

# Chapter 1

## Introduction

### 1.0 General

Realizing the need for achieving a balanced regional development, the erstwhile Union Ministry of Irrigation and the Central Water Commission (CWC), formulated in the year 1980, a National Perspective Plan (NPP) for water resources development which comprises two components viz. The Himalayan rivers development and the Peninsular rivers development.

### 1.1 Himalayan rivers development

Himalayan rivers development envisages construction of storage reservoirs on the main Ganga and Brahmaputra and their principal tributaries in India and Nepal, along with inter-linking canal systems to transfer surplus flows of the eastern tributaries of the Ganga to the west, apart from linking of the main Brahmaputra with the Ganga. This component would provide additional irrigation of about 22 M ha. and generation of hydropower of about 30 million KW, besides providing substantial flood control in the Ganga and Brahmaputra basins.

### 1.2 Peninsular rivers development

This scheme envisages, as its **first** part, the diversion of surplus flows of the Mahanadi to the Godavari system and further transfer along with the surplus water from Godavari system to the Krishna, Pennar, Cauvery, Vaigai and Gundar basins through the nine-link system. This would benefit areas of Andhra Pradesh, Telangana, Karnataka, Odisha, Tamil Nadu and Puducherry. The **second** part is to construct storages and to inter-link the small west-flowing rivers along the west coast, north of Mumbai and south of the Tapi, for transfer of surplus waters to the needy areas of Gujarat & Maharashtra. Another scheme under this part envisages water supply to the metropolitan area of Mumbai. The **third** part envisages inter-linking of the southern tributaries of the Yamuna by constructing a dam on the Yamuna at Panchnad besides construction of small storages in the system to benefit the Ujjain and Indore areas of Madhya Pradesh and the Bundelkhand region of Uttar Pradesh.

The **fourth** part of the proposal is to divert a part of the surplus waters of the west flowing rivers of Karnataka and Kerala to the east for benefiting the drought areas on the eastern side of the western ghats apart from bringing new areas on the western side under irrigation.

The Peninsular rivers development component is expected to provide additional Irrigation benefits to more than 13 Mha in the States of Andhra Pradesh, Telangana, Odisha, Karnataka, Kerala, Madhya Pradesh, Gujarat, Maharashtra, Tamil Nadu, Puducherry, Rajasthan and Uttar Pradesh besides generation of power.

### **1.3 Proposed link canals between Mahanadi and Cauvery as per Peninsular Component of National Perspective Plan (NPP)**

The hydrological analysis of various river basins by NWDA revealed that the surplus in the Mahanadi basin near Manibhadra is about 12165 Mcum and that in Godavari basin at Inchampalli and Polavaram is about 20327 Mcum and 15020 Mcum respectively at 75% dependability duly considering the demands at the ultimate stage of development (i.e. by the year 2050 AD).

On the other hand, the deficit in Krishna basin at Nagarjunasagar and Pulichintala will be of the order of 1525 Mcum and 671 Mcum respectively and the same at Prakasam barrage will be 3235 Mcum. Considering these water balance assessments, it has been proposed to divert 12165 Mcum of water from the Mahanadi river to the south through the Mahanadi - Godavari link, the first link of the nine-link system. The transferred water will be partly used for irrigation enroute in the States of Andhra Pradesh and Odisha and the remaining quantity of 6500 Mcum will be received in the Godavari. About 21520 Mcum of water including 6500 Mcum received from Mahanadi and the 15020 Mcum of surplus available in Godavari at Polavaram, will be transferred to Krishna river system through three links, viz.,

1. Polavaram - Vijayawada link,
2. Inchampalli - Pulichintala link, and
3. Inchampalli - Nagarjunasagar link.

These link canals cater to the requirements of irrigation, domestic and industrial uses enroute and meeting the deficits in the Krishna basin. Part of the water received in Krishna from Godavari is further diverted to Pennar, river system through a network of the following link canal projects to meet the deficits as possible in Pennar besides providing domestic, irrigation and industrial water benefits enroute.

1. Krishna (Almatti) - Pennar link
2. Krishna (Srisailam) - Pennar link
3. Krishna (Nagarjunasagar) - Pennar (Somasila) link

From Pennar, Pennar (Somasila)-Palar-Cauvery (Grand Anicut) link envisages diversion of a part of the waters received in Pennar basin to provide domestic, irrigation and industrial water supply benefits enroute and to supplement the Cauvery basin. Further, as the last component of the link system, Cauvery (Kattalai)-Vaigai-Gundar link proposes to transfer a part of the waters received in Cauvery to benefit the areas lying south of Cauvery upto Gundar with domestic, industrial and irrigation water supplies.

### **1.3.1 Brief description of the nine-link system as per the National Perspective Plan.**

As stated above, the following nine links under peninsular component are joining the rivers Mahanadi - Godavari - Krishna - Pennar - Cauvery – Vaigai – Gundar.

