Co Ltd., for drought prone villages and towns . The related canal net work is complete in command areas in phase-I districts and the trial irrigation have already

commenced. In view of this progress, it is essential that the infrastructure facilities as provided in the plan are made operational.

- **Provision of additional incremental facilities in upstream, downstream and the command area** should make functional.
- **Identifying and firming up a structure and mechanism for disease surveillance**
The immediate inputs needed, thus, would be identifying a structure from top to peripheral area, that can ensure regular flow and monitoring of health information and suggest / implement mitigative measures.
 - **Surveillance of communicable diseases** on the pattern of National Programme for surveillance of communicable diseases. Blanks in the proforma received from Maharashtra indicate that surveillance is yet to be taken up.
 - **Entomological surveillance for vector borne diseases:** Regular Entomological surveillance in view of the possibilities of changes of vector prevalence and densities due to alterations in ecology of the area due to irrigation / impoundment.
 - **Bacteriological surveillance** of drinking water for monitoring bacteriological quality of drinking water influencing the prevalence of water borne diseases.
 - **Malaria and vector borne diseases surveillance**
- **Prevention of Malaria** As per the reports malaria is declining in all the three States due to inputs by EMCP of NAMP and the efforts of the corresponding state / district authorities. However, keeping in view the high risk involved, qualified experts may be involved in preventing its recurrence.
- **PHO** The infrastructure facilities including a Preventive Health Organisation (PHO) Vertical Anti Malaria Unit and State monitoring cell are made functional soon as recommended by SCHM & ME in 1995 for the areas in Gujarat.
- **Other National Health Programmes under implementation** Progress and Status of other National Programmes under implementation should also be reflected in the reports brought out by the State Authorities to present a comprehensive picture on the general status of the diseases surveillance and health delivery system in the Project areas.

B) Govt. of Maharashtra:

In accordance with State provision for normal health care facilities, two cottage hospitals, eight primary health centers and 55 primary health units were functional

Taking Into account the inaccessibility of some of the villages, provisions were made for eight additional public health unit's, 10 mobile unit's and a floating dispensary for villages within 10 km of the submergence zone in the plan of 1994 by Government of Maharashtra.

District Health Officer Nandurbar submitted report for the Distt as a whole which included certain impact areas also. This data regarding water quality indicated serious problems of contamination of drinking water with night soil etc. as pointed out by the health committee which visited impact areas in Maharashtra during 2001. Diseases surveillance continued to be weak.

Summary of the implementation of Health safeguards for the SSP in Maharashtra:

Action	Maharashtra										
❖ Baseline studies	Complete in 1987 & being extended further.										
❖ Preparation of state Action Plan	Original Action Plan was submitted in 1987 and subsequently revised in 1991 and 1992. Final revised Action Plan was submitted in 1993. This plan is being updated. A draft health action plan 2005-06 was submitted during March 2006 and falls much short of addressing the requirement outlined by the plan of 1994.										
❖ Survey of existing facilities	Given in plan of 1994 updated to 2005. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Floating Disp.</th> <th>RH</th> <th>PHC</th> <th>PHU</th> <th>Sub-centre</th> </tr> </thead> <tbody> <tr> <td>10 (1 in Akkalkua working on rental basis).</td> <td>2</td> <td>17 (only 8 constructed)</td> <td>5</td> <td>96</td> </tr> </tbody> </table>	Floating Disp.	RH	PHC	PHU	Sub-centre	10 (1 in Akkalkua working on rental basis).	2	17 (only 8 constructed)	5	96
Floating Disp.	RH	PHC	PHU	Sub-centre							
10 (1 in Akkalkua working on rental basis).	2	17 (only 8 constructed)	5	96							
❖ Establishment of new health facilities	Following health institutions are sanctioned in 1994 are not started yet.										
❖ Vector control measures in place	Includes both preventive and curative measures i.e. surveillance & strengthening of clinics not yet firmed up,										
❖ Appointment of staff	❖ In adequate and required to be geared up										
❖ Disease monitoring and responsibility	<ul style="list-style-type: none"> ❖ Has been entrusted to State Health Department : reported only for diarrhea & dysentery. . ❖ Surveillance studies had commenced and survey report for Phase-I of the study has been submitted by Topiwala National Medical College, Mumbai. Phase-II of study is under implementation by Govt. College, Dhule. A report on status of malaria and some waterborne diseases is made available, alongwith certain recommendations. Review of recommendations and adequacy of the report is awaited. ❖ Training for chlorination, reproductive & child health, adolescent girls orientation and Anganwadi workers etc. is yet to be initiated 										

Works remaining:

Planned provisions are yet to be geared up. Progress on health provisions (existing/ proposed) for peripheral villages is also awaited. GOM sanctioned funds for implementation of Health plan. Health Department of GOM utilised the funds for creation of facilities of operation theater at Distt Headquarter

C) Govt. of Madhya Pradesh

Action	Madhya Pradesh
❖ Baseline studies	Complete, 1994 being extended further.
❖ Preparation of state	Original Action Plan was submitted in 1986 and then revised in 1988. Final plan

