

# **Chapter – 10**

## **Environmental Impact Assessment and Environment Management Plan**

### **10.0 General**

The Ponnaiyar (Nedungal) - Palar Intra-state link project envisages annual diversion of 86 Mm<sup>3</sup> of flood waters of Ponnaiyar river to the Palar basin to stabilize the existing command area of about 9850 ha. Since the command area contemplated to be benefitted is below 10000 ha the project falls under Category B as per the relevant EIA notifications. The State Environmental Impact Assessment Authority (SEIAA) of Tamil Nadu is the authority to approve Terms of Reference (ToR) for carrying out the Comprehensive Environmental Impact Assessment (CEIA) study and Socio-economic study of the project. After completion of the CEIA study by the project proponent, the findings and recommendations there from would be suitably incorporated in the DPR of the project at a later date. Meanwhile, baseline information from secondary sources on various environment related issues are discussed briefly in the present chapter along with a tentative Environmental Management Plan (EMP).

### **10.1 Objective of the Study**

Water is an essential element in all the developmental activities of man-kind as well as in sustaining the surrounding environment. The development of water resources while providing food, shelter and fibre to the mankind may cause some impacts on the environment too.

The objective of Environmental Impact Assessment (EIA) study is to identify the possible environmental effects due to the proposed Ponnaiyar (Nedungal) - Palar intra-state link project and to suggest measures to mitigate the anticipated adverse impacts on the environment along with Environmental Management Plan (EMP) and Environmental Monitoring Plan.

### **10.2 The Project Proposal**

The project envisages diversion of 86 Mm<sup>3</sup> of flood waters of Ponnaiyar river annually available at existing Krishnagiri dam during monsoon months to water-short Palar basin for stabilising the existing command area being irrigated through open wells and bore

wells by recharging the ground water. The link canal is proposed to feed the enroute system tanks for irrigation and recharging ground water enroute the link canal in Krishnagiri and Vellore districts as well as Vaniyambadi taluka in Palar basin at tail end for stabilising the existing ayacut of 9850 ha annually, besides providing 3.882 Mm<sup>3</sup> of drinking water supply to the enroute villages benefiting 1.52 lakh human population.

The total length of link canal is 54.150 km off-takes at FSL of 434.450 m from the left flank of the existing Nedungal Anicut across the Ponnaiyar river near Peruhalli village and out falls into Kal Ar river near Karuppanur village. No new reservoirs are contemplated under the project. The flood waters spilling down the existing Krishnagiri dam will be regulated to Ponnaiyar (Nedungal) – Palar link canal through existing Nedungal Anicut located about 16 km downstream of Krishnagiri dam on Ponnaiyar river. This link canal crosses a number of streams/ rivulets/existing feeder canals and several roads including a railway line for which 6 Canal syphons, 6 Aqueducts, 2 Super passages, 34 Road bridges, 5 Under tunnels and 1 Elevated pipe/trough have been proposed. One Head regulator, one Cross regulator cum canal escape, 8 Canal outlets and one Outfall structure have also been provided for canal regulation.

As is well known, any water resources development project results in both positive and negative impacts on the environment. Such projects require a detailed study of various aspects for identifying positive and negative impacts that may occur in the area and also to formulate a meaningful and applicable Management Plan to mitigate these adverse environmental impacts, or if possible completely eliminate.

### **10.2.1 The Project Background**

The proposed link canal located in Ponnaiyar and Palar basins in Krishnagiri and Vellore districts. No Major/medium irrigation projects were taken up in the vicinity of the proposed Ponnaiyar (Nedungal) - Palar link Project. Krishnagiri dam, a medium existing irrigation Project constructed on Ponnaiyar river in Krishnagiri district provides irrigation over 3642 ha of CCA utilising 57 Mm<sup>3</sup> of water annually benefitting only Krishnagiri district. No command area is however being benefitted/influenced by Krishnagiri project in the vicinity of the link Project. Therefore, due to non availability of canal irrigation facilities in the existing command areas in the vicinity of the proposed link project the farmers mainly depend on rainfall and ground water through minor irrigation tanks, tube wells/bore wells and open wells etc., for irrigation and drinking water purposes. The ground water studies conducted by CGWB, Govt. of India also reveal that the ground water is overexploited leading to the

availability of ground water for future irrigation development being almost nil, especially in Vaniyambadi taluka of Vellore district in Palar basin. Annual ground water extraction is almost twice the annual replenishable ground water. A large population in the vicinity of the proposed project in Krishnagiri and Pochampalli talukas of Krishnagiri district and Tirupattur and Vaniyambadi talukas of Vellore district experience acute shortage of water for irrigation and drinking water. It is in this context the proposed Ponnaiyar (Nedungal) - Palar link has been conceived.

In light of the above scenario the Ponnaiyar (Nedungal) - Palar link project is proposed to divert the flood water from Ponnaiyar river to enable recharging the ground water for utilisation in Palar basin in Vaniyambadi taluka of Vellore district, besides feeding enroute tanks in Krishnagiri and Vellore districts for drinking water supply as well as to stabilise the existing command area under these tanks. No new command areas are identified in the vicinity of the link canal.

It is proposed to utilise 75.141 Mm<sup>3</sup> for irrigation component in the above mentioned areas, besides 3.882 Mm<sup>3</sup> of water for drinking water supply to enroute villages for 1.52 lakh human population at 70 lit/head /day.

### **10.2.2 The Project Justification**

The Ponnaiyar is a major inter-state river amongst the streams between Palar and Cauvery which rises in the Hills of Nandidurg in Kolar district of Karnataka at an elevation of about 900 m above MSL. The total catchment area of Ponnaiyar and Gadilum rivers lies in Karnataka, Andhra Pradesh, Tamil Nadu and Union Territory of Puducherry. It mainly flows through Karnataka and Tamil Nadu States and confluences into Bay of Bengal at Cuddalore.

The Palar river which is also an inter-state river originates in Kolar district of Karnataka state near Kaivara village at an altitude of 900 m. The catchment area of the basin lies in Karnataka, Andhra Pradesh and Tamil Nadu States.

Presently, the main source of irrigation in the command area under the Ponnaiyar (Nedungal) - Palar Link Project is only ground water through bore wells and open wells. Tank irrigation by harvesting rainwater also practiced to some extent. The open wells account for more than 90% of the area being irrigated in the vicinity of the proposed link project. Besides irrigation use, for domestic use also ground water is the only source in Krishnagiri and Vellore districts of Tamil Nadu in the vicinity of Ponnaiyar (Nedungal) - Palar

link project. Further, the ground water assessment made by Central Ground Water Board (CGWB) indicates that the ground water usage increased above 100% (between 142% and 201%) in all the blocks lying especially in Vaniyambadi taluka of Vellore district and the same have been categorized as over-exploited for future ground water development. ground water exploitation is almost twice the annual replenishable ground water. Further, it has been observed that during monsoon periods, the Ponnaiyar river is in spate while the Palar river mostly remains dry. Hence, in light of the above scenario and due to non-availability of canal irrigation facilities in the existing command area in the vicinity of the proposed project, where the farmers mainly depend on rainfall and ground water for irrigation and other domestic needs, the Ponnaiyar (Nedungal)- Palar Link Project has been planned to divert the flood water available at Krishnagiri dam in the project will stabilise the irrigation over an area of 7950 ha presently being irrigated under tanks/open wells/bore wells by recharging the ground water potential.

