



स्थिति विवरण
Status Report

पर्यावरण प्रबन्धन
Environment Management
इंदिरा सागर परियोजना
Indira Sagar Project



मार्च, 2006
March, 2006

नर्मदा नियंत्रण प्राधिकरण
NARMADA CONTROL AUTHORITY
इन्दौर
Indore
अगस्त 2006
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स्पीड पोस्ट द्वारा

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सेवा में,

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महोदय,

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

भवदीय,

संलग्नक: उपरोक्तानुसार।

(डा. पवन कुमार)
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निदेशक (पर्यावरण)

**Environment Management:
Indira Sagar Project
March, 2006**

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Chapter - 1

ENVIRONMENT MANAGEMENT

Narmada is the fifth largest river of India. It originates from Amarkantak in district Shahdol of Madhya Pradesh at an altitude of 900 meters and runs through a deep valley between Vindhya and Satpuda ranges for a distance of 1312 Km and joins the Arabian Sea. It runs about 1077 km in the State of Madhya Pradesh through the districts of Shahdol, Mandla, Jabalpur, Khandwa, Khargone, Dhar and Jhabua.

Investigations into harnessing the waters of the Narmada Valley commenced around the time of Independence. There were differences amongst riparian States with regard to sharing of Narmada Water. Therefore, on the application of Government of Gujarat, in order to settle the dispute relating to sharing of Narmada water among the concerned States of Gujarat, Madhya Pradesh and Maharashtra, the Govt. of India constituted the Narmada Water Dispute Tribunal in October 1969 under Section-4 of the Inter State Water Disputes Act, 1956. The Tribunal investigated the matters referred to it and forwarded to the Central Government a report in August 1978. Award of the Tribunal was published in the gazette by the Central Govt. on 12th December 1979.

NARMADA WATER DISPUTES TRIBUNAL AWARD

The total water availability of the river at 75% dependability was estimated by the Tribunal as 34580 mm³ (28 MAF) and the Tribunal awarded the share of Narmada waters to the different States as follows:

Madhya Pradesh	18.25 MAF (22529.0 mm ³)
Gujarat	9.00 MAF (11110 mm ³)
Maharashtra	0.25 MAF (309 mm ³)
Rajasthan	0.50 MAF (617mm ³)

The Award inter-alia stipulated the FRL of the Sardar Sarovar Project in Gujarat and Indira Sagar Project in M.P, the regulated releases to be made by Indira Sagar for utilisation at Sardar Sarovar and the sharing of cost by Sardar Sarovar in Indira Sagar. It has also stipulated that the construction of Indira Sagar be taken up by M.P concurrently with or earlier than the construction of Sardar Sarovar dam. Key projects in the basin are shown in the map below.



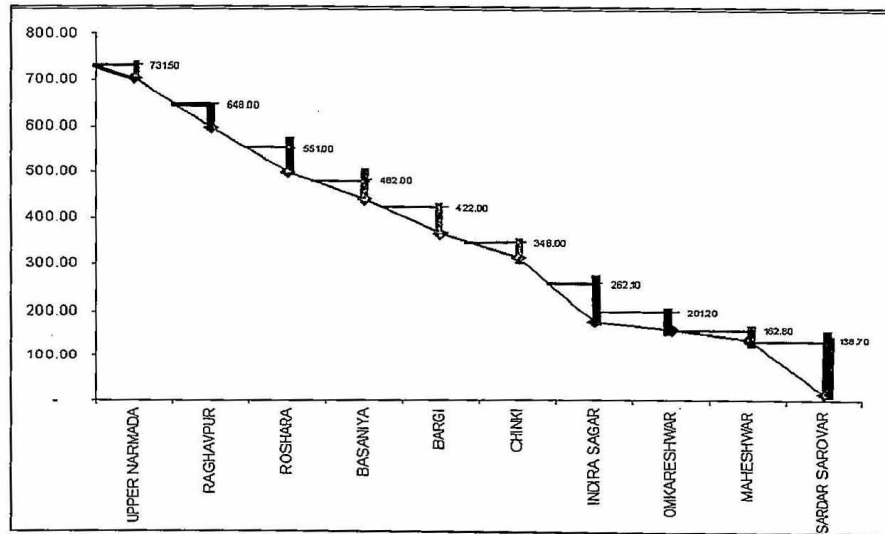
NARMADA BASIN PLAN

After the Tribunal fixed the share of Narmada Water, the Master Plan of Narmada Water was prepared for the development of irrigation, industries land domestics requirements. It has been proposed to construct 29 major projects of which 10 would be on the main river and 19 on the tributaries, 135 medium and 3,000 minor projects.

NARMADA RIVER DEVELOPMENT IN MADHYA PRADESH

Out of the major projects on tributaries in Madhya Pradesh such as , Tawa, Barna and Sukta projects have been completed: and Mateyari, Bargi and Kolar projects are nearing completion. The balance projects, are proposed to be completed in two phases. In the first phase, Indira Sagar, Omkareshwar, Maheshwar, Bargi Diversion on the main river, Man and Jobat Projects on tributaries, are proposed to be completed.

	Chainage (In kms.)	Name of dam	FRL of the reservoir (In mtr)	Status of construction
1.	77	Upper Narmada	731.5	Under planning
2.	135	Raghavpur	648	
3.	206	Rosra	551	
4.	261	Basania	482	
5.	378	Bargi	422.8	Completed
6.	489	Chinki	348	Under planning
7.	845	Narmada Sagar	262.1	Nearly Completed
8.	900	Omkareshwar	201.2	Under construction
9.	941	Maheshwar	162.8	Under construction
10.	1164	Sardar Sarovar	138.7	Under construction



Graphic representation of Major project on main river in Madhya Pradesh

NARMADA CONTROL AUTHORITY

The Award also stipulated the setting up of an inter-state administrative authority called Narmada Control Authority (NCA) for the purpose of securing compliance with the implementation of the decision and directions of the Tribunal. The Award envisaged a coordination and direction role for the Authority. Narmada Control Authority was charged with the power and under key duty to do, any or all, things necessary, sufficient and expedient for the implementation of the Award. In view of the directions of the Award, the Narmada Water scheme was notified by the Central Govt. in September 1980 and NCA was setup with the duties and functions envisaged by the NWDTA.

Before Environmental clearance was accorded to the Indira Sagar Project, Govt. of India on 3rd June 1987 modified through statutory instrument, the powers, functions and duties of Narmada Control Authority. Accordingly amongst others Union Secretaries of Ministry of Environment & Forests, Social Justice & Empowerment were included as key members. Besides this, the role of the Authority was modified to include overall coordination and direction of the implementation of all the projects, including the engineering works, the environmental protection measures and the rehabilitation programme besides ensuring the faithful compliance of the terms and conditions stipulated by the Central Government at the time of clearance of the aforesaid projects. The Authority was given the mandate to constitute one or more sub-Committees and to assign them such of its function and delegate such of its powers as deem fit.

Environmental Clearance by Govt. of India:

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.

Ministry of Environment & Forests formally issued order of clearance to this project from Environmental angle on 24th June 1987 subject to the following conditions :

- i) NCA will ensure that environmental safeguard measures are planned and implemented pari-passu with the progress of work on the project.
- ii) Detailed survey / studies assured will be carried out as per the schedule proposed and details made available to the department of assessment.
- iii) Catchment Area Treatment programme and the rehabilitation plans be so drawn as to be completed ahead of reservoir filling.
- iv) The department of Environment should be kept informed of progress on various works periodically.

ENVIRONMENT SUB-GROUP

To ensure proper planning and its implementation with regard to Environmental safeguards the Authority under clause 9(2) of the Scheme notified under Inter State water Dispute act of 1956, constituted among others a sub-groups on Environment, under the Chairmanship of Secretary, Govt. of India, Ministry of Environment & Forests (MOE&F).

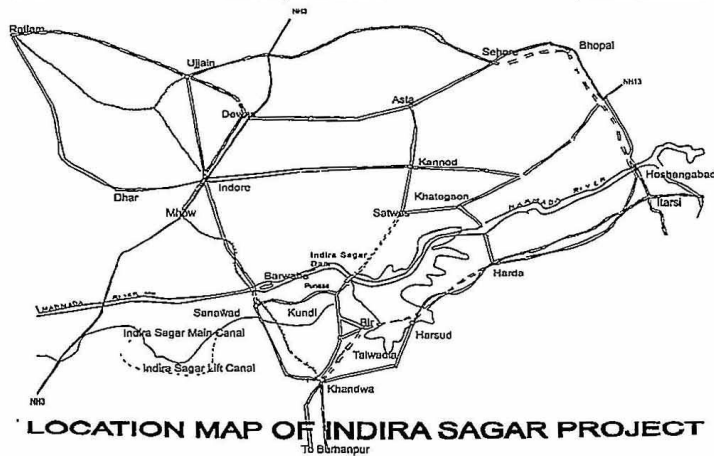
Environment Sub-Group, a body constituted under proviso to Statute, is headed by Secretary MOEF and has as members one representative each from the four participating States. Representative of ICAR, MOWR, technical experts in the field of forestry, wild life, hydrology, flora, health, archaeology, anthropology, agriculture, and environment. The terms of reference to the sub-group are as follows:

- To work out the environmental safeguard measures to be planned and implemented for the **entire Narmada Basin** so that the environmental safeguard measures are executed and remain fully in consonance with the clearance accorded to the **Indira Sagar and Sardar Sarovar Projects**
- To determine the terms of reference of required surveys necessary for the implementation of environmental safeguard measures inclusive of data-base required, the method by which the data base is to be prepared and also to identify the institutions/individuals to undertake the preparation of such documents.
- To get prepared for clearance by Ministries and NCA the action plans with regard to all environmental safeguard measures and the assessment criteria thereof.
- **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.

NARMADA SAGAR COMPLEX & INDIRA SAGAR PROJECT (ISP)

Indira Sagar Project (earlier known as Narmada Sagar Project) is the key project on Narmada River providing excellent storage site. The dam is proposed on the main river near village Punasa in Khandwa district of Madhya Pradesh. Omkareshwar, Maheshwar and Sardar Sarovar projects located downstream of ISP which are under execution are to utilise the regulated releases of Indira Sagar Project for irrigation and power generation.

Indira Sagar is a multipurpose project with the largest storage capacity in the country. The water releases from ISP on its way to the SSP would generate power at two intermediate projects in Madhya Pradesh.



LOCATION MAP OF INDIRA SAGAR PROJECT

Mrs. Indira Gandhi, the then Prime Minister of India laid the foundation stone of the then Narmada Sagar Project located about 467 Km from the sea, roughly 320-Km upstream from the Sardar Sarovar dam site, on 24th October 1984. The ISP Dam would create a lake that will inundate about 91,300 ha of valley lands. The area to be inundated constitute lands from five tehsils of three districts in Madhya Pradesh namely Khandwa and Harsud in Khandwa District, Kannod and Khategaon in Dewas Dist. and Harda in Hoshangabad District. Of the total area of 91,300 ha to be submerged about 67,000 ha. is in Harsud Tehsil, 11,500 ha is in Khandwa Tehsil and 12,800 ha area is divided among the other three tehsils.