1. Mahanadi (Manibhadra) – Godavari (Dowlaiswaram) link
2. Godavari (Polavaram) – Krishna (Vijayawada) link
3. Godavari (Inchampalli) – Krishna (Pulichintala) link
4. Godavari (Inchampalli) – Krishna (Nagarjunasagar) link
5. Krishna (Almatti) – Pennar link
6. Krishna (Srisailam) – Pennar link
7. Krishna (Nagarjunasagar) – Pennar (Somasila) link
8. Pennar (Somasila) – Palar – Cauvery (Grand Anicut) link
9. Cauvery (Kattalai) – Vaigai – Gundar link

Out of these, Godavari (Polavaram) – Krishna (Vijayawada) link has been implemented by Govt of Andhra Pradesh.

***Mahanadi (Manibhadra) – Godavari (Dowlaiswaram) link***

Mahanadi (Manibhadra) – Godavari (Dowlaiswaram) link canal envisages to transfer 12,165 Mcum of surplus waters of Mahanadi annually to Godavari and other southern river basins. The 827.70 km long canal takes off with FSL of 74.00 m from the proposed Manibhadra reservoir across Mahanadi with gross storage capacity of 6000 Mcum and FRL of 86.00 m, traverses through Odisha (301.70 km) and Andhra Pradesh (526.0 km) and falls into river Godavari with FSL of 15.824 m at a distance of 15 km upstream of the existing Dowlaiswaram barrage.

Out of the total diversion of 12165 Mcum, about 3790 Mcum is earmarked for irrigation (Odisha: 3184 Mcum and Andhra Pradesh: 606 Mcum), 802 Mcum for domestic and industrial water supply by 2050 AD. Transmission losses in the link canal are estimated to be 1073 Mcum and the remaining 6500 Mcum would be finally transferred to the Godavari river through the link canal to meet the Godavari delta requirements. The link canal will provide irrigation to an area of 363959 ha (256770 ha in Odisha and 107189 ha in Andhra Pradesh) in the districts of Nayagarh, Khurda, Cuttack, Puri, Ganjam, and Gajapati districts of Odisha and Srikakulam, Vizianagaram and Visakhapatnam districts of Andhra Pradesh. The link project envisages construction of a canal power house at the head of the link canal. The power house will have an installed capacity of 70 MW with one 30 MW standby unit.

However, the planning of Mahanadi - Godavari link is under revision in consultation with Govt. of Odisha.

***Godavari (Polavaram) - Krishna (Vijayawada) link:***

The Godavari (Polavaram) - Krishna (Vijayawada) link envisages to transfer 5325 Mcum of surplus waters of Godavari annually to Krishna basin. The 174 km long link canal takes off with FSL of 40.23 m from the proposed Polavaram project across Godavari river with live storage capacity of 2130 Mcum and FRL of 45.72 m and falls into river Budameru, from where, water

will reach river Krishna through Budameru diversion channel at about 8 km upstream of Prakasam barrage with FSL of 27.97 m.

Out of the total diversion of 5325 Mcum, about 1402 Mcum is earmarked for enroute irrigation in Andhra Pradesh, 162 Mcum for domestic and industrial water supply by 2050 AD. The transmission losses in the link canal are estimated to be 260 Mcum and the remaining 3501 Mcum is for augmentation of Krishna basin. The link canal will provide enroute irrigation to an area of 139740 ha (CCA) with annual irrigation of 209610 ha. The project also envisages a powerhouse with 720 MW installed capacity at Polavaram. This link is implemented by Govt of Andhra Pradesh as per their planning.

### ***Godavari (Inchampalli) – Krishna (Nagarjunasagar) link project***

The Godavari (Inchampalli) - Krishna (Nagarjunasagar) link envisages to transfer 16426 Mcum of surplus waters of Godavari annually to Krishna basin. The 299.26 Km (including a tunnel of 9.15 Km) long link canal takes off with FSL of 106.00 m from the proposed Inchampalli project across Godavari river with gross storage capacity of 10374 Mcum and FRL of 112.77 m and falls into Nagarjunasagar reservoir across river Krishna with FSL of 180.25 m. The proposal involves pumping of water by 107 m in four stages.

Out of the total diversion of 16426 Mcum, about 1427 Mcum is earmarked for enroute irrigation in Telangana & Andhra Pradesh, 237 Mcum for domestic and industrial water supply by 2050 AD. The transmission losses in the link canal are estimated to be 562 Mcum and the remaining 14200 Mcum is for augmentation of Krishna basin and further use in southern river basins. The link canal will provide irrigation to an area of 287305 ha under SRSP Stage-II (178055 ha) and the SLBC (109250 ha). In addition to the Inchampalli dam powerhouse with installed capacity of 975 MW, a canal powerhouse is also proposed with 70 MW installed capacity at the off-take point from the intermittent balancing reservoir 'Musi' of the link canal.

### ***Godavari (Inchampalli) – Krishna (Pulichintala) link project***

The Godavari (Inchampalli) - Krishna (Pulichintala) link envisages transfer of 4370 Mcum of surplus waters of Godavari annually to Krishna basin. The 312.20 km (including a tunnel of 12.50 km) long link canal takes off with FSL of 106.68 m from the proposed Inchampalli project across Godavari river with gross storage capacity of 10374 Mcum and FRL of 112.77 m and falls into Pulichintala reservoir across river Krishna with FSL of 55.44 m.