Apart from above, the enroute command area of 1900 ha identified under the link project in Krishnagiri and Pochampalli talukas of Krishnagiri district and Tirupattur taluka of Vellore district will also be stabilised by feeding the enroute existing system tanks (Eris).

The project will bring economic prosperity to the drought-prone area lying in the vicinity of the link project through stabilisation of the irrigation facility in the existing irrigated area.

### **10.2.3 The Project Description**

The proposed Ponnaiyar (Nedungal) - Palar link Project comprises the following components:

#### **I. Nedungal Anicut/Weir (Head Works)**

1. Existing Nedungal Anicut is situated on Ponnaiyar river with crest level 434.71 m at 16 km d/s of Krishnagiri Dam.
2. Proposed Head Regulator on left flank of Nedungal Anicut

#### **II. Link Canal**

1. An unlined link canal of 54.15 km length is proposed to off- take with FSL of 434.450 m from the left flank of the existing Nedungal Anicut/Weir which out-falls in to Godd Ar (a tributary of Kal Ar which in-turn is a tributary of Palar) at FSL of 419.676 m near Natrampalli village of Vaniyambadi taluka of Vellore district.

2. Cross drainage / Cross masonry works are proposed along the link canal.

### **10.3 Legal Status of the Project**

Though there are numerous benefits that may accrue due to implementation of this Project, due weightage need to be given in respect of social and environmental aspects. One of the important social considerations is the process of Public consultation. Appraising articles about the project proposals and associated benefits have been published in leading News Papers in Tamil Nadu region. The District Collectors of Krishnagiri and Vellore were apprised of the proposal in order to make the proposal popular in the vicinity of the Project and also informal public hearings were conducted by NWDA as well as by the concerned District Collectors from time to time while carrying out survey & investigations works, explaining the importance of the project in meeting the immediate needs of the region.

No new reservoirs are proposed and hence no submergence area is involved in the project proposal as the existing Krishnagiri dam and Nedungal Anicut are planned for Head works of the proposed link canal. The link canal traverses through non-forest area because of which there will be no adverse impact on the flora and fauna. No wildlife issue as per the Wild life (Protection) Act-1972 is involved. No important Sites/Temples/ Monuments or any remains of Archaeological/ Historical and Cultural importance are being affected due to the link canal project. As per the Mineral Survey carried out by the GSI, Chennai in the project area no potential mineral deposits of economic importance get affected/submerged/falling within the project area. Therefore, in Ponnaiyar (Nedungal) - Palar link project, protection of wildlife and archaeological monument (as per 1972 Act) are not required.

The impact of the link canal on account of land acquisition for execution of the canal is very less as the link canal passes through rural areas. However, the issues related with land acquisition are to be dealt amicably while acquiring the land for the canal way.

While implementing the project due care is to be taken towards various provisions of the National Policy on Land Acquisition and R&R as per the latest Land acquisition Bill-2015 (with amendments) along with the policies enunciated by the Govt. of Tamil Nadu if any, regarding Land Acquisition. Techno-economic clearance for the proposed Ponnaiyar (Nedungal) - Palar link project is required from concerned state/central

organisations/ departments. In addition, pre-environmental clearance is required to be obtained from concerned designated authority.

#### **10.4 Study Area of the Project**

The project area lies in Ponnaiyar and Palar basins covering Krishnagiri and Vellore districts of Tamil Nadu state. The study area proposed for the project is as following:

1. 10 km on either side of the link canal.
2. Command areas where stabilization is proposed and riverine areas in the downstream and enroute link canal and influence of storages in the upstream. However, only direct draining rivers/streams/tributaries and nallas enroute the link canal shall be considered as part of the project.

#### **10.5 Baseline Environmental Data**

Before initiating any study for Environmental Impact Assessment of the project, it is essential to identify the baseline levels of relevant environmental parameters which are likely to be affected as a result of the construction and operation of the proposed project. A scoping matrix has to be formulated to discuss on various parameters such as air environment, water environment, land environment, biological / terrestrial and aquatic environment which are likely to be affected due to implementation of the project.

##### **10.5.1 Air Environment**

The air in the project area is almost fresh except some zones in Vaniyambadi town. Vellore is major leather processing centre and top exporter for finished goods in the country. Therefore, atmospheric pollution have harmful effects due to leather tanneries waste water treatment and disposal facilities in Vellore and surrounding areas. Climate of Krishnagiri district is comparatively more pleasant. During summer season, the maximum temperature is about 37<sup>o</sup> C and the mean daily minimum temperature is about 25<sup>o</sup> C. Vellore district has a tropical climate. The mean daily maximum and minimum temperature are 36.8<sup>o</sup> C in April and 18.2<sup>o</sup> C respectively. Vaniyambadi is hot in summer with highest dry temperatures in the range of 31<sup>o</sup> C to 41<sup>o</sup> C. In general, the project area has a pleasant climate.

##### **10.5.2 Meteorology**

Climatologically, the Ponnaiyar(Nedungal)-Palar link project area has four distinct seasons viz., dry period from January to February, hot period from March to May, south-west monsoon from June to September and north-east monsoon from October to

December. The climate is cold from December to February followed by hot season from March to May.

The average annual rainfall of Krishnagiri district varies from 750 to 900 mm. During monsoon the average rainfall is about 706 mm. Maximum rainfall occurs in the month of September and minimum rainfall in the month of July. The average annual rainfall in Krishnagiri region which is very close to the head works of the link Project is 882 mm, of which 706 mm is during monsoon. The annual normal rainfall of Vellore district is about 1023 mm and during monsoon it is about 748 mm. The mean annual rainfall of Vaniyambadi station where maximum command area is proposed under the link canal is about 800 mm, of which monsoon rainfall is about 668 mm. The mean annual rainfall of Tirupattur, which is located closer to the canal outfall point is about 878 mm, of which 724 mm is during monsoon. As per the IMD observatory of Dharmapuri which is located nearer to the link Project, the daily maximum and minimum temperatures recorded are 37.1<sup>o</sup> C in April and 17.2<sup>o</sup> C in January. The mean monthly wind speed observed as per IMD data is 6.7 kmph.

The relative humidity as per the IMD observatory of Dharmapuri is maximum during monsoon months and minimum during winter and summer months. The maximum and minimum relative humidity observed is 78% in December and 31% in March respectively.

### **10.5.3 Water Quality**

#### **10.5.3.1 Surface Water Quality Monitoring**

The quality of water impounded in Krishnagiri Reservoir is being monitored by the Public Works Department (PWD), WRD, Govt. of Tamil Nadu. Water samples of Krishnagiri Reservoir were collected from different locations of the reservoir such as (i) from reservoir water (ii) seepage water from drainage galleries (iii) from toe-drain of earthen section. The quality of surface water has been ascertained from the chemical and physio-chemical analysis by the Soil Mechanics and Research Division, PWD, WRD, Chennai.

