

# Chapter 12

## Environmental and Ecological Aspects

### 12.1 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 alkalinity 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 realized 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 water resources projects should be planned, implemented and managed in such a way that the future demands of the growing population have to be made 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.

## **12.2 Environmental and ecological aspects of storage reservoirs**

No new reservoirs are proposed to be constructed for the link project. The two existing reservoirs viz. the Nagarjunasagar on Krishna and Somasila on Pennar are proposed to be utilised as the off-take and tail end reservoirs respectively for the link project. Also no additional storage is proposed to be created in these two reservoirs for the purpose of the link project and these reservoirs will be used without any change in their capacities. Hence, there would be no change/adverse impacts connected to the building-up of storages such as those on the ecological balance, hydrological regime, submergence of forests and other areas, rehabilitation and resettlement of affected population etc. The minimum draw down levels for these two reservoirs have already been fixed duly considering the possibility of sedimentation and no extra siltation is expected due to the link project. Both the Nagarjunasagar and Somasila projects have been commissioned long back and no reservoir induced seismic activity is observed in the vicinity of these projects.

## **12.3 Impact of the link canal**

Major impact of the link project could be on account of land acquisition for construction of the canal, rehabilitation and resettlement of the affected population due to construction of the link canal, environmental impact due to formation of canal water body and introduction of irrigation in the command area enroute the link canal.

### **12.3.1 Land acquisition**

A total land area of 9823.80 ha needs to be acquired, of which 9735.50 ha will be for main canal and borrow areas, 49.30 ha for rehabilitation colonies, 34 ha for offices and staff colonies, and 5 ha for power house. Out of the total land to be acquired as above, 7103.30 ha is patta land, 895 ha is forest land and 1825.50 ha is government land other than forest.

### **Forest land**

The proposed link canal passes through two main reserved forests viz. Guttikonda and Udayagiri-Veligonda forests. About 895 ha of forestland is to be acquired for the construction of canal. These forests mainly consist of open scrubs, thorny bushes, trees like neem, bamboo and common fuel species like maredu, etc. Compensatory afforestation as

per the norms, is to be taken-up in consultation with the Department of Forests, in the degraded forest lands and other waste lands available nearby the affected forestland. In addition to this, spoil banks of the link canal are proposed to be used for social forestry. Suitable provision for the cost of afforestation is made in the estimate for the construction of the link project.

### 12.3.2 Rehabilitation and resettlement of affected population

The link canal running adjacent to the existing NSRBC, passes through the periphery of nine villages, partially affecting these villages. In some of these villages, recently developed colonies adjacent to the existing NSRBC are also getting affected. All the 9 villages get only partly affected and 5148 people need to be rehabilitated. The measures proposed to be adopted for the rehabilitation and resettlement of the affected people are dealt in the following paragraphs. The assessment of the requirements of rehabilitation is based on the general information collected from the local agencies.

#### i) Housing

The village-wise, category-wise distribution of the affected population is given in Table 12.1.

**Table 12.1**  
**Village-wise distribution of affected population**

Sl. No.	Name of village	Category			Total population affected
		MIG	LIG	EWS	
1	Tallapally	132	380	680	1192
2	Zulakkallu	228	396	184	808
3	Sivapuram Tanda	-	-	868	868
4	Jellapeta Tanda	-	-	332	332
5	Bhadrapalem	56	472	420	948
6	Prempuri	-	-	412	412
7	Iskatipuravaram	-	-	196	196
8	Lakshmipuram	-	28	184	212
9	Katamvaripalle	180	-	-	180
	Total	596	1276	3276	5148

Considering 4 members for each family, the number of families to be rehabilitated would be 1287. It is proposed to allot a modestly

constructed house to each of the displaced family for their quick resettlement. Depending on the economic status of the displaced families, plots of area 350, 250 and 200 sq.m per family with a built up areas of 70, 50 and 30 sq.m are proposed for the middle income group (MIG), lower income group (LIG) and economically weaker sections (EWS) respectively. It is proposed to rehabilitate the affected population in the model villages proposed to be constructed nearby the affected villages with all basic amenities for health, recreation, education, water supply, markets, sanitary, communications etc. In rehabilitation & resettlement the provision of National Policy will be strictly followed:

**ii) Basic amenities**

**iii) Rehabilitation grants and maintenance allowance**

As per general norms, all project affected people who are not allotted agricultural land should be given alternative employment or other amenities for restoration to their original trade within a reasonable time. One time rehabilitation grant of Rs 10000/- per family and a maintenance allowance of Rs 1000/- per family per month for one year are proposed as per the norms.

Suitable provision under the rehabilitation and resettlement component to take care of the above proposed measures of rehabilitation has been made in the estimate for construction of the link canal.