Out of the total diversion of 4370 Mcum, about 3665 Mcum is earmarked for irrigation in Telangana & Andhra Pradesh, 413 Mcum for domestic and industrial water supply by 2050 AD. The transmission losses in the link canal are estimated to be 292 Mcum. The link canal will provide irrigation to an area of 445299 ha comprising proposed command area under Inchampalli RBC (48230 ha), Nagarjunasagar LBC beyond Tammileru (37000 ha), existing command area under NSLBC (156700 ha) & NSRBC (203369 ha). In addition to a dam powerhouse at Inchampalli of 975 MW, three canal powerhouses with 9 MW each are proposed in the link project.

### ***Krishna (Almatti) – Pennar link project***

The Krishna (Almatti) - Pennar link envisages transfer of 1980 Mcum in partial exchange to the waters received from Godavari-Krishna links. The 587 km long link canal takes off with FSL 510 m from the existing Almatti dam across Krishna river with gross storage capacity of 3440 Mcum and FRL of 519.60 m and joins Maddileru stream, a tributary of river Pennar with FSL of 434.78 m.

Out of the total diversion of 1980 Mcum, about 1714 Mcum is earmarked for enroute irrigation in Karnataka (372 Mcum) and Andhra Pradesh (1342 Mcum). About 56 Mcum (Karnataka 13 Mcum and AP 43 Mcum) is provided for domestic and industrial water supply by 2050 AD. The transmission losses in the link canal are estimated to be 210 Mcum. The link canal will provide annual irrigation of 258334 ha in both the States of Karnataka and Andhra Pradesh. Further, a canal powerhouse is also planned with installed capacity of 13.50 MW at head works.

### ***Krishna (Srisaïlam) – Pennar link project***

The Krishna (Srisaïlam) - Pennar link envisages transfer of 2310 Mcum in partial exchange to the waters received from Godavari-Krishna links. The 203.62 km long link canal which includes 3.40 km of existing approach channel, 16.34 km of ongoing Srisaïlam Right Main Canal, 3.56 km of escape channel and 180.32 km of natural streams of Nippulavagu, Galeru and Kunderu takes off with FSL of 268.15 m from the existing Srisaïlam reservoir across Krishna river with gross storage capacity of 8723 Mcum and FRL of 269.75 m and joins river Pennar through above the natural streams.

The link canal is solely a water transfer canal with no enroute irrigation or other use. About 2095 Mcum will reach river Pennar, after meeting the transmission losses of 215 Mcum. Four mini hydel projects are proposed enroute the link canal utilizing the falls in the streams of Nippulavagu, Galeru and Kunderu. The total installed capacity is 17 MW.

### ***Krishna (Nagarjunasagar) – Pennar (Somasila) link project***

The Krishna (Nagarjunasagar) – Pennar (Somasila) link envisages transfer of 12146 Mcum of received waters at Nagarjunasagar from Godavari. The said quantity is proposed to be transferred through link canal (8167 Mcum) and the existing NSRBC (3979 Mcum) upto its terminal point at RD 202.75 km near village Kurichedu, from where, the quantity of transfer through link canal will be 9790 Mcum (8167 + 3979 - 2356 of NSRBC existing utilisation). The 393 km (including tunnel of 1.27 km) long link canal takes off with FSL of 151.67 m from the existing Nagarjunasagar reservoir with gross storage capacity of 11560 Mcum and FRL of 179.83 m and falls into Somasila reservoir across river Pennar with FSL of 101.10 m.

Out of the total diversion of 9790 Mcum, about 908 Mcum is earmarked for enroute irrigation and 124 Mcum for domestic & industrial water supply by 2050 AD in Andhra Pradesh. The transmission losses in the link canal are estimated to be 332 Mcum and the balance 8426 Mcum will reach Somasila reservoir in Pennar basin. The link canal will provide irrigation to a new area of 168017 ha in the districts of Prakasam and Nellore in addition to / taking over the existing command area under NSRBC (295238 ha). Further, the link

canal envisages installed capacity of 90 MW at the canal off-take, with three units of 30 MW each and one stand by unit of the same capacity.

### ***Pennar (Somasila) - Palar - Cauvery (Grand Anicut) link project***

A quantum of 10521 Mm<sup>3</sup> of water is brought to Somasila reservoir in Pennar basin through Srisailem-Pennar link (2095 Mm<sup>3</sup>) and Nagarjunasagar-Somasila link (8426 Mm<sup>3</sup>). Out of this 1956 Mm<sup>3</sup> is proposed to be utilized for Pennar delta (1066 Mm<sup>3</sup>) and Telugu Ganga project (890 Mm<sup>3</sup>) and the balance quantity available is 8565 Mm<sup>3</sup> (10521-1956). The Pennar (Somasila) – Palar – Cauvery (Grand Anicut) link project envisages transfer of 8565 Mcum of waters annually for enroute irrigation, domestic & industrial use and for further transfer beyond Cauvery basin besides transmission losses. The 529.19 Km long link canal takes off with FSL of 95.42 m from the existing Somasila reservoir with gross storage capacity of 2208 Mcum and FRL of 100.58 m and falls into the existing Grand Anicut pond with FSL of 60.86 m.