Action Plan	was submitted in 1991. Cost details were incorporated in the Final Action Plan in 1996. The plan is further revised in August 2003. The requirement of funds for incremental health facilities was placed at Rs.848 lacs.
❖ Survey of existing facilities	Complete
❖ Provision of incremental health facilities and functionality.	<p>As per revised plan,</p> <ul style="list-style-type: none"> ❖ 1 Hospital, 1 mini PHC & 58 Dispensaries are proposed at rehabilitation sites, ❖ 30 bed hospital at Nisarpur completed and handed over to Health Department. This is functional. ❖ Establishment of a community centre at Dharampuri is awaited. ❖ 21 Dispensaries are completed and handed over to Ayurved Department, 10 dispensaries are completed but not yet handed over to Ayurved Department. At 15 dispensaries work is under completion and at 13 dispensaries construction is yet to start. However most of these remained non functional for various reasons. ❖ Provision of one Mobile Public Health laboratory has been made. Progress is awaited.
❖ Vector control measures in place	<ul style="list-style-type: none"> ❖ Disease surveillance was to be carried out on the formats designed by NICD and comprehensive picture on all the schemes of Central & States under implementation in the project areas was to be reported. This is awaited. ❖ Geographical reconnaissance studies for disease vector, mosquito was under progress for the ISP areas and that it would be applicable to SSP also. The progress was awaited.
❖ Appointment of staff	Is yet to be done. It was suggested by the Sub-group that staff can be appointed on contract basis to meet the incremental requirement created by the SSP. No progress is reported so far.
❖ Disease monitoring and responsibility	<ul style="list-style-type: none"> ❖ Gandhi Medical College, Bhopal was entrusted with epidemiological surveillance studies. Final report is received. Action plan is prepared, implementation awaited. ❖ Has been entrusted to Evaluation Cell established by NVDA, under Subject matter Specialist (Ex Director Health Services, GOMP) but no activity is reported yet.

Works remain to be done

Submergence has already commenced in 1994 and with raising of dam height to EL 121.92 m. shall spread widely in Madhya Pradesh areas. Implementation of the Action Plan before setting of the affected population at R&R site as well as the peripheral villages is required. For preventing the possibility of diseases caused by impurities sampling of the water quality and related tests are needed. Mobile public health dispensary is required to be operationalised besides promotional activities on health education.

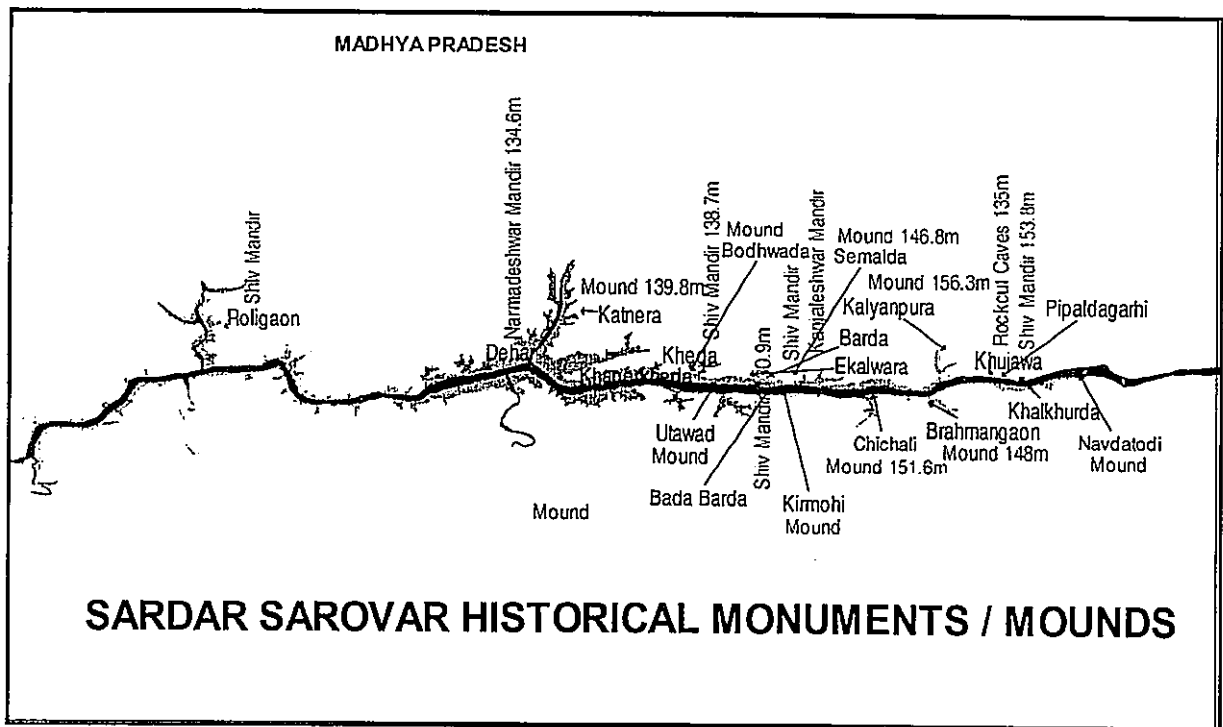
Chapter - 8

ARCHAEOLOGY & ANTHROPOLOGY

The Sardar Sarovar Project has necessitated a fresh look at the archaeological and cultural heritage available in the Narmada valley. The Government of India recognises the value of such cultural sites and has enacted a series of laws to maintain and protect them from decay, misuse or development activities. Sites are classified into three categories as follows :

- Type 1 : Monuments of national importance which are protected by central government;
- Type 2 : Monuments of religious or cultural importance which are protected by the state governments;
- Type 3 : Monuments which are neither centrally nor State-protected but which are considered to be an Important part of cultural heritage.

