CHAPTER - 11

ENVIRONMENTAL AND ECOLOGICAL ASPECTS OF THE PROJECT

11.1 General

Survival of the mankind, with its alarming increase in population growth is linked in the long term, requires a stable eco-system and increase in food production, for which the development of water resources is unavoidable. The development of water resources project is linked with change in the environment of the area due to construction of reservoirs because of submergence of land, displacement of population including the flora and fauna and resettlement in the surrounding catchment, denudation of forest, water logging, salinity and alkality of soil, water quality and ground water table change, etc.

The environment and ecology is degraded by both inappropriate and lack of development. In respect of disturbance of environment, there are two schools of thoughts. One school holds that eco-system is fragile and highly unstable. It is implicit, therefore, that eco-system should be left as much as possible in its natural state and that its diversity should be preserved at any cost. Modification for the purpose of development should be minimal and confine to the range of tolerance limits of various elements of eco-system. The second school of thoughts assuring that the eco-system is globally stable and there is large element of built in resilience in eco-system. In any case, it is realised that the water resources projects should be planned to be aimed for the sustainable developments of the inter-connected elements that co-exist in the system.

Water resources development that meets the needs of the present generation without compromising the ability of future generation to meet their own needs will alone be considered as a sustainable development. It is, therefore, realized that the water resources projects should be planned, implemented and managed in such a way that the future demands of the growing population have to be met with minimum disturbance to the existing eco-system along with the incorporation of adequate control measures at appropriate stages to mitigate the adverse effects, if any; to maintain the sustainability of the system, in long run.

11.2 Present environmental & ecological status of the project area

Proposed K-B link project comprises a storage reservoir to be created by an earthen dam across Ken river at Daudhan about 2.5 km upstream of the existing Gangau weir and about 19 km from Chhatarpur-Panna road, a side channel concrete spillway, two powerhouses, and a 231.45 km long link canal to transfer surplus waters from Ken to Betwa river.

The various features of the project area are:

(a) No major industries are located in the project area;

(b) No thermal power house is located in the project area;

(c) There is a diamond mine at Panna, which is located very near to the project area, but outside the submergence of the dam at Daudhan.

(d) As the villages in the project area are not accessible by all weather roads no prominent developmental activities are seen in these areas. The living conditions of the people of these villages are very pathetic. Only 15% to 20% of the population is having agriculture as their occupation. Lack of any developmental activities in the area has further deteriorated the condition of the people;

(e) At present, ground water is being used by the villagers from the wells and the springs nearby. The wells are generally shallow (3 to 6 m) and subterranean water is available in them;

(f) A wide range of indigenous fishes are found in Ken river. They are Rahu, Bhadur, Mrigal, Tingar, Singahi, Mangur, Pawda, Baam, Sooja, Sinni and Mahasir; and

(g) Like other North Indian rivers, flood in Ken basin lying in Madhya Pradesh is not a regular phenomenon. However, floods of minor nature are causing concern to the people residing in Uttar Pradesh portion of the basin. Floods that occurred in September, 1992 in Ken river was considered unprecedented and created extensive damage to the lives and properties of both the states. Long-term flood control measures are; therefore, need to be taken in some areas of the basin.

11.3 Favourable aspects of the project

11.3.1. Irrigation: The reservoir will irrigate an area of 3.70 lakh ha by the direct irrigation and provide water to drought prone areas of Upper Betwa sub-basin by way of substitution to 1.27 lakh ha annually. Besides this, the project will provide 850 Mcum of water to U.P. to utilize in the downstream areas of the proposed KMPP. The ultimate benefits going to be accrued from the project will go to the states of M.P. and U.P.

11.3.2. Power generation: The total installed capacities of the power houses proposed under the project are 72 MW.

11.3.3 Pisciculture: A wide range of indigenous fishes are found in the Ken river. They are Rahu, Bhadur, Mrigal, Tingar, Singahi, Mangur, Pawda, Baam, Sooja, Sinni and Mahasir. Creation of the Daudhan reservoir shall-definitely increase the production rate of all the varieties of fishes found in the area. In addition to this some other improved varieties of fishes like Catla, Common Carp, Kariyat, Mrigal etc. can be cultured very easily.

The Pisciculture development proposed to be created in the project area will also provide additional work to the local fishermen and revenue to the governments.