Out of the total diversion of 8565 Mcum, about 3048 Mcum is earmarked for enroute irrigation, 1105 Mcum for domestic and industrial water supply by 2050 AD. The transmission losses in the link canal are estimated to be 557 Mcum. The remaining quantity of 3855 Mcum will reach Grand Anicut for further use. The link canal will provide irrigation to an area of 491200 ha.

### ***Cauvery (Kattalai) – Vaigai – Gundar link project***

The Cauvery (Kattalai) - Vaigai - Gundar link project envisages transfer of 2252 Mcum of water to Vaigai and Gundar basins. The 256.82 km long link canal takes off with FSL of 100.75 m from the existing Kattalai barrage with pond level of 101.20 m and at out fall Tiruchuli branch canal oftakes with FSL of 72.048 m.

Out of the total diversion of 2252 Mcum, about 1931 Mcum is earmarked for enroute irrigation, 218 Mcum for domestic and industrial water supply by 2050 AD. The transmission losses in the link canal are estimated to be 103 Mcum. The link canal will provide irrigation to an area of 448340 ha in the districts of Karur, Tiruchirappalli, Pudukkottai, Sivaganga, Ramanathapuram, Virudhunagar and Thoothukudi in Tamil Nadu.



The link canals proposed under southern water grid i.e. Mahanadi-Godavari-Krishna-Pennar-Cauvery-Vaigai-Gundar link system of peninsular component is depicted in **Plate 1.1**. The schematic line diagram of the link system indicating the major river linking is given at **Plate 1.2**.

#### **1.4 Phased development of the nine-link system**

The nine link system has been planned based on the surpluses in Mahanadi & Godavari basins and proposed storages at Manibhadra on Mahanadi & Inchampalli on Godavari. These two dams have not been taken up so far by the State Govts in view of submergence and inter-state issues.

Further, the water balance studies in Mahanadi and Godavari have been updated recently. The water balance study in Mahanadi basin at Barmul (2018) indicates a surplus of 6794 Mcum only. Similarly, as per the updated water balance study in Godavari basin at Inchampalli (2018), there is only surplus of 5002 Mcum. Similar study for Godavari basin upto Polavaram is under preparation. As can be seen, the surpluses in Mahanadi & Godavari have reduced as per the updated WBS. The planning of Mahanadi - Godavari link is therefore under revision in consultation with Govt of Odisha. Once the issue of surplus water in Mahanadi basin is finalized with the concurrence of Govt of Odisha, the amount of water that can be transferred to Godavari basin can be quantified. The reduced surpluses in Mahanadi & Godavari basins are proposed to be supplemented from a part of about 11 BCM of water transfer being envisaged through Himalayan links to the Peninsular nine link system under Phase-II, to ensure water transfer from Godavari and beyond upto Gundar as originally planned. This proposed supplementation from Himalayan component to Mahanadi basin is also under finalisation.

In view of the above, an **alternate plan** to utilise the surplus waters of Godavari basin in water short Krishna, Pennar and Cauvery basins has been devised. Now, it is proposed that the originally contemplated nine link system will be taken up in two phases.

- a) Phase I: Identifying surplus waters in Godavari basin without affecting the interests of the co-basin States and transferring these waters upto Cauvery through Godavari - Krishna - Pennar - Palar – Cauvery link

system while meeting the requirements of the areas enroute, to the extent possible.

- b) Phase II: Linking Brahmaputra - Ganga - Subernarekha - Mahanadi - Godavari rivers, thus enriching the Phase I with additional water and suitable modifications.

#### **1.4.1 Phase I of the nine-link system in peninsular component**

Phase I comprises the following links:

1. Godavari (Inchampalli/Janampet) – Krishna (Nagarjunasagar) link  
*In lieu of Godavari (Inchampalli) – Krishna (Pulichintala) & Godavari (Inchampalli) – Krishna (Nagarjunasagar) links*
2. Krishna (Nagarjunasagar) – Pennar (Somasila) link
3. Pennar (Somasila)– Cauvery (Grand Anicut) link

In **Phase I**, the surplus water available in Godavari basin along with the unutilized waters of Chhattisgarh in Indravati sub-basin shall be diverted to Cauvery basin through Krishna and Pennar basins. Nagarjunasagar on Krishna river and Somasila on Pennar river will be used as balancing reservoirs to transfer water up to Grand Anicut on Cauvery while meeting the enroute requirements in Telangana, Andhra Pradesh and Tamil Nadu. This is the main objective of evolving the **Godavari (Inchampalli / Janampet) - Cauvery (Grand Anicut) link project**.

National Water Development Agency (NWDA) prepared a technical feasibility note and Memorandum of Agreement (MoA) for preparation of DPR of the phase-I proposal and sent to Govt of Chhattisgarh, Telangana, Andhra Pradesh, Tamil Nadu, Puducherry, Karnataka, Odisha for their concurrence. In response to the above, Govt of Chhattisgarh, Puducherry and Telangana submitted their views/ comments which are given below.