Indira Sagar Project is a key project providing water storage which enables the downstream projects in the cascade, i.e., Omkareshwar, Maheshwar and Sardar Sarovar to cater the needs of irrigation and power generation as given in the following table:

Sl.No.	Name of Project	Gross Submergence (Lakh Ha.)	Proposed annual irrigation (Lakh Ha.)	Power Generation (MW)
1.	Indira Sagar	0.91348	1.69	1,000
2.	Omkareshwar	0.09393	2.83	520
3.	Maheshwar	0.04866	-	400
4.	Sardar Sarovar	0.37533	17.92	1,450
Total		1.4314	22.44	3,370

REGULATED RELEASE TO SSP

In accordance with Clause-IX of Narmada Water Dispute Tribunal (NWDI) "Award regulated flows corresponding to 10.01 B Cum (8.12 MAF) are to be released from Indira Sagar Project (Ex- Maheshwar) to Sardar Sarovar Project .

PROJECT FEATURES:

- i) Construction of a concrete gravity dam, 653 m long with a slightly curved alignment of 880 m radius and 92 m high above the deepest foundation level. The dam comprises of 35 blocks of which 4 (part) to 16 (part) form the main spillway, 16 (part) to 24 (part) the auxiliary spillway and rest non over flow blocks.
- ii) The gross storage capacity of the reservoir is 12.22 Bm³ (9.9 MAF) and live storage of 9.75 Bm³ (7.9Maf).
- iii) Construction of a subsurface powerhouse on the right flank of dam with eight turbine units each of 125 MW. (Total 1000 MW).
- iv) Construction of 400 KV switchyard, on right bank of river Narmada.
- v) River diversion arrangement comprising of upstream and downstream coffer dam and 390 m long diversion tunnel on the left bank.
- vi) Construction of a tunnel of 9.25 diameter and 3.677 km long popularly known as "Punasa facilities" with appurtenant structures taking off from the reservoir, designed to carry a discharge of 185 cumec inclusive of 25 cumec for Punasa lift irrigation scheme. This is followed by a 248.65 km

long gravity flow left bank canal with a head discharge of 160 cumec to irrigate 1.23 lacks ha of CCA ,comprising 19000 ha in Khandwa District, 68000 ha in Khargone District and 36000 ha. in Barwani District, with an irrigation intensity of 138%. The Annual irrigation from the project shall spread to 1.69 lakh ha.

- vii) The Punasa lift irrigation scheme is proposed to irrigate additional 35008 ha. of CCA in high reaches of Khandwa District. A canal head powerhouse with three units of 5 MW each have also been planned.

Irrigation Potential :

The ultimate creation of the irrigation potential from the project has been planned in three phases as tabulated below :

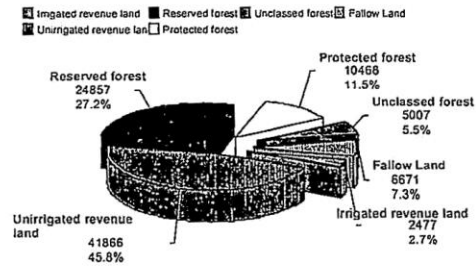
Sl.No.	Phase	Description of canal reach	Proposed Irrigation (ha) (CCA)
1.	I	Main canal from Km 0 to Km 81.00	36,100
2.	II	Main canal from km. 81.00 to Km 206.00 km.	46,800
3.	III	Main Canal to km 248.65, including canal from Khargone Lift Scheme	40,100
Total			123,000

Note:-* As per Revised Implementation Schedule of the Project-1992.

SUBMERGENCE OF LAND

The break-up of 91346 ha areas proposed to be submerged by the ISP is as under

- Irrigated revenue land : 2477ha.
- Unirrigated revenue land : 41866ha.
- Reserved forest : 24857ha.
- Protected forest : 10468ha.
- Unclassed forest : 5007ha.
- Fallow land : 6671ha.



Progress on Construction Works :

After getting necessary clearances the construction works were started in May, 1992 and the dam was targeted to be completed by June, 2000. However, due to various reasons the progress lagged behind. Subsequently, the work was handed over to Narmada Hydroelectric Development Corp. (NHDC), a Joint venture of Govt., of Madhya Pradesh and National Hydroelectric Power Corporation. The dam and power house has since been completed. However the water level of the reservoir is not being allowed to go higher than 255 m as per the direction of the Jabalpur High Court. The F.R.L. of the project is 262.13m.

KEY ENVIRONMENTAL CONCERN IN INDIRA SAGAR PROJECT

Ecological transformations following impoundment result in succession of fluvial biocoenoses by lentic environment, the hydrography undergoes a shift by way of, fluctuations in water level, changes in physico-chemical regime and inundation, impacting areas upstream, downstream and in the irrigated command. Inundation results in involuntary resettlement of the people living in the submergence area, submergence of agricultural, forests and other resources like minerals, spawning grounds of fishes, resting/nesting places, buildings, roads etc. Fluctuation in water level brings in the issues of diseases, sedimentation, aesthetics of the area etc. Physico-chemical changes relates to quality of water, formation of hydro-sulphuric sludge, morphology of the river/estuary, salinity ingress etc. The key issues being monitored included the following:

- ◆ Losses of natural forests & Afforestation programme.
- ◆ Loss of wildlife : Flora Fauna & Carrying capacity.
- ◆ Erosion and sedimentation : Catchment Area Treatment
- ◆ Public Health issues, especially the water-borne diseases
- ◆ Seismicity and reservoir-induced seismicity.
- ◆ Cultural resources/Heritage : Loss of religious and historic sites.
- ◆ Command Area and Waterlogging .

LOSS OF FOREST & WILDLIFE RESOURCES/EROSION AND SEDIMENTATION

The loss of forest and wildlife resources and the question of erosion and sedimentation are linked to a greater extent as both of these have synergistic impact and are fuelled by a common causative factor, excessive pressures from human and bovine.

The total forest area getting submerged by the impoundment of Indira Sagar dam has been estimated is 40,332 ha. The total forest in Khandwa division constitutes about 28% of its geographical area. After losses to submergence, the forest area will be reduced to 26%. In Dewas and Hoshangabad divisions, forest areas of 35.7% and 34.1% will be reduced by 0.6 and 0.01% respectively in terms of geographical areas. The project also impacts the people living in the submergences area.

The process of soil erosion and sedimentation of the Narmada River could shorten the useful life of the project reservoirs as they gets filled with sediments. The rate of erosion stand increased each time the land was disturbed/overexploited. In order to achieve an expected project life of at least 100 years for the Indira Sagar Project, notwithstanding that planners have incorporated into project designs sufficient provisions for the same, plans for afforestation and treatment of large areas within the Narmada catchment and also resettlement are under implementation.

PUBLIC HEALTH

Large water-development projects have often been accompanied by increases in water-related diseases. The Narmada projects involve large reservoirs and canal distribution systems. Their potential to create public health hazards has been recognised and provisions have been included in project planning to budget funds to provide adequate medical facilities, staffing and services. Studies have shown that the project areas are now

free of Schistosomiasis. Plans are set to monitor on a continuing basis and to take whatever actions are necessary to keep the project areas free from the schistosomiasis and other diseases.

SEISMICITY & RESERVOIR INDUCED SEISMICITY

Seismicity and the potential for reservoir induced seismicity (RIS) have been studied by the Geological Survey of India, Central Water and Power Research Station of Pune, University of Roorkee, and several consultants. Investigations have considered the Narmada Sagar Complex the dam sites at Indira Sagar, Omkareshwar and Maheshwar. The conclusions of the studies were that reservoirs might cause earthquakes to occur sooner but that the magnitude or intensity of ground motion associated with the earthquakes would not be affected. This implies that the dam design should be determined by the estimated possible severity of an earthquake that could occur. In case of the Indira Sagar dam, upon the recommendation of the experts, a conservative seismic design that provides an extra measure of safety has already accepted and implemented. A network of seismological stations has been proposed through Indian Meteorological Department covering the area of the projects of Indira Sagar Complex.

CULTURAL RESOURCES/HERITAGE

The Narmada Projects will have two impacts on cultural resources. The Narmada River is sacred. In keeping with its holy status, the river is the site of a religious pilgrimage known as the Parikrama. Traditionally, the Parikrama is called as the circumambulation of the entire river by foot. There is possibility to discontinue this Parikrama as the Parikrama path will be lost because of the change in configuration of the river. From the Sardar Sarovar Dam Site in Gujarat to the eastern extreme of Indira Sagar Reservoir in M.P, the riverine environment of Narmada River will be transformed largely into a lake environment. There are Plans for providing new pilgrimage routes to replace the earlier Parikrama Path so that Parikrama of the Narmada can be continued by traditions.

In addition, a number of religious and historic sites will be inundated by the reservoirs. Central Govt. and State Govt. departments have prepared plans for relocation and protection of the monuments impacted by the submergence. These plans are under implementation by the agencies otherwise responsible for maintaining and safeguarding the archaeological monuments under the provisions of the relevant acts.

COMMAND AREA & WATERLOGGING

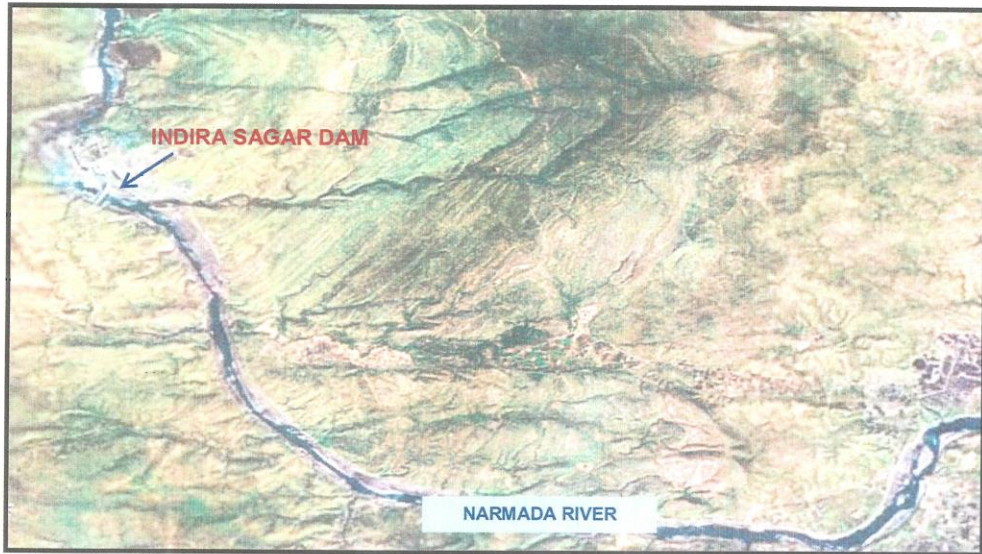
Water logging occurs when the groundwater table rises too close to the ground surface and the soils are unable to drain properly. Considering that several projects in India, including the Tawa project, located within the Narmada basin, less than 200 km, east of the Indira Sagar reservoir site in Hoshangabad District have suffered from such conditions of water logging in the past, the issue of water logging in the Command Area of Narmada project needs attention.

This concern has been carefully tackled in planning stage to avoid the problems. The conjunctive use of surface and groundwater resources, the provision of drainage systems to prevent the accumulation of excessive water in the soils, water management planning and

monitoring to control the proportions of surface water and groundwater used in irrigation and monitoring of water levels in the groundwater aquifers are some of the measures planned for prevention of any such eventuality.

