

CHAPTER – VIII

ENVIRONMENT IMPACT ASSESSMENT & ENVIRONMENTAL MANAGEMENT PLAN

8.0 General

The objective of environmental impact assessment is to identify possible environmental effects likely to accrue as a result of the proposed structures i.e. one dam and four barrages in Ken–Betwa link project (Phase–II). The chapter also outlines the broad framework of Environmental Management Plan for amelioration of adverse impacts on account of implementation of the project. The outline of an Environmental Monitoring Programme too has also been formulated as a part of the present Chapter. The study for Lower Orr dam is being carried out by M/s WAPCOS, Ltd., New Delhi and study for four barrages, namely Neemkheda, Barari, Kotha & Kesari is being carried out by M/s AFC, Hyderabad. The detailed environmental assessment and environmental assessment plan for Project are briefly described in the following paras.

8.1 Lower Orr Dam

8.1.1 Environmental Baseline Status

The assessment of pre-project environmental status is essential to determine the environmental parameters which could be significantly affected due to the proposed Project. The planning of baseline survey study emanated from short listing of impacts. This process is known as Scoping. The baseline study requires both field work and review of existing documents, which is necessary for identification of data which may already have been collected for other purposes.

8.1.2 Climate

The project area is located in the sub-humid region and receives its rainfall from the south-west monsoon. It has three distinct seasons namely

the monsoon (mid-June to October), the winter (November to February) and the summer (March to mid-June). The nearest IMD station is at Guna.

The average annual rainfall in the Orr sub-basin varies between 1000 mm to 1400 mm and the Orr sub-basin lies in the medium rainfall zone. The normal annual rainfall for the Guna IMD station is 1219.8 mm. The monthly temperature in the sub-basin varies from 7.7° C to 41.3° C. The mean wind velocity values in the sub-basin vary between 4.3 km/hr to 14.2 km/hr. The mean monthly relative humidity in the sub-basin varies from 21% to 85%. Mean values of the cloud cover in the sub-basin varies from 1.2 oktas to 6.1 oktas.

8.1.3 Topography

The Orr sub-basin is in the shape of a leaf with an average width of about 12 km. The Upper reaches of the sub-basin consist of the Shivpuri plateau at an elevation of about 400 m. The middle reaches comprise isolated hillocks of reserve forests on the right bank of the river. The lower reaches of the sub-basin are mostly plain area.

8.1.4 Agriculture

The major crops grown in the sub-basin is Wheat (28.8%), Jowar (0.2%), Gram (7.7%), Fodder (3.4%), Maize/other cereals (3.5%), and Pulses (1.0%).

8.1.5 Forests

Broadly speaking based on altitude, following Champion and Seth (1968) Classification of forest types of India published as ‘A revision survey of the forest types of India’, the project area falls under tropical dry deciduous forest. The characteristic features of this type of forest are given below:

Tectona grandis is the most characteristic species of this type of forest types as recorded from the project site. *Tectona grandis-Butea monosperma-Lagerstroemia parviflora*, associations are the most dominant in the forests. Trees height usually varies from 8 m reaches upto 20 m. However in some places, *Terminellia arjuna*, *Adina cordifolia*, *Diospyros melanoxylon*,

Zizyphus nummularia, and *Gymnosporia montana* also recorded in the natural forest areas. In the project area, *Madhuca indica*, *Azadiracta indica* and *Eucalyptus* species are also recorded. There is usually a thin grass growth which may appear fairly during the monsoon season, but more or less, soil is barren throughout the year. *Solanum xanthocarpum*, *Carica carranda*, *Calotropis procera*, *Zizyphus nummularia*, and *Vitex negundo* are dominant shrub species recorded in such forest. Climbers are few and showing xerophytic characters of adaptation.

In some areas, village people used to plant bamboo such as *Dendrocalamus strictus* and *Bambusa* species. The herbaceous floral species includes *Achyranthus aspera*, *Cassia tora*, *Celosia argentea*, *Alternanthera sessilis*, *Xanthium strumarium*, *Themeda quadrivalvis*, *Argemone mexicana*, *Tribulus terrestris*, *Sphaeranthus indicus*, *Tridax procumbens*, and other species. Some invasive species were recorded from the study area, viz. *Ipomea carnae*, *Parthenium hysterophorus*, and *Cassia tora* are recorded in large number along the road side and in crop land areas.

8.1.6 Fauna

About 968.243 ha of forest is coming under reservoir submergence. The forests in the area are degraded due to significant human interferences in the area, Faunal population in the command area is nearly absent. However, within the catchment area, where dense forest patches are observed, wildlife population is observed.

8.1.7 Fisheries

River Orr is seasonal in nature. The river carries discharge only in monsoon season. Normally, in such rivers, fisheries is not well developed.

The list of fish species reported in the study area include Catla, Bata, Mrigal, Rohu, common Murrel etc. No migratory fish species is reported for the area.

8.1.8 Prediction of Impacts

The impacts on various aspects of environment are briefly described in the following sections.

8.1.8.1 Impacts on Land Environment

8.1.8.1.1 Construction Phase

8.1.8.1.1.1 Environmental degradation due to immigration of labour population

The peak labour and technical staff congregation would be of the order of 1600 and 400 respectively. The total increase in population shall be of the order of 6,000. Separate accommodation and related facilities for workers, service providers and technical staff are to be provided as a part of the project. The congregation of labour force is likely to create problems of sewage disposal, solid waste management and felling of trees for meeting fuel requirements, etc.

8.1.8.1.1.2 Operation of construction equipment

During construction phase, various types of equipment will be brought to the site. These include crushers, batching plant, drillers, earth movers, etc. The setting of these construction equipment would require significant amount of space. In addition, land will be required for storage of various construction material as well. However, land for this purpose will be temporarily acquired, i.e. for the duration of project construction phase.

The site for storage of construction material and equipment should be selected such that it causes minimum adverse impacts on various aspects of environment. Such land requirements are temporary in nature. Efforts shall be made that such facilities are located on Government or Panchayat land only and to the extent possible away from human population, so that hardships caused as a result of land acquisition, though temporarily on this account are minimized to the extent possible.

8.1.8.1.1.3 Soil erosion

The runoff from various construction sites will have a natural tendency to flow towards along with the natural drainage. Thus, the disposal of drainage effluent with such high turbidity levels is bound to affect the water quality, especially in the lean season. The drains/nallahs close to various construction sites along the canal alignment are seasonal in nature. Normally in such rivers biological productivity is not high. Hence, the increase in turbidity levels are not expected to be significant in nature.

8.1.8.1.2 Operation Phase

8.1.8.1.2.1 Acquisition of land

The total land to be acquired for the project is 3727.20 ha. Out of which 2723.70 ha. under Dam and reservoir, 950 ha. under canal net work and 53.5 ha. under Colony.

The total land coming under reservoir submergence is 2723.70 ha. Out of which 968.243 ha. under Forest, 853.3 ha under culturable land, 576.20 ha. under unculturable land and 326 ha. other land. As a part of CEIA study, compensatory measures as per the ownership of the land to be acquired shall be formulated.

8.1.8.1.2.2 Change in land use pattern

The command area of Lower Orr canal is spread in the Shivpuri district of Madhya Pradesh. The GCA and CCA of the project are envisaged as 85672 ha and 45047 ha. About 9,009 ha of area is envisaged under pressurized irrigation. The proposed project envisages irrigation over an area of 67570 ha. The irrigation intensity shall be 150%. The project will lead to increase in cropping as well as irrigation intensity. The project will thus increase agriculture production, which will be a positive impact.