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

The three State governments carried out a complete survey of cultural and religious sites within the submergence zone under the direction of the project proponents. The principal aim of these studies was to list all archaeological sites, identify and name any sites under state-protection and further identify sites of religious or cultural significance which,

although not protected under national law, are of sufficient value to merit relocation. These studies are summarised below. 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 by Department of Archaeology.
- ❖ Survey was carried out by the State Department of Archaeology for cultural sites in 24 villages of Akrani taluk and nine villages from Akkalkuwa taluk, Dhule district.
- ❖ Madhya Pradesh: Survey by State Department of Archaeology and Museum (1992), in sixteen volumes.
- ❖ Anthropological Survey of India: Narmada Salvage Plan.
- ❖ Anthropological Survey of India: People's of India.
- ❖ Adivasi Kala Parishad: Survey of Material Cultural in the Narmada Valley.
- ❖ Rashtriya Manav Sanghralaya: Narmada Salvage Plan.

Gujarat

Archaeological Survey of Nineteen Villages submerged by Sardar Sarovar Reservoir, 1989: - The Department of Archaeology was instructed to carry out a survey of archaeological sites in 19 villages of the proposed SSP submergence zone in Gujarat. By June, 1989, 12 villages had been surveyed. The initial report, submitted by the Director of Archaeology, contained a full list of villages surveyed and photographs of the Shoolpaneshwar and Hamfeshwar temples. Two further studies of sites in the remaining seven villages were carried out in March 1992 and a supplementary report issued.

Maharashtra

▪ **State Department of Archaeology :**

A survey was carried out by the Department of Archaeology of cultural sites in 24 villages of Akkrani Taluk and nine villages from Akkalkuwa Taluk, Dhule District. A brief summary note was submitted by the Director of Archaeology in February 1992 which stated that no state-protected monuments were located in the area but recommended the preservation of monuments at the village of Manibeli, Dhule District.

Madhya Pradesh

▪ **State Department of Archaeology and Museum**

The Archaeology Department of Madhya Pradesh compiled a detailed report of archaeological sites in 120 villages likely to be affected by SSP. A second study of 73 villages was completed in July, 1991. Each study contained photographs together with detailed descriptions of the current use and historical significance of the sites.

In addition to baseline studies on archaeological aspects, work has been carried out on the anthropological heritage of the Narmada Basin including examination of evidence of ancient dwellings and cultural artifacts. The principal studies in this area are described below.

- Anthropological Survey of India. Narmada Salvage Plan : The Narmada Salvage Plan contains detailed background data on paleo-anthropological, human ecological and other aspects of the Narmada valley. By May 1992, surface scanning of 17 sample villages

coming under submergence had been carried out, 424 specimens including ancient tools etc had been collected.

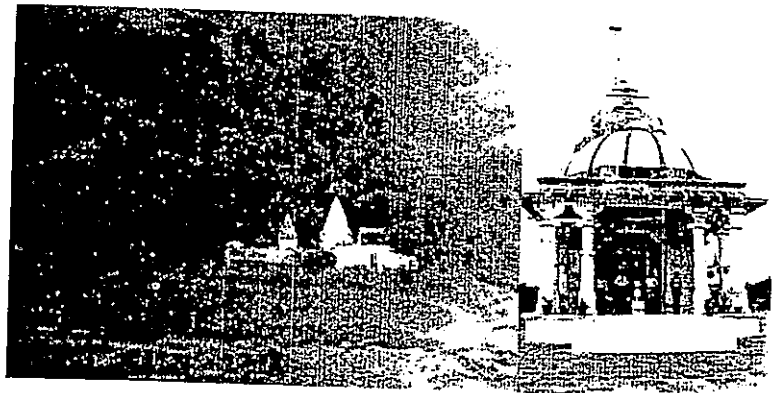
- Anthropological Survey of India. Peoples' of India : This project entailed a complete survey of 33 tribes of India including those of the Narmada Basin. The study covered all aspects of tribal culture in India and was published in 61 volumes in 1992.
- Parishad, A.K. Survey of Material Culture in the Narmada Valley : Work was completed and a report published by the National Museum of Humanity, Bhopal, on cultural objects from tribal artisans in Madhya Pradesh in 1990. Copies of the interim report were circulated to the Ministry of Environment and Forests and the Narmada Control Authority in April 1991.

ACTION PLANS AND IMPLEMENTATION

Gujarat

The Action Plan for two temples, i.e., Shoolpaneshwar and Hamfeshwar was prepared and implemented by GOG.