#### **Govt. of Chhattisgarh**

The proposed utilization from Indravati waters of Chhattisgarh, in the link project should be reviewed as the state of Chhattisgarh is already in deficit

in view of its estimated demand of 10884 Mcum against water allocation of 8360 Mcum by GWDT. The consent of Govt of Odisha is imperative for Mahanadi – Godavari link project. Fulfillment of water demand of Chhattisgarh in summer months shall be ensured while implementing the proposed Godavari – Cauvery link project. The submergence area of the Akinepalli (Now Janampet/ Inchampalli) barrage falling in Chhattisgarh may be clarified.

### **Govt. of Tamil Nadu**

The Godavari – Cauvery link project has to be taken as National Project. The DPR has to be prepared without waiting for the concurrence of co-basin states. Tamil Nadu state does not have any objection for taking up this project.

### **Govt. of Telangana**

The Govt of Telangana is of the view that it is premature to sign MoA before establishing the availability of surplus water after duly considering all the requirements of basin states. The hydrological studies should be conducted by Govt of India.

### **Govt. of Puducherry**

Detailed Project Report (DPR) proposed to be prepared shall also consider the feasibility of linking of Godavari (Inchampalli) - Krishna (Nagarjunasagar) – Pennar (Somasila) – Cauvery (Grand Anicut) with south Ponniyar. South Ponniyar shall be linked with Sankaraparani river to benefit the downstream villages of Puducherry districts. Interests of Puducherry shall be protected by ensuring that the UT gets additional quantum of water, on prorata basis, vis a vis the quantum of water to be shared by the stake holder states while implementing this project. This shall be in addition to 7 TMC of Cauvery water allocated through the final Award of Cauvery Water Disputes Tribunal (CWDT), the quantum of which, has since been upheld by the Hon'ble Supreme Court.

## **Views of Central Water Commission (CWC)**

The Central Water Commission (CWC), carried out the water availability studies of Indravati sub-basin of Godavari basin (Nov, 2016) considering inflows at Pathagudem G&D site for the period from 1985 to 2014 according to which, the gross yield at 75% dependability is 23170 Mcum. This is against the corresponding yield of 21166 Mcum as estimated by NWDA. Thus, the yield of NWDA is on the conservative side and the same is used for computations.

Further, Central Water Commission submitted their report on the technical feasibility note circulated by NWDA in December 2017 stating that the study carried out by NWDA is in order and advised to carryout consistency checks for homogeneity. Further CWC clarified that after complete utilization of its share by Chhattisgarh, the availability of 247 TMC may only be possible at 50% dependability.

Accordingly, taking into consideration of the above views, NWDA has taken up the preparation of DPR of the Godavari (Inchampalli / Janampet) - Cauvery (Grand Anicut) link project. The draft Detailed Project Report (DPR) of the Phase I was completed and circulated in March 2019 to concerned states for the observations.

### **1.4.2 Phase II of nine link system in peninsular component**

Phase II comprises the following additional links:

1. Mahanadi (Barmul) - Godavari (Dowlaiswaram) link
2. Godavari (Polavaram) - Krishna - Pennar link (implemented by Govt of AP as per their planning)
3. Krishna (Almatti) - Pennar link
4. Krishna (Srisailam) - Pennar link
5. Cauvery (Kattalai) - Vaigai – Gundar link

In **Phase II**, the surplus water available in Brahmaputra and Mahanadi basins are proposed to be diverted to Godavari and further south to develop the proposed links in Phase I and to enrich the Phase I with additional waters.

### 1.4.3 The Cauvery (Kattalai) - Vaigai - Gundar link project

The Cauvery (Kattalai) - Vaigai - Gundar link project which forms part of Phase II of the nine-link system connecting Mahanadi - Godavari - Krishna - Pennar - Cauvery - Vaigai - Gundar is envisaged to divert 2252 Mcum of water from Kattalai barrage. Out of the total diversion of 2252 Mcum, about 1931 Mcum is earmarked for enroute irrigation, 218 Mcum for domestic and industrial water supply by 2050 AD. The transmission losses in the link canal are estimated to be 103 Mcum. The link canal will provide irrigation to an area of 448340 ha in the districts of Karur, Tiruchirappalli, Pudukkottai, Sivaganga, Ramanathapuram, Virudhunagar and Thoothukudi in Tamil Nadu.

The surplus waters received at Somasila on Pennar river will be transferred through Pennar (Somasila) - Palar - Cauvery (Grand Anicut) link and the part quantity of 2252 Mcum from this link will be transferred through a branch canal (taking off from the Arani river crossing) to Kattalai barrage to facilitate the operation of Cauvery (Kattalai) - Vaigai - Gundar link project.

The proposed link canal comprises of the following components.