8.1.8.2 Impacts on Water Resources and Quality

8.1.8.2.1 Construction Phase

8.1.8.2.1.1 Impacts due to sewage generation from labour camps

The increase in the population is expected to be of the order of 5,000. The labour population is likely to be congregated at three to four labour colonies. The exact population in each of the labour colonies cannot be estimated at this stage. However, the persons residing in each labour camps/labour colonies is expected to be of the order of 1500-2000. The total domestic water requirements of the labour population (including families) are expected to be of the order of 0.68 mld @ 135 lpcd. It is assumed that about 80% of the water supplied will be generated as sewage. Thus, the total quantum of sewage generated is expected to be of the order of 0.54 mld. The above pollution loading is likely to be spread over 3 to 4 labour camps. It is proposed that a sewage treatment plant be commissioned at various labour colonies for treatment of sewage prior to disposal.

8.1.8.2.1.2 Impacts due to runoff from construction sites

Substantial quantities of water would be used in the construction activities. With regards to water quality, waste water from construction activities would mostly contain suspended impurities. Adequate care should be taken so that excess suspended solids in the wastewater are removed before discharge into water body.

8.1.8.2.2 Operation Phase

8.1.8.2.2.1 Impacts on downstream users

The water balance at 75% dependability (Net inflow) at Lower Orr dam is 362.53 MCM. As per simulation study of Lower Orr reservoir, about 335.67 MCM of water can be utilized in to Lower Orr canal from Lower Orr reservoir after meeting the upstream demand and releasing about 44.898 MCM water for environmental and ecological purposes. The evaporation losses for the reservoir have already been considered in the simulation study. Provision of 6 MCM (@ 0.5 MCM per month) of water is kept for drinking

purpose in the enroute villages/towns. Therefore, remaining 329.67 MCM of water is available for irrigation and using 0.5106 m Delta for traditional irrigation system and 0.397 m Delta for pressurized irrigation system, about 67570 ha (45047 CCA) can be irrigated from the Lower Orr dam. Out of which, about 33677 ha CCA (50516 ha annual irrigation) using 257.96 MCM of water is proposed to be irrigated in the command by traditional irrigation. Besides above, about 2950 ha CCA (4425 ha annual irrigation) will be covered in the vicinity of the Lower Orr main canal in the initial reaches of 50 km length through pumping by the local people. Out of which 2360 ha CCA (3540 ha annual irrigation) will be covered by traditional irrigation using 18.08 MCM of water. Provision of 53.64 MCM water has been kept for pressurized irrigation in the Shivpuri district for irrigating about 9009 ha (13514 ha annual irrigation) which is about 20% of total CCA of 45047 ha. Thus lower reservoir and its canal will have possible impact on command area.

8.1.8.2.2 Impacts on water logging and soil salinity

The increase in water availability can lead to water logging in the command area due to introduction of irrigation.

8.1.8.2.3 Changes in water quality due to increased use of fertilizers

The fertilizer dose is likely to increase once irrigation is introduced in the command area. To compensate the nutrient removal by crops, additional dose of nutrients, i.e. fertilizers dosing needs to be given.

8.1.8.2.4 Impacts due to effluent from project colony

During project operation phase, three to four permanent divisions for operation phase maintenance will be developed. At each colony, about 100 families are likely to reside. It is proposed to provide biological treatment facilities including secondary treatment units for sewage so generated from these settlements.

8.1.8.3 Impacts on Terrestrial Ecology

8.1.8.3.1 Construction Phase

Flora

During project construction phase, labour population is likely to congregate near various construction sites. It can be assumed that the technical staff likely to congregate will be of higher economic status and will live in a more urbanized habitat and will not use wood as fuel. However, workers and other population groups residing in the area may use fuel wood (if no alternate fuel is provided) for whom firewood/coal depot could be provided.

Hence, to minimize impacts on Flora, community kitchens with LPG or diesel as fuel are recommended. The details are covered in Environmental Management Plan in this chapter in para 8.1.5.

Fauna

During construction phase, a large number of machinery and construction labour will have to be mobilized. This activity may create slight disturbance to the existing Fauna in the area. Since the project command has very little area under dense vegetation and the land use pattern is mainly agriculture land interspersed with settlements adverse impact. As a result of absence of forest or vegetal cover in the command area and high level of human interferences in the area, wildlife is generally absent in the area.

8.1.8.3.2 Operation Phase

Impacts on vegetal cover

The proposed project envisages acquisition of 3727.20 ha of land. About 968.3 ha of forest land is to be acquired for the project. As per the present level of investigations, no rare/endangered/threatened species is reported in the forests coming under reservoir submergence. Likewise, tree density too is low in the submergence area. The impacts due to acquisition of forest land will be studied as a part of the EIA study report.

The introduction of irrigation in the command area will increase the agriculture production of the area, leading to the increased availability of fodder as a result of increased agricultural by products and residues. The increased level of fodder availability, would reduce the pressure on existing pasture and vegetal cover, which is a significant positive impact on the ecology of the area.

Impacts on wildlife

About 968.3 ha of forest land to be acquired for the project. The command area has forests with low tree density and no major faunal species are reported. The project area does not appear to be on the migratory routes of animals and therefore, the construction of project will not affect migration of animals as well. Thus, construction of the reservoir as a part of the project, is not likely to have any impact on wildlife movement in the area.

The mammal species are reported to be under Least Concern category as per IUCN status. Amongst avi-fauna, most of the species reported in the area belonged to Schedule-IV of Wildlife Protection Act (1972). The commonly observed herpetofauna in the study area includes Ground Gecko, rat snake, Krait, Lizard, etc. As per IUCN status, they belong to least common or Data Deficient category. Thus, no major impacts on fauna are anticipated.

8.1.8.4 Impacts on Aquatic Ecology

8.1.8.4.1 Impacts on riverine ecology

The water for diversion for irrigation dam will affect the water availability downstream. It is recommended to release Environmental flows as per the norms of Ministry of Environment & Forests.

8.1.8.4.2 Impacts on fisheries potential

At present, fishing is not very common due to lack of water availability in the region. With the increased availability of water in the tank/command area, fisheries potential would improve. The average fish yield is expected to the order of 2 to 4 tonnes/ha/year in fishing ponds.

8.1.8.5. Operation Phase

In a water resources project, noise pollution occurs mainly during project construction phase. During project operation phase, no major impacts are envisaged.

8.1.8.6 Impacts on Air Quality

8.1.8.6.1 Construction Phase

Pollution due to fuel combustion in various equipments

The operation of various construction equipments requires combustion of fuel. Normally, diesel is used in such equipment. The major pollutant which gets emitted as a result of diesel combustion is SO₂. The SPM emissions are minimal due to low ash content in diesel. The short-term increase in SO₂, even assuming that all the equipment are operating at a common point, is quite low, i.e. of the order of less than 1µg/m³. Hence, no major impact is anticipated on this account.

Fugitive Emissions from various sources

During construction phase, there will be increased vehicular movement. Lot of construction material like sand, fine aggregate is stored at various sites, during the project construction phase. Normally, due to blowing of winds, especially when the environment is dry, some of the stored material can get entrained in the atmosphere. However, such impacts are visible only in and around the storage sites. The impacts on this account are generally, insignificant in nature.