The Action Plans and status of studies and implementation of Environmental Safeguard Measures upto March 2006 are summarised in this report. As 'Resettlement and Rehabilitation' is dealt with separately, current status of other suggested parameters is presented.

A PANORAMIC VIEW OF INDIRA SAGAR DAM SITE AND NARMADA RIVER STRETCH



Chapter - 2

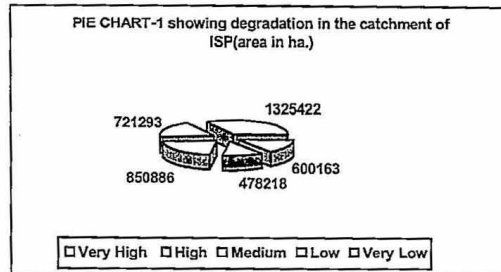
CATCHMENT AREA TREATMENT

Consequent to the preliminary assessment, based on the reconnaissance report of Inter-Departmental Committee, on Soil Conservation and Afforestation, (the Dewan Committee Report), 1985, the MOEF clearance granted in 1987, contained two conditions pertaining to CAT, as follows:

- ❖ More detailed surveys for prioritisation of the sub-catchments in the ISP area should be undertaken;
- ❖ A phased CAT programme should be prepared and implemented ahead of reservoir filling.

Studies : Detailed surveys for prioritisation

The Narmada River drains a total catchment area of 9.879 million ha. upto it's mouth at the Arabian sea. Out of this, about 6.164 million ha forms the catchment area of Indira Sagar Project. The freely draining area of Indira Sagar Project down stream of Bargi Dam is about 3.975 million ha. The prioritisation at watershed level using LANDSAT TM data of 1:2,50,000 scale was completed much before 1986.



As per the master plan for treatment of the Indira Sagar catchment area submitted by the state Govt. of M.P. during December 1986, about 7,920 km² was classified as critical catchment area to be treated. Establishment of priority in areas to be treated was followed by a detailed soil survey to determine what treatment measures would be most effective. This surveys was carried-out by the All India Soil and Land Use Survey Organisation of the Govt of India during 1989 to 1991. which was subsequently revised and updated during 1993.

Surveys and studies have been undertaken to aid the development of a management plan for CAT in the ISP catchment. They are: -

- Report on Prioritisation of Sub-watersheds in sub-catchments of the Namada Catchment, 1991 by AIS&LUSO, New Delhi. Revised subsequently in 1994.

According to the above studies the freely draining area of Indira Sagar Project down stream of Bargi Dam is about 39,75,982 ha. Prioritisation survey of the watersheds was entrusted to the All India Soil & Land Use Survey Organisation, New Delhi. The Survey has been completed by AIS&LUSO, New Delhi and the survey reports have been received in the Narmada Valley Development Authority (NVDA) Government of Madhya

Pradesh. Findings of the AIS&LUSO suggested that the catchment yielding SYI of 1200 and above are considered as critically degraded and required treatment.

AIS&LUSO in their final report have identified 508 no. of critically degraded sub-watersheds (having Silt Yield Index of 1200 and above). However considering that the area requiring treatment was large, enough to be loaded on to the cost of the project, Ministry of Water Resources referred the issues to the Govt. of India. After consideration it was directed by Govt. of India in its order of 8th July 1992 that

- ❖ The project would bear the costs of the treatment of all critically degraded sub-watersheds draining directly [Phase-I] into the reservoir. These watersheds were identified amongst those classified as either very high or high-priority categories by the All India Soil and Land Use Survey Organisation (AISLUSO). The project would also be responsible for the treatment of those areas of the catchment, which are directly damaged by the project activities.
- ❖ In addition, plans are required to be prepared for the treatment of the balance of the critically degraded sub-watersheds but the cost of this will be met from other ongoing schemes and in a timeframe to be determined.

Phased Programme:

As per the guidelines of MOWR, directly draining watersheds of very high and high priority categories only, are to be treated *pari-passu* with the construction of the dam and at the project cost. On the basis of their proximity to the reservoir these watersheds have been planned for treatment in two phases namely Phase-I and Phase-II

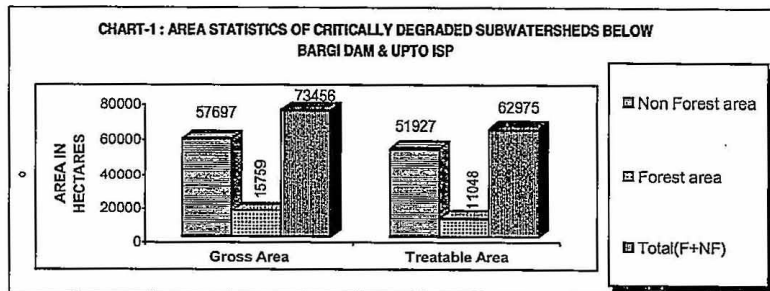
Action Plan :

1. Macro-watershed plan for the ISP was submitted during 1993. This plan was subsequently revised and updated. The updated plan of work is under implementation.

Phase-I

According to the plan submitted by the NVDA, 30 sub-watersheds covering an area of 73,456 ha have been identified as directly draining sub-watersheds.

Out of the gross area of 73,456 ha, directly draining sub-watersheds, 57,697 ha is non-forest and the remaining 15,769 ha is forestland. The net area available for treatment, however, is 62,975 ha of which 51,927 ha area is non-forest and the balance 11,048 ha is forest land. Micro

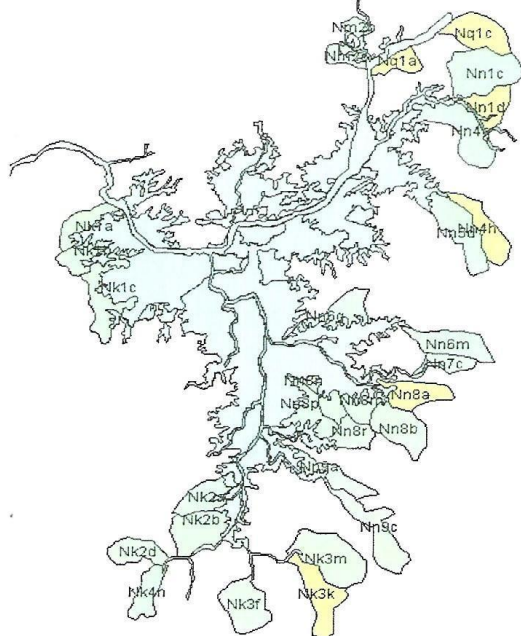


planning of the catchment revealed that the actual area of forest land is 11515 ha and that 822 ha of which is not available being rocky, bouldery etc. Thus the actual area requiring treatment was 10693 ha. Similarly for the non forest area micro planning identified 49837 ha area of which 2090 ha was under road, village, abadi, submergence, rocky and was considered as not available. Thus the actual area requiring treatment was 49837 ha. In all both forest and non forest area put together was 60530 ha.

IMPLEMENTATION:

NVDA have planned to treat the Phase-I area in about 10 years' time commencing 1991, at the cost of the project and pari-passu with the construction work on the project.

By the end of March, 2006, it was reported that entire area was treated as per details given below



	Area in ha.	Treated by NVDA	Covered under Comp Afforestation	Treated by State Forest Department	Total area treated up
Non-forest	49837	49837	00	00	49837
Forest land	10693	5686	4587	420	10693
Total	60530	55523	4587	420	60530

Action plan for catchment area treatment was taken up for implementation much before the report of All India Soil & Land Use Survey was available. As a result the areas identified for compensatory afforestation within the catchment also were included for catchment treatment works. The Environment Sub-group took note of the situation and directed that areas covered under compensatory afforestation are to be counted against the catchment treatment works with additional measures for soil conservations if required so from catchment treatment angle and fresh areas for compensatory afforestation would be taken up. State Government reported that while taking up plantations soil conservation measures are already taken up alongwith plantation activities. Hence catchment area treatment works were considered completed.

Phase- II

FREELY DRAINING AREA (Excluding Directly Draining Sub-watersheds)

According to the plan submitted by the NVDA, 478 sub-watersheds, covering a gross area of 10,12,640 ha have been identified as freely draining (other than directly draining) sub-watersheds. The net area available for treatment, however, is 9,15,150 ha of which 806720 ha area is non-forest and the balance 108430 ha is forestland.

ACTION PLAN :

NVDA have submitted macro-watershed plans covering the above area during 1993. NVDA have planned to treat the Phase-II area in about 30 years' time commencing 1994-95, as per the schedule of implementation given in Table below. However, detailed micro-watershed schemes are required to be submitted to the funding agencies like NAEB, RVP etc. in accordance with the guidelines of these schemes. A few schemes have been submitted and got approved while the remaining schemes are under formulation.

IMPLEMENTATION :

The Project Authorities have submitted CAT Phase-II plans for NAEB/ Jawahar Rojgar Yojna etc. funding for seeking funds. Fourteen schemes covering the area of 28,949 ha were approved by the Govt. of India. By the end of March2006 the progress reported was 20734 ha. The progress achieved is about 2.26% as depicted below.

	Area in ha.	Treated by NVDA	Already treated under other schemes	Schemes submitted	Balance Area remained to be treated
Non forest	806720	20734	Not available	Not available	
Forest land	108430				
Total	915150	20734			894416

REQUIREMENT OF FUNDS :

It was informed by the NVDA that progress is behind schedule due to non availability of the required funds The plan drawn up for treatment of Phase-II treatment works places requirement of total funds at Rs. 1038 crores. It is proposed by GOMP to treat the non-forest area at an estimated cost of Rs.602.57 crores and forest area Rs.435.12 crores.

Works remain to be done.

- ❖ Assessment of the efficacy of the treatment work for both forest & non-forest area.
- ❖ Submission of the scheme for Phase-II works, schedule of treatment with manpower, resources & budget.

Summary of the Status :

Sl.No.	Issue	Implementation	Balance works
1.	Assessment of the quality of work (forest & non-forest).	Non initiated.	100% remaining.
2.	Submission of the scheme for Phase-II works, schedule of treatment with manpower, resources & budget.	Work very slow due to lack of resources.	97.74% remaining. (8,94,416 ha.)

Chapter - 3

COMPENSATORY PLANTATIONS

Ministry of Environment and Forest vide letter No. 8-646-84-FC Dated the 7th Oct. 1987 permitted, under Section 2 of the Forest (Conservation), Act, 1980, diversion of 41,111.97 hectares of forest land in Khandwa, Dewas and Hoshangabad districts for the Narmada Sagar Multipurpose Project, subject to the following key conditions that:

1. Compensatory afforestation will be carried out over suitable degraded forest land double the diverted forest area in extent and in addition to the equivalent area in non-forest land.
2. The areas will be surveyed, demarcated and declared protected forests and placed under the control of the Forest Department for compensatory afforestation at the cost of the project. Areas not found suitable will be substituted by suitable area.
3. Forest clearance was to be done only upto 4 M below FRL

A scheme for compensatory afforestation submitted by NVDA vide letter Nos. F.D /AAA/ AO/3 dated 13.11.1987, as detailed below was approved by the MOEF. However additional compensatory afforestation over 150 ha. degraded forest was directed.