- ❖ Shoolpaneshwar temple which was on the border with State of Maharashtra is relocated 15 km. downstream of the SSP in village Gora. Relocation works already completed. Photographs of old and new temples are shown on rightside



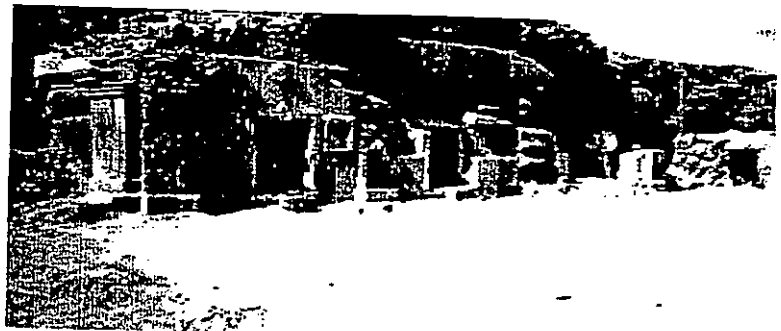
- ❖ Hampheshwar Temple has been relocated at higher elevations within the same village. Construction of Temple was completed.

Maharashtra

No work was required to be done.

Madhya Pradesh

A large number of sites were identified for relocation although none of these sites are protected under the 1958 Act. It was proposed, therefore, that any decision on whether they should be relocated would be made on a case-by-case basis by an independent expert panel. This panel comprised representatives of the Archaeological Survey of India, Central and State Governments and was established by GOMP. The panel's decisions were ratified by a joint Inspection committee of the Irrigation Department and Archaeological Department.



Photographs of rock-cut caves are shown above

The expert panel proposed, a 4-phase Action Plan framework for relocation operations :

Phase-I – Survey work, survey report, listing of monuments and sculptures, estimates for shifting.

Phase-II – Action Plan, documentation, detailed estimates.

Phase-III – Building construction, shifting of sculptures, shifting of monuments.

Phase-IV – Display arrangements, model preparation, video library, publication report, excavation reports, new findings (if any).

- o GOMP prepared an action plan in 1993. The plan was updated / revised in 1997. This plan identifies the relocation of 13 monuments and 5 mounds by State Dept. of Archaeology & Museum (SDA&M), this plan also includes the relocation of 10 monuments and 6 mounds by Archaeological Survey of India (ASI). This plan also includes the four mounds of 1993 plan. Presently all the 38 structures are being relocated/excavated by the state Department of Archeology & museum, Madhya Pradesh

The status of implementation is summarized in the Table on the following pages

Sl. No	Particulars of monuments / mounds as per action plan of 1997 prepared by State Deptt. of Archaeology & Museum, Govt. of M.P.					Impact at 121.94 mt.	Status
	Chain age	Name of Monuments	Village	Tehsil	District		
Monuments/sculptures							
1.	84425	Shiv Mandir	Roligaon	Airajpur	Jhabua	Yes	Completed
2.	117037	Koteshwar Mandir	Kothara	Dhrampuri	Dhar	No	Completed.
3.	125876	6 tombs	Bheelkheda	Barwani	Barwani	No	Work was to be started in the financial year 2002-2003.
4.	128181	Neel Kantheshwar Mandir	Chikalda	Barwani	Barwani	No	Not surveyed due to interference of NBA.
5.	128181	Pashumateshwar Mandir	Chikalda	Barwani	Barwani	No	Not surveyed due to interference of NBA.
6.	131667	Shiv Mandir	Chhoti Kasrawad	Barwani	Barwani	Yes	Held up by the villagers.
7.	171594	Jalaleshwar Mandir	Khujawa	Dharamपुरी	Dhar	No	Work was to be started in the financial year 2002-2003.
8.	173427	Vilvamriteshwar Mandir	Dharamपुरी	Dharamपुरी	Dhar	No	Work was to be started in the financial year 2002-2003.
9.	173427	Nageshwar Mandir	Dharamपुरी	Dharamपुरी	Dhar	No	Work was to be started in the financial year 2002-2003.
10.	194757	Kanjleshwar	Semalda	Manawar	Dhar	No	Not surveyed due to interference of NBA.
11.	111551	Narmadesh-war Mandir	Dehar	Kukshi	Dhar	No	Relocation work completed. The temple has been shifted to a hill 2 km away.
12.	132581	Shiv Mandir	Bodhwada	Kukshi	Dhar	No	Scrapping, numbering, drawing, photography is completed. Relocation works under progress.