**12.3.3 Environmental impact**

**12.3.3.1 Groundwater**

The groundwater in the command area fluctuates between 2.5 and 8.75 m in pre-monsoon season and between 0.30 and 4.25 m in the post-monsoon season below ground level as per the data observed by the AP State Ground Water Board. The fluctuation data at the observation wells in and around the command area are presented in the Chapter on "Command area development". Quality-wise, the groundwater in certain pockets in the Podili and Kanigiri areas is affected by flourides, whereas it is saline in areas near the sea coast. The groundwater is good and potable in other areas of the command. Availability of groundwater in the area is moderate. The available groundwater potential, draft etc. based on district-wise CGWB statistics are also dealt in Chapter on Command area development.

The maximum ground water level in pre-monsoon is 8.75 m below ground level. It means the general ground water level is shallow. Hence, seepage from canal and irrigated fields may cause water level rise in the short and long terms. Suitable schemes should be devised to use the additional water accrued from seepage as a part of command area development programme. The detail study in this regard will be conducted at the stage of preparation of DPR.

#### **12.3.3.2 Surface water**

There will be tremendous increase in the surface water availability in the region, which would enhance the drinking water supply and its quality in the entire command area. Many natural drainages are crossed by the link canal where cross drainage works are proposed and hence interference with their flows is avoided. The regeneration from the command area is likely to add to the available flows in these natural drainages, by which the salinity ingression would get reduced.

#### **12.3.3.3 Flood control**

The existing Nagarjunasagar dam has a 470 m long spillway with 26 vents with a maximum discharging capacity of 58802 cumec and is capable of discharging the flood flows to the Krishna River downstream. In addition, a number of canal escapes are proposed at suitable intervals along the link canal to drain out the excess flows, if any, into the natural streams nearby the link canal, which help in controlling the floods more effectively.

#### **12.3.3.4 Pollution and industrial development**

The proposed command area does not have any major industries at present and no development projects are likely to be taken-up in the immediate future and as such, the area is free from industrial pollution.

The introduction of irrigation is likely to give an impetus for the growth of agro- based industries leading to some pollution in a very few limited pockets of the area, where strict measures may have to be undertaken to control the pollution. However, this is not expected to lead to any large-scale pollution.

#### **12.3.3.5 Aquatic life**

There is no specific information available in respect of fish production within and surroundings of Nagarjunasagar - Somasila link command

area. However, the specie-wise fish production in the Prakasam and Nellore districts during the year 1994 - 95 is given in Table 12.2.

**Table 12.2**  
**Specie-wise fish production during the year 1994 – 95**

Unit: Tonnes

Sl.No	Name of Specie	Prakasam District	Nellore district
1.	Barbus	1250	1972
2.	Carps	10000	2045
3.	Cat fish	80	1995
4.	Murrel	750	1960
5.	Prawns	2500	1020
6.	Mulletts	600	1670
7.	Hilsa	50	950
8.	Miscellaneous	1500	4537

Source: District hand book of Prakasam and Nellore districts for 1994-95.

The formation of the link canal is not likely to cause any adverse impact on the aquatic life.

#### **12.3.3.6 Public health**

The area as at present does not come under malaria zone and no health risks are involved. However, formation of a water body in the shape of the link canal and conversion of the hitherto dry area into wet area might result in introduction of water borne diseases unless precautionary measures are taken. Adequate supplies of medicines to the public health centres will have to be ensured to prevent and contain the flare up of epidemics, apart from creating adequate infrastructural facilities for the same.

#### **12.3.3.7 Water logging and salinity**

The groundwater table is well below the root zone of the crops. However, the irrigation supplies to the command area would add to the groundwater recharge. This might lead to rise in the groundwater table to some extent but not to the alarming levels so as to cause water logging and salinity. Adequate natural drainages are also available in the area to drain the water from the command area. Though no serious water logging problems are anticipated, studies and regular observations on the behaviour of the soils in the area will have to be carried out for a few years before and after introduction of irrigation in the area.

### **12.3.3.8 Climate and ecology**

The construction of the link canal is not likely to cause any significant changes ecologically in the area. The climatic and ecological conditions of the area continue to remain more or less same even after construction of the link canal.

### **12.3.3.9 Natural resources**

No mineral resources likely to be lost as a result of construction of the link canal.

## **12.3.4 Beneficial impacts of the link canal**

### **12.3.4.1 General benefits**

The link project would greatly help in improving the general prosperity of the region on account of the following.

- i) Introduction of the irrigation in about 1.68 lakh ha of the area hitherto almost devoid of any irrigation facility would increase the agricultural production by nearly 3 to 4 times. This would lead to substantial rise in the average annual income of the local population, as they are mostly dependent on agriculture.
- ii) Agricultural development by introduction of irrigation would give impetus to agro-based, small scale and cottage industries, dairy and poultry development, development of communication network, infrastructural, health and educational facilities, rise in the economic activities, rise in the living standards of the general public and several other aspects of socio-economic development.
- iii) Environmental enhancement of the region on account of the afforestation programmes on the banks of link canal, branch canals and distributaries.
- iv) Adequate protected and fresh assured drinking water supplies to the rural and urban population, major chunk of which is hitherto suffering from acute shortages of potable drinking water.
- v) The link project would create a lot of employment opportunities to the local population during its construction spreading over considerable number of years. The continuous and increased agricultural operations due to irrigation and development in industrial, infrastructural and economic aspects would largely

enhance the continued employment opportunities even after construction of the link project.