Impacts due to vehicular movement

During construction phase, increase in number of vehicles is anticipated for transportation of construction material. The increase in number of vehicles is expected to be a maximum of 35 trucks/hour. The impacts on ambient air quality due to increase in vehicular movement has been studied and no major impacts on ambient air quality is anticipated due to increase in a vehicular movement during construction phase.

8.1.8.6.2 Operation Phase

In a water resources project, air pollution occurs mainly during project construction phase. During operation phase, no major impacts are envisaged.

8.1.8.7 Impacts Due to Command Area Development

In project operation phase, the area under irrigation will increase significantly, with corresponding increase in agriculture production. This will improve the income levels.

8.1.8.7.1 Increased income Level

Thus, the project will play a significant role in poverty alleviation in the project area. The increased income levels would lead to demands for better communication, health, education and other services. The increased income levels would also provide an impetus for development of these facilities.

8.1.8.7.2 Improvement in livestock

During project operation phase, food grain production will increase significantly. Assuming even 50% of agriculture by product is usable as fodder, hence, significant quantity of additional fodder would be available. This will reduce the pressure on the existing forests or vegetation of the area, which is a significant positive impact.

8.1.8.7.3 Employment generation

The introduction of irrigation requires a greater amount of labour in fields. On average, labour demand in irrigated and unirrigated field is 200 mandays/year/ha and 100 mandays/ha/year. The employment potential in pre-project phase for a cropped area of 67570 ha has about 6.7 million which will increase to 13.4 million mandays in project operation phase. Thus, with the increase in the irrigation intensity, manpower requirement in the agriculture sector would increase by 6.7 million man days per year, which is a significant positive impact.

8.1.8.7.4 Urbanization

The commissioning of the project will increase the gross money flow in the command area. Thus, with the increased income level, there will be a greater demand for urbanization in the command area.

8.1.8.7.5 Industrialization

The increased production of paddy, wheat, pulses and oilseeds will lead to mushrooming of small scale agro-industries for processing of some of the agriculture produce. The increased level of industrialization would provide greater employment opportunities. The industrialization will also lead to improvement in roads, communication, markets, storage yards, service yards, etc. as ancillary benefits.

8.1.8.8 Other changes

8.1.8.8.1 Impacts on local services like water supply, education, healthcare, community forests etc

The project will support for the improvement of public facilities like drinking water supply to command villages, support to education, improve healthcare etc.

8.1.8.8.2 Impacts on business opportunities

An expanded local market will be created by the migration of workers. There is a possibility of increased economic opportunities and significant growth and extension of the local markets along the project areas especially market areas and project camp areas.

8.1.8.8.3 Impacts on law and order

Construction period of the proposed Lower Orr project will be five years. The peak time human resources requirement is estimated to be around 5000, most of which belonging to different socio-cultural background will temporarily migrate to the project area. Furthermore, cash flow in the area may attract the workers towards gambling, alcohol consumption,, and such

other social evil. In such situation general breakdown of law and crime may occur during project construction period.

8.1.8.8.4 Impact on child discrimination risks

During construction time, if both parents will be employed in project they cannot give their time to children so that children will be discriminated. Although, the project will have the provision of not employing workers, less than 18 years of age, the poor parents may engage their children in some form of work like in tea stalls, collection of sand, aggregates etc. Since there would be extra earnings, the children will try to help their parents in working with the project than going to school for education.

8.1.8.8.5 Impacts due to occupational health and safety

Unsafe construction activities construction related accidents are common due to lack of training for construction workers and unavailability of safety equipment. The most common injuries that might occur are due to falls from scaffoldings or other structures, injuries due to falling objects or other construction equipment, traffic accidents and drowning. Utmost care need to be taken to minimize the accidents.

8.1.8.8.6 Impacts due to water supply for drinking water requirements

The provision of 6 MCM of water for meeting drinking water requirements will go a long way in reducing the hardships to the local 1.65 lakhs population. The per capita demand @ 100 lpcd has been considered.

8.1.9 Resettlement and rehabilitation Plan

8.1.9.1 Details of Project Affected Families

The project envisages acquisition of 3727.20 ha of land for various project appurtenances. 853.20 ha of private land is to be acquired.

In all 12 numbers of villages will be affected due to submergence at FRL 380.0 m, out of which seven (7) villages - Naroni, Pagra, Pahadpur, Lidhora Munjapta, Bithala, Khyawada, Kirraya will be fully affected. Five (5) villages- Danga Bairasiya, Gadariya Konder, Burhi Chanderi, Lakhari and

Lohagarh will be partially affected. In fully affected villages, both land and households will be affected. About 944 families with 2535 persons are likely to be resettled.

In addition, 96 pucca buildings, 146 kachha buildings, 60 wells and 2 temples will also be affected. About 537 fruit bearing trees too will be affected.

The provisions of the Madhya Pradesh Government PPKKVVA - 1985 and NRRP – 2007 have been taken into consideration, and the best option has been recommended for preparation of Resettlement and Rehabilitation Plan for the Project affected families.

8.1.9.2 Measures for Resettlement

- Any affected family whose house has been acquired or lost, may be allotted free of cost house site to the extent of actual loss of area of the acquired house but not more than 250 sqm of land in rural areas. In addition, about 25% of the plot size would be required for providing civic amenities and about 25% of the plot size for providing infrastructure facilities.

- Sensitized conscious effort needs to be put-in to ensure entire population of the village or area is shifted and resettled as far as possible en-masse so that communities, kinship ties, socio-cultural relations and social harmony is not disturbed.

- Conscious effort needs to be put-in to ensure the Scheduled Caste affected families are resettled in the areas close to the villages, so that they are not marginalized in the new relocation sites.

- All PAFs losing homestead would be provided with House Building assistance of Rs. 150,000.

- In case of a project involving land acquisition on behalf of a requiring body, the stamp duty and other fees payable for registration of the land or house allotted to the affected families shall be borne by the requiring body.

- The land or house allotted to the affected families under this policy shall be free from all encumbrances
- The land or house allotted to the affected families under this policy may be in the joint names of wife and husband of the affected family.
- Each affected family that is displaced and has cattle, shall get financial assistance of such amount as the appropriate Government may decide but not less than Rs. 15,000 for construction of cattle shed.
- Each affected family that is displaced shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than Rs.10,000, for shifting of the family, building materials, belongings and cattle.
- Each affected person who is a rural artisan, small trader or self-employed person and who has been displaced shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than Rs. 25,000 for construction of working shed or shop.
- In case of a project involving land acquisition on behalf of a requiring body, each affected family which is involuntarily displaced shall get a monthly subsistence allowance equivalent to 25 days minimum agricultural wages per month for a period of 1 year from the date of displacement.
- Amenities and Infrastructural facilities to be provided at Resettlement Areas. Such facilities and amenities shall, inter alia, include Internal Village Road Network, drainage Network within the Resettlement site, sanitation Network within the Resettlement site, safe drinking water, footpath, public transport, drinking water trough for cattle, Place of Worship, Cremation grounds, Fair Price shops and other shops, Post Office, Panchayat Ghar, Community Hall, Health Care Facility, Garden and children's playground, Educational institutions (schools) in resettlement sites, Space for weekly market,

8.1.9.3 Measures for Rehabilitation

The following measures are suggested to be extended as rehabilitation measures to the PAFs losing land:

- Based on past experiences, it is observed that a land for land may not be available in the command area. Thus it is suggested that Rehabilitation grant may be extended in-lieu of land to PAFs losing land.