13.	143553	Shiv Mandir	Bada Barda	Manavar	Dhar	No	Relocated completely two kms. away from the original place in the year 1997-98.
14.	171594	Shomeshwar Mandir	Khujawa	Dharamपुरी	Dhar	No	Detailed photography, numbering, drawing etc. completed.
15.	171594	Big statues	Khujawa	Dharamपुरी	Dhar	No	Copying in fibre glass completed and the same is placed at Kasravad Museum. Further relocation work is stopped due to public resentment.
16.	171594	Bhawani Mata Mandir	Khujawa	Dharamपुरी	Dhar	No	Scrapping of lime plaster done for numbering and detailed drawing. Further work of relocation stopped due to public resentment.
17.	171594	Shiv Mandir (S.No.1)	Khujawa	Dharamपुरी	Dhar	No	Drawing numbering and photography completed. Work of relocation started but due to public resentment, it was stopped by the collector.
18.	171594	Shiv Mandir (S.No.2)	Khujawa	Dharamपुरी	Dhar	No	Drawing numbering and photography completed. Work of relocation started but due to public resentment, it was stopped
19.	171594	Shiv Mandir (S.No.3)	Khujawa	Dharamपुरी	Dhar	No	Drawing numbering and photography completed. Work of relocation started but due to public resentment, it was stopped
20.	171594	Rock-cut caves	Khujawa	Dharamपुरी	Dhar	No	Silt deposited inside the cave is totally cleaned. Numbering is done and further work is stopped due to public resentment.
21.	180432	Rock-cut-sculptures	Pipaldagarhi	Dharamपुरी	Dhar	No	Relocated completely in village Nimbola in the year 1998-99.
22.	180432	Shiv Mandir (Mauni Baba Ashram)	Pipaldagarhi	Dharamपुरी	Dhar	No	Relocated completely in village Nimbola. In the year 1998-99.
23.	199939	Baneshwar Mandir (Shiv Mandir)	Navadatoli	Kasarawad	Khargone	No	Scrapping work is completed. Relocation work stopped due to agitation.
Mounds							
1.	114903	Mound	Jangarwa	Barwani	Barwani	No	Progress in nil.

2.	122523	Mound	Khapar-kheda	Manawar	Dhar	-	Completed earlier to 1997 as per 1993 plan.
3.	129228	Mound	Kheda	Manawar	Dhar	No	Progress is nil.
4.	138982	Mound	Kavathi	Manawar	Dhar	No	Not surveyed due to interference of NBA.
5.	139286	Mound	Utawad	Barwani	Barwani	-	Progress Completed earlier to 1997. as per 1993 plan,
6.	143553	Mound	Chota Barda	Thikri	Barwani	No	Work sanctioned and being started.
7.	152697	Mound	Kirmohi	Thikri	Barwani	Not relevant	Experimental excavation was done in 1995. Now these mounds vanished due to soil erosion by agricultural practices.
8.	160012	Mound	Navadakhedi	Thikri	Barwani	No	Progress is nil.
9.	167327	Mound	Brahman-gaon	Thikri	Barwani	Not relevant	Experimental excavation was done in 1995. Now these mounds vanished due to soil erosion by agricultural practices.
10.	199939	Mound	Navadatoli	Kasrawad	Khargone	No	Progress is nil.
11.	120999	Mound	Katnera	Kukshi	Dhar	No	Completed in April, 2001. Material is stored in the office of Dy. Director, State Deptt. of Archaeology & Museum, Rajwada, Indore.
12.	138982	Mound	Ekalwara	Manawar	Dhar	No	Completed in April, 2001. Material is displayed at Kasrawad Museum.
13.	162755	Mound	Maru Chichali	Thikari	Barwani	No	Completed . Records are with ASI office Nagpur.
14.	165193	Mound	Kalyanpura	Manawar	Dhar	No	Completed in April, 2001, material is stored in the office of Archaeologists, State Deptt. of Archaeology & Museum, Banganga, Bhopal.
15.	183480	Mound	Khalghat (Khalkhurd)	Dharamपुरी	Dhar	No	Excavated, records are with the office of the Archaeologists, State Deptt. of Archaeology & Museum, Rajwada, Indore.

Collection and display at Museum

Sculptures, 118 in nos. were collected from the regions coming under the submergence area of the Sardar Sarovar dam. This sculptures were obtained from Pipaldagarhi, Khujawa, Dharamपुरी and different other villages. These are displayed at Distt. Museum in Dhar Distt.

Since these sculptures were lying open for a very long time they bear traces of weathering effect on them like salt formation, red-oxide deposition, besides accumulating dust, dirt and fungus on them. They were cleaned by the chemists using necessary chemicals like Ammonia, Sodium hydroxide, Benzene P.V.A. etc. After cleaning the sculptures were coated with preservative for saving them from further deterioration.

Museum

- Narmada Park and Museum at Lalbagh at Indore, besides Museum at Barwani and Kasarawad proposed.

Museum at Barwani is yet to be started.

Museum at Kasrawad is completed by NVDA and handed over to the State Department of Archaeology & Museum, Govt. of MP. Statues and models are displayed. Development and beautification work under progress.

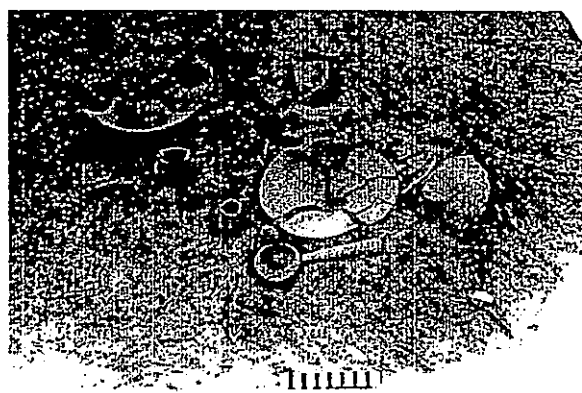
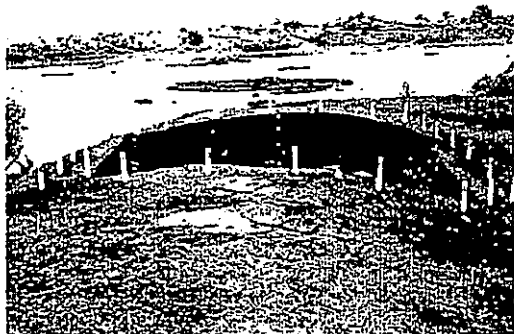
- Construction of a section on 'Narmada Vithika' in the museum at Bhopal has been completed and inaugurated.