1. A barrage across Cauvery river at Kattalai with pond level of 101.20 m on the upstream of Grand Anicut and about 138 km downstream of the existing Mettur dam.
2. A head regulator on the right flank of the barrage with discharge capacity of 180.30 cumec.
3. A link canal of 256.820 km proposed to take off from the Kattalai barrage with FSL of 100.75 m and design capacity of 180.30 cumec.
4. Four tunnels of total length 15.54 km, located at 82.300 km (3.940 km), RD 104.100 km (6.040 km) RD 148.100 km (3.630 km), and RD 156.300 km (1.930 km)
5. 12 branch canals and 25 direct sluices to facilitate irrigation in the command area.
6. 464 Nos. of cross drainage/ cross masonry and regulating works across the link canal.
7. New command of about 4.48 lakh ha at 100% intensity in Karur, Tiruchirappalli, Pudukkottai, Sivaganga, Ramanathapuram, Virudhunagar and Thoothukudi districts.

## **1.5 Location of the project area**

The Cauvery (Kattalai) - Vaigai - Gundar link project traverses through Cauvery basin, basin covering streams between Cauvery & Vaigai, Vaigai basin and basins covering streams between Vaigai and Vaippar in the state of Tamil Nadu. The alignment of the link canal passes through the districts of Karur, Tiruchirappalli, Pudukkottai, Sivaganga, and Virudhunagar. The Index map of the link project is at **Plate 1.3**.

## **1.6 Communication facilities**

The Kattalai barrage is accessible by road from Chennai, Coimbatore and Tiruchirappalli approximately located at a distance of 375 km, 175 km and 60 km respectively. Mayanur railway station on Tiruchirappalli - Erode broad gauge line is located near the proposed head regulator. The link canal takes off from Kattalai barrage and passes in the vicinity of Krishnarayapuram, Kiranur, Pudukkottai, Karaikudi, Sivaganga and Tiruchuli towns.

The link canal traverses in the vicinity of many villages and towns. The head works and canal alignment are well approachable by means of highways, major district and village roads of bituminous top. All the villages/towns in the vicinity of head works, and link canal alignment are fully electrified and connected by telephone lines. Detailed information on the communication network in the project area is presented in **Chapter 4: Surveys & Investigations**.

## **1.7 General climatic conditions of the states and project area**

The climate of the project area is basically tropical in nature. The mean daily maximum temperature in the command area ranges from 29.5° C to 39.1° C. During the hottest month, i.e., May, the temperature varies from 39.1° C to 26.2° C. Mean daily minimum temperature varies from 19.9° C to 27.2° C. During the coolest month, i.e., January, the temperature varies from 19.9° C to 30.8° C. The annual rainfall in the command area varies from 844.2 to 1187 mm. The summer season starts by March and continues till May. Thereafter, the south-west monsoon season follows and lasts up to September. North-east monsoon sets in by mid-October and ends during mid-December.

During the north-east monsoon period, the coastal belt of Tamil Nadu receives significant more rainfall. The cold weather period from mid-December to February is a season of generally fine weather. The Seasonal distribution of the rainfall is furnished in **Table 1.1** below.

**Table 1.1**  
**Seasonal distribution of rainfall** **Unit: %**

Sl. No	Name of district	Southwest monsoon	Northeast monsoon	Winter season	Summer season	Total
1	Karur	29	48	4	19	100
2	Tiruchirappalli	33	47	4	16	100
3	Pudukkottai	38	43	5	14	100
4	Sivaganga	34	45	5	16	100
5	Virudhunagar	17	60	8	15	100
6	Ramanathapuram	20	52	7	21	100
7	Thoothukudi	10	65	8	17	100

## 1.8 General topography, physiography and geology of the project area

The canal mostly runs in plain area except at the crossings of ridges between various river basins en route. Major soil types encountered along the alignment are black cotton and red sandy soils.

The link canal passes through Archaean metamorphic terrain consisting of migmatitic and hornblende biotite gneiss upto 130 km. The thickness of weathered zone is fairly high at 10 - 15 m upto RD 50 km. In Pudukkottai area, fresh rock is seen at shallow depth of 1-2 m. Sedimentary formations of Upper Gondwana (Sivaganga formations) and mio-pliocene (Cuddalore formations) ages occupy remaining stretch of canal. Horizontally bedded gravel, sand, shale and clay which constitute these formations are capped by laterite intermittently. The canal traverses through alluvial tract of about 10 km in Vaigai basin.

## 1.9 Population

The Kattalai barrage is an existing project and there is no proposed dam/barrage involved in the link project. Only a few settlements are required to be displaced on account of canal acquisition. The details are discussed in chapter 10- EIA & EMP. The link alignment will however be appropriately

detoured to avoid crossing these habitations in the final DPR. Therefore, there will, practically, be no affected population on account of the link project.

On the other hand, the benefitted population in the command area is 28.05 lakh of which 11.84 lakh is urban. Considering Pudukkottai, the largest district lying in the command, as a representative district, out of the total workforce, 40.06% are agricultural workers, 27.47% are cultivators, 1.83% are workers of house hold industry, and 30.63% are other workers. Similarly, the people living in the districts situated further south, which will be benefitted by the diverted water, are mainly dependent upon agriculture.

The details according to 2011 census carried out by Govt of India is shown in **Table 1.2**.