11.3.4. Water supply: It will also provide about 12 Mm^3 of water for drinking purpose to the enroute areas of the link canal.

11.3.5. Flood modernization: As the FRL of the proposed Daudhan reservoir has been fixed at 287.0m, which is about 52.0 m above the present FRL of the existing Gangau weir. It is therefore, seen that the storage of Daudhan dam will definitely contribute its own role in mitigating floods in the downstream portion of Ken basin to a greater extent.

11.3.6. Industrial development: At present there is no industrial unit has been set up in the area. However, due to coming up of such a multipurpose project in the area may encourage setting up of some medium and small scale industrial units in and around the project area and will be helpful for the overall development of the area economically.

11.4 Need for impact assessments on environmental and ecological aspects of the project area

The major environmental and ecological aspects of K-B link canal project mainly pertain to the areas of the reservoir site, downstream river course below the dam, link canal enroute and command area of the project. Different types of environmental and ecological impacts may be observed in the areas due to the coming up of the project. It is, therefore, necessary to anticipate the possible adverse impacts along with the positive aspects from the relevant areas of the project. This will help to incorporate adequate control measures on the adverse effects from the project planning phase to various other stages of developments, such as implementation and management to accrue optimum benefits from the project. Relevant aspects on environment and ecology of K-B link canal project and the possible impacts along with mitigative measures thereon have been discussed in the following paragraphs:

11.4.1 Reservoir site

The site of the dam on Ken river at Daudhan, 2.5 km upstream of the existing Gangau weir has been finalized after conducting detailed toposheet study on alternative sites and subsequent field survey and geological investigations. The site provides maximum storage and minimum impacts on the population and area coming under submergence. The total area of submergence at FRL 287 m of the reservoir is 8650 ha, out of which 6400 ha is forest, 2171 ha are culturable land and 79 ha are unculturable land. 10 numbers of villages are fully coming under submergence and about 900 families having a total population of about 8550 will be displaced. Available information on population and their occupation are projected in the Table no. 7.3 of the chapter on “Reservoir”.

11.4.2 Living conditions of the affected tribal

Out of the total population submerged, the schedule castes and schedule tribes constitute about 15.5% and 34.4% respectively. The literacy rate is about 9.7%, which indicates that the available educational facilities are inadequate. About two-third of the population constitutes the labour force and their main occupation is agriculture.

11.4.3 Impact on wild life including birds and reptiles

Out of the total submergence area of 8650 ha, 6400 ha is forest area. The region is covered by dense to moderate forests. The tiger called locally as 'Nahar' is fairly common and man-eating tigers are scarcely known. The tigers are found on the hills and rocky ravines in wet weather. The leopard or panther called locally tendua is found all over the region. Presence of many other animals like Jungle Cat, Cheeta, Indian lynix (Felis caracall), striped Hyaena, destructive Wolf, wild Dogs, Jackals, and Foxes are common animals in these forest areas. Different types of Deer like Sambhar (Cervus unicolor), Cheetal or spotted Deer, Nilgai, Chowsingha are commonly found but the swamp -Deer is not found in these areas. These are generally found along the banks of the rivers. The presence of Bandar (Maconcus Yhesus) common monkey of north India is also reported in this region. The Mangoose is found in almost all the regions and is easily tamed.

Species of wild animals, birds and reptiles commonly found in and around the submerged area of the project are as given below:

11.4.3.1. Animals (Mammals)

(i)	Carnivora	Tiger, Panther, Jackel, Wild Cat and Leopard
(ii)	Herbivora	Spotted deer, Neelgai, Wild Boars, Rabits, Black faced Monkeys, (Langoors), Red faced Monkeys

11.4.3.2. Birds

About 153 species of birds are permanent resident of the districts covering this basin. These include:

(i) Pheasant and Fowl group	Peacock and Wild Fowl (Wild Hen)
(ii) Partridges and Quail group	Titar (Francolinus pondicerianus) and Batair (Coturnix)
(iii) Doves and Pigeon group	Harial (Crocopus phoenicopteris) and Fakhta (Streptopelia shinen-sis)
(iv) Non-game	Crow, Parrot, Myna, Bulbul, Koel, birds Kaikil, Ababil, Owl, Gidh, Baaz, Cheel, Baya, Mokha and Sat-Bahin

(v) Aquatic	Sarus (Antigone antigone), Duck, birds (Sarkidiornis melanonotas), Cotton teals (Nettopus Coromandelianus), the large whistling teal, silhi (Dendrocynga fulva), grey Heron and Bagla (Ardea Cinera).