Besides, Film documentation of all the monuments of SSP is in progress through an agency 'Madhyam', engaged by State Department for Documentation of the important monuments.

Anthropological Survey & Studies

Anthropological salvage plan for Narmada Valley : A two week salvage operation conducted in February 1992 with focus on Harsud area of Khandwa under submergence of Indira Sagar Project was conducted by the Anthropological Survey of India. Surface scanning of the anthropological sites of 17 villages was completed and 424 specimens taken. In this plan the Udaipur Branch of the Anthropological Survey of India has collected information and specimens from 19 villages in Gujarat.

Anthropological Survey of India has decided to conduct extensive exploration in Central Narmada Valley between Jabalpur & Handia and to carry out explorations at Hathnora on the right bank of Narmada a fossilized partial skull and right collar bone of the solitary known early age man in south asia was discovered. Which was named as skull of **Homo floresiensis** or Hobbits. A systematic and large scale attempts is being under taken by the Anthropological Survey of India. A copy of the plan was received from Anthropological Survey of India accordingly work is to commenced shortly. However, the areas under study fall outside the submergence zone of the Sardar Sarovar Project. Photo graphs of mound excavated and excavated ruined evidences are shown below



CLEARANCES ACCORDED TO SSP

CLEARANCE FROM ENVIRONMENTAL ANGLE TO SSP & ISP BY MOEF
GOVT. OF INDIA, MINISTRY OF ENVIRONMENT & FORESTS.
NEW DELHI

No. 3-87/80-IA

Dated 24 June, 1987

OFFICE MEMORANDUM

Subject : Approval of Narmada Sagar Project, Madhya Pradesh and Sardar Sarovar Project, Gujarat from environmental angle.

The Narmada Sagar Project, Madhya Pradesh and Sardar Sarovar Project, Gujarat have been referred to this Department for environmental clearance.

2. On the basis of examination of details of these projects by the Environmental Appraisal Committee for River Valley Projects and discussions with the Central and State authorities the following details were sought from the project authorities:

- (i) Rehabilitation Master Plan.
- (ii) Phased Catchment Area Treatment Scheme.
- (iii) Compensatory Afforestation Plan.
- (iv) Command Area Development.
- (v) Survey of Flora and Fauna.
- (vi) Carrying Capacity of surrounding area.
- (vii) Seismicity; and
- (viii) Health Aspects.

3. Field surveys are yet to be completed. The first set of Information has been made available and complete details have been assured to be furnished by 1989.

4. The NCA has been expanded and its terms of reference have been amplified to ensure that environmental safeguard measures are planned and implemented in depth and in its pace of implementation part passu with the progress of work on the project.

5. After taking into account all relevant facts the Narmada Sagar Project, Madhya Pradesh and the Sardar Sarovar Project, Gujarat are hereby accorded environmental clearance subject to the following conditions :

- i. The Narmada Control Authority (NCA) will ensure that environmental safeguard measures are planned and implemented pari passu with progress of work on projects.
- ii. The detailed surveys/studies assured will be carried out as per the schedule proposed and details made available to the Department for assessment.
- iii. The Catchment Area Treatment programme and the Rehabilitation plans be so drawn as to be completed ahead of reservoir filling.
- iv. The Department should be kept informed of progress on various works periodically.

6. Approval under Forest (Conservation) Act, 1980 for diversion of forest land will be obtained separately. No work should be initiated on forest area prior to this approval.

7. Approval from environmental and forestry angles for any other Irrigation, power or development projects in the Narmada Basin should be obtained separately.

Sd/-
(S. MAUDGAL)
Director (IA)

The Secretary,
Ministry of Water Resources,
New Delhi.

No. D-372/83-FC
GOVT. OF INDIA, MINISTRY OF ENVIRONMENT & FORESTS.
NEW DELHI

Dated 8TH September, 1987

To

1. The Secretary,
Agriculture Forest and
Cooperative Department,
Govt. of Gujarat,
Sachivalaya, Gandhinagar.
2. The Secretary,
Forest Deptt.,
Govt. of M.P.,
Bhopal.
3. The Secretary,
Revenue & Forest Department,
Govt. of Maharashtra,
Mantralaya, Bombay.

Sub: Diversion of 13385.45 ha (6488.54 ha in Maharashtra 4165.91 ha in Gujarat and 2731.00 ha in Madhya Pradesh) of Forest land in Dhule, Bharuch and Khargone district respectively for Sardar Sarovar Project.

Sir.

1. I am directed to refer to your letter Nos. (1) FLD-1282-78159-V-1 dated 17.2.83 (Gujarat) (2) 5/58/83/10/3 dated 31.8.84 (Madhya Pradesh) and (3) FLD. 1080/111531-11-F3 dated 8.9.83 (Maharashtra) on the above mentioned subject seeking prior approval of the Central Government under Section 2 of the Forest (Cons) Act. 1980 and to say that the proposal has been considered by the Advisory Committee constituted by the Central Government under Section 3 of the Forest (Cons) Act. 1980.