The latest data for the period from 2009 to 2013 on laboratory test results of the water samples of Krishnagiri reservoir have been collected and the averages of results of the samples during the months of October, November and December which have already been furnished in **Table - 4.3** are reproduced in **Table-10.1** below.

**Table-10.1****Statement of Test Results of Water Samples from Krishnagiri Dam**

Sl. No	Parameter	Average of observed Values			Limits as per IS 10500 -1991 for drinking and domestic uses
		Oct	Nov	Dec	
1.	pH Value	7.79	7.85	7.86	6.5 to 8.5
2.	Colour (visual)	Colour less	Colour less	Colour less	Colour less
3.	Specific conductivity at 25 <sup>0</sup> C (Micro mhos/cm)	857	813.5	888.25	-
4.	Bicarbonate alkalinity as CaCO <sub>3</sub> (mg/l)	258	246.25	272.5	600
5.	Carbonate alkalinity as CaCO <sub>3</sub> (mg/l)	Nil	Nil	Nil	-
6.	Total solids (mg/l)	540	505.25	590.75	-
7.	Total dissolved salts(mg/l)	462.6	439.5	480	500
8.	Suspended solids (mg/l)	77.4	65.75	110.75	-
9.	Total hardness (mg/l)	255	257.5	273.75	600
10.	Calcium hardness (mg/l)	51.2	53	64.5	200
11.	Magnesium hardness(mg/l)	30.48	30	27	-
12.	Sulphates (mg/l)	21.70	21.1	23.04	400
13	Chlorides (mg/l)	151.73	136.48	152.43	1000

**Source:** Soil Mechanics and research Division, WRO, PWD, Chennai.

The results of Water Quality Monitoring indicate that:

- (i) The pH level ranges between 7.79 to 7.86 during October to December months (North-East Monsoon). The pH level indicates neutral nature of the water and the values are within permissible limits of 6.5 to 8.5 as per IS 10500-1991 specified for drinking and domestic uses.
- (ii) The levels of total dissolved salts are well below the permissible limit of 500mg/l, ranging from 439.5 to 480 mg/l during October to November months and indicate that the water is suitable for drinking and domestic uses. The total hardness of the water ranged from 255 to 273.75 mg/l, which is well below the permissible limit of 600 mg/l specified for drinking and domestic uses.



- (iii) The calcium hardness level ranged from 51.2 to 64.5 mg/l which is well within the permissible limit of 200 mg/l specified for drinking water.
- (iv) The concentration of Sulphate is in the range of 21.1 to 23.04 mg/l which is within the permissible limit of 400 mg/l.
- (v) The concentration of chlorides is within the range of 136.48 to 152.43 mg/l which is within the permissible limit of 1000 mg/l as per IS 10500-1991 for drinking water quality standards.
- (vi) The lime content as  $\text{CaCO}_3$  in the above water samples is well within the permissible limit of 600 mg/l ranging from 246.25 to 272.5 mg/l.
- (vii) The conductivity of water which is less than 1000 micro mhos/cm indicates that the water is 'Excellent To Good-Class-1' for irrigation purpose.
- (viii) As the levels of total dissolved salts in various samples collected are well below the permissible limits of less than 700 ppm, the same is 'Excellent to Good-Class-1' for irrigation.
- (ix) The range of Chlorides in the water of less than 175 ppm indicates as 'Excellent to Good-Class-1' for irrigation.
- (x) Also, the other parameters such as Carbonate / Bi-carbonate alkalinity, total hardness, Calcium/Magnesium/including Sulphates are within the limits for irrigation water. Hence, the water proposed for diversion through the link canal is suitable for irrigation purpose.

### **10.5.3.2 Ground Water Study**

#### **(a) Quality Monitoring**

The ground water quality monitoring in the study area was done by the CGWB under Hydrology Project by constructing a number of ground water monitoring wells (Dug Wells), Piezometers, Exploratory Bore Wells and observed various parameters viz., depth of ground water table, rate of ground water discharge, storativity, transmissivity etc. Further, the ground water study on quality of water reveals that presence of chemical constituents Fe, F and Nitrate levels are more than the permissible limits in Krishnagiri district and ground water in the phreatic zone may cause medium to high salinity hazard and low to very high alkali hazard when used for irrigation. The groundwater in Krishnagiri

district is NaCl with mixed CaMgCl. The presence of excessive Na and Cl is observed in the groundwater, in general in Krishnagiri district areas. The type of water is CaHCO<sub>3</sub>, NaHCO<sub>3</sub>, and NaCl in the zones of Krishnagiri district. In the zones of Vellore district, the ground water study on quality of water indicates that the presence of chemical constituents of CaCO<sub>3</sub>, Cl and No<sub>3</sub>, are more than permissible limits. Vellore is surrounded by many leather industries and their effluents are discharged into the Palar river causing impact on the quality of the groundwater. The quality is deteriorating. All the parameters such as TDS, electrical conductivity, chloride, hardness and salinity is found to be very high. Hence proper treatment is warranted. The type of water is CaHCO<sub>3</sub>, NaCl and CaCl.

However, the hazards of water logging and salinization are not anticipated due to the proposed project.

**(b) Ground Water Levels in the Command Area**

Based on the ground water study conducted by CGWB in Krishnagiri and Vellore districts as mentioned under para 10.5.3.2 above, the long term annual water level trend which has been observed in 10 years during 1998 to 2007 is shown in **Table 10.2**.

**Table-10.2**  
**Long-term Annual Water Level Trend in the Command Area**

Sl. No	District		Annual water level trend (m/year)	
			Rise	Fall
1.	Krishnagiri	Min:	0.0980	0.0666
		Max:	0.4140	1.6180
2.	Vellore	Min:	0.0025	0.0568
		Max:	0.5264	2.3958

**Source:** District Ground water Brochure, Jan-2009, Krishnagiri and Vellore Districts, CGWB.

**(c) Depth to Water Levels in the Command Area**

The level is subject to change both due to natural and man-made causes. Ground water level is an important indicator for the recharge of the aquifer, ground water extraction and the discharge from the aquifer to surface water. Ground water levels vary significantly over time and season. Decline in ground water levels occur as a result of low rainfall, changes in land use and over exploitation. Rise in ground water levels occur due to heavy rainfall, changes in land use or as a result of artificial recharge to ground water.

As per the ground water study by CGWB the pre-monsoon depth and post-monsoon depth to water levels were measured in Krishnagiri and Vellore districts in May 2006 and January 2007 respectively. The results are furnished in **Table 10.3**.

**Table 10.3**

**Pre-Monsoon and Post-Monsoon Depths to Water Levels in the Command Area**

Sl. No	District	Water level (m)	
		Pre-monsoon (May,2006)	Post-monsoon (Jan,2007)
1.	Krishnagiri	0.50-9.90	2.00-9.90
2.	Vellore	1.15-18.60	1.00-18.45

**Source:** District Ground water Brochure, Jan-2009, Krishnagiri and Vellore Districts, CGWB.

**(d) Ground Water Assessment**

As per the assessment of Dynamic Ground water Resources by CGWB, Govt. of India as on 31.03.2011, the details on ground water resources in Krishnagiri and Vellore districts are given in **Table-10.4**.