11.4.3.3 Reptiles

The common reptiles found in this area are Cobra and Crate, both of which are deadly poisonous and also Dhaman (Zamenis mucosus) with less poisonous. As per the information collected, the mortality caused by the reptiles and wild animals are seen to be significant in these areas.

11.4.4 Impact on Plant life/ Forest area

The 6400 ha of forest area coming under submergence is covered by dense to moderate forests. Part of the forest land, which is a part of the Panna reserved forest/National Park lies on north and south side of the submerged areas. The protected forest on the north is away from the reservoir area but a part in the south is within the Panna National Park. A good number of trees belonging to different species are found in the forest area. A few evergreen or semi -evergreen and a few xerophytic to semi-xerophytic types of species are met with, mostly mixed up in various proportions. However, variations in the predominating species at different localities, their equality and density are marked and affected depending upon the terrain conditions like hill slopes, depressions, valleys, soil configurations like alluvium, clayey, sandy loams, stony or rocky lands; geological phenomena like degree of denudation, erosion and water logging; and other factors like grazing and fires. Based on these considerations, the forests are further subdivided into different categories viz. (i) Mixed forests, (ii) Teak forests, (iii) Salai forests, (iv) Karkhai, (v) Khair forests and (vi) Bhirra forests.

An area of about 25 ha is to be cleared for the construction of the project staff colony near the existing Gangau weir. No additional area for the construction of road is to be cleared, as almost all the locations are accessible by the motorable dry weather roads.

Important species of the forest trees, scrubs, grasses generally encountered in the region, are given in the Table-11.1.

Table: 11.1
Important species of trees

Sl. No.	Local name of Tree species	Botanical name	General use
A	**Forests**		
1	Sagwan (Teak)	Tectona Grandis	Used for houses & furniture
2	Sal (Saj)	Terminali Tomentosa	Used for houses & furniture
3	Seja	Legerstromia Parviflora	Best timber for house posts, rafte and agricultural impliments
4	Dhaura	Angeissus acuminate	-
5	Tinsa	Ougeinia delbergioides	-
6	Moyan	Lannea Grandis	Timber used for planks, posts; Bark used for tanning; leaves for fodder
7	Tabdu (ebony)	Diospyros Melanoxylon edible	Timber used for furniture,fruits
8	Aonla (Amla)	Emplica officinalis	Bark & leaves used for tanning & as a medicine.Fruit edible
B	**Shrubs & grasses**		
9	Dhawai	Wood Fordia	For obtaining dye
10	Karnoda	Carissa Carandas	Used for fencing, fruits used in tarts and jam
11	Gunher	Thameda Candata	Yields valuable oil
12	Rusa	Cymbopogon martini	Yields valuable oil
13	Khus	Vetvera zizanioides	Roots used for making Khus tati & aromatic oil
C	**Tree species in open country**		
14	Mahua	Madhuca Latifolia	For flower & fruit and to make country liquor
15	Nim	Azadir Indica	Used as Avenue trees medicinal value and tooth brushing.
16	Banyam (Pipal)	Ficus religiosa	Avenue trees for shade
17	Imli	Femarindus Indica	Avenue tree, fruits used as imli
18	Mango	-	Avenue trees. Also cultivated in groves for its sweet fruits
19	Munga	Moringa Pterygouspermia	Cultivated in valleys for its fruits

11.4.5 Impact on national park and sanctuaries

The total area of of “Panna National Park", is 533 sqkm. Out of which, about 45.96 Sqkm area of the park, comprises of reserved forest, is falling under the submerged area of the reservoir at FRL.

The impact of the submergence on the wild life of the park will be nil, as the area coming under submergence is only about 9% of the total area of the national park and the wild life has got its own natural characteristic of moving to the interior forest areas adjacent to the areas of submergence of the project area. However, adequate remedial measures have to be adopted for covering the biodiversity impacts on the endangered species of flora and fauna of the sensitive area, starting right away from the planning phase to implementation stage followed by management level.

11.4.6 Impact on sites and monuments of historical, cultural and religious significances

No monuments of historical, archeological, cultural and religious significances are coming under the submergence.