2. After careful consideration of the proposal, the Central Government hereby conveys its approval for diversion of 13385.45 ha of forest land for Sardar Sarovar Project as per details given below :

S.No.	State	Forest land to be diverted (ha)
1.	Gujarat	4165.91
2.	Madhya Pradesh	2731.00
3.	Maharashtra	6488.54

3. This approval is strictly subject to the following conditions :

- i) Legal status of the land will remain unchanged.
- ii) The full details of the non-forest lands for retaining compensatory afforestation with complete details viz. Khasara No, village etc. will be reported by the State Government before 30.9.87.
- iii) The non-forest areas available for rehabilitation of all the oustees will be reported by the State Governments or a proposal to the satisfaction of Govt. of India In this regard will be furnished by the State Governments before 30.11.87.
- iv) No work on the project In forest area will be commenced until and unless condition under (II) & (III) above are fulfilled.
- v) Since the project involves violation and also most of the non-forest areas for compensatory afforestation are away from the project area. the State Govts. will raised compensatory afforestation In double the degraded forest lands also In the project Impact areas In addition to the afforestation on equivalent non-forest land. A scheme for this will be submitted by 30.11.87.

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- vi) The State Governments will prepare by 30.11.87 a plan for the treatment of catchment areas failing which the Central Government will appoint a team for this purpose at the cost of the project for this purpose.
- vii) No Forest land will be utilised for the rehabilitation of oustees.
- viii) Tree felling will be permitted in submergence area only up to 4 M below FRL.
- ix) Tree planting will be done on either side of the canals, roads, forest area of the reservoir and in the wasteland/vacant land under the control of the Irrigation Department.
- x) Water will be supplied free of cost to the Forest Department for raising nursery and for irrigating forestry plantations in the command area.
- xi) In order that the construction labour & staff while working on the project in the forest area may not allow destruction to the forest area for meeting their fuel wood needed, the user agency will establish fuel depots and will provide suitable alternative domestic fuel such as fuel wood, coal, kerosene oil etc to them free of cost or at cost deducted from their salary and wages.

Yours faithfully,

Sd/

(R.S. Bisht)

Under Secretary to the Govt. of India.

GOVERNMENT OF INDIA, PLANNING COMMISSION
New Delhi

No. 2(194)/88-I&CAD.

October 5, 1988

To

The Secretary,
Planning Department,
Government of Gujarat,
Gandhinagar.

I am directed to convey that the Sardar Sarovar Project, estimated to cost Rs. 6406.04 Crores (Rupees six thousand four hundred six crores and four lakhs) as per the salient features vide Annexure-I enclosed herewith, has been considered acceptable for investment subject to the conditions as laid down below:

- (i) The State shall comply with the conditions as laid down in the O.M.No.3-87/80-IA dated 24.6.1987 and 8-372/83-FC dated 8.9.1987 issued by the Ministry of Environment and Forest while according the environmental clearance and the approval for diversion of forest lands for this project respectively (copies enclosed).
- (ii) Looking to the size and importance of this project, the State Government will give sufficient priority to this project in the Eighth Plan by ensuring adequate funding to match with the construction schedule as indicated in the concurrence of State Planning and Finance Department vide Government of Gujarat in Narmada Development Department's letter No. NPP/1084/GOI-4/Pat.V/J dated 3.10.1988. The state will also complete other on going projects at advance stage in time to ensure that there is no difficulty in funding the peak requirements of Sardar Sarovar Project.
- (iii) A programme of drainage and ground water balance studies has been completed for Mahi Narmada-Doab. Such a programme must be completed for the areas beyond the Mahi, The Bhal, Saurashtra, Kutch, Sami-Harij and other areas require this as a pre-condition. The State should submit to Planning Commission a detailed programme of studies, with milestones of achievements, duly vetted through Central Water Commission for monitoring the same by Planning Commission.
- (iv) The State should take suitable advance measures, as may be necessary, to ensure that annual revenue to be accrued from this project covers at least annual operation and maintenance charges including depreciation charges by setting the water rates suitably.
- (v) The State should set up a special group of experts to study the siltation aspect in the main canals under all operating conditions since such siltation, if occurs, is likely to pose a serious problem during the actual operation of this project and may require a huge expenditure for desilting as well as result into serious operational difficulties.
- (vi) State should draw up a detailed time schedule for completion within five years the investigation, detailed survey, planning and working out the detailed cost estimates for micro level network system for the balance area of the total command of this project.
- (vii) Past experience of irrigation projects have revealed that main and branch canals are completed upto the end but, in absence of micro-level networks to take irrigation water upto outlet, corresponding irrigation benefits do not start accruing in spite of huge financial investment made. To avoid this, the State should draw up an implementation schedule, segment wise, for completion of canal network, in such a way that a segment of the canal network, taken up from head reaches, is completed in all respects so as to make the irrigation waters available, for the designed potential of that segment, upto the outlet in that particular segment.

Contd....2/

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2. This project may be executed as per the approved outlay from year to year.

Yours faithfully.