**Table-10.4**

**Dynamic Ground Water Resources in the Command Area  
(As on 31.03.2011)**

Sl. No	Details	District	
		Krishnagiri	Vellore
1.	Annual net ground water availability (Mm <sup>3</sup> )	354.94	592.80
2.	Total annual ground water draft for all purposes (Mm <sup>3</sup> )	471.44	621.44
3.	Projected demand for Domestic and Industrial Uses by 2025 AD (Mm <sup>3</sup> )	27.82	93.04
4.	Stage of ground water development (%)	133.00	105.00

**Source:** Dynamic ground water resources (as on 31-3-2011), CGWB, July-2014.

## **10.5.4 Land Environment**

### **10.5.4.1 Land Use**

The present land use and land cover information of the proposed project area has already been discussed in **Chapter-8, Irrigation Planning and Command Area**. However, the land use and land cover is expected to change due to the developmental activities of the project.

### **10.5.4.2 Mineral Deposits**

Mineral Surveys have been carried out along the canal alignment in Krishnagiri and Vellore districts of Tamil Nadu. The Director, Engineering Geology Division, Geological Survey of India (GSI), Chennai communicated vide letter No.5546/06/IB/EGD/NWDA/2013-14 dated 19.12.2013 that no major mineral deposits of economic importance gets affected or falling within the proposed project area.

### **10.5.4.3 Historical/Archaeological Monuments**

The Department of Archaeology, Govt. of Tamil Nadu, Chennai communicated that no sites / temples / monuments or any remains of archaeological, historical and cultural importance are found in project area. The Archaeological field explorations have also been carried out for the entire Ponnaiyar (Nedungal) - Palar link Project by the Archaeological Survey of India (ASI), Chennai Circle, Chennai. According to the said exploration report, no archaeological remains were identified on the surface of the Ponnaiyar (Nedungal) - Palar link project alignment except in Peruhalli village. A Hero Stone (16<sup>th</sup> Century CE) broken into three pieces was found on the left bank of the Ponnaiyar river in Peruhalli village at a distance of about 110 m from the canal alignment.

## **10.5.5 Geology of the Command Area**

The command area proposed under the link canal in Ponnaiyar and Palar basins falls in Krishnagiri and Vellore districts of Tamil Nadu State. The rock types observed along the canal alignment include Charnokites, Granite Gneiss/grey Migmatite, pink Migmatite, Epidote Hornblende Gneiss, Pyroxenites, Quartz veins and Pegmatites. In general various geological sub-surface details encountered along the canal alignment consist of the top soil as red sandy soil and sandy clayey soil of thickness of about 1 m below top soil, a highly weathered zone and semi-weathered/fractured formation with basement as hard rock.

In Krishnagiri district, the predominant geological formations are Recent Alluvium, Upper Proterozoic, Lower Proterozoic and Archaeons, whereas Alluvium, Granite gneisses and Charnockite are the predominant geological formations in most parts of Vellore district.

#### **10.5.6 Soils in the Project Command Area**

Command area of the link project planned for stabilisation of existing irrigation lies entirely in 2 talukas of Krishnagiri district and 2 talukas of Vellore district of Tamil Nadu state.

Soil surveys were not conducted in the vicinity of project area. However, based on the particulars contained in the Hydro-geological Atlas of Tamil Nadu, brought out by the Central Ground water Board, the soils in the vicinity of the project in Krishnagiri and Vellore districts are grouped as - mainly (i) Red sandy clay loam soils (ii) Brown clay loam (iii) Recent old alluvium soils and (iv) Rock outcrops with loamy sand soils in Krishnagiri district and (i) Brown clay loam soils (ii) Rock outcrops with loamy sand soils in Vellore district.

The red sandy clay loam soils are partly matured soils and they are shallow to deep, possessing good drainage characteristics. These soils are suitable for cultivation of large variety of crops including ragi, bajra, jowar, paddy, etc., both under irrigated and rain-fed conditions.

The Brown clay loamy soils are moderately well drained and have rapid to moderately rapid permeability. Crops like cotton, jowar, pulses, chillies, onion, groundnut etc., are cultivable in these soils.

The recent/old Alluvial soils are generally fertile and respond well to management practices and are suitable for cultivation of crops like paddy, sugarcane, jowar, groundnut, chillies, pulses etc.,

The rock outcrops with loamy sand soils respond well to irrigation, manuring and other management practices. The crops grown under rain-fed cultivation are ragi, jowar, millets, pulses and oil seeds. Under irrigation crops like ragi, jowar, groundnut and pulses are grown.

## 10.5.7 Public Health

### 10.5.7.1 Medical and Health Facilities in the Project Command Area

The major portion of the command area to be benefited from the Ponnaiyar (Nedungal) - Palar link project lies in Vellore district. The existing public health facilities in Vellore district are good as indicated in **Table-10.5**.

**Table-10.5**  
**Medical Health Facilities Available**

<b>Sl. No</b>	<b>Particulars</b>	<b>Vellore District</b>
<b>1</b>	<b>Allopathic Hospitals</b>	13
	Dispensaries	8 (ESI)
	PHC	76
	Sub Centre	454
<b>2</b>	<b>Indian Medicine Hospitals:</b>	12
	Dispensaries	2
	PHC	13
<b>3</b>	<b>Homeopathic</b> Dispensaries	3
<b>4</b>	<b>No. Of Doctors</b>	
	Allopathic	384
	Other Medicines	23
<b>5</b>	<b>Total No. of Nurses</b>	802

*Source: Asst. Director of Statistics, Department of Statistics, Vellore district*

Vellore district has a total of 13 Hospitals including the Christian Medical College and Hospital, one of the largest in Asia and a major health care provider for surrounding districts and 76 primary health care centres. In Krishnagiri district also, good public health facilities are available.

### 10.5.7.2 Sanitation in the Project Command Area

The link canal passes through Krishnagiri and Pochampalli talukas of Krishnagiri district and Tirupattur and Vaniyambadi talukas of Vellore district. The canal traverses mainly through rural areas.

Lack of proper sanitary facilities and sanitary waste disposal in the rural area are the root causes of many diseases. In this project too, the rural areas are lacking in drainage system. Even in the semi-urban areas open drainage systems exist, which expose the sewage to the disease transmitting organisms like flies, insects, germs etc. These organisms contaminate the water and food to be consumed by the people leading to water borne diseases like diarrhoea, amebiasis, gastroenteritis etc. depending upon the type of infecting organism. Open air defecation is still a predominant practice in all the villages in project area which is a potential hazard for spreading of diseases in the area.

#### **10.5.7.3 Drinking Water Supply**

The people living in areas in the vicinity of the link project mainly depend on bore wells, dug wells and hand/motorised pumps for drinking water supply. They depend on rainfall and ground water. Since the ground water exploitation is more than safer limits and many blocks in the talukas to be benefited by the link canal are vulnerable to water table depletion. In Vaniyambadi and Tirupattur talukas lying in Palar basin the pollution from tanneries and industrial units has caused irrevocable deterioration of quality of ground water and soils in vast areas.