11.4.7 Mineral resources

No mineral wealth is coming under the submergence. So, no detailed study is considered at this stage.

11.4.8 Public health aspects of the population

The Chhatarpur and Panna districts of Madhya Pradesh, where the proposed project construction work shall be taken up is well known for endemic malaria. The survey conducted on this aspect shows that the districts were covered under the National Malaria Control Programme since 1953. Under this programme, intensive residual spray, house-to-house searches for fever cases by trained workers were done twice a month as a routine affair. Treatment for fever cases and proved malaria cases after laboratory examination of blood samples was being carried out by the passive agencies (hospitals) and also by the field staff of the Malaria unit at Nowgong. Panna district, in view of its greater endamicity, received DDT spray under the “Attack Phase”. In the recent years, this programme, however, has suffered some set back due to many reasons and as a result the numbers of positive cases have shown an upward trend.

The villagers along the periphery of the reservoir will face the problem of waste water disposal as the existing drains will become inefficient due to the impoundment of water in the reservoir in their vicinity. Proper drainage system is, therefore, to be designed for the villages to minimise the adverse effects. Although no important road will be submerged yet the dry season motorable road measuring about 30 km in length from Gangau to Palkohan- Sukwaha-Bhorkhowa-Basudha-Shahpura will get submerged.

At present there is no industrial unit has been set up in the area. However, due to coming of such a multipurpose project in the area may encourage setting up of some medium and small industrial units in and around the project area in near future can't be ruled out. Possible pollutions due to industrial unites have to be studied and adequate mitigative measures have to be adopted, while sanctioning the units.

11.4.8.1 Need for taking precautionary measures:

When the project will be taken up for construction, there may be increased chances of mosquitogenic conditions. Increased mosquito breeding places due to quarrying will result in increased output of vector mosquitoes. Changed humidity and temperature conditions due to extensive water sheets will make it more conducive to greater transmission potential throughout the year. To deal with the problems, it is necessary to inform the labours and other personals engaged in the various works of the project and introduce anti-malaria measures like distribution of oral medicines and mosquito nets, educating the people for maintaining hygienic living conditions etc. at the construction stages followed by management phases and to be implemented in the field by the project authority with the co-operation and guidance of National Malaria Eradication Programme Authorities.

11.4.8 Aquatic resources

Pisciculture will be one of the attractions of this project. The major aquatic life found in the area at present is the fish. Due to creation of Daudhan reservoir, the production of fish shall go up many folds and it is expected that the rate of production of fish shall be @ 30 kg/ha. As such it would be possible to produce about 140 tonnes of fish annually.

11.4.9.1 Pre-impoundment survey on fish habitat and nutrients level

The annual fish yields obtainable from newly constructed reservoir depend on various factors viz. proper jungle clearance from its bed before water is allowed to accumulate in the reservoir, proper guarding of water weir and canal heads, species of fish available or stocked in adequate number and efficiency of management measures adopted. For undertaking jungle clearance, proper selection of species of fish, selection of sites for fish farm dry bunds, storage ponds, identification of economic fish landing centres, pre-impoundment survey of the reservoir area is essential.

Following fast growing, non predatory, compatible species of economic importance have been considered.

(a) Indigeneous	(i) Catla (Catla Catla)
	(ii) Rohu (Labeo rohita)
	(iii) Mirgal (Cirrhinus Mrigala)
(b) Exotic	(iv) Grass carp (Ctenopharyngo donidellns)
	(v) Silver Carp (Hypathalmitchys mofitrix)
	(vi) Common Carp (Cycrinus Carpio)

The survey for this purpose was conducted by the Directorate of Fisheries, Madhya Pradesh and a report was prepared by them in the year 1977.

11.4.9 Water logging and salinity aspects

The water holding capacity of the soils of the command area is low to medium and the water table levels in the command area on an average is well below the ground surface, there is no need to take any special efforts to lower down the sub-soil water table in the areas under normal conditions. Ground water found in these areas is free from salinity problems.

The ground water table is expected to rise, due to the reservoir impoundment in the submerged area. The ground water regime in the canal alignment would generally remain unaffected as the canal is proposed to be wholly lined with cement concrete. However, the ground water regime in the command areas of the link canal project would increase due to the application of irrigation water, in due course of time. Action may be taken to promote conjunctive use of water along with the adequate selection of cropping patterns for the region.