- In case of a project involving land acquisition on behalf of a requiring body, the affected families who have not been provided agricultural land shall be entitled to a rehabilitation grant equivalent to 750 days minimum agricultural wages or such other higher amount as may be prescribed by the appropriate Government.

- Fishing rights in the reservoirs shall be given to the affected families, if such rights were enjoyed by them in the affected area;

- Stamp duty and other fees payable for Registration of the land allotted to the affected families shall be borne by the requiring body.

- Land allotted to the affected families under this policy shall be free from all encumbrances.

- Land allotted to the affected families under this policy may be in the joint names of wife and husband of the affected family.

- In case each khatedar in the affected family is allotment of wasteland or degraded land in lieu of the acquired land, s/he shall be entitled for a one-time "financial assistance of not less than Rs. 15,000/ha for land development.

- A provision of Rs. 10,000 per PAF is being kept for a one-time financial assistance to each khatedar in the affected family for agricultural production

- Preference to be given to atleast one person per affected family in providing employment in the project, subject to the availability of vacancies and suitability of the affected person for the employment.

- A provision of Rs. 500/month for 6 months for one person per PAF shall be given for training.
- Scholarship @ Rs. 500 per month to atleast 1 child per PAF for a period of 1 year.
- A provision of Rs. 500/month for 6 months for one person per PAF shall be given to extend other skill development opportunities to eligible persons.
- Requiring body shall give preference to willing landless labourers and unemployed affected persons while engaging labour in the project during the construction phase.
- One person from each affected family shall be offered necessary training facilities for development of entrepreneurship, technical and professional skills for self-employment.

8.1.10 Environmental Management Plan

8.1.10.1 Environmental Measures During Construction Phase

8.1.10.1.1 Facilities in Labour Camps

It is proposed that it should be made mandatory for the contractor involved in the construction activities to provide adequate facilities for water supply and sanitation. It is recommended that the contractor provides living units of 30-40 m² to each of the labour family involved in the construction activities. The unit should have proper ventilation.

8.1.10.1.2 Water supply

Appropriate water supply sources need to be identified. Proper infrastructure for storage and if required treatment e.g. disinfection or other units, should also be provided.

8.1.10.1.3 Sewage treatment

The labour population is proposed to be situated in existing colonies. One community toilet needs to be provided for 20 persons. The

sewage from the community toilets shall be treated in a sewage treatment plant comprising of aerated lagoon and secondary settling tank.

8.1.10.1.4 Provision of community kitchen and Free Fuel

A community kitchen could be provided where workers have their meals. The fuel used in such community kitchens could be LPG or diesel. The project contractor in association with Water Resource Department, state government of Madhya Pradesh shall make necessary arrangements for supply of fuel to labour population for which provision shall be kept in the cost estimate.

8.1.10.1.5 Restoration of construction sites

In the proposed project, it is proposed to collect the construction waste from various construction sites, and disposed off at sites identified in consultation with the district administration. The levelling or reclamation of various construction sites, should be made mandatory for the contractor, hence, no additional cost has been earmarked as a part of the cost to be earmarked for implementation of EMP.

8.1.10.1.6 Solid waste management

The labour colonies will generate substantial amount of municipal wastes. Adequate facilities for collection, conveyance and disposal of solid waste needs to be developed. For solid waste collection, adequate number of masonry storage vats, each of 2 m³ capacity should be constructed at appropriate locations in various labour camps and the collected waste can then be transported to landfill sites. A suitable landfill site should be identified and designed to contain municipal waste from various project township, labour colonies, etc.

8.1.10.2 Maintenance of Water Quality

It is proposed to provide sewage treatment plant in the project colony, cost of which shall be included in the contract for constructing the project colony. Hence, the same have not been included in cost estimate for implementation of Environmental Management Plan.

8.1.10.3 Health Delivery System

The various measures for control of Public Health are listed as below:

- The site selected for habitation of workers should not be in the path of natural drainage.
- Adequate drainage system to dispose storm water drainage from the labour colonies should be provided.
- Adequate vaccination and immunization facilities should be provided for workers at various construction sites.
- The labour camps and resettlement sites should be at least 2 to 3 km away from quarry areas.

It is proposed to develop one dispensary in the Lower Orr Dam/reservoir site area with 1 Doctor, 3 Auxiliary Nurse, 3 attendant and 1 Driver.

The dispensary shall have a waiting hall for 20-30 people, rooms for doctors, one general ward to accommodate 10 beds, one minor operation theater/dressing room

A first aid post shall be provided at the major construction sites with First aid box with essential medicines including ORS packets, First aid appliances-splints and dressing materials, Stretcher, wheel chair, etc.

8.1.10.4 Compensatory Afforestation

The total land to be acquired for the project is 3080.57 ha. The total forest area to be acquired is 968.243 ha. There is no wildlife sanctuary, national park, etc. within the study area. No rare, endangered and threatened species are reported in the project area.

The Indian Forest Conservation Act (1980) stipulates:

- If non-forest land is not available, compensatory plantation are to be established on degraded forest lands, which must be twice the forest area affected or lost.

- If non- forest land is available, compensatory forest are to be raised over an area equivalent to the forest area affected or lost.

It is proposed to afforest double the amount of entire land being acquired for the project. Thus, a total of (968.243x2) 1936.5 ha of land is proposed to be afforested. The afforestation work is to be done by the Forest Department. In addition to above the project proponent will pay Net Present value (NPV) and cost of trees to the Forest Department, which shall be estimated by the Forest Department, as a part of Forestry clearance.

8.1.10.5 Wildlife Conservation Plan

As a part of the CEIA study, a detailed Wildlife Conservation Plan shall be proposed covering Forest Protection Plan, Measures to improve habitat of avi-fauna, Wildlife Management Plan, Anti-poaching measures.

8.1.10.6 Substance & Enhancement of Fisheries Potential

The commissioning of the proposed irrigation project will increase the water availability in the project command area. The important management measures can be as below includes: Provision of slope and sides of dykes with grass turfing to reduce erosion, Manuring of ponds before stocking and at regular intervals after stocking , the manure be put in heaps in ponds; to avoid oxygen depletion, control of fouling of water or development of thick algal bloom, and regular, sampling of fish stock to observe their growth rate & health.

8.1.10.7 Control of Water Logging

It is proposed to provide pressurized irrigation system in 10% to 20% area of command of this project as a pilot scheme. Accordingly out of 45047 ha. CCA, 9009 ha. area is kept under pressurized irrigation. This will substantially control water logging in the proposed command area.

8.1.10.8 Infrastructure for Agricultural Development

Financial and credit facilities

The credit agencies through their various rural development schemes can play a very important role. An optimal combination of short term, intermediate term and long term credits are proposed formulated to provide maximum benefits to the command area population.

Marketing facilities and institutions

Improved marketing facilities and procedures contribute to the objectives of agricultural development directly through providing greater use of a given level of production and indirectly by fostering increased production.

Efforts shall also be made to develop the transportation and storage facilities. The co-operatives can play a very important role in the marketing of agricultural commodities and supply of inputs to the farmers.