As per the ground water study in the vicinity of the project area which have been conducted jointly by CGWB and State Ground water Resources and Data Centre, PWD, WRO, Govt. of Tamil Nadu as on 31<sup>st</sup> March, 2004, it was observed that the ground water is suitable for drinking and domestic uses in respect of all the constituents except total hardness, chloride and nitrate. In about 42% of samples, nitrate concentration is above permissible limits of 100 mg/l. The incidence of high total hardness is attributed to the composition of litho units constituting the aquifers in these district areas, whereas nitrate pollution is most likely due to use of fertilisers and other improper waste disposal.

#### **10.5.7.4 Water Borne and Communicable Diseases**

Water borne diseases like diarrhoea, gastroenteritis and hepatitis are prevalent in the project area due to inadequate sanitation. There is a prevailing threat of chances of spreading of periodical epidemics due to poor drainage facilities and low economic status of the people living in unplanned settlements. Further, special care needs to be taken to avoid spread of communicable diseases and other health hazards in the project area in view of the migrant labour deployed in the constructional activities.

#### **10.5.7.5 Nutrition**

Many children in the rural areas suffer from malnutrition due to under nourishment. Non availability of balanced food at affordable prices to feed the children adequately, improper cooking habits, low crop yields and persistent worm infestations due to lack of proper sanitation are also acting synergistically leading to nutritional problem. Malnutrition is by and large the result of poverty, ignorance, illiteracy, lack of proper knowledge of nutrition value of different foods and larger family size in these areas. Malnutrition leads to recurrence of infections thereby reducing the full working capacity of the people.

#### **10.5.7.6 Construction Phase**

Large number of workers, skilled, semiskilled and unskilled shall be deployed at the project site during the construction phase. It is a common practice that people are provided with good accommodation with satisfactory sanitation facilities. However, the unskilled labour, who constitute the majority of the workers live in cramped places with little or no sanitation facilities. Therefore, this large population may become susceptible to water borne diseases as discussed above. Improper sanitation facilities provided to unskilled workers may cause health hazards not only for them but neighbouring people also. As such this aspect needs proper attention. It may be pointed out that the heavy traffic movement and use of machines like crushers, welding machines etc. during the construction phase may also lead to temporary air pollution resulting in respiratory tract diseases like bronchitis, asthma etc.

#### **10.5.7.7 Post Construction Phase (Operation Phase)**

After implementation of the project, though, the diversion of water through the link canal is proposed during a very short period in a year, there is a possibility of stagnation of water in the link canal and the places where the water gets stagnant are the likely places for breeding of Malaria spreading mosquitoes. Suitable remedial measures are needed to be implemented to avoid such occurrences.

### **10.6 Environmental Impact Assessment**

Environmental Impact Assessment (EIA) consist of a systematic investigation of both positive and negative impacts on the physical, biological and socio-economic environment which would be caused or induced due to implementation of a proposed project.



The EIA and EMP and Socio Economic aspects in respect of Ponnaiyar (Nedungal) - Palar link Project are to be carried out by the project proponent through the specialist consultancy Agencies, separately, as discussed at para 10.0 above. However, these aspects are discussed briefly in general terms in the following paras.

### **10.6.1 Impact on Air Environment**

#### **10.6.1.1 Impact on Air Quality**

##### **(a) Construction Phase:**

**(i) Pollution Due to Fuel Combustion by 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 SO<sub>2</sub>. The SPM emissions are minimal due to low ash content in diesel. The short-term increase in SO<sub>2</sub>, even assuming that all the equipment are operating at a common point, is quite low. Hence, no major impact is anticipated on this account.

**(ii) Fugitive Emissions from Various Sources:** During construction phase, lot of construction material like sand, fine aggregate is to be stored at various sites. 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.

**(iii) Impacts Due to Vehicular Movement:** During construction phase, increase in number of vehicles is anticipated for transportation of construction material for short term. The impact on this account is generally insignificant.

**(b) Operation Phase:** No major impacts are envisaged during operation phase.

#### **10.6.1.2 Impact on Noise Environment**

##### **(a) Construction Phase**

Due to increased transport vehicles movement / traffic volume, use of earth moving machinery and other machinery etc. at the time of construction of the project, the impacts on ambient noise levels are expected. Though, the possible impacts due to project proposal on noise environment are little, the main impacts would be during the construction due to: excavation, drilling operations, road rollers, crawler tractors, dumpers, concrete mixers, concrete matching plants, stone crushers, air compressors, D.G sets etc.

**(b) Operation Phase:** No major impacts are expected during operation phase.

## **10.6.2 Impacts on Water Resources and Quality**

### **(a) Construction Phase**

#### **(i) Impacts Due to Sewage Generation from Labour Camps**

During Project construction Phase, due to migration of labour/workers and other staff, chances are there to pollute the water source because of sewage generation from labour camps/colonies. 80% of the water supplied will be generated as sewage. Therefore, disposal of sewage without treatment could lead to adverse impacts on land environment as well as water environment.

#### **(ii) Impacts Due to Runoff from Construction Sites**

Some contaminants present in the waste water which would be generated from the construction activities of the project may cause water pollution which will harm the health and welfare of living organisms or natural system.

#### **(iii) Impact on Drainage System**

The proposed Ponnaiyar (Nedungal) – Palar link canal crosses several streams/rivulets/tributaries of river and suitable CD works are proposed without hampering the course of the streams and discharge capacities. Suitable diversion arrangements are proposed for small rivulets or nallas with suitable under tunnels etc. Thus, no adverse impact on drainage aspects are anticipated.

### **(b) Operation Phase**

#### **(i) Impact on Downstream Users**

86 Mm<sup>3</sup> of spill over flood waters from existing Krishnagiri dam during flood period is proposed to be diverted through the Ponnaiyar (Nedungal) – Palar link canal from the existing Nedungal Anicut (on Ponnaiyar river) to meet the irrigation and drinking water requirement by way of stabilisation through ground water recharge and feeding the enroute existing system tanks. Hence, there is a beneficial impact on the population in the vicinity of the Nedungal Anicut by overcoming the shortage on meeting the domestic water requirement. Hence, there is no adverse impact to the population residing downstream of Krishnagiri Dam, since the water proposed for transfer is flood water.

**(ii) Impact on Existing Projects/Water Bodies Upstream of Krishnagiri Dam**

The water resources of existing projects/water bodies upstream of the proposed diversion point/Krishnagiri dam will not be diverted for the link canal supplies. Therefore, this project will not have impact on the water resources of upstream existing projects/water bodies.

**(iii) Impacts on Downstream Water Quality Due to Diversion of Water**

The Ponnaiyar (Nedungal) - Palar link Project is envisaged to transfer flood waters of Ponnaiyar river available at Krishnagiri dam.