11.4.11 Soil erosion and its conservation strategies

11.4.11.1 In the catchment area:

The soil and water conservation programme was started in Ken catchment during the second five years plan period. Initially the main thrust was on checking of soil erosion and conserving adequate moisture in the soil to facilitate better crop yield on sustained basis. The measures adopted were mostly bunding the agricultural lands. From the fourth plan period, the scope of this programme was broadened by introducing a "Need-based Programme" to be taken up on small watershed basis in order to treat all possible types of agricultural lands in an integrated manner by different soil conservation measures. So far 1, 30,000 ha of rainfed area have been covered in 8 districts of Ken basin since the induction of the scheme. The district wise details are given in the Table 11.2.

Table - 11.2
District wise soil conservation measures

Sl. No.	Name of the district	Culturable area in basin (ha)	Area treated so far (ha)
1	Chhatarpur	24,135	5,000
2	Panna	1,38,669	25,000
3	Jabalpur	28,775	Nil
4	Satna	3,461	Nil
5	Damoh	3,17,993	50,000
6	Sagar	1,89,352	50,000
7	Raisen	13,794	Nil
8	Narsinghpur	139	Nil
	Total	**7,16,258**	**1,30,000**

Based on the general topographical survey, the critical area that requires soil and water conservation measures works out to be about 40% of the total culturable land in Ken basin. Detailed soil survey is to be carried out at the DPR stage, for incorporating adequate soil conservation measures in the catchment area of the reservoir.

11.4.11.2 In the command area:

Soil conservation programme for the command area is based on problems, which are different from that of the rainfed areas of the catchment. Some of the problems which have to be attended in the command area are:

(a) A good system of water courses to carry water to each irrigable tract or field without excessive losses and flooding.

(b) An effective drainage system to prevent damage due to accumulation of water and seepage from canals.

(c) Establishing proper size of fields, water courses, drains, farm roads etc.

(d) Land levelling and shaping the fields to provide a proper slope so as to use the water effectively.

The main objective of the command area development is to provide adequate and optimum irrigation at suitable interval to keep the soils healthy and fit for sustained and productive agricultural use.

11.4.12 Landslides on the periphery of the reservoir

Ground level is rising gently on the left bank and little steeper in the right bank of the reservoir. There is very little possibility of landslide on the periphery of the reservoir, since the area mainly consists of pink granite rock free from faults etc, as per the available geological reports.

11.4.13 Siltation due to sediment load

Due to the water spread area of the reservoir, the long hill streams joining to the river will get shortened, which may result in widening of the channels close to the periphery of the reservoir. The widening will cause more silt deposit at the reservoir site. The rate of siltation at the rate of 357cum/sqkm/year has been considered for this project. This aspect has been discussed in detail in the para 5.8 of the chapter-5 on "Hydrology".

11.4.14 Potential seismic impact due to reservoir loading

Although no major earthquake has taken place in the project area since 15th January, 1934 but occurrence of small tremors to a medium earthquake cannot be ruled out. Necessary measures to prevent earthquake damages to the different structures of this project shall be taken along with the general instructions to all the builders of the area in and around the project.

11.4.15 Occurrence of tornadoes, cyclones and hurricane

The maximum and minimum wind velocities that are experienced in the project area are 16.1 km/hr. and 1.0 km/hr respectively. The area has not experienced any natural calamities like tornadoes, cyclones, hurricane etc so far.

11.4.16 Effect of project on climatological changes

As there are a number of small irrigation projects exist, in the vicinity of the project site, major climatological changes are not expected because of the implementation of the project.

11.4.17 Measures to prevent animal over-grazing & premature silting

Proper steps are to be taken in this regard, during the planning stage of the project itself followed by implementation and management phases. Fencing around the periphery of the reservoir area including the area under afforestation programme shall be a suitable device to adopt for safeguarding the plantation cover and thereby reducing the chances of soil erosion to the reservoir site.

11.5 Socio-cultural aspects

11.5.1 Population density

11.5.1.1 Catchment: The total catchment area of Ken basin is 28058 sqkm of which 24472 sqkm lies in Madhya Pradesh and the remaining 3586 sqkm in Uttar Pradesh. The population densities of Chhatarpur and Panna districts are 102 and 76 per sqkm respectively.