#### **12.3.4.2 Employment generation during construction of the project**

The data on employment generation in respect of Upper Ganga Canal Development & Modernization project (Govt. of U.P) has been taken into consideration for assessing the employment generation in this report. The project is one of the nine irrigation projects considered by the Advisory Group on Expenditure and Employment Generation in Major and Medium Irrigation Projects set up by Central Water Commission in their study. As this project suits the scenario of the proposed link canal project in its nature, the employment norm of 35 achieved in this project has been taken into account for arriving at the employment likely to be generated during the construction of the link canal project.

The total estimated cost of the Nagarjunasagar – Somasila link project is Rs.6321 crore (based on 1998-99 price – level). The employment generation potential of the project following the norms as mentioned above will be 14200 personnel per annum in the order of 3000 in the technical and 11200 in the non-technical categories. The technical category comprises of 940 engineers, 955 other technical, 1105 skilled and semi – skilled personnel whereas the non – technical category comprises of 8550 un-skilled and 2650 administrative personnel, annually.

#### **12.4 Impact matrix**

An impact matrix including the beneficial/adverse impacts relating to physical, biological and socio-economic aspects is given in Table 12.3.

**Table 12.3  
Impact matrix of Nagarjunasagar – Somasila link project**

<b>Impact</b>	<b>Assessment</b>
<b>A) Physical Impacts</b>	
(i) Sedimentation	No significant additional sedimentation is expected. The available dead storages at Nagarjunasagar and Somasila are adequate.
(ii) Seismic	Inconsequential, as no new storage reservoirs are proposed for the link project.

(iii) Forest area submerged	Small patches of forests totalling to 895 ha are to be acquired along the link canal to facilitate its construction. Suitable provision has made in the estimate of the link project for compensatory afforestation.
(iv) Other area submerged	An area of 8928.80 ha consisting of both private and government land is to be acquired for construction of the link canal. Adequate provision towards cost of acquisition kept in the estimate of the link canal.
(vi) Groundwater recharge	The groundwater condition will improve along the link canal and in the command area due to irrigation.
(vii) Natural resources	Nil
(viii) Irrigated area	An area of 168017 ha will be provided with irrigation by the link project. The area currently under irrigation from canals under existing medium projects in the proposed command is below 10000 ha, which would also get stabilised.
(ix) Hydro power	4 Units of 30 MW each are proposed to be installed additionally at the head of the link canal. The water after power generation would be flowing through the link canal.
(x) Historical monuments and archaeological structures	No historical monuments or archeological structures are affected by the construction of the link project.
(xi) Salinity intrusion in delta and estuaries	Lean season flows in natural drainages will get increased to some extent and thus further reduce the salinity intrusion in delta.
(xi) Salinity in irrigable area	No serious impact is anticipated.
(xiii) Water logging	-do-
(xiv) Availability of drinking water	As the link canal is planned for providing domestic water to enroute areas, availability of water for drinking would improve.
(xv) Quantity of water diversion	12146 Mm <sup>3</sup> at the off-take point (including the requirement of the NSRBC part command)
<b>(B) Biological impacts</b>	
(i) Public health aspects	No hazards are expected. Infrastructure for health aspects are likely to improve.
(ii) Wild animals and	No adverse impacts are expected.

birds	
(iii) Other species	-do-
(iv) Availability of bio-mass	Increases.

**(C) Socio-economic impacts**

(i) Socio-economic aspects	Tremendous socio-economic developments expected.
(ii) Resettlement plans	The resettlement of very few (5148 nos) affected people from 9 partially affected villages on account of construction of the link canal in model colonies with all basic amenities is planned. Adequate provision for R&R is made in the estimate.
(iii) Land acquisition	A total area 9823.80 ha of land is to be acquired for the purpose of laying the link canal. Suitable provision is made in the link project estimate.
(iv) Farmers to be benefited	All the farmers in the command area will get the irrigation facilities.
(v) Water quality downstream of storage	Water quality in the streams will improve with the addition to the lean season flows due to irrigation.
(vi) Employment generation	Tremendous potential for employment generation during the construction of the link project and continued large-scale employment opportunities thereafter, are expected.
(vii) Infrastructure development	Impetus to various infrastructure development aspects like industries, agricultural and related activities, communications, economic activities, health, education and all other spheres of socio-economic aspects is expected.
(viii) General prosperity	The living standards of the population will improve substantially and the general prosperity of the region would get boosted during and after implementation of the link canal project.