8.1.10.9 Control of Weeds on Agriculture Lands

Measures against weeds comprise mechanical (cultivation and mowing), cultural or cropping, biological and chemical means. These include and hand weeding, adopting farming practices that change the conditions in such a way as to enable plants to compete with weeds and use of weedicides.

8.1.10.10 Pests Control

Integrated pest management strategy are proposed to be followed to reduce the use of pesticides. In this method, a limited number of insecticidal sprays are undertaken and simultaneously bio-control agents like pheromones, etc. are used. The pheromones are organic compounds developed specifically for each type of pest which are commercially synthesized in the laboratories and sold in the market.

8.1.10.11 Training and Extension Courses for Farmers

The change from rainfed to irrigated cropping requires extension, training and demonstration programmes for farmers. Considering these aspects it is proposed that the project authorities need to provide adequate training to

farmers. The training shall include Prevention of spread of water related diseases; Safe use of agro-chemicals, and Environmental conservation programmes.

8.1.10.12 Control of Air Pollution

The contractor will be responsible for maintaining properly functioning construction equipment to minimize exhaust. Construction equipment and vehicles will be turned off when not used for extended periods of time. Unnecessary idling of construction vehicles to be prohibited. Effective traffic management to be undertaken to avoid significant delays in and around the project area. Road damage caused by sub-project activities will be promptly attended to with proper road repair and maintenance work. Identification of construction limits (minimal area required for construction activities). When practical, excavated spoils will be removed as the contractor proceeds along the length of the activity. When necessary, stockpiling of excavated material will be covered. Excessive soil on paved areas will be sprayed (wet) and/or swept and unpaved areas will be sprayed and/or mulched. Contractors will be required to cover stockpiled soils and trucks hauling soil, sand, and other loose materials (or require trucks to maintain at least two feet of freeboard). Contractor shall ensure that there is effective traffic management at site. The number of trucks/vehicles to move at various construction sites to be fixed. Dust sweeping - The construction area and vicinity (access roads, and working areas) shall be swept with water sweepers on a daily basis or as necessary to ensure there is no visible dust.

8.1.10.13 Noise Control Measures

The contractors will be required to maintain properly functioning equipment and comply with occupational safety and health standards. The construction equipment will be required to use available noise suppression devices and properly maintained mufflers. The suggested measures include:

Equipment and machineries should be maintained regularly to keep the noise generation, Silencers and mufflers of the individual machineries

to be regularly checked; Yearly audiometric survey on workers exposed to high noise levels should be undertaken.

8.1.11 Catchment Area Treatment Plan

A Catchment area Treatment Plan for catchment area intercepted at dam site upto the catchment of upstream project will be prepared as a part of the Comprehensive EIA study. The procedure for preparation of CAT plan for each watershed area to be covered is given as below:

- Catchment area Treatment Plan to be prepared using SYI method.
- Delineation of sub-watersheds in the catchment area.
- Land use pattern using satellite data, slope map using Survey of India toposheets, etc. will be prepared.
- Mapping of critically degraded areas based on Integration of Remote Sensing technique, GIS methodology and Silt Yield Index method and prioritization Watershed treatment
- Preparation of phase wise Catchment Area Treatment (CAT) Plan for sub-watersheds with very high and high erosion intensity.
- Estimation of cost required for implementation of CAT plan.

The catchment area treatment plan for Lower Orr dam/ reservoir is furnished at Annexure-8.1 of Volume-II.

The Cost required for implementation of various measures is Rs. 2317.00 Lakhs as given in Table-8.17.

Table-8.17

Cost earmarked for implementation of CAT plan

S.No.	Activity	Amount (Rs. million)
1	Biological Treatment Measures	131.25
2	Forest Protection measures	20.00
3.	Silt observation	2.91
3	Engineering Treatment Measures	49.5
5	Monitoring and Evaluation	10.0
	Total	213.66 say Rs. 213.7 million

8.1.12 Dam Break Analysis and Disaster Management Plan

A Dam Break Analysis using has been carried out by NIH, Roorkee as a part of the study. The details of dam break analysis of Lower Orr dam are given in Volume-III of Hydrological studies.

Based on the findings of the study, an inundation map will be prepared. A Disaster Management Plan comprising of the following components will be prepared.

- Dam Safety and Maintenance Manual
- Emergency Action Plan (EAP)
- Administration and Procedural Aspects
- Preventive Action
- Communication System
- Notifications
- Evacuations Plans and Evacuation Team

- Public Awareness for Disaster Mitigation
- Management after receding of Flood Water

8.1.13 Location Area Development Plan

An amount of Rs. 0.5% of Project cost shall be earmarked for area development activities. The area development activities proposed as a part of the plan given in following paragraphs:

Upgradation of educational facilities

The following activities are proposed under Local Area Development Plan:

- Up-gradation of school fixtures, equipment
- Improvement of drinking water and sanitation facilities
- School bus service
- Scholarship to students

Improvement of Public Health Facilities

- Furniture, Beds and other items
- Up-gradation of Pathological laboratory
- Up-gradation of operation theater (labor room)

8.1.14 Environmental Monitoring Programme

An Environmental Monitoring Programme should be undertaken during construction and operation phase of the project. The details of environmental monitoring programme are given in Table-8.18 and 8.19 respectively.

Table - 8.18**Summary of Environmental Monitoring Programme during Project Construction Phase**

S. No.	Item	Parameters	Frequency	Location
1.	Effluent from STPs	pH, BOD, TSS, TDS	Once every month	Before and after treatment from each STP
2.	Water-related diseases	Identification of water related diseases, adequacy of local vector control and curative measure, etc.	Three times a year	Labour camps and colonies
3.	Air quality	PM ₁₀ , SO ₂ and NO ₂	Three times a year	At major construction sites
4.	Noise	Equivalent noise level	Once every three months	At major construction sites.

Table - 8.19**Summary of Environmental Monitoring Programme during Project Operation Phase**

S. No.	Items	Parameters	Frequency	Location
1.	Water quality	pH, Calcium, DO, Free Ammonia, BOD, Total Kjeldahl Nitrogen, COD, Boron, TDS, Percent Sodium, Total hardness, Chlorides, Magnesium, Phosphates, Sulphates, Faecal Coliform, Total Coliform	Thrice a year	<ul style="list-style-type: none"> • Ground water quality in command area • Reservoir water quality • Main canals

S. No.	Items	Parameters	Frequency	Location
2.	Soil	pH, organic matter, texture, Available Nitrogen, Available Phosphorus and Available Potassium	Twice a year	Command area
3.	Ecology	Status of afforestation programmes along canal, Pasture development	Once every year	-
5.	Socio-economics	Changes in growth of population, income levels and distribution, occupation profile, electrification of the area, adequacy of infrastructure facilities such as roads, markets, seeds and fertilizer sales counter, etc.	Once in a year	• Command area
6.	Landuse	Landuse pattern using satellite data	Once in a year	• Command area

8.1.15 Cost Estimates

Cost for Implementing Environmental Management Plan

The total amount to be spent for implementation of Environmental Management Plan (EMP) is Rs. 53.4 crore. The details are given in Table-8.20. The cost outlined in this section is exclusion of the cost required for implementation of Resettlement and Rehabilitation Plan.