The quantum of water impounded in Krishnagiri reservoir which is planned either for its canal system including Barur Water Supply System or the downstream Project commitments is not disturbed. Also, the proposed diversion has no impact on ecological requirement of the river downstream of the diversion point. After considering all the in-basin upstream and committed downstream requirements of the basin, the project proposal is framed by utilising spill over flood waters of Krishnagiri dam. Thus, no major adverse impact on downstream water quality due to diversion of water from Krishnagiri dam is anticipated.

**(iv) Impacts on Performance of Existing Projects Due to Diversion of Water**

The projects downstream of the Krishnagiri dam are Inchampadi Anicut, Sathanur and Tirukkoilur Anicut, utilising a total quantum of 313 Mm<sup>3</sup> for committed irrigation requirements. These requirements will be met from the contribution from intercepting catchment area between Krishnagiri dam and Tirukkoilur Anicut including the water balance available at Krishnagiri dam. The project proposal is for diversion of flood flows of Ponnaiyar and not from the 75% dependable yields of the Ponnaiyar basin at Krishnagiri dam site. As such no adverse impact on existing projects is anticipated.

**(v) Recharge of Ground Water**

The Ponnaiyar (Nedungal) - Palar link project is planned as a flood flow canal, mainly to recharge the ground water potential enroute the link canal in Krishnagiri and Pochampalli talukas of Krishnagiri district and Tirupattur and Vaniyambadi talukas of Vellore district for stabilising the existing command area presently being irrigated by tanks/bore wells and open wells. Further, as mentioned in earlier chapters the water to be diverted to Kal Ar/Palar river from canal outfall can percolate in the alluvial tract on either side of the

Palar river because of which many villages in Vaniyambadi and Tirupattur talukas of Vellore district will be benefitted due to more ground water recharge possibility.

**(vi) Impact on Ground Water Quality in Palar Region**

Highly polluted condition of ground water in the vicinity of Palar river and in Vaniyambadi taluka by the effluents let into the Palar river by the existing tanneries and other industrial units will be considerably improved due to the diverted water.

**(vii) Impact due to Contamination by Agro-chemicals and Fertilisers**

Use of optimum level of fertilisers and other agro-chemicals in farming for increasing agricultural production will affect the quality of ground water. Therefore it would be worthwhile to take up precautionary measures to test the quality of ground water periodically in order to adopt suitable corrective measures from time to time.

**10.6.3 Impact on Land Environment**

**(a) Construction Phase**

Majority of the environmental impacts during construction phase are temporary in nature, lasting mainly during the construction phase. The major impacts anticipated on Land Environment during this stage are discussed below.

**(i) Acquisition of Land**

About 591 ha of land is required for construction of link canal. The link canal is planned to traverse in rural areas away from residential areas and through mango/coconut gardens/plantations in some reaches. Hence, no residential area is involved and no families are affected.

**(ii) Environmental Degradation due to Migration of Labour**

The congregation of labour force for construction and related activities of the link project and service providers is likely to create problems of sewage disposal, solid waste management and felling of trees for meeting fuel requirements etc.,

**(iii) Operation of Construction Equipment**

During construction phase the site for storage of various construction materials and equipment will be selected such that it causes minimum adverse impacts on various aspects of environment. By providing such facilities on government or panchayat land, problems for land acquisition on this account will be minimised.

**(iv) Soil Erosion**

Possibilities of soil erosion and hence degradation of land environment due to construction of colonies/temporary houses/toilet blocks etc. are anticipated for which suitable remedial measures are to be adopted.

**(v) Solid Waste Management**

Facilities for collection and conveyance of solid waste/municipal wastes which may generate from the labour camp/colonies of the Project shall be developed.

**(vi) Waste (Muck) Generation and Disposal**

The proposed project envisages construction of 54.150 km long link canal and various CD/CM structures in hard soil strata. Therefore, construction of the project is expected to lead to generation of huge muck causing degradation of land and lots of biomass leading to environmental effect. Appropriate action therefore shall have to be taken for safe muck disposal to avoid hazards and mitigate adverse impact on the environment.

**(vii) Mineral Resources**

As per the findings of the study no major mineral deposit of economic importance gets affected or falling within the proposed study area of the project. As such adverse impact on mineral resources is not anticipated.

**(viii) Roads**

There is a well developed wide network of National High Ways (NH), State High Ways (SH) and District and village roads in the Project area. Only cart-tracks will have to be improved and new approach roads to quarry sites, labour colony, construction sites and Material and equipment stores will have to be constructed. Therefore, no adverse impact of land in this aspect is anticipated.

**(ix) Submergence of Land**

No new reservoirs are proposed in the project and hence no submergence of land is involved.

**(b) Operation Phase**

**(i) Water Logging and Salinity**

The existing command area in the vicinity of the project has been categorized by CGWB as over exploited for future ground water development, since the exploitation of ground water is almost twice the annual replenishable ground water. The Palar basin to

which the link canal is proposed for diversion of water from the Ponnaiyar river is an acute drought-prone zone and almost dry. Therefore, no water-logging, salinity and flooding problems of serious nature is anticipated in the command area during operation phase.

#### **10.6.4 Impact on Biological Environment**

##### **10.6.4.1 Terrestrial Environment**

###### **10.6.4.1.1 Impact on Forest Cover and Protected Area**

Since there is no forest area or protected zone in the project area, the question of any effect in this aspect does not arise. Hence no adverse impact on biodiversity is anticipated.

###### **10.6.4.1.2 Impact on Aquatic Ecology**

There is no potential impact on aquatic ecology including fisheries and endangered species. The ecosystem of the study area is not sensitive hence there is no possibility of any impact due to bio-accumulation and bio-magnification in aquatic life and biota of the area.

###### **10.6.4.1.3 General Environmental Issues**

Illegal sand mining in the main water sources such as South Pennar and the river Markandeya has affected water supply and agriculture in Krishnagiri district. Kodiyalam, Kelvarapalli Dam and Krishnagiri Reservoir Project(KRP)are the main water sources for Krishnagiri and Dharmapuri districts. Many agriculture wells in Krishnagiri and Pochampalli areas have become dry because of rampant sand mining in South Pennar and other branch rivers. Many canals became dry and the ground water table had gone down due to sand mining. Water supply in rural areas has been affected as the bore wells on the river beds were damaged by the earthmovers used by the sand miners.

#### **10.6.5 Beneficial Impact**

Vaniyambadi taluka faces acute shortage of water for irrigation, drinking and industrial sectors due to over exploitation of ground water. Since this region mainly depends on ground water, this link proposal will definitely cater to the above requirements in Vaniyambadi taluka to some extent and also in Krishnagiri, Pochampalli and Tirupattur talukas resulting in increased agricultural and industrial production and create continuous, steady and all round prosperity. By implementing this link proposal the living standard of the people along with socio-cultural and economic conditions will be improved in the region.

### 10.6.5.1 Impact Matrix

An impact matrix indicating the beneficial / adverse impacts relating to physical, biological, financial and socio-economic conditions are given in **Table 10.6**.