MOEF clearance granted in 1987 contained several conditions pertaining to compensatory afforestation. The key conditions among others was that " Since the project involves violation of Forest (Conservation) Act, 1980, compensatory afforestation will be carried out over suitable degraded forest land double the diverted forest area in extent and in addition to the equivalent area in non-forest land. For this purpose, the area offered by the State Govt. vide their letter No.5/III/84-10-3, dated 14.10.1986 will be accepted and compensatory afforestation raised at the cost of the project in this area."

- State Forest Department re-conveyed the forestland for the purpose of ISP vide it's letter dated 28th November 1987 clarifying that-

"The plantations over the degraded forest, double in extent to the area which has been worked upon without the permission of the Forest Department, violating Forest Conservation Act thereby, shall be carried out, in addition to the usual plantations over non-forestland equal in extent to the area diverted."

Subsequently, another 308.40 ha. of forestland was permitted to be diverted for powerhouse by MoEF vide their letter dated 25th July 1990 and yet another 40.49 ha was permitted for diversion for construction of railway line, by MoEF vide their letter of 20th Nov 1992. These diversions required plantations (afforestation) over equivalent non forest areas

A total of 41460.86 ha of forestland has been permitted to be utilised for the construction of ISP, under forest conservation act of 1980. about 128 ha of forest land was utilised prior to enactment of forest conservation act. Thus in all total area proposed to be utilised for the ISP is 41,589.00 as shown in Table-1 below.

TABLE-1 : Showing area diverted for the ISP

Year of diversion	Purpose	Area in hectares diverted for ISP
Prior to 1980	Misc	00,128.14
1987	Submergence=40,332 ha	41,111.97
	Power house=50 ha	
	Saddle dam= 37.26 ha	
	Road =70.73 ha	
	Colony and approach road = 621.98 ha	
1990	Power house	00,308.40
1992	Railway line	00,040.49
TOTAL		41,589.00

ACTION PLAN :

To compensate for this loss of forest the M.P. Forest Department had submitted an Action Plan for Compensatory Afforestation for the Indira Sagar Project in December, 1986. Area offered to this plan was accepted. The acceptance was acknowledged through the clearance order.

Accordingly, 10,143 ha of non-forest and 70,802 ha of degraded forestland has been identified for compensatory afforestation, in the districts of Khandwa, Hoshangabad, Dewas, Sehore, Dhar and Khargone as shown in Table below.

Table showing the district wise areas identified for compensatory plantation

District	Degraded Forest (In ha)	Area other than forest (In ha)	TOTAL
Khandwa	30,572	2,314	32,886
Hoshangabad	22,739	2,842	25,581
Dewas	17,491	802	18,293
Sehore	-	1,247	1,247
Dhar	-	1,001	1,001
Khargone	-	1,937	1,937
Total	70,802	10,143	80,945

In view of further clearances by the MoEF, NVDA revised the targets by adding 150 ha in degraded forests and 349 ha in non forest targets , as follows

District	Degraded Forest (In ha)	Area other than forest (In ha)	TOTAL
Revised targets	70,952	10,492	81,444

The M.P. Forest Department has added additional areas to the prescribed afforestation hectare as a contingency to account for unforeseen circumstances. In selecting forestlands for the plantations, local requirements for grazing, firewood, and other nistar needs were kept in view. However, considering that with the dedication of vast areas to the proposed National Parks, some future adverse impacts on the local population's nistar needs may develop and that the wood from the submergence zone was expected to meet local fuel needs only for about 8 to 10 years, more emphasis was placed

on fodder production in plantation areas in Khandwa and Dewas divisions. The plantations were to provide shelter and habitat to wildlife also.

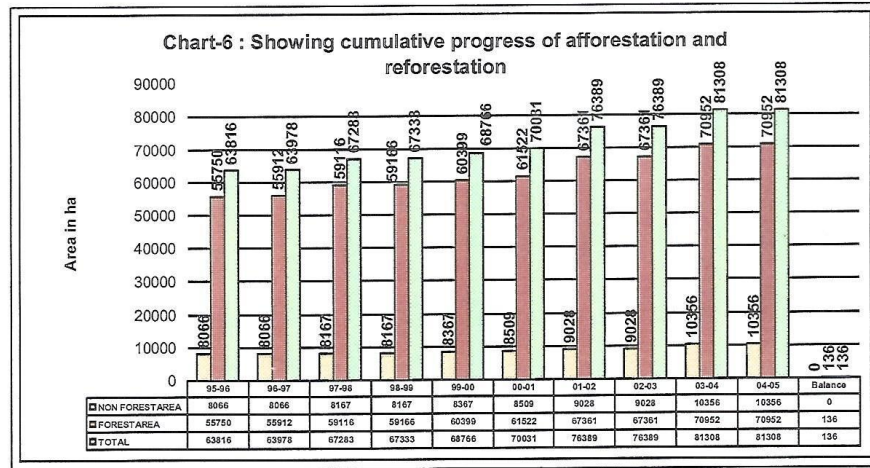
IMPLEMENTATION :

NVDA started the plantation works in the degraded forests within the Narmada catchment on the areas identified in the plan. By the end of March 2006 plantations as targeted were completed



District	CA target in Degraded Forest	CA target in non forest area	Total target in ha.
Khandwa	30,572	2,314	32886
Dewas	17,491	802	18293
Hoshangabad	22,739	2,842	25581
Sehore	0	1,247	1,247
Dhar	0	1,001	1,001
Khargone	0	1,937	1,937
Additional targets	150	349	499
Total	70,952	10,492	81,444

Progress of implementation



It was directed by the Environment Sub-Group that plantations raised as vegetative measures under CAT should not be doubly counted. Accordingly GoMP was requested to exclude the plantation areas covered under the CAT from the

achievement of compensatory afforestation. It was reported that by the end of March 2006 entire targets on forest areas were achieved , whereas 136 ha of plantations in non forest areas still remain outstanding

Works remain to be done:

- ❖ Plantations on non forest area 136 ha in extent.
- ❖ Regular upkeep & maintenance of the plantations until established & transferred.
- ❖ Assessment of survival percentage, crop composition, replacement of casualties
- ❖ Studies on development of Neo ecosystem in the newly established plantation areas
- ❖ Transfer of forest area planted to territorial forest division for regular upkeep & maintenance.

Summary of the Status :

Sl. No.	Issue	Implementation	Balance works
1.	Treatment of balance area of 136 ha	Schedule for completion by June, 2006.	0.2% remaining. (136 ha.)
2.	Assessment of the survival percentage & crop composition	Awaited.	Not available.
3.	Transfer of forest area planted up to territorial forest division for regular upkeep & maintenance.	Work progressing.	Details awaited.

Chapter - 4

COMMAND AREA DEVELOPMENT

The command of Indira Sagar Project lies on left bank of Narmada River. The Satpura Ranges flank the command on the south. The northern boundary is formed by the Narmada River itself. The command area covers Barwaha, Bhikangaon, Khargone, Kasarwad tehsils of Khargone District, Badwani and Rajpur tehsils of Badwani District and Khandwa tahsil of Khandwa District. As per the Project Report, the Gross command is 2,10,020 ha. Culturable command is 1,74,967 ha and proposed irrigation is 1,23,000 ha. Badwani and Rajpur are drought prone tehsils and the irrigation facilities are expected to remove occurrence of scarcity conditions. The land of the command includes beside habitation and other areas, the forest:10,055 ha; the Grasses and the pastures:10,498 ha; Cultivated land: 142,406 ha; Culturable fallow : 8,116 ha; Barren:18,385 ha. The project on completion will provide annual irrigation to 1.69 lakh ha.

The main canal of Indira Sagar Project is 248.65 km long. The project envisages annual irrigation of 1.69 lakh ha in a CCA of 1.23 lakh ha in 571 villages of Khandwa, Khargone and Barwani districts as per details given below.

S.No.	District	Irrigation in Lakh ha	No. of villages
1	Khandwa	0.31	76
2	Khargone	0.90	345
3	Barwani	0.48	150
	Total	1.69	571

The objectives of the command area development are :

- Optimum utilisation of created potential of irrigation.
- Introduction of multiple cropping patterns and increasing the levels of productivity and strengthening of agriculture research activities.
- Creation of adequate communication and storage facilities.
- Conservation management of integrated fisheries development.
- Intensification of dairy development.

The main components of the command area development program are

- On Farm Development,
- Conjunctive Use,
- Agro-Industries
- Regulated Market,
- Warehousing Facilities,
- Roads etc.

As per the direction of the Planning Commission, project proposals are required to include the command area development plan also. MoEF clearance of 1987 also required it. The forest clearance stipulated that tree planting should also be done on either side of canal road and foreshore of the reservoir and in the wasteland / vacant lands under the control of the Irrigation Department in the command area.

The key conditions attached with the investment clearance were as follows.

- o The State shall comply with the conditions as laid down in the O.M.No.3-87/80-IA dated 24.6.1987 and letter No.8/646/84-FC dated 7.10.1987 both 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 for this project and ensure. Completion of Rehabilitation and Resettlement Plan in scheduled time with close monitoring as per requirements of Department of Environment and Forest.
- o State will establish adequate network for ground water monitoring in the command within 2 years and the State should submit to Planning Commission the time frame for establishing such network with mile-stone achievements, duly vetted through Central Water Commission, for monitoring the same by Planning Commission
- o State should draw up a detailed time schedule for completion within 5 years the investigation, detailed survey, planning and working out the detailed cost estimates for micro level network system for the balance area (Not already submitted) of the total command of this project.
- o The State should draw up an implementation schedule segment-wise for completion of canal network, in such a manner that a segment of the canal network, taken up from head reaches, is completed in all respect so as to make the irrigation water available, for the design potential of that segment upto the outlet in that particular segment;

STUDIES AND FINDINGS

In 1975, at the request of the Narmada Water Dispute Tribunal (NWDI), the Gwalior Campus of J.N.K.V.V. University undertook a reconnaissance survey of the Narmada Sagar Command, using a 2-mile grid. Nearly 265 soil profiles were examined.

Reports on the quality of groundwater in the Indira Sagar Project area are limited, but the general assumption is that the quality is suitable for use in irrigation. Limited water quality testing was done in several blocks in the Indira Sagar Project area. These tests were apparently conducted in 1966 and 1967. In Barwaha block, five samples out of seven tested were of excellent quality.

During 1982-83, to appraise land irrigability, an area of about 2,80,000 ha falling within parts of Khandwa and Khargone districts was surveyed by the Department of Agriculture, M.P. Surveys were carried out on 1:50,000 – scale topo-sheets. Aerial photo-interpretation was carried out wherever possible. About 366 profiles and about 2787 auger bores were examined. The rate of profile examination was about 1 per 1000 ha. A total of 30 soil series were mapped. Areas falling under different classes of depth, erosion, slope, texture, and land irrigability subclasses were identified. This report indicated that typical vertisols are not extensive in the surveyed area .