Table - 8.20

Cost for Implementing Environmental Management Plan

S. No.	Item	Cost (Rs. in lakh)#
1.	Compensatory Afforestation and Bio-diversity conservation	400
2.	Fisheries Management	700

S. No.	Item	Cost (Rs. in lakh)#
3.	Environmental Management in labour camp	650
4.	Public health delivery system	350
5.	Restoration and Landscaping of construction sites	200
6.	Greenbelt development	50
7.	Air, Water and Noise Pollution Control Measures	1000
8.	Energy Conservation measures	50
9.	Public Awareness Programmes	50
10.	Local Area Development Plan @ 0.5% of project cost	340
11.	Catchment Area Treatment Plan	2137
12.	Disaster Management Plan	150
13.	Environmental Monitoring during construction phase	150
14.	Purchase of instruments and equipment	10
	Total	5337

Note: # Cost excludes budget for implementation of Rehabilitation and Resettlement Plan

8.2 Environmental Aspects of Proposed Barrages

8.2.1 Location of Barrages

Out of the four proposed barrages, one is located in Raisen districts and remaining 3 barrages are proposed in Vidisha district. Further, 3 barrages are proposed on Betwa River while one located on Keotan River. Salient features of these four barrages are presented in the Table – 8.21.

The barrage at Neemkheda is proposed on Betwa River in Raisen district. The total storage potential of this barrage is 11.06 MCM, with annual

irrigation potential of 3066 ha in Raisen district. The project will bring about 484 ha area under submergence.

The Barari barrage proposed in upper Betwa River basin in the Vidisha district. It carries the storage capacity of 14.00 MCM and irrigation command of about 4444 ha.

Kesari barrage is proposed on Keotan River in Vidisha district. This will have storage capacity of about 10.0 MCM and irrigation potential of 2070 ha.

The Kotha barrage comes next after Barari project proposed again on Betwa River. Submergence of Kotha barrage is 2210 ha. The submergence area is confined to River course its storage capacity is 104.6 MCM. The irrigable command of this barrage is estimated to be 21696 ha spread in Vidisha, Sagar and Ashoknagar districts.

Table – 8.21

Salient Features of Barrages/Reservoirs proposed in Upper Betwa Basin

S. N.	Name of the Project	Toposheet Number	Name of River	Benefited village Total no of villages 97 nos	Benefited Tehsil	Benefited District	Affected area
1	Neemkheda	55 E/11	Betwa	Pipalkhiriya, Rangpura, Nimkhera, Kharwai, Mendori, Ratnapur, Kewati, makoriya, urden, Nand, Manipuri, Haripura, Dhandhar, Begumpur – (14nos)	Raisen	Raisin	484
2	Barari	55 E/14	Betwa	Kagpur, Rusalli, Chambisa, Andiakalan, Andikhura, Khajurichambisa, Gulakhant, Gulabganj, Bariighat, Manpur, Khairnughat, Kalan, Sumer, Murara, Poha, Rosalie, Lakhorpur, Sankarkheda, Chitanurya, Davkhajuni, Dupariya, Hinadiya - (22No.)	Basoda	Vidisha	597
3	Kotha	54 L/14	Betwa	Kotha Janakheri Sarera Sirawali Bhugawali Rusiya Shahpur Bukhara	Kurwai	Vidisha	2210

				<p>Korwai Bhaunrasa Khiriya Pirotha Kanka Padochho Naukuna Tenku</p> <p>Dongi kumhari Rachhauwa Girwasa Parariya Dadurar Jaraha Bandora - (24 in Vidisha District)</p> <p>Hasalkheri Dhimroli Dharampura Besra Dhana</p> <p>Lakhahar Sirchopi Hinnod Bagaspur Raamsagar Gonchi Daulatpur , Kanjiya - (13 in Sagar District) Malhargarh Pipariya Pathargarh Belharu</p> <p>Kankar Sawalhera - (6 in Ashok Nagar District) (Total 43Nos.)</p>	Mungawali Bina	Ashoknagar Sagar	
4	Kesari	55E/13	Keaton	<p>Barath, Kharakheri, Jhillipur, Sahuba, Muradpur, Dithol, Bhareru, Basoda, Gung, Kanchrod, Khurpari, Pipariya, Dighoro, Sirnota, Ritahari, Kakrouda, Mudra, Semra, Udaipur - (19 Nos.)</p>	Basoda	Vidisha	362

Since the submergence area of all the barrages is confined to river course, no environmental impact assessment study is necessary. However, a Rapid EIA study is being carried out by M/s AFC Ltd., New Delhi for four barrages for assessing environmental impact of these barrages. Status of Environmental Resource Base, Environmental Impact Assessment of all the barrages and required Environmental Management Plans are presented in the following paragraphs.

8.2.2 Status of Environmental Resource Base

It is imperative to assess the pre project environmental resource base to determine the environment parameters which could be significantly affected as a result of the projects. The base line survey becomes essential which envisages both field work and review of existing documents.

8.2.3 Climate

These barrages are located in the sub humid region of the districts of Raisen Vidisha and Sagar in Madhya Pradesh. The rain fall of this region varies between 1100 and 1200 mm per year which is mostly received from South –West Monsoon. The rain fall pattern determines the agricultural seasons which are spread in periods viz. kharif (mid-June to October) Rabi (November to February) and the Summer (March to mid-June)

The annual temperature of this area ranges between 10° C and 40° C. The average wind velocity varies from 4.5 to 15 km/hr .the mean monthly relative humidity in the sub-basin ranges between 25 percent and 85 percent. Mean values of cloud cover in the sub barrage varies from 1.2 oktas to 6%oktas.

8.2.4 Topography

The topography of the upper Betwa sub basin is plain as well as undulating in some parts. The slope pattern in some areas divides the area in to plain lands and undulating terrain (60%). In 15% of the hilly areas the slope varies from 2 to 8 percent.

8.2.5 Agriculture

As maintained earlier the cropping pattern of the area is primarily determined by rain fall temperature, humidity, soil types, etc. The major crops grown in three district are wheat, gram, paddy, oilseeds and other pulses in three seasons namely Kharif, Rabi and Summer. The farmers of the area also grow vegetables, sugarcane and jowar.

8.2.6 Forests

No forest area will be affected due to creation of these four barrages i.e. Neemkheda, Kotha, Barari and Kesari as submergence area of all the barrages are confined to river gorge. Faunal population in the command area is nearly absent.

8.2.7 Fisheries

Rivers in basin are seasonal but for Betwa. Most of the Rivers carry discharge only in monsoon season. Normally, in such Rivers, fisheries are not well developed. In the study area even the flow in Betwa River is only during the monsoon period. The major fish reported in the study area include Catla, Bata, Mrigal, Rohu, Common Murrel etc. No migratory fish species is reported in the area.

8.2.8 Prediction of Impacts

The construction of various barrages would lead to different impacts on various aspects of environment in the upper Betwa Basin (UBB). The prediction of impacts is undertaken both during construction and operation phases. These impacts are presented below.

8.2.8.1 Impacts on Land Environment

a) Construction Phase

Environmental degradation due to migration of labor population: During the construction phase, considerable population of technical staff and labor will be congregating at the project sites. Approximately, on an average, the project staff including labor would range

between 2000 and 6000 at every site of the project. Since the labor congregation in the project area is very small, the impact of labor migration on the land environment will be marginal.

Operation of construction equipment and machinery: On the onset of barrage construction, various types of construction equipments will have to be brought at the site such as crushers, batching plant, drillers, earth movers etc. To place these equipments, a good land space would be required. Besides, storage facilities for construction materials during construction phase need to be created. Such land requirements are temporary in nature. Therefore, as far as possible public lands (Government / Panchayath etc) will be used for the purpose. Thus, such selected lands should be away from human settlements so as to minimize the hazards arising due to barrage construction.