**Table 10.6**  
**Impact Matrix**

Sl. No.	Impact	Ponnaiyar (Nedungal) – Palar link Project
<b>A</b>	<b>Physical Impacts</b>	
i)	Sedimentation	No siltation, as no new reservoirs are proposed
ii)	Seismic	Nil
iii)	Forest area submerged	Nil
iv)	Other areas submerged	Nil
v)	Change in Hydrological regime of river	Nil
vi)	Ground water recharge	Ground water conditions will improve significantly.
vii)	Resources impact aspect	Nil
viii)	Irrigated area	9850 ha being irrigated by tanks, dug wells and bore-wells gets stabilised.
ix)	Hydro power	Nil
x)	Historical monuments and archaeological structures submerged	Nil
xi)	Salinity intrusion in delta and estuaries	Nil
xii)	Salinity in irrigated land	Nil
xiii)	Water logging	Nil
xiv)	Availability of drinking water	Improves with quality
xv)	Quantity of water diversion	86 Mm <sup>3</sup>

<b>Sl. No.</b>	<b>Impact</b>	<b>Ponnaiyar (Nedungal) – Palar link Project</b>
<b>B</b>	<b>Biological Impacts</b>	
i)	Public health aspect	No hazards are expected
ii)	Wild animals and birds	Nil
iii)	Other species	Nil
iv)	Availability of Biomass	Increases
<b>C</b>	<b>Impact on Human Life</b>	
i)	Socio-cultural aspect	Considerable improvement in present socio-economic conditions and living standards of the people in the project vicinity.
ii)	Resettlement plans	Nil
iii)	Tourism	May boost
iv)	Land acquisition	About 591 ha (For canal construction)
v)	Water quality downstream of storage	Nil

## **10.7 Environmental Management Plan**

A detailed Environmental Management Plan (EMP) will be evolved along with CEIA studies of the project. However, these aspects are discussed briefly in general as under.

### **10.7.1 Controlling Air Quality at Construction Sites**

#### **10.7.1.1 Air Pollution Control**

##### **(a) Construction Phase**

Since only construction of canal is involved, no major adverse impact on air quality is anticipated.

Emissions from construction vehicles, equipment and DG sets, and transportation traffic will cause minor air quality impacts. However, this can be managed by the following measures:

- Proper maintenance of construction equipment to minimize exhaust.
- Construction equipment shall be turned off when not in use.



- Unnecessary idling of construction vehicles to be prohibited.
- Effective traffic management to be undertaken to avoid significant delays in and around the project area.
- Prompt repair and maintenance of roads.
- Location of DG sets and other emission generating equipment should be decided keeping in view the predominant wind direction and stack height of DG sets to be kept in accordance with CPCB norms.

To minimize dust generation during construction phase, the following Measures to be taken:

- Identification of construction limits.
- Stockpiling of excavated material will be covered or staged offsite location.
- Excessive soil on paved areas will be sprayed (wet) and/or swept and unpaved areas will be sprayed and/or mulched.
- Stockpiled soils and trucks hauling soil, sand, and other loose materials will be covered.
- Effective traffic management at site.

**(a) Operation Phase**

No negative impacts are expected during operation Phase.

**10.7.1.2 Noise Control**

**(i) Noise Generation from Construction Equipment:**

The construction equipment, Vehicles, DG sets etc. shall be properly maintained and occupational safety and health standards shall be complied. The construction equipment will be required to use available noise suppression devices and properly maintained mufflers.

- Vehicles to be equipped with mufflers recommended by the vehicle manufacturer.
- Staging of construction equipment and unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible.
- A proper routine and preventive maintenance procedure for the DG sets should be set and followed in consultation with the manufacturer which would help prevent noise levels from deteriorating with use.

**(ii) Noise Generation from Controlled Blasting Operations**

- Controlled blasting will be done as per the provisions of Indian Explosives Act.
- Blasting will not be undertaken in night hours.
- Workers at blasting sites will be provided with proper earplugs and helmets.
- Explosives used for controlled blasting will be kept in safest custody under lock and key as per the provisions of Indian Explosives Act.

**(iii) Noise Due to Crusher:**

The exposure to labour operating with crushers shall be restricted upto 30 minutes on a daily basis. Alternatively, the workers need to be provided with ear muffs or plugs, so as to attenuate the noise level near the crusher by at least 15 dB (A). The exposure to noise level in such a scenario to be limited upto 4 hours per day.

**10.7.2 Water Pollution Management**

**10.7.2.1 Surface Water Quality**

- (i) Major contribution of the Surface water to Ponnaiyar basin is from regeneration water from the Bengaluru city located in the upper reaches. Since the spills of flood water during monsoon is proposed for diversion, quality of the water is much better. The parameters such as pH, temperature, electrical conductivity, turbidity, total hardness, total dissolved solids, DO, BOD, COD, Ca, Mg, chlorides, sulphates, nitrates, iron and zinc are being analyses by the Krishnagiri dam authorities as a measure for testing the quality of water for domestic and Irrigation uses from time to time, based on which the quality of water is found to be within limits for domestic/irrigation uses. However, the surface water quality needs to be monitored since the Krishnagiri reservoir is a hyper - eutrophicated reservoir. Maintaining aquatic ecology is essential to make the aquatic fauna flourish.
- (ii) Sewage generated from various labour camps during project construction phase shall be treated in a sewage treatment plant prior to disposal.
- (iii) The effluent generated from the crushers will have high-suspended solids and needs to be treated before disposal. Settling tanks of appropriate size for treatment of effluent from various crushers should be provided. The sludge from the various settling tanks can be collected once in 15 days and disposed at the site designed for disposal of municipal solid wastes from the labour camps. The sludge after drying could also be used as cover material for landfill disposal site.

### **10.7.2.2 Ground Water Quality**

- (i) The pollution from tanneries has caused irrevocable deterioration of quality of ground water and soil in vast areas. There is an urgent need to arrest/prevent further deterioration of ground water and soil quality through a comprehensive plan by providing common effluent treatment plant (CETP) and adoption of environment friendly technologies for tanning and safe disposal of waste water in the area.
- (ii) The link canal is proposed as unlined for increasing the ground water potential enroute, due to seepage. Highly polluted condition of ground water in the vicinity of the Kal Ar and Palar rivers and Vaniyambadi taluka by the effluents let in to the river by existing tanneries and other industries will be considerably improved due to the diverted water.
- (iii) A number of piezometers at close spacing need to be established in entire study area to monitor the changes in water levels and quality. The data on water fluctuations and quality would be collected for both pre and post project. However, the hazards of water logging and salinisation are not anticipated due to the project.
- (iv) Studies have been carried out to find the Chromium (Cr) contamination level and the ecology of heavy metal tolerance of the native bacterial flora. Chromium tolerant strains were isolated from contaminated sediments, water and effluents of various tanneries. The tolerance of soil bacteria to heavy metals has been proposed as an indicator of potential toxicity of metals to other forms of life. These high chromium tolerant bacteria confirmed the chromium contamination in Palar river in Vellore District. Micro organisms with the ability to tolerate and reduce Chromium can be used for detoxification of environments, contaminated with Chromium.
- (v) The data on water fluctuations and its quality would be collected and verified for both pre and post project.