A detailed reconnaissance soil survey of the Narmada Sagar Command Area was also carried out in January 1984 by the Directorate of Agriculture in co-ordination with the Govt. of India, National Bureau of Soil Survey and Land Use Planning Wing and the Agricultural University, Jabalpur in the command area of 2.10 lakh ha. The soils of the areas have been classified into 26 soil series taking into account the morphological features, topography, and physical and chemical characteristics. As per soil taxonomy (1970), altogether three orders, three suborders, three great groups, eight subgroups and

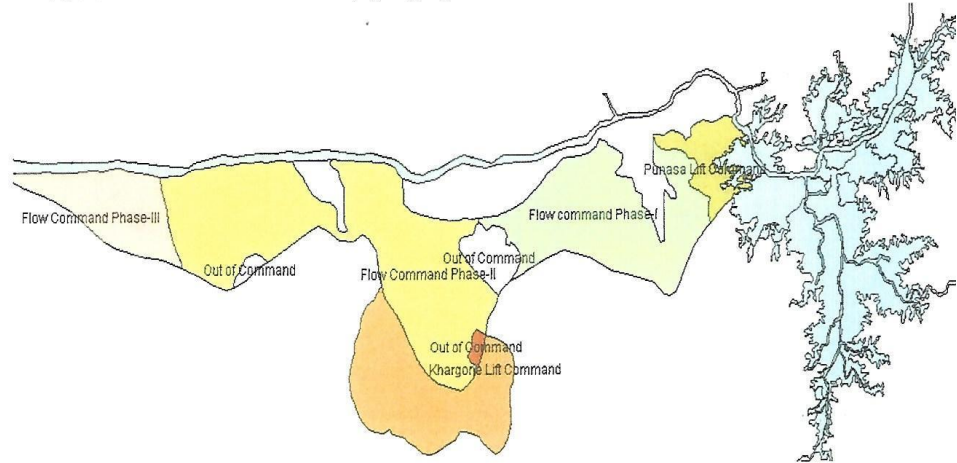
ten families have been identified. Soils have been classified into various recognised classes in terms of their suitability for irrigation.

Showing land irrigability classification

Sl. No.	Land Irrigability Class	Slope Percent	Depth of Soil (in cms.)	Percentage of gross command area
1.	2	0-3%	More than 90	29.5
2.	3	1-5%	22.5 to 90	21.5
3.	4	3-10%	7.5 to 45	25.7
4.	6	5-15%	0 to 22.5	23.3

In order to study whether full irrigation would lead to water logging and salinity problems, state govt. of Madhya Pradesh commissioned, the Indian Institute of Science at Bangalore for special studies on subsurface drainage and groundwater behavior. For study purposes, the entire Narmada Sagar complex Area was divided into 34 hydro-geological zones. The studies considered the following :

- Rainfall data from stations around the composite command.
- Runoff as measured in nearby gauging stations.



- Evaporation rate data.
- Climatological data.
- Groundwater-level data from all types of wells.
- Pump test data.
- Hydro-geological information on wells and aquifers.
- Soil and soil moisture data.
- Agricultural land use data, including information on crops and the seasonal nature and extent of surface water and groundwater irrigation.
- Proposed crop-water requirements.

Jawaharlal Nehru Krishi Vishwavidhyalaya, Jabalpur through their research centre are carrying out studies on impact of agro-chemicals run-off from fields on underground and surface water in command area with an objective of assessing the residues of toxic agricultural chemicals from fields in the ground water and surface water of command areas and ecological effects of the residues in irrigation water and their physiological effects on aquatic and terrestrial vegetation, crops, animal life and agro-ecosystem as a whole for devising measures to mitigate the same under the fallow and cropped yield conditions. Studies are commenced and are making progress.

SUGGESTED STRATEGIES

The Bangalore institute's study concluded that conjunctive use of surface water and groundwater on a significant scale would be required to avoid water logging and salinity problems in the Composite Command Area. Study data indicated that a water balance of 70% surface water and 30% groundwater would be suitable in most project areas to avoid waterlogged conditions.

Natural drainage conditions in the Narmada Sagar Complex Command Areas are quite favourable as Narmada Sagar area has a well-developed natural drainage system. The command complex lies on both flanks of the Narmada River, with a number of tributaries draining the area towards the Narmada River. The slope of the cultivable land generally ranges from 1 to 3% and it has good natural drainage. The groundwater aquifers are deeply incised, and major problems of surface drainage do not appear to exist. Surface drainage will, however, be required after irrigation is implemented through the provision of a proper network of field drains so that excess water will be removed from the cultivated fields.

Irrigation water from the Narmada River will be of good quality, and normal irrigation applications are considered sufficient to leach out the salts from saline/sodic soils. No additional leaching requirements will generally be necessary. Project planners do not expect any salinity problems if proper surface and subsurface drainage systems are installed.

ACTION PLAN :

Macro-Plan

The Government of Madhya Pradesh have submitted command area development plan, delineating the soil classifications and land irrigability in the Narmada Sagar Command Area showing the first three phases of irrigation development by area, the land irrigability map of the Narmada Sagar Command Area showing lands of classes 2 through 6 by location in the first three phases of irrigation development during 1986. Accordingly, the implementation of the plan was to be taken up in three phases for completion by December-2007. The project on completion will provide annual irrigation to 1.69 lakh ha.

Water-logging occurs when the groundwater table rises too close to the ground surface and the soils are unable to drain properly. In the plan of 1986, this concern was addressed to avoid the problems. The conjunctive use of surface and groundwater resources to the extent of 30% was also proposed. The provision of drainage systems to

prevent the accumulation of excessive water in the soils, and water management planning and monitoring to control the proportions of surface water and groundwater used in irrigation and the water levels in the groundwater aquifers are some of the measures planned for prevention of any such eventuality.

In keeping with the study conclusions, planning for the Indira Sagar Project includes maintaining a water balance of 70% surface water and 30% groundwater use, lining of the canal distribution system from the Main Canal upto the eight ha. service area, and installing and maintaining surface and field drainage systems. Because of the deeply incised aquifers, plans for surface and field drains, and plans for conjunctive use of surface water and groundwater, the planned groundwater monitoring program would be sufficient to indicate the needed remedial measures. Essentially all of the groundwater development will be undertaken by the farmers, however the State Govt. plan to take appropriate action to encourage planned groundwater development on schedule and to ensure that the required 30% of the total irrigation demand was met from the groundwater. If groundwater development does not occur on schedule because of the lack of farmer initiative or because of problems with water quality or adverse aquifer conditions, State Govt. plan to step in and install appropriate drainage systems whenever wherever needed

Action Plan : Micro-Plan

The subgroup directed updating of this plan in line with the plans being developed for the SSP in Gujarat and Rajasthan.

As informed during the 40th meeting, a GIS based CAD plan is under preparation with the help of NIC, MAPCOST and Survey of India and experts from NCA. Preparation of a comprehensive command area development plan has been entrusted to MITCON, Pune at the estimated cost of about Rs.40.00 lacs. A Multi-disciplinary Expert Group has been constituted by the GoMP to supervise and monitor the preparation of this plan. The MITCON, Pune has already started the work. Inception report has been submitted by the consultant and existing data was collected from secondary sources. The Survey of India have completed digitization of the area of interest. The MAPCOST have also completed digitization of land use maps for the ISP command. The GIS is being developed with the help of NIC. The work though behind schedule was progressing.

Progress of construction works on Canal System

As per Detailed Project Report canal system is divided into three phases. The works were making progress as given in table below .

S.No.	Phase	Description of Canal reach	Length of main canal planned as per DPR	Status of works as of March, 2006	Irrigated Area (ha) CCA	Revised construction period
1	I Phase	Main canal from ch.km 0 to 81 Km	81 km	In progress	36100	June, 2006
2	II Phase	Main Canal from ch. km 81 to Km 206	125 km		46800	June, 2007
3	III Phase	Main Canal from ch. km 206 to km 248.65, including Khargone Lift Scheme	42 km		40100	Not available
		Total	248 km		123000	

IMPLEMENTATION: Environment Safe guard measures

Implementation shall be taken up after formulation of the micro-plan.

Summary of the Status :

Sl. No.	Issue	Implementation
1.	Canal Network	Out of 248.65 km of Main Canal works were progressing in parts.
2.	Preparation of CAD plan by the consultant. Preparation of EIA report Preparation of Environmental Management Plan	Micro planning by the consultant is progressing. Data collection is progressing. Results will be known after completion of CAD plan. Shall be prepared after results of EIA studies are known.

Chapter - 5

FLORA, FAUNA & CARRYING CAPACITY

The guidelines of the MOEF require that while seeking environmental clearance for the hydropower projects, surveys should be conducted so that the status of the flora and fauna present can be assessed, listed (rare and endangered) species can be detected, if present, and appropriate conservation measures devised. Important survey work undertaken for the purpose included the following

- 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.
- 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.
- Water quality data has been collected by the Central Pollution Control Board, Central Water Commission, the State Pollution Control Boards and the National Institute of Oceanography

On the basis of relevant details supplied by the various states, MOEF issued clearance in 1987. 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 and fauna needed for implementation of environmental safeguard measures.

Further in-depth studies with focus on the following prime concerns were taken up.

- Relocating and protecting wildlife through setting up and maintenance of the permanent protection areas.
- Detailed surveys of both flora and fauna to determine the number of individuals of the various species, their habitat types and other needs, their status in terms of being endangered, threatened or protected under Indian Legislation, and recommendations for minimising project impacts and maximising opportunities for protecting and enhancing plant and animal life.
- Studies to ascertain the capacity of the surrounding areas to accommodate additional wildlife

The objective of the suggested studies was to assess the environmental impacts as a result of the Narmada Sagar Complex, consisting of the three dams: the Narmada Sagar, Maheshwar and Omkareshwar, to ensure minimal adverse effects on wildlife as a result of the project development works. Studies were entrusted to Wildlife Institute of India, Dehradun, Friends of Nature Society, Bhopal and Limnological studies to the universities of Jabalpur, Ujjain & Bhopal. Institutes carried out exhaustive studies with a view to address the above concerns. Studies focused on the following

The reports submitted by the identified premier organisation during the period 1986 and 1997 included the following

- Sociological Survey of the Fishing Families of the Namada River by CICFRI, 1991.
- Aquatic Fauna (Fish) Studies in Indira Sagar Submergence Area, prepared by the Friends of Nature Society in 1991.
- Pre-and Post-Impoundment Limnological Studies of Narmada Basin, by three universities coordinated by Barkatullah University (1994).
- Studies on Fish Conservation in Narmada Sagar, Sardar Sarovar and its Downstream, by CICFRI, (1993).
- Wetland and aquatic flora of Narmada Valley in Madhya Pradesh published in 1991 in Vol. 15 No.3 in J.Econ. Toxicology Bot.
- Studies on EIA of Flora & Fauna of NSP by the Wildlife Institute of India, Dehradun in December, (March 1994).

Ongoing study

- ❖ "Ecosystem resoration and development of Analogue forest near NVDA project area" by IIFM.

A) Terrestrial Eco-System:

Key concerns addressed on the terrestrial ecosystem were as follows:

- A wildlife inventory giving reliable estimates of the numbers of various species of wildlife in the project impact area.
- A catalogue of habitat types found in the project area.
- A status report on individual species indicating ones that are endangered, threatened, or protected under prevailing Indian wildlife Laws. The report on these special status species was also included the recommendations for actions to be taken to safeguard threatened species
- Recommendations for the creation of new protected areas for wildlife in the areas neighboring the submergence area.
- An assessment of the impact of the project gene pool reserves of wildlife in the project area.

Suggested strategies & Action Plan :

It is suggested that the severity of the impact resulting from direct and indirect losses could be minimised through restoration of some of the aquatic vertebrates and delineation of a substantial area of the contiguity forest which has similar conservation values that are being lost in submergence and to elevate its status to a protected area – a combination of a national park and sanctuary.