11.5.1.2 Submerged area: An area of 8650 ha will be submerged due to the creation of Daudhan dam and about 10 nos. of villages having about 900 families with a population of about 8550 shall be affected. The population density of the area is about 70 persons per sqkm.

11.5.1.3 Command Area: Population densities of the command areas that are coming under the districts of Chhatarpur, Tikamgarh and Panna of Madhya Pradesh and the districts of Hamirpur and Jhansi of Uttar Pradesh as per the district census book of 1990-91, are:

Chhatarpur	102 per SqKm
Panna	76 per SqKm
Tikamgarh	186 per SqKm
Hamirpur	167 per SqKm
Jhansi	226 per SqKm

11.5.2 Rehabilitation and resettlement of project affected people

The primary objective of a good rehabilitation and resettlement strategy should be to reinforce the traditional ethos and aspiration of displaced people to develop a society living in perfect harmony with nature. Besides, the main thrust of the rehabilitation strategy also should aim at providing fair and equitable treatment of the persons displaced from their homes, professions, farms etc. due to construction of a project. This may require a detailed analysis of the cost involved in providing houses, land and civic amenities to the displaced people. Accordingly, the approximate cost for providing the rehabilitation and resettlement of the project affected people of K-B link canal project have been worked out and the details are presented in the Table-11.3.

11.5.2.1 Housing

Annual population at the present growth rate of nearly 2.0 percent, the expected number of people needing rehabilitation & resettlement, say by 2005; would be nearly ten thousand. By considering five members per family, the number of families requiring rehabilitation would be around two thousand. Therefore, these families would need to be resettled in different villages, say seven - six villages with 300 families each and the seventh one with 200 families. To expect a displaced person to embark upon the task of constructing a house by him is perhaps expecting too much from him. Therefore, a modestly constructed house needs to be allotted to each of the displaced family that would facilitate their prime need. Based on the survey on the existing economic status of the persons to be displaced, plot areas of 150, 250 and 350 sqm have been considered per family with 30, 50 and 70 sqm as living area respectively. The total cost involved in the acquisition of land, development and constructions of houses would be approximately Rs. 2440 lakhs (Table-11.3).

11.5.2.2 Land

There are considerable variations in the norms prescribed by different states and agencies in respect of land compensation to be provided to the displaced persons. In some cases, the norms differ from project to project within the same state. The policy of providing land for land is commendable. However, complications may arise when the choice of land is also given to the displaced families. To avoid dispute and problems, the selection of suitable agricultural land in the command area and its division into required sizes and its distribution by draw of lot with the control of a High Level Committee comprising senior officers of concerned departments should be performed. In the case of Ken-Betwa link canal, 2171 ha of culturable area is coming under the submergence of the proposed reservoir at Daudhan. Therefore, at least an equivalent area of land has to be acquired, suitably in the command area of the project for encouraging to carry out the normal agricultural activities by the displaced families. If the cost of the acquired irrigated land is considered as Rs. 35,000 per ha, the total land cost works out to be about Rs. 760 lakh. Further, the cost of development of pasture lands at the rate of Rs. 10,000 per ha. for 6400 ha. works out to be Rs. 640 lakh.

11.5.2.3 Basic amenities

Facilities for health, education, water supply, market, sanitary, communication, community park, panchayat ghar etc. are to be provided to make the life in resettlements more adaptive and comfortable. The total cost involved in providing these facilities is indicated in the Table-11.3.

11.5.2.4 Rehabilitation grant and maintenance allowance

To restore the displaced families in the new surroundings, it becomes essential to provide for resettlement grant and maintenance allowance atleast for one year. For this purpose, a resettlement grant of Rs. 10,000 per family and maintenance allowance of Rs. 1,000 per month per family for one year has been considered. Similarly, provisions have also been made to provide 300 families with means of occupation other than farming.