Sd/

(B.N. NAVALAWALA)

Deputy Adviser (I&CAD)

for Secretary, Planning Commission

Copy to :

- 1) Secretary to Chief Minister,
Government of Gujarat, Gandhinagar.
- 2) Chairman, Sardar Sarovar Namada Nigam Ltd.,
Gandhinagar.
- 3) Secretary, Namada Development Department / Finance Department,
Government of Gujarat, Gandhinagar.
- 4) Secretary, Irrigation Department, Government of Maharashtra / Madhya Pradesh / Rajasthan,
Bombay/Bhopal/Jaipur.
- 5) Ministry of Water Resources, Shram Shakti Bhawan, New Delhi.
Secretary
Commissioner (PP)
Financial Adviser
Commissioner (Project) / Commissioner (India) / Commissioner (Floods), Joint Commissioner (P)
Deputy Secretary
Budget Section.
- 6) Secretary, Ministry of Environment & Forests,
Paryavaran Bhawan, C.G.O. Complex, Lodi Road, New Delhi.
- 7) Central Water Commission, Sewa Bhawan, R.K. Puram, New Delhi
Chairman
Member (P&P)
Chief Engineer (PAO)
Director (PAO)
- 8) Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi.
- 9) Ministry of Finance, Department of Expenditure (Plan Finance Division) North Block, New Delhi
(Joint Secretary (PF/Director (PF)
- 10) Executive Member, Namada Control Authority, Palika Bhawan, Sector-13, R.K. Puram, New Delhi.
- 11) Planning Commission
PS to Deputy Chairman
Secretary / Special Secretary
Adviser (I&CAD)/(P&E) / (Agri)
Joint Secretary (SP)
Library
Information Officer
All Officers of I&CAD Division
Guard File

No. 8-29/89 - FC
Govt. of India
Ministry of Environment & Forests
Lodi Road, New Delhi - 110 003

To

July 20, 1990.

The Secretary (Forests)
Govt. of Maharashtra,
Bombay.

Subject : Diversion of 2700 ha. of forest land for rehabilitation of Sardar Sarovar Project affected persons.

Sir,

I am directed to refer to your letter No.1688/CR 329/F-10 dated 28.12.88 on the above mentioned subject seeking prior approval of the Central Govt. in accordance with Section-2 of the Forest (Cons.) Act, 1980.

After careful consideration of the proposal of the State Govt., The Central Govt. hereby conveys its approval under Section-2 of the Forest (Cons.) Act, 1980 for release of 2700 ha. of forest land for rehabilitation of persons affected by Sardar Sarovar Project in Dhule District subject to the condition that compensatory afforestation be done by the Government of Maharashtra. The Government of Maharashtra is requested to identify the land for raising compensatory afforestation and send a detailed report along with a scheme for raising compensatory afforestation before 30.9.1990.

The original proposal of the State Govt. was for diversion of 2583.42ha. of forest land, whereas 2700 ha. of forest land are being diverted by this order. The State Govt. is requested to send the details of survey number etc. along with map showing the additional area being diverted by this order.

This issues in relaxation of condition No.(iii) * (vii) of this Ministry's letter No.8-372/83-FC dated 8.9.1987.

Yours faithfully,

(BHAGWAN SINGH)
Asstt. Inspector General of Forests.

Copy to :

- 1) Principal Chief Conservator of Forests, Govt. of Maharashtra, Nagpur.
- 2) Regional Office (Western Zone), Bhopal,
- 3) Regional Office (HQ), New Delhi.
- 4) Guard file.
- 5) Secretary of Govt. of India, Ministry of Water Resources, Shram Shakti Bhawan, New Delhi.

(BHAGWAN SINGH)
Asstt. Inspector General of Forests.

No. 225/92 - FC
Govt. of India
Ministry of Environment & Forests
Lodi Road, New Delhi - 110 003

Dated the 21st February, 1994.

To

The Secretary,
Forest Department
Government of Maharashtra,
Bombay.

Subject : Diversion of 1500 ha. of forest land for rehabilitation of Sardar Sarovar Project affected persons in Dhule District.

Sir,

I am directed to refer to your letter No.FLD-1692/CR-239/F-10 dated 11th February, 1994 on the above mentioned subject seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980 and to say that the proposal has been examined by the Advisory Committee constituted by the Central Government under Section-3 of the aforesaid Act.

2. After careful consideration of the proposal of the State Government and on the basis of the recommendations of the above sanctioned Advisory Committee, the Central Government hereby conveys its approval under Section-2 of the Forest (Conservation) Act, 1980 for diversion of 1500 ha. of forest land for rehabilitation of Sardar Sarovar affected persons in Dhule district subject to the following conditions :

- i) The felling of trees on the proposed forest land shall be done in phases as per requirement of land for rehabilitation.
- ii) The amount realized by the felling of trees in 1500 ha. of forest land shall be transferred in favour of Forest Department in the special fund created for compensatory afforestation as an additionality for afforestation and allied activities.
- iii) Compensatory afforestation to be raised over equivalent non-forest land which will be notified as protected forest under Indian Forest Act.

Yours faithfully,

Sd/-
(INDER DHAMIJA)
Asstt. Inspector General of Forests.

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 standardized 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 along with 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.