1. Key aquatic vertebrates species like **otter** was proposed to be restored and translocated. It was suggested to explore the possibility of capturing and translocation of impacted otters of Narmada Sagar into identified localities of the vacant niches in central Indian rivers.
2. Besides, a species restoration plan for **aquatic reptile (turtle)** was also suggested within the submergence zone and also in other stretches of the river with rocky structure and sandy banks.

3. The restoration program for **muggar crocodile** as being practised in other districts of M.P. was also suggested.
4. The studies of certain aspects of fisheries and reservoir sciences have been included in the Limnological studies being conducted by the three Universities of the State. Studies in the Upper Narmada, (Bargi Reservoir) by Rani Durgawati University, Jabalpur, studies in the Middle Narmada (Tawa, Bama and Kolar Reservoirs) by Barkatullah University, Bhopal, studies in the Lower Narmada by Vikram University, Ujjain. All the three Universities have completed the studies in their respective areas as per MOU and final report is available
5. Since the topography in the reservoir area consists of rolling hills, the higher peaks remain above the water surface level and constitute islands in the reservoir. In addition to these small islands, two large islands will be formed to the north and south of the Narmada River just upstream of the Indira Sagar Dam. These islands were required to be protected. As per suggestions of the Sub-group, NVDA had presented a plan for protection which was required to be implemented.
6. **National Park / Sanctuaries for ISP areas :**
Three new protected areas were proposed to mitigate the losses. This included Narmada National Park, Suryanmaya Sanctuary and Omkareshwar Sanctuary, as per details given below.

Govt. of M.P. vide their letter No. F5/58/83/10/3 dated 29.05.1990, formed a committee for suggesting the steps and drawing up of the plan for conservation & management of wildlife for SSP & ISP both. It was reported by the NVDA that, to ensure that no villages are included inside the proposed area of National Park and Wildlife Sanctuaries, the areas recommended by the EIA report was reduced by about 35.23%. i.e. instead of covering an area of 75888 ha recommended by the EIA studies, GoMP is to constitute protected area only for 49154 ha. as follows

Name of the Sanctuary/Park	Area in ha.		Difference in area
	As per WII	As per State committee	
Omkareshwar National Park	47522	25082	- 22440
Suryamanya Sanctuary	16370	17400	+ 1030
Narmada(Mandhata) Sanctuary	11996	6672	- 5324
Total Area	75888	49154	- 26734

Map showing areas recommended for protection by the Wild-Life Institute of India, Dehradun.



B) Aquatic Ecosystem

The studies of certain aspects of fisheries and reservoir sciences were included in Limnological studies conducted by the three Universities of the State. Studies in the Upper Narmada, (Bargi Reservoir) by Rani Durgawati University, Jabalpur, studies in the Middle Narmada (Tawa, Bama and Kolar Reservoirs) by Barkatullah University, Bhopal, studies in the Lower Narmada by Vikram University, Ujjain. All the three Universities have completed the studies in their respective areas as per MOU and final report is available

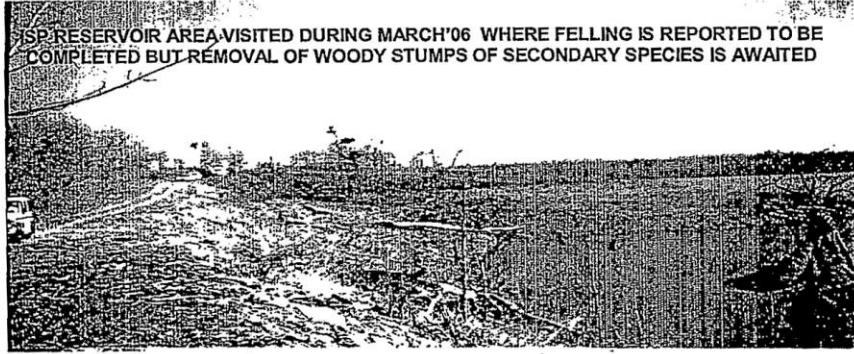
IMPLEMENTATION:

- ❖ Administrative offices of Project Director(s) have been established but notifications regarding declaration of Sanctuaries areas are awaited.
- ❖ GoMP reported that felling was under progress in 300 compartments of forest areas, 407 Khasra from 24 villages besides private areas of 125 villages. It was further reported that by the end of March 2006 all trees with exception of 23,743 trees were already removed
- ❖ In addition to these small islands, two large islands will be formed to the north and south of the Narmada River just upstream of the Indira Sagar Dam. Present plans are to reserve the northern island of 17 km², for people and to link it to the mainland and the highways leading to Indore and Bhopal. The southern island of about 23 km², however, is earmarked for conversion into a wildlife sanctuary. This prospective island would be considered large enough to preserve existing flora and fauna.

Summary of the Status of preparation & implementation of action plans.

Sl. No.	Issue	Action Plan	Implementation of Environment Safeguard Measures
A) Terrestrial Ecosystem			
	Declaring the Island as sanctuaries / protected areas. Topography in the reservoir area consists of rolling hills therefore the higher peaks remain above the water surface level and constitute islands in the reservoir. These islands would contain remnant flora and fauna that would remain isolated and would be subjected to changes in microclimate by virtue of being surrounded by a large body of water.	No formal action plan yet. Statement to declare only one island as sanctuary.	Nil
	Key aquatic vertebrates species like otter was proposed to be restored and translocated. It was suggested to explore the possibility of capturing and translocation of impacted otters of Narmada Sagar into identified localities of the vacant niches in central Indian rivers. Besides, a species restoration plan for aquatic reptile (turtle) was also suggested within the submergence zone and also in other stretches of the river with rocky structure and sandy banks. The restoration program for muggar crocodile as being practised in other districts of M.P. was also suggested.	Action plan included in the EIA report itself.	Nil
	Protection for the wildlife moving out from the submergence area A plan for felling was also required, to ensure protection to wildlife (providing of migratory corridor). Environmental consequences of this large scale felling were documented to by the wildlife Institute of India in the EIA studies which called for implementation of mitigation measures, commensurate with progressive filling of the reservoir.	Except for 23,743 no of trees in forest areas the felling is nearly completed. Submergence is already effected. No formal action plan	NIL
	Name of the Sanctuary/Park Area (in ha.)	As per State committee	
	Omkareshwar National Park	47522	25082
	Suryamanya Sanctuary	16370	17400

	Narmada(Mandhata) Sanctuary	11996	6672	
	Total Area	75888	49154	
	By IIFM study entitled "Ecosystem restoration and development of Analogue forest near NVDA project area"	Ongoing study		
B) Aquatic Ecosystem :				
	Fisheries conservation & Development			Nil
	Water Quality; Hydro biological Monitoring			
	Prevention of Eutrophication (felling of trees)		No formal plan	Forest areas : Out of 9561272 trees, 23743 trees left for felling



Chapter - 6

SEISMICITY & RIM STABILITY

The Narmada Sagar reservoir has a gross capacity of 12,200 million cubic meters, or about 9.9 million acre-feet, by far the largest-capacity reservoir planned in the Narmada River basin. Therefore the issues of seismicity, the potential for reservoir-induced seismicity (RIS) and the rim stability have been carefully studied and addressed.

STUDIES

Investigations have considered the Narmada Sagar complex dam sites at Indira Sagar, Omkareshwar and Maheshwar together for the studies. Geological Survey of India, the Central Water and Power Research Station of Pune, the University of Roorkee, GOG, GOMP and World Bank Consultants Pinkerton, Markwell and others have been closely associated with the studies and the mitigation planning. Several reports on seismological factors affecting design of the dam, including the following are available

- Technical Memorandum 3.09, Evaluation of the Earthquake Parameters of the Indira Sagar Dam, by the Department of Earthquake Engineering, Roorkee University. Technical Memorandum 4.12,
- Seismological Considerations for Indira Sagar Dam. Part-1: Evaluation of Earthquake Parameters for Design of Dam. Part-2: Assessment of Potential for Reservoir-Induced Seismicity in Narmada Basin.
- Induced Seismicity and Other Geodynamic Processes Associated with Man-made lakes, Guha, S.K., Visiting Seismology Consultant, North Eastern Council, Shillong, India,
- Sessional Report presented at IVth International Congress, International Association of Engineering Geology, New Delhi, India, 10-15 December 1982.

SUGGESTED STRATEGIES

Considering that Reservoir impoundment may trigger significant earthquakes, detailed studies done by the University of Roorkee, consultancy report of Dr. Guha and expert opinion obtained from Dr. Ray W.Clough, were placed before the Indira Sagar Dam Review Panel. The Panel considered all available reports and data and recommended that

- To monitor seismicity during the pre and post-impoundment phases. Network of about five stations each be developed in the Narmada Sagar, Omkareshwar, and Maheshwar areas .
- To record the ground motion intensity and response of the dams for any significant earthquake in the vicinity, installation of three strong motion seismographs at each dam site.
- To record any significant ground motion that occurs during construction, one strong motion instrument near each dam site.

Based on the recommendations of Dam Safety Review Panel a network of 10 seismological observatories with sophisticated instruments has been established.

The locations of these seismic observatories was finalised on the recommendations of IMD. It has been proposed to monitor pre and post impoundment seismicity also at these seismic stations to help in assessing the adequacy of seismic parameters adopted for designs. In addition one observatory was established at Pandhana in Khandwa District as per the request of the District Collector. The location of these 11 seismic observatories in all is as under:

- | | |
|------------------|------------------------|
| 1. Narmada Nagar | 2. Omkareshwar (Kothi) |
| 3. Maheshwar | 4. Khandwa |
| 5. Indore | 6. Barwani |
| 7. Bagli | 8. Kannod |
| 9. Hirapur | 10. Chhanera |
| 11. Pandhana | |

1. In order to study the seismic effects in the Narmada Sagar Complex Zone a network of 11 seismological observatories with sophisticated instruments are proposed to be established based on the recommendations of erstwhile Dam Review Panel, Central Water and Power Research Station, (CWPRS) Pune and Indian Meteorological Department (IMD). It is proposed to monitor pre and post impoundment seismicity also at these seismic stations to help in assessing the adequacy of seismic parameters adopted for designs.
2. Micro Earthquake (MEQ) recorders were installed at 10 seismic observatories which includes
 - Micro Earthquake recording system
 - Short period Seismometer
 - Long Period Seismometer
 - Strong Motion Oscillograph
3. At Pandhana only MEQ has been installed at the request of the Collector, Khandwa which is being maintained by the NHDC.
4. It was reported that Indian Meteorological Department is likely to takeover monitoring station at Narmada Nagar to setup an unmanned observatory equipped with state of the art equipment and "V"-Sat communication facilities. It was further reported that cost of maintenance etc. shall be borne by the IMD.
5. Observatories at Narmada Nagar, Kothi, Chhanera, Hirapur and Kannod have the facility of Solar Photo voltaic system to provide power backup. Balance observatories shall be provided these facilities shortly.

The complete package of seismic digital and analog recorders and sensors had been procured from M/S. Sprengnether Inst. Inc. USA and installed.

IMD had recommended installing Wood Anderson Seismographs at 6 locations. Eminent seismologist, who visited ISP, suggested that seismic data collected by digital seismographic are more reliable. The existing digital recorders having 2 MB data recording capacity and manual time synchronization are on the process of upgradation to digital recorders of 10 GB (8 & 4 channel) capacity with GPS facility for automatic time

synchronization as per recommendations of Experts. The latest versions of Digital Recorders are proposed to be procured and action has been already taken up and the same is being processed.