**Table 1.2**  
**Population in the districts pertaining to the project area**

Sl.No.	Name of the State/ District	Rural	Urban	Total
	<b>Tamil Nadu</b>			
1	Karur	629976	434517	1064493
2	Tiruchirappalli	1384257	1338033	2722290
3	Pudukkottai	1301991	316354	1618345
4	Sivaganga	926256	412845	1339101
5	Ramanathapuram	942746	410699	1353445
6	Virudhunagar	962062	980226	1942288
7	Thoothukudi	873374	876802	1750176
	<b>Total</b>	<b>7020662</b>	<b>4769476</b>	<b>11790138</b>

### 1.10 Occupation

The social fabric of villages in the project area is predominantly agrarian and main occupation of people is farming, which may get boost if adequate irrigation facilities are made available.



## 1.11 Natural resources

### 1.11.1 Water resources

The water balance of various river basins / sub-basins from Cauvery to Gundar in the region shows that all the river basins are categorized as deficit at 75% dependability. **Table 1.3** furnishes the information on water resources scenario in various basins/ sub-basins in and around the region.

**Table 1.3**  
**Water resources scenario in various basins / sub-basins**

Sl.No.	River basin / Sub-basin / diversion point	Quantity of water balance (Mcum)	Status of water resources (Mcum)
1	Cauvery at Kattalai	(-)12635 Mcum	Deficit
2	Tirumanimuttar sub-basin of Cauvery basin	(-) 80 Mcum	Deficit
3	Streams between Cauvery & Vaigai	(-) 410 Mcum	Deficit
4	Vaigai basin	(-) 225 Mcum	Deficit
5	Streams between Vaigai and Vaippar basins	(-) 728 Mcum	Deficit

*Source: Water balance study reports of NWDA*

### 1.11.2 Land resources

As per the land use information available for districts in the project area, the culturable area constitutes about 72 percent of the geographical area. The net area sown accounts for 41 percent of the total culturable area (the range being 20 to 56 percent). The district wise land use statistics of the region lying in the project area for the year 2016-17 are placed in **Annexure 1.1** while the district-wise gist of land use is furnished in **Table 1.4**.

**Table 1.4**  
**Gist of district-wise land use details in the project area**      **Unit: ha**

<b>District</b>	<b>Geographical area</b>	<b>Culturable area</b>	<b>Net area sown</b>	<b>Gross cropped area</b>	<b>% of net sown area to culturable area</b>
<b>Tamil Nadu (2016-17)</b>					
Karur	289557	232151	46839	47460	20.18
Tiruchirappalli	440383	305094	119439	127383	39.15
Pudukkottai	466329	292304	116938	119609	40.00
Ramanathapuram	408957	312745	172464	172464	55.15
Sivaganga	418900	273704	96098	96106	35.11
Virudhunagar	424323	322017	118649	120938	36.85
Thoothukudi	470724	358218	199144	200372	55.59
<b>Total</b>	<b>2919173</b>	<b>2096233</b>	<b>869571</b>	<b>884332</b>	<b>41.48</b>

*Source: Bureau of Economics and Statistics of Tamil Nadu.*

### 1.11.3 Agriculture

The main food crops of the region are rice, sorghum (jowar), bajra, barley, maize, pulses, sugarcane, vegetables, condiments & spices. The main cash crops of the region are cotton, vegetables, groundnut and chillies. The source-wise irrigation particulars for the districts in the project area as available are furnished in **Table 1.5**.

**Table 1.5**  
**Source-wise irrigation in the districts pertaining to Project area**  
**Unit : ha**

District/Year	Total net area irrigated			% of net area irrigated to net area sown	Area irrigated more than once	Total gross area of crops irrigated	% of gross area irrigated to the gross cropped area
	Surface	Well	Total				
<b>Tamil Nadu (2016-17)</b>							
Karur	2151	27874	30025	64.10	621	30646	64.57
Tiruchirappalli	16268	37290	53558	44.84	7944	61502	48.28
Pudukkottai	50056	43358	93414	79.88	2671	96085	80.33
Ramanathapuram	50541	13383	63924	37.07	0	63924	37.07
Sivaganga	50512	16500	67012	69.73	8	67020	69.74
Virudhunagar	13593	26203	39796	33.54	2289	42085	34.80
Thoothukudi	11224	16692	27916	14.02	1228	29144	14.54

*Source: Bureau of Economics & Statistics, Government of Tamil Nadu*

As can be seen, there is a wide gap between the cropped area and level of irrigation in the project area, particularly in the districts of Thoothukudi, Virudhunagar, Ramanathapuram and Tiruchirappalli. Hence, there is much scope for extending irrigation facilities through non-conventional means like inter basin water transfer apart from conventional projects.

#### **1.11.4 Mineral wealth**

No minerals of economic importance have been found along Canal alignment. Sporadic sulphide mineralization in the form of Pyrite and rare incidence of Chalcopyrite is reported in the granites of Nartamalai area. White

clay of refractory grade occurs in Karaikudi and Sivaganga taluks. Some of the best-known deposits of graphite occur near Sivaganga. Yellow Shale and ferruginous material used as mineral pigment occur below laterite west of Puvali and Pudupatti near Sivaganga. Ochre occurs as buff, mauve, yellow and pink coloured shale exposed near Sivaganga. Minor occurrence of Baryte is noticed north of Tiruppuvanam.