Table - 11.3
Rehabilitation & Resettlement costs in the case of Ken-Betwa link *

Sl. No.	**Item**	**Unit cost (Rs. in lakhs)**	**No. of units required**	**Total cost (Rs. in lakhs)**
1	Housing plot cost	0.4 per ha.	100 ha	40.0
2	Land development cost	2.0 per ha.	100 ha	200.0
3	Housing construction	0.25/10 sqm	88000 sqm	2200.0
4	Schools	10.0	7	70.0
5	Dispensaries	2.0	7	14.0
6	Police station	2.0	3	6.0
7	Borewells	0.5	7	3.5
8	Electrification	20.0	7	140.0
9	Temple/other places of worship	2.0	7	14.0
10	Post office	2.0	3	6.0
11	Panchayat Ghar	2.0	7	14.0
12	Roads	15.0/km	35km	525.0
13	Bank	5.0	1	5.0
14	Commercial/ occupational development	1.0	300	300.0
15	Rehabilitation grant	0.1 per family	2000 families	200.0
16	Maintenance allowance for 12 months to each family	0.12 per family	2000 families	240.0
17	Compensation for agricultural land	0.35/ha	2171 ha	759.85
18	Compensatory afforestation	0.1 per ha	6400 ha	640.0
	Total			**5377.35**
	Say		**Rs.5377 lakh**	

* *The detailed studies in respect of the exact number of families, persons, their occupation, present facilities available and the cost of rehabilitation & resettlement of the persons affected due to the project on the basis of a detailed R&R plan, as per the latest prescribed norms, would be prepared at the time of preparation of the DPR of the project.*

11.6 Proposed period of construction of the project

The proposed period of construction of K-B link project is 9 years, including the pre-construction period of one year. The detailed construction programme has been discussed in the Chapter-10 of this report.

11.7 Labour requirement

11.7.1 Estimated strength (Peak)

(i) Total - It is difficult to assess the exact number of labours to be required for the construction of this project during the peak activity period. However, approximately 1000 labours are seems to be necessary for a project of this magnitude.

(ii) Skilled -Out of the total number of labours required for the construction of the multipurpose project, at least 25% of them should be of skilled nature. As such about 200 to 250 nos. of skilled labours should be required.

(iii) Semiskilled and Unskilled -The rest of the labours numbering about 750 may be of semiskilled and unskilled in nature.

11.7.2 Availability of labour from the affected areas

(i) Total -About 2000 workers are estimated to be available from the affected areas, mostly from the villages coming under submergence. So it would be possible to give alternate employment to atleast 50% of the labour force, by way of engaging them in the various construction activities of the project.

(ii) Skilled -No prominent skilled labours are expected to be available from these areas. However, some semi-skilled persons may be available amongst from this strength.

(iii) Unskilled -Most of the labours available in the area are unskilled. Of course, a very small numbers have some knowledge of the construction and repairing works of small dams and weirs.

11.8 Arrangement made for fuel requirement of the labour during construction stage

As the firewoods are found in abundant in the forest areas in and around the project site, it is not necessary to make any other arrangement for meeting the fuel requirement. Compensatory afforestation is a must to preserve forest cover that is going to be submerged. For that a separate forest land has to be

created, where all the endangered species of trees shall be planted and adequate care shall be taken to protect them.

11.9 Tourism and its development

(a) In view of the location of the project near Khajuraho, a tourist attraction for the people because of the presence of glorious temples the proposed project could be developed into a famous tourist resort. In addition to the temples of Khajuraho, some other spots of tourist attractions are also exist in the vicinity of the project site. They are:

(i) Rahne falls: The location of this site is about 15 to 17 km from the Khajuraho. It is a fall of about 70 ft. on Ken river.

(ii) Pandav falls: The location is about 72 km from the proposed dam site towards Panna and adjacent to the Chhatarpur- Panna road.

(iii) Rangawan dam: The location is only 9 km away from the proposed dam site. It is a very good picnic spot.

(iv) Dhubela museum: This place is about 80 km from the proposed project site. The museum has been built in the memory of Raja Chhatrasal, which has a collection of articles of historical and architectural interests.

(v) Rajgarh palace: This location is about 25 km from the project site near Chandra nagar. It is an old palatial building constructed by the king of the state.

(b) To develop the proposed project site as a place of tourist importance, the following facilities are to be provided:

(i) The approach road to the dam site should be an all seasoned road.

(ii) The roads connecting the near about visiting places should be improved and proper street lighting should be done to make the project site beautiful at night.

(iii) A rest house with all modern facilities should be constructed for the comfort of the tourists.

(iv) Flower garden and water fountain should be developed and a good picnic spot should be made to the satisfaction of the tourists.

(v) Facilities for boating, angling, swimming and other water sports should be provided for the recreation of the tourists.