### **10.7.3 Land Management Plan**

#### **10.7.3.1 Disposal of Muck/Excavated Material**

The Ponnaiyar (Nedungal) - Palar link project mainly consists of construction of about 54 km long canal and Cross Drainage and Cross Masonry structures/Head Regulator/Cross Regulators/outlets etc., along the link canal. A large quantity of muck/excavated material from construction of the canal is expected to be generated as a result of the above structures and due to canal excavation in deep-cut reaches. A part of the

excavated material of the canal in deep-cut reaches can be used in filling the embankment reaches and balance muck/excavated material requires to be suitably disposed off in disposal sites in the project area to be suitably identified in such a manner to occupy least space. This is to be dumped along the streams/river course and in low-lying areas by taking precautionary measures in scientific manner without creating hazards to the environment.

#### **10.7.3.2 Restoration Plan for Quarry Sites**

The link project requires a significant quantity of construction material. The aggregate required for concrete is proposed to be met from the identified nearby rock quarry sites, which are suitable for use in concrete.

The fine aggregates (sand) required for the project is proposed to be met from Palar river and crushed sand from one of the identified rock quarry sites in Krishnagiri district. The quarrying operations are semi-mechanized in nature. Quarrying is normally done by cutting a face of the hill. A permanent scar is likely to be left, once quarrying activities are over. With the passage of time, the rock from the exposed face of the quarry under the action of wind and other erosion forces get slowly weathered and after some time they become a potential source of landslide. Thus, it is necessary to implement appropriate slope stabilization measures to prevent the possibility of soil erosion and landslides in the quarry sites. After excavation of the required material these quarry sites will be restored by adopting appropriate engineering, bio-engineering and biological measures.

#### **10.7.3.3 Silt Transfer**

The Ponnaiyar (Nedungal) - Palar link canal is proposed as a flood flow canal. During monsoon season the spillover flood discharges will be diverted to the link canal for a limited period. This flood waters mostly contain suspended silt only. Since only part of flood flows are proposed for diversion, the proportion of suspended silt entering into canal is expected to be minimum and as such no adverse impact on this account is apprehended. Further, under sluices are already provided in the Nedungal Anicut for flushing of silt deposit from upstream of the Anicut.

#### **10.7.3.4 Command Area Management**

Objective of the Ponnaiyar (Nedungal) - Palar link Project is to divert the flood water from Ponnaiyar river for stabilising the existing command area being irrigated through open wells, bore wells and tanks by recharging the ground water in Krishnagiri and Vellore districts of Tamil Nadu. Therefore, no new command area is proposed for irrigation.

No land development works or drainage system is required in the above proposed command area. Since, the vicinity area of the Project is water deficit and drought prone area with overexploited ground water, no chances of stagnation of water and thereby water logging is anticipated in the command area.

#### **10.7.3.5 Public Health Management**

There is a scope of spread of water-borne /epidemic/communicable diseases during construction phase of the project. Therefore, in view of the above, special care needs to be taken to avoid such health hazards.

Some preventive/curative measures are given as under:

- (i) Well maintained labour camps to be provided for the project workers with all basic sanitary facilities.
- (ii) Provision of safe drinking water and proper drainage facilities.
- (iii) Regular organisation of Health Checkups and provision of required medical treatments of the diseases in labour colonies/camps. Providing and maintaining first aid kits at strategic locations.
- (iv) The quality of water needs to be monitored in terms of electrical conductivity, total dissolved salts, fluorides, chlorides, nitrates, pH and Sodium absorption ratio besides pathological and bacteriological parameters.
- (v) Frequent Chlorination of the drinking water etc.
- (vi) Proper planning and provision of sewage waste disposal under total sanitation programme in the region of labour accommodated etc.,

#### **10.7.3.6 Management of Flora and Fauna**

No forest area is involved in the proposed project. So the flora, whatever is there in form of trees planted and agriculture crops will flourish even better after coming up of the project due to plantation of trees on the banks of the proposed link canal. Fauna also shall have better habitat after commissioning of the proposed project. Of course during construction phase, minimum temporary disturbances only are likely to occur.

Though the fauna easily adopt and/or migrate temporarily during the harsh conditions or disturbances, they again rehabilitates back when the conditions become favourable.

Hence, no management of the flora and fauna along the link canal including action plan for alternate breeding grounds is needed.

### **10.7.3.7 Earthquake Management**

No new dams/reservoirs are involved in the present study, since the existing dam and anicut are planned as 'controlling structures' for diversion of water. The link canal of about 54 km with enroute CD/CM structures are the only proposed structures in the project execution. However, the Ponnaiyar (Nedungal) – Palar link Project falls under Seismic Zone-II in Krishnagiri and Vellore districts of Tamil Nadu state with moderate seismic hazard zone. Therefore, in view of only canal is involved, no earthquake management measures are required.

### **10.7.3.8 Protection of Sensitive and Archaeological Monument Sites**

There is no reported sensitive and archaeological monument site in the project area. However, ASI informed that a Hero Stone (16<sup>th</sup> Century CE) broken into three pieces was found on the left bank of the Ponnaiyar river in Peruhalli village at a distance of about 110 m from the canal alignment. The historical Hero Stone identified as above by ASI, will be protected by providing a steel cage around the stone to safeguard during pre-construction stage of the project. This Hero Stone will not be affected by the link canal as the bed width of the canal with side slopes 1.5:1 is only 25 m.

### **10.7.4 Environment Monitoring Programme**

Environmental Monitoring is an essential tool in relation to environmental management as it provides the basis for rational management decisions regarding impact control. Environmental monitoring shall be performed during construction, commissioning and operation phases of the project to ensure that the adverse impacts have been mitigated efficiently and to verify the impact predictions. The monitoring program will indicate where changes to procedures or operations are required to reduce the impacts on the environment or local population as essential as described under para 10.6. A lump sum tentative provision of Rs.500 lakh has been kept in the estimate towards implementing EMP. The details are given in **Table 10.7**.

**Table 10.7**  
**Cost for Implementing Environmental Management Plan (EMP)**

<b>Sl. No.</b>	<b>Description of Item</b>	<b>Quantity</b>	<b>Amount (Rs. In lakhs)</b>
1.	Bio-diversity Conservation	L.S	40.00
2.	Environmental Management in labour camp viz. Establishment of fuel depots	L.S	10.00
3.	Public health delivery system viz. Controlling of water and soil borne diseases and Anti malaria etc.	L.S	10.00
4.	Restoration and Landscaping of construction sites	L.S	25.00
5.	Green belt development		130.00
6.	Air, Water and Noise Pollution Control Measure	L.S	50.00
7.	Energy Conservation measures	L.S	25.00
8.	Public Awareness Programmes	L.S	30.00
9.	Local Area Development Plan	L.S	50.00
10.	Environmental Monitoring during construction phase	L.S	30.00
11.	Purchase of instruments and equipment	L.S	100.00
	<b>Total</b>		<b>500.00</b>

However, the actual cost will be considered in the estimate after carrying out EIA & EMP study of the link project by the project proponent through the reputed consultant.