Soil Erosion: During the construction phase, a lot of effluents will come out and will flow from higher level to lower levels in natural course. Thus, disposal of drainage effluent with high turbidity level is bound to affect the water quality particularly during lean season. Most of these nallas/ River courses are seasonal in nature as such, biological production in them will not be too high. Hence the rise in turbidity levels is not expected to be significant.

(b) Operation phase:

Acquisition of land: The details of estimate of lands for different purposes such as submergence area other than gorge, canal net work, colony, green coverage etc. to be acquired, are presented in Table-8.23.

Table – 8.23**Land to be acquired for the barrages**

S. No.	Name	River	Component wise area (ha) to be acquired excluding river gorge area and Government land				Proposed Annual Irrigation
			Submergence area	Canal network	Colony and Roads	Total	
1	Neemkheda	Betwa	84.75	-	2.50	87.25	3066.00
2	Barari	Betwa	104.75	14.25	3.00	122.00	4444.00
3	Kotha	Betwa	387.70	145.75	6.00	539.45	21696.00
4	Kesari	Keotan	63.30	36.25	5.75	105.30	2070.00
	Total		640.50	196.25	17.25	854.00	31276.00

Change in land use pattern: The command area of 2 barrages i.e. Barari and Kesari are falling under Vidisha district while Neemkheda barrage will benefit command in Raisen district and command of Kotha barrage will benefit Vidisha, Sagar and Ashoknagar districts. The projected command is expected to bring about changes in cropping pattern, intensity, area under irrigation and its intensity. It is evident that there will be tangible increase in the area of paddy and wheat. The area under oil seeds including groundnut will also be increasing to a marked extent. It is also expected that farmers will take the advantage of available irrigation potential and cultivate the cash crop like sugarcane, vegetables etc. The irrigation facility is expected to enhance the Gross Command Area (GCA) and Cultivable Command Area (CCA).

8.2.8.2 Impacts on Water Resources and Quality

a) Construction Phase

Impacts Due to Sewage Generation from Labor camps: The increase in the population is expected to be of the order of 5,000. The labour population is likely to be congregated at three to or more labor colonies. The disposal of sewage without treatment could lead to adverse impacts on land environment or water environment in which the effluent from the labor camps/colonies are disposed. However, this impact is expected to be moderate. It is recommended that a sewage treatment plant be commissioned at various labour colonies for treatment of sewage prior to disposal.

Impacts Due to Runoff from Construction Sites: Substantial quantities of water would be used in the construction activities. With regards to water quality, waste water from construction activities would mostly contain suspended impurities. These suspended particles will have moderate impact on water quality in the project area. Adequate care should be taken so that excess suspended solids in the wastewater are removed before discharge into water body.

b) Operation Phase

Impacts on Downstream Users: It needs to be highlighted that all the projects will benefit the downstream population in primarily meeting their domestic and irrigation water needs. This will automatically help in augmenting the cropping and irrigation intensity. In terms of irrigation highest water availability will be from Neemkheda project Barari followed by Kotha project. As regards domestic water needs Kotha project is expected to benefit maximum population. The estimated annual irrigation and domestic water demands are presented in Table-8.24.

Table – 8.24

Estimated Annual Irrigation and Domestic Water Demands from the barrages

S.no	Name of projects	Distt	Annual irrigation (ha)	Annual utilization of water (MCM)
1	Neemkheda	Raisen	3065.98	16.61
2	Barari	Vidisha	4444.45	24.53
3	Kesari	Vidisha	2069.99	10.03
4	Kotha	Vidisha, Sagar, Ashok Nagar	21696.25	107.77

Impacts on Water logging and Soil Salinity: The increase in water availability can lead to water logging in the command area. The main causes of water logging in a command area due to introduction of irrigation need to be addressed properly.

Changes in Water Quality due to Increased Use of Fertilizers:

With the introduction of irrigation, use of fertilizers is likely to increase, to maintain the increased levels of production. The drainage system (natural or man-made) is likely to contain much higher level of nutrients. The climatic conditions in the project area too is suitable for the proliferation of eutrophication. Thus, in the project operation phase, there will be increased probability of eutrophication in the water bodies receiving agricultural runoff. Appropriate control measures have been recommended as a part of Environmental Management Plan.

Impacts due to effluent from Project Colony:

This aspect has already been discussed earlier at para 8.1.8.2.2.4.

Other likely impacts due to creation of the barrages like impacts on terrestrial ecology, aquatic ecology, noise environment, air quality, command area development, spread of water related diseases and other likely impacts have already been discussed earlier in the dam section in para 8.1.8.3 to 8.1.8.9.

8.2.9 Rehabilitation and Resettlement Plan

8.2.9.1 Details of Project Affected Families

The project envisages acquisition of 1165 ha of land (approx.) for various project appurtenances. Private land to be acquired is 462 ha In affected villages both land and homestead shall be acquired. About 25 families are likely to lose homestead. The same shall be confirmed as a part of DPR preparation. There is no direct displacement of the local population except some structures such as, cattle shades, tanks open wells etc.

The Rehabilitation and Resettlement Plan proposes to provide compensation for structures to be submerged under project.

The provisions of the Madhya Pradesh MPPKKVVA - 1985 and NRRP – 2007 have been taken into consideration, and the best option has been recommended for preparation of Resettlement and Rehabilitation Plan for the PAFs.

8.2.9.2 Measures for Resettlement

- Conscious effort needs to be put-in to ensure the Scheduled Caste affected families are resettled in the areas close to the villages, so that they are not marginalized.
- All PAFs losing homestead would be provided with House Building assistance of Rs. 150,000.
- In case of a project involving land acquisition on behalf of a requiring body, the stamp duty and other fees payable for registration of the

land or house allotted to the affected families shall be borne by the requiring body.

- The land allotted to the affected families under this policy may be in the joint names of wife and husband of the affected family.

- Each affected family that is displaced and has cattle, shall get financial assistance of such amount as the appropriate Government may decide but not less than Rs. 15,000 for construction of cattle shed.

- Each affected family that is displaced shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than Rs. 10,000, for shifting building materials, belongings and cattle.

- Each affected person who is a rural artisan, small trader or self-employed person and who has been displaced shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than Rs. 25,000 for construction of working shed or shop.

- In case of a project involving land acquisition on behalf of a requiring body, each affected family which is involuntarily displaced shall get a monthly subsistence allowance equivalent to 25 days minimum agricultural wages per month for a period of 1 year from the date of displacement.

8.2.9.3 Measures for Rehabilitation

The following measures are suggested to be extended as rehabilitation measures to the PAFs losing land:

- Based on past experiences, it is observed that a land for land may not be available in the command area. Thus it is suggested that Rehabilitation grant may be extended in-lieu of land to PAFs losing land.

- In case of a project involving land acquisition on behalf of a requiring body, the affected families who have not been provided agricultural land shall be entitled to a rehabilitation grant equivalent to 750 days minimum

agricultural wages or such other higher amount as may be prescribed by the appropriate Government.