The visual recorders VR-60 operate on AC power mains and require costly heat sensitive papers. Ink pen assembly which operates on 12V DC power is proposed to be installed in place of the AC power operated system. The case for supply and installation of VR-60 ink pen recorder is finalized. This will ensure continuous operation of VR-60 recorder by Solar Power.

Manpower has been deployed for day-to-day operation, maintenance and watch and ward of seismic observatories of ISP on contract basis at a cost of Rs. 9.3 lacs per annum. The laboratory attendant so deployed operates seismic instruments for data collection. However, the data of MEQ collected needs to be analyzed regularly. Trained manpower is proposed to be deployed at the observatories and for which action has been initiated by the project authorities. Project authorities are also considering entrusting entire seismicity studies to private agency that are well equipped and having expertise in this field.

Accordingly a high level committee was constituted for consideration for engaging private agency for day-to-day running maintenance, data acquisition and analysis for an initial period of three years. M/s. Anatech Instruments, Mumbai, the Indian agent of M/s. Sprengnether Instruments Inc., USA who supplied, installed and maintained the entire seismic instruments during warranty period have been approached and proposal invited. On finalization of their offer the seismicity studies shall be done in systematic manner and project personals shall be attached with them to get on job training for operating such systems. However, as an alternative Central Water & Power Research Institute, Pune has also been approached for getting the job of inferring long term trends by analyzing data acquired so far from 1995 to 2003 and 2003 onwards and also to provide training to project officers so that in future the work can be expedited. The work has been awarded on 23.09.2004 to CWPRS, Pune for a sum of Rs. 13,13,700. Accordingly CWPRS officials shall be providing training to NHDC officials on handling data and its compilation. Report on seismic activities based on the data collected at various observatories during 1995 to 2003 is awaited

RESERVOIR RIM STABILITY

The reservoir competency survey has been done by GSI and report is submitted. In the report, GSI suggested further studies for some patches of narrow water divide. However environment sub-group decided not to have further studies as experts were of the opinion that there was no water loss between Mandla & Rajghat.

MEQ recorders All the 11 MEQ recorders have been installed. MEQ recorders are now in working condition at 7 stations. Action is also taken by Project Authority to make functional the remaining MEQ recorders.

Anderson Seismometers Out of 6 nos. of Wood Anderson Seismometers supply for 4 was received and 2 sets have been installed already at Narmada Nagar, Khandwa during 1999. These however required recalibration by the IMD.

Seismic Instrument Complete instruments including digital data acquisition and analysis system was installed at 10 locations during 1998-99 which includes short term seismometer, long period seismometer, Strong Motion Accelerograph.

Presently only Narmada Nagar and Khandwa observatory station are fully functional.

Summary of the Status :

Sl. No.	Issue	Implementation	Balance works
1.	Instrumentation of observatories	10 completed	Nil
2.	Functioning of observatories	2 functional	80% remaining.
3.	Running maintenance & data acquisition.	Contract is being awarded- yet to start	
4.	Training for analysis of the data	CWPRS to conduct training – yet to start	

Current status of the working of instrument is as below :

S.No.	Name of observatories	Name of instrument	
		VR-60 (short & Long period)	Micro earth quake recorder
1.	Narmada Nagar	Two are working out of four	Working
2.	Kothi (Omkareshwar)	Three are working out of four	Working
3.	Maheshwar	One is working out of four	Not working
4.	Khandwa	Working	working
5.	Barwani	Not working	Working
6.	Umrikhera (Indore)	Not working	Working
7.	Hirapur	Working	Not working
8.	Kannod	Not working	Not working
9.	Bagli	Working	Not working
10.	Chhanera	Working	Working
11.	Pandhana		Working.

Chapter - 7

HEALTH ASPECTS

Surveys have been conducted in the Indira Sagar impact areas to investigate existing levels of health and to gather information on specific diseases.

STUDIES :

- ❖ Three specific diseases namely Malaria, Schistosomiasis, and Filaria were studied. Other diseases investigated were leishmaniasis scabies and other water-washed diseases. The geographical reconnaissance study, to identify the potential breeding sites of malaria vector, is being explored.
- ❖ Pre-impoundment and post-impoundment Limnological studies carried out by three Universities take care of water quality aspect. These studies have been completed and the final report is submitted.
- ❖ Further regarding preventive aspects, Department of Preventive and Social Medicine, Gandhi Medical College, Bhopal carried out epidemiological studies.
- ❖ Jawahar Lal Nehru University which carried out initial studies for the planning commission on the aspects related with the use of insecticides and pesticides in the command through their research station at Khandwa have been entrusted with studies on impacts of application of insecticides etc.

Findings & Suggested Strategies :

According to the above studies, key findings included the following :

- Malaria is increasing in Khandwa and Khargone Districts surrounding the Indira Sagar Dam site.
- Cholera and gastroenteritis are endemic in Indore, Dhar and Jhabua Districts for more than seven months each year.
- Other common diseases are typhoid and dengue fever, although they are not often found in the project area.
- Filariasis is endemic to at least eight districts of MP, including Chindwara, adjacent to the Narmada Sagar Site. The vector mosquito (mainly *Culex fatigans* responsible for this parasitic diseases proliferates in dirty water in ponded areas and artificial containers and also to a lesser extent in stagnant irrigation tributaries and lakes.
- Little or no autochthonous leishmaniasis exists at present in MP. This disease is not water related since it is spread by sand flies that do not need water to breed. However, according to NICD, Delhi, leishmaniasis flared up following the construction of the Rajasthan canal.
- Guinea worm disease (dracontiasis) affects 3,000 villages in MP. This disease is caused by a nematode worm and the vector for its transmission is Cyclops, the fresh water fleas.

Health problems related to these causes are expected to improve for better when the projects are implemented. The incidence of water-washed diseases should be reduced by the increased availability of water. The point has also been made that large water supply and irrigation projects often cause problems related to the expanded water environment. Plans have been prepared in both project areas to increase public health-related facilities, staffing, and services during project implementation. The incidence of water borne diseases in the Narmada Valley, as elsewhere in MP, is constantly being monitored by GOMP's Directorate of Health Services (DHS).

Means to control schistosomiasis include physical, chemical, and biological mitigation measures. Physical mitigation measures include draining area with standing water, clearing vegetation from water channels and banks, utilising flushing flows, and manipulating water levels. The primary chemical mitigation measure is the use of molluscicides. Biological mitigation measures would include the use of predator species that would eat the secondary host snails. Schistosomiasis is to be kept out of the project area through vigilant monitoring and the prompt use of eradication measures when needed

Malaria is another disease that requires monitoring and control actions in the project areas. It was found that most of the existing diseases in the project area were related to prevailing socio-economic levels, mainly hygiene. Since the Anopheline mosquito vector has the potential to proliferate in the reservoir, the large draw down strip, and the canals and drains, preventive measures are to be in place to keep the mosquitoes in check. Some experimental resistance of adult mosquitoes to commonly used biocides has been noted under laboratory conditions. Thus research to maintain effective biocides will have to be continued on long term basis. Land levelling and land filling operations as well as appropriate vegetation clearing are being integrated. Control measures will include larvae-eating fish in water bodies, mosquito-inhibiting plants, and clearing of vegetation and other actions to destroy breeding sites.

The geographical reconnaissance study, to identify the potential breeding sites of malaria vector, was suggested and is an ongoing studies with the help of ICMR.

ACTION PLAN :

A. Action Plan on Public health

The NVDA has prepared a plan on health aspect for ISP. The plan covered the up-stream, dam site, command area and the rehabilitation sites of the Indira Sagar and Omkareshwar projects. The plan is estimated to cost Rs.6.49 crores including incremental provisions towards ISP for 30 bedded hospital at Punasa and other facilities as follows:

- ❖ 1 mobile unit,
- ❖ 29 Sub-Health Centers,
- ❖ 2 Public Health Centers besides
- ❖ strengthening of 6 existing health sub-centers.
- ❖ Provisions for IEC, control of Arthropods,
- ❖ provision of insecticides and surveillance were also incorporated.

B. Action Plan on limnology & Water Quality

Action Plan includes continued investigations of the Central and Western Zone of Narmada at selected sites for the identified parameters. In addition, plan proposes biological characteristic study, microphytes, phytoplankton, zooplanktons, micro invertebrates, biomass etc. The proposal includes among others continued limnological studies, ecological studies.

IMPLEMENTATION :

A. Health Plan

The above Action Plan is under implementation as brought out below.

Project site.

- ❖ Presently one 20 bedded hospital is functioning at ISP site with Chief Medical Officer posted with adequate staff and a pathological laboratory. In addition to this, the contractor M/s. Jai Prakash Associates has one hospital with two Medical Officers and a pathological laboratory available at project site.
- ❖ For the control of vector borne diseases the project authorities have engaged M/s. Bayer Company for spraying of insecticides in the project area.

Progress on work on Health services being created in ISP Rehabilitation sites.

Sl. No.	Rehabilitation sites	Provision	Status
1.	Bedhani	Ayurvedic Hospital	Work in progress
2.	Anjanika Khurd	Ayurvedic Hospital	Work in progress
3.	Chainpur	Ayurvedic Hospital	Work in progress
4.	Saralya	Sub-Health Centre	Work completed

Peripheral population

Surveillance studies

- ❖ Monthly Statement showing Institutional Cases and Deaths due to Communicable Diseases are being compiled on monthly basis and are available in NVDA.

Incremental facilities:

Progress awaited on the following

- ❖ Mobile unit
- ❖ PHC 3 nos., equipped with 5 beds each, equipments, vehicles, staff etc.
- ❖ 2 civil dispensaries with labs
- ❖ 24 sub-health centres with equipments etc

B. Limnological aspects and Water quality

Included in fisheries plan

Summary of the Status of Planning & Implementation :

Sl. No.	Issue	Implementation		Balance works
		Phy	Fin.	
1.	Incremental Health Infrastructure ❖ Dam site	2 Hospital & Spray of pesticides		In position
	❖ Peripheral villages	Not available		
	❖ Rehabilitation sites	3- Ayurvedic and 1 SHC		Major works remain
2.	Appointment of Doctors / Nurses.	Not Available		
3.	The private practitioners should be imparted training on drug policies for malaria and filariasis etc.			
4.	Supplies of medicines and pesticides etc.			
5.	Supplies of instruments (X-ray, Microscope, Testing kit etc.			
6.	All proposals should indicate management of collection of seepage water from dams in the Engineering Action plan to avoid breeding of mosquitoes.			
7.	All proposals should incorporate introduction of larvi-vorous fishes for mosquito control besides insecticide spray.	Details awaited		Progress awaited
8.	Entomological Reconnaissance studies. The research activities plant with Malaria Research Center			
9.	Water quality monitoring on identified parameters			
10	Epidemiological surveillance The surveillance activity for prevention and control of malaria & other vector borne diseases.			
11	The Action Plan for IEC activities at village level requires detail method of communication activities viz. group meetings, slogans on walls, video films, newspapers, pamphlets etc.	Progressing		Report progress
12	There should be a centralized data management preferably on weekly basis. The details should be indicated in the Action plan.	Monitoring cell in position		Report progress after analysis

Chapter - 8

ARCHAEOLOGICAL & ANTHROPOLOGICAL ASPECTS

Archaeological Aspects

Investigations of the basin revealed that valley was rich in archaeological belongings:

- ◆ Paleolithic sites are discovered in Nemavar, Kannod, Punjabura, Chirapahad, Sitabau, Dhardi, Moretakka, Maheshwar, Kasrawad, Sahastradhara, Khalghat, Dharamपुरी, Kalibaodi, Manawar, Budada, Barwani, and Kukshi.
- ◆ Mesolithic sites are discovered all over the valley.
- ◆ Cholelithic sites are to be found in Chikalda, Khedi, Badada, Mohipura, Hathnawar, Piplada, Khalghat, Maheshwar, Nawada, Todi, Kapila Sangam, Veda Sangam and Mardana.
- ◆ Rock-cut caves and sculptures are discovered at Piploda, Dharamपुरी, Bijagadha, Bagha and Mandogarth.

None of the archaeological sites mentioned above, that have special significance, would fall within the area of submergence of the projects.

SURVEYS :

A survey of the 254 villages for identification of the archaeological monuments falling within the submergence area was carried out by the State Department of Archaeology and Museum.

Archaeological Survey of India has also completed the survey for 167 villages for centrally protected monuments for identification of the monuments of significance. Implementation of the Action Plan is already initiated.

ACTION PLAN :

State Protected Monuments :

The State Department has submitted an Action Plan for relocation of monuments of archaeological significance earlier in 1993. According to this, the archaeological mound at village Khedinema is excavated.

Later on GOMP has revised its plan as Action Plan 1997. The plan was again revised in 2002 and in this plan there are 9 monuments under consideration. Current status is presented in table below.

Sl. No	Particulars				Status
	Name of monument	Village / Tehsil	Distt.	RL in m	
1.	Shiv Mandir, Dharikotla	Harsud	Khandwa	229.500	completed
2.	Shiv Mandir, Punghat	Harsud	Khandwa	240.315	completed
3.	Shiv Mandir, Badkeshwar	Harsud	Khandwa	263.805	Already ruined
4.	Shiv Mandir (Durga Mandir), Chandel	Khandwa	Khandwa	254.917	Not to be relocated as outside the submergence
5.	Chhatri Ghisor	Harsud	Khandwa	239.300	completed

6.	Shiv Mandir, Saraswati Kund,	Harsud	Khandwa	--	completed
7.	Ridheshwar Mandir, Handia	Handia	Hoshangabad	273.380	Retaining wall proposed
8.	Rock-cut statues	Daiat	Dewas	267.830	completed
9.	Tomb of Sant Sangaji	Harsud	Khandwa		Protected and development works are progressing.

- 153 statues have already been collected and preserved at Museum at Dewas, Hoshangabad and Khandwa.

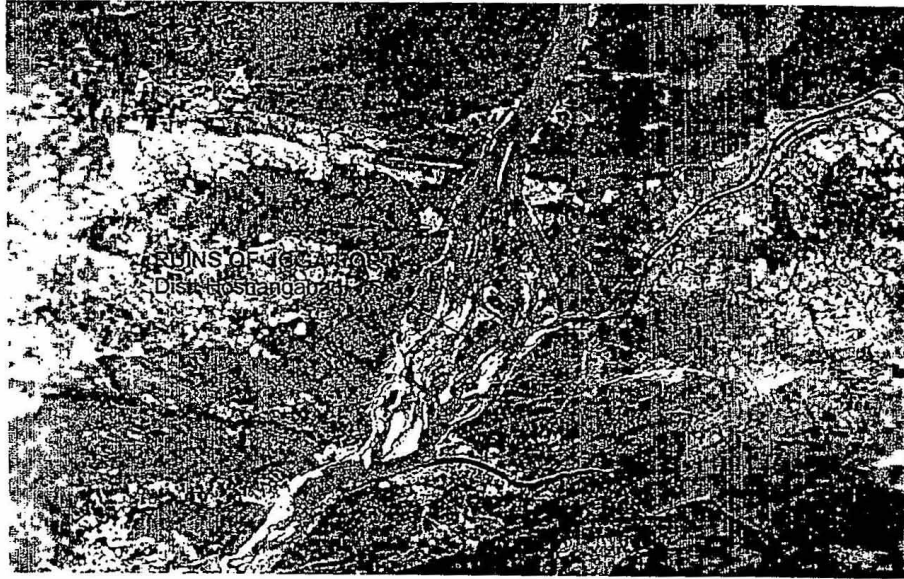
Centrally Protected Monuments :

Archaeological Survey of India have prepared a plan for protection of monuments coming under the submergence of Narmada Sagar Complex area. According to this plan, in the area of submergence of Indira Sagar Project, only north bastion of the Joga Fort is likely to be affected by scour action of water.

• **Plan of Archaeological Survey of India**

Environment Sub-group constituted a committee to look into the plans to protect the Joga Fort, located in Joga Kalan of Hoshangabad District in Madhya Pradesh towards the tail end of the Indira Sagar Project. Location of the Joga Fort is shown in the Picture/Map below .

PANORAMIC VIEW MAP: Location of Joga Fort (Ruins) in Village Joga Kalan



The committee constituted by the Environment Sub Group met twice and undertook field visits and collected the data. From the data made available to the Committee, presented below It was inferred that the, well situated in the midst of north bastion will be fully submerged at FRL + 262.16 M. However, this will remain submerged for 2-3 months during monsoon when reservoir might be at FRL.

As far as backwater effect is concerned, the temporary rise due to backwater will be about 0.60 M near well, above HFL. Archaeological Survey of India had prepared an estimate of Rs.1.50 crores for construction of a wall to protect the in-take well. It was decided that NVDA will carryout the work through NHDC under supervision/ Guidance of ASI.

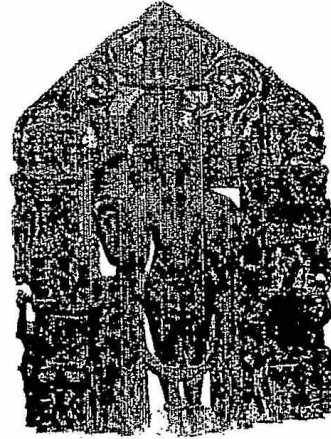
Table showing data, extracted from the report of the committee, made available to the Committee by the NVDA Officials during field visit

R.L.of plinth of Joga Fort	+274.80 M
R.L. of Top of Joga Fort	+ 284.75 M
R.L. of Main Gate of Joga Fort	+271.035 M
R.L. of Top of well	+ 261.39 M
F.R.L. of ISP	+ 262.16 M
Observed Highest Flood Level (54,000 cumecs)	+ 264.27 M
HFL corresponding to 1 in 100 year Flood (62,500 cumecs)	+ 265.52 M
HFL corresponding to 1 in 1000 year Flood (83,366 cumecs)	+ 266.029M
BWL corresponding to 1 in 100 year Flood	+265.00 M
BWL corresponding to 1 in 1000 year Flood	+ 266.637M
Water Level (20.7.98)	+ 252.00 M
River Bank	+ 259.14 M
River Bed	+ 248.00 M

NHDC has prepared an estimate of Rs.25.00 lacs for construction of protection wall, which has been approved by the Archaeological Survey of India and that NHDC was directed to carry out the work . The work has been completed.

Anthropological aspects:

The Narmada Valley can be divided into three physiographic units (1) Western Vindhyas (2) Narmada through West and South and (3) Western Satpuras. Some Indologists place the Narmada-Chambal civilisation of Malwa as a contemporary of Indus civilisation. Navada Toli is a site contemporary to Harappa where evidence of early farming villages were discovered. Findings of a hominoid skull from Hathnora indicated the possibilities of the existence of human bio-cultural remains within the basin.



SURVEYS/STUDIES :

A series of studies have been conducted for salvaging the Narmada Basin from anthropological point of view which includes Paleo-Anthropological, human ecological, ethnography and pre-historic aspects. Besides studies on contemporary culture and collection of ethnographic specimens were collected and leading anthropologists were associated.

- Rashtriya Manav Sanghralaya has constituted a working group for the retrieval of bio-cultural material in Narmada Basin this includes studies on taphonomy and paleo ecology, excavation of upper paleo lithic sites, collection and documentation of material culture objects from tribal, artisan and folk culture.
- Survey of tribal art and handicraft entrusted to *M.P. Adivasi Kala Parishad* is completed and report is available. The report gathered details from the 24 submergence villages and identified 75 sculptors and eight groups of exhibitionists besides documentation of identified important sculptures. Cultural aspects of the tribes including marriages and their lifestyle were collected.
- The Bhil Track, a study of displaced tribal, sponsored by NVDA, of the 17 submergence villages of SSP compiled the information on their status, layout of their resettlements, construction of houses, social structure, division into clans, economic structure, in-depth, dependence on forests for living, inter-community relationship, leadership pattern, women's role, religion, superstitions and festivals.
- Besides Anthropological Survey of India has covered these studies under its own project called "People of India". The report is in 61 volumes out of which 7 volumes are under final editing.
- A Narmada salvage plan is also launched by Anthropological Survey of India.

ACTION PLAN

- Archaeological Survey of India is carrying out excavation at selected sites.
- State Department has reviewed the Action Plan and has proposed 5 excavation sites , in addition to the earlier proposal of collection of sculptures and excavation at Khedinama.
- NVDA has also planned to establish a Centre on Religious and Cultural heritage of the Narmada Basin. Initial discussions were held with the experts by the NVDA during the meeting convened for the purpose on 11th July 2003. Decision has been taken to start this Centre in New Narmada Bhawan, located at Arera Hills, Bhopal. Commissioner, Archaeology and Museum, and other experts have been requested to give necessary documents, books, literatures and excavation materials for establishment of this Centre.

IMPLEMENTATION

- ❖ Ancient tools and artifacts were found and report is available in NCA. The entire area was scanned by the Anthropological Survey of India under Narmada Salvage Plan and some ancient tools have been found

- ❖ Excavation of the early historic mound in village Khedinama in Hoshangabad district was completed earlier during 1993-94.
- ❖ Status of works at excavation sites

EXCAVATION SITES

STATUS

Bijalpur Khurd, Khandwa	Completed
Chhalpa Kala, Khandwa	Completed
Gajanpur, Dewas	Completed
Nabalpura, Khandwa	Completed
Gannaur, Khandwa	Completed

- ❖ NVDA has also planned to establish a Centre on Religious and Cultural heritage of the Narmada Basin. Implementation is awaited.
- ❖ Anthropological survey of India has planned a detailed investigations on Namada area implementation is awaited.
- ❖ A report on findings of the excavations is awaited from the State Archaeological Department is awaited.

Summary of the Status :

Sl. No.	Issue	Progress	Balance works
1.	Relocation of State protected monuments	Completed	
2.	Excavation of mounds by State agencies	Completed	
3.	Anthropology documented	Completed. Report awaited.	
4.	Display at Museum	Progressing	
5.	Collection of sculpture	153 collected	30 remain
6.	Cultural Centre at Narmada Bhawan	Being formulated	Yet to be done.
7.	Centrally protected monuments	Work completed	
8.	Narmada Salvage Plan by Central agencies.	Anthropological Survey of India to start the work.	Yet to be done