- Fishing rights in the reservoirs shall be given to the affected families, if such rights were enjoyed by them in the affected area;
- Stamp duty and other fees payable for Registration of the land allotted to the affected families shall be borne by the requiring body.
- Land allotted to the affected families under this policy shall be free from all encumbrances.
- Land allotted to the affected families under this policy may be in the joint names of wife and husband of the affected family.
- In case each khatedar in the affected family is allotment of wasteland or degraded land in lieu of the acquired land, she/he shall be entitled for a one-time "financial assistance of not less than Rs. 15,000/ha for land development.
- A provision of Rs. 10,000 per PAF is being kept for a one-time financial assistance to each khatedar in the affected family for agricultural production
- Preference to be given to at least one person per affected family in providing employment in the project, subject to the availability of vacancies and suitability of the affected person for the employment.
- A provision of Rs. 500/month for 6 months for one person per PAF shall be given for training.
- Scholarship @ Rs. 500 per month to at least 1 child per PAF for a period of 1 year.
- A provision of Rs. 500/month for 6 months for one person per PAF shall be given to extend other skill development opportunities to eligible persons.

- Requiring body shall give preference to willing landless laborers and unemployed affected persons while engaging labour in the project during the construction phase.

- One person from each affected family shall be offered necessary training facilities for development of entrepreneurship, technical and professional skills for self-employment.

8.2.10 Environmental Management Plan

8.2.10.1 Environmental Measures during Construction Phase

These aspects i.e. environmental measures during construction phase like facilities in labour camps, water supply, sewage treatment, fuel supply, solid waste management, water quality, health delivery system etc. have already been discussed earlier in para 8.1.5.

8.2.10.2 Sustenance and Enhancement of Fisheries Potential

The commissioning of the proposed irrigation projects will increase the water availability in the project command area. The important management measures includes:

Slope and sides of dykes be provided with grass turfing to reduce erosion, ponds be properly prepared, manuring of ponds before stocking of fish seeds and at regular intervals after stocking the manure should be put in heaps in ponds, on fouling of water or development of thick algal bloom, manuring and feeding be stopped supplement natural food with artificial feed; sampling of fish stock every month to observe their growth rate and health.

8.2.10.3 Control of water logging

It is proposed to provide pressurized irrigation system in 10% to 20% area of command of this project as a pilot scheme. This will substantially control water logging in the proposed command area.

Other aspects including infrastructure for agricultural development, control of weeds, pest control, training and extension courses for

farmers, control of air pollution and noise control measures are already discussed earlier in para 8.1.10.8 to 8.1.10.13.

8.2.11 Catchment Area Treatment Plan

A Catchment Area Treatment Plan for catchment area intercepted at barrage/ dam site upto the catchment of upstream project will be prepared as a part of the Comprehensive EIA study. The procedure for preparation of CAT plan for each watershed area to be covered is given as below:

- Catchment area Treatment Plan to be prepared using Silt Yield Index(SYI) method.
- Delineation of sub-watersheds in the catchment area.
- Landuse pattern using satellite data, and slope map using Survey of India toposheets, etc. will be prepared.
- Mapping of critically degraded areas based on Integration of Remote Sensing technique, GIS methodology and Silt Yield Index method and prioritization of Watershed treatment
- Preparation of phase wise Catchment Area Treatment (CAT) Plan for sub-watersheds with very high and high erosion intensity.
- Estimation of cost required for implementation of CAT plan.

8.2.12 Local Area Development Plan

An amount to the extent of 0.5% of Project cost shall be earmarked for area development activities. The area development activities proposed as a part of the plan given in following paragraphs:

Up gradation of educational facilities

The following activities are proposed under Local Area Development Plan:

- Up-gradation of school fixtures, equipment
- Improvement of drinking water and sanitation facilities

- School bus service
- Scholarship to students

Improvement of Public Health Facilities

- Furniture, Beds and other items
- Up-gradation of Pathological laboratory
- Up-gradation of operation theater (labor room)

8.2.13 Environmental Monitoring Programme

An Environmental Monitoring Program should be undertaken during construction and operation phase of the project. The details of environmental monitoring programme are given in Table-8.25 and 8.26 respectively.

Table – 8.25

Summary of Environmental Monitoring Program during Project Construction Phase

S. No.	Item	Parameters	Frequency	Location
1.	Effluent from STPs	pH, BOD, TSS, TDS	Once every month	Before and after treatment from each STP
2.	Water-related diseases	Identification of water related diseases, adequacy of local vector control and curative measure, etc.	Three times a year	Labour camps and colonies
3.	Air quality	PM ₁₀ , SO ₂ and NO ₂	Three times a year	At major construction sites
4.	Noise	Equivalent noise level	Once every three months	At major construction sites.

Table – 8.26

**Summary of Environmental Monitoring Program during Project
Operation Phase**

S. No.	Items	Parameters	Frequency	Location
1.	Water quality	pH, Calcium, DO, Free Ammonia, BOD, Total Kjeldahl Nitrogen, COD, Boron, TDS, Percent Sodium, Total hardness, Chlorides, Magnesium, Phosphates, Sulphates, Faecal Coliform, Total Coliform	Thrice a year	10. Ground water quality in command area 11. Reservoir water quality 12. Main canals
2.	Soil	pH, organic matter, texture, Available Nitrogen, Available Phosphorus and Available Potassium	Twice a year	Command area
3.	Ecology	Status of afforestation programmes along canal, Pasture development	Once every year	-
4.	Water-related diseases	Identification of water-related diseases, sites, adequacy of local vector control measures, etc.	Four times a year	• Villages adjacent to project sites
5.	Socio-economics	Changes in growth of population, income levels and distribution, occupation profile, electrification of the area, adequacy of infrastructure facilities such as roads, markets, seeds and fertilizer sales counter, etc.	Once in a year	• Command area
6.	Landuse	Landuse pattern using satellite data	Once in a year	• Command area

8.2.14 Cost Estimates of Barrages

The total cost for implementing Environmental Management Plan for four barrages has been worked out to Rs, 3752.02 lakh. Details are mentioned in Table-8.27.

The total cost for implementing Environmental Management Plan for Lower Orr dam and four barrages have been worked out to Rs. 9089 lakh only.

Table – 8.27

Cost for Implementing Environmental Management Plan

Sl. No.	Particulars	Neem-kheda	Barari	Kotha	Kesari	Total
1	Bio-diversity Conservation	8.18	10.09	37.34	6.12	61.72
2	Fisheries Management	32.45	40.03	148.18	24.27	244.94
3	Environmental Management in Labour Camps	16.23	20.01	74.09	12.14	122.47
4	Public Health Delivery System	6.82	8.41	31.12	5.10	51.44
5	Restoration and Land Scapping of Construction sites	6.49	8.01	29.64	4.85	48.99
6	Greenbelt Development	9.74	12.01	44.45	7.28	73.48
7	Energy Conservation measures	6.49	8.01	29.64	4.85	48.99
8	Public Awareness programmes	4.87	6.00	22.23	3.64	36.74
9	Local area Development Plan	58.41	72.05	266.73	43.69	440.89
10	Catchment area treatment plan	805.00	1128.00	357.00	205.00	2495.00
11	Environmental Monitoring during Construction Phase	9.74	12.01	44.45	7.28	73.48
12	Purchase of Instruments and Equipment	2.92	3.60	13.34	2.18	22.04
13	Air, Water, Noise rotation	4.22	5.20	19.26	3.16	31.84
Total		971.55	1333.43	1117.47	329.57	3752.02