### **1.11.5 Industry**

There is a no. of large, medium and small-scale industries in the project area. Most of the large-scale industries are located in Karur, Tiruchirappalli, Virudhunagar and Thoothukudi districts. Some of the important industries in Karur district are Tamil Nadu News print and Papers Limited (TNPL), TNPL Cement factory, Chettinad Cement factory, Cheran Cement factory, Bus Body Building units, Textile units, Fish and Mosquito nets manufacturing units and Agro based industries. The Bharat Heavy Electricals Limited (BHEL), Golden Rock Locomotive Workshop, Heavy Alloy Penetrator Project (HAPP), Ordinance Factory, Trichy Distilleries and Chemicals Ltd (TDCL), Trichy Steel Rolling Mills, EID Parry Sugar factory, Dalmia Cement and Amman-TRY Steel industry are the important large-scale industries in Tiruchirappalli district. Apart from this, a number of medium and small-scale Textile units and Agro based industries are also located in Tiruchirappalli district. Sivakasi in Virudhunagar district is a major hub of industrial units in manufacture of Pyrotechnics (Fireworks) and Safety Matches. The town of Sivakasi is notable for printing industries as well with the region housing more than 450 printing presses including Offset Printing and flexo printing.

The types of industries available in Pudukkottai district are Heavy Steel & Structural Fabrication, Manufacturing of Boilers, Modern Rice mills, coir products and Agro based industries. Sakthi sugar factory, Moser Bear Clean Energy Ltd., Rice Mills, Textile units, Videocon TV plant and potteries are located in Sivaganga district. Large scale industries located in Ramanathapuram district include Oil and Natural Gas Corporation (4 units), Pennar Gas Power plant, Tamil Nadu Salt Corporation, South Indian Bromine & Allied Chemicals Pvt Ltd., and a number of Cotton Mills.

Known as "Pearl city", Thoothukudi is most famous for pearl fish. Due to weather and soil conditions, salt pans are in abundance in the district which contribute 70% of salt production of the entire State of Tamil Nadu and meets 30% requirement of entire nation. The salt produced here is majorly used in Chemical industries located in Thoothukudi. The Sterlite Copper Smelter Plant, Tuticorin Thermal Power Station, Tuticorin Alkali Chemicals, Dhrangadhra Chemicals, Kilburn Chemicals, Southern Petrochemical Industries Corporation, Agsar Paints and Madura Coats are some of the large industries located in Thoothukudi district. Apart from this, a number of medium and small-scale industries in the field of Sea Food, Oil Mills, Chemicals and Textiles are also located in this district.

### 1.11.6 Tourism

A number of tourist spots are located in the project area. Kattalai barrage, Ponnanaiar dam, Rockfort, Srirangam, Thiruvanaikkaval, Kallanai, Thirumayam Fort, Cave temples in Kudimiyamalai & Northamalai, Karaikudi Chettiyar Mansions, Karpaga Vinayagar Temple at Pillayarpathi, Vettankudi Bird Sanctuary, Kalayar Kovil, Pilavakkal dam, Idaikattur Church, Thiruchendur Murugan Temple, Church of Our Lady of Snow, Rameswaram, Pamban Railway Bridge and Dhanushkodi are located in the vicinity of the link project. Karur, Tiruchirappalli, Pudukkottai, Thirumayam, Karaikudi, Thirupattur, Sivaganga, Ramanathapuram, Thoothukudi and several other places are significant from tourism point of view.

### 1.11.7 Scriptural importance

Srirangam and Cauvery river cannot be separated from each other. Srirangam is a 600 Acre River Island Town where the Gigantic Sri Ranganatha Swamy Temple dedicated to Lord Vishnu is located. This is one of the 108 *Divya Desams*. Thiruvanaikkaval Jambukeshwarar - Akilandeswari temple dedicated to Lord Siva is one of the *Pancha Bhootha Sthalam* (representing water) is located near Tiruchirappalli city. Ramanathaswamy Temple dedicated to Lord Siva located in Rameswaram Island is one of the twelve *Jyotirlinga* temples and where the three of the most revered *Nayanars* (Saivite saints), *Appar*, *Sundarar* and *Tirugnana Sambandar* have glorified the temple with their songs. According to *Ramayana*, the presiding deity, the *Lingam* of

Ramanathaswamy has been established and worshiped by *Rama*, the seventh *avatar* of the god *Vishnu*.

The unique cultural heritage of Tamil Nadu is seen all along the link canal. There is a mention of several places in Sangam literature and their remnant features are strikingly visible even in present times. Tiruchirappalli, Pudukkottai, Karaikudi, Sivaganga, Ramanathapuram and Rameswaram are some of the places of religious and historical importance that got place in scriptures.

### **1.11.8 Culture & people**

The state of Tamil Nadu is rich in cultural and historical background distinct from rest of the country. The festivals like Vijayadashmi/ Dussehra, Diwali and Pongal are celebrated in the state. The state of Tamil Nadu preserved its Dravidian culture while it was being ruled by Pandyas, Cholas, Pallavas and other rulers of north for brief periods.

## **1.12 Land use and socio-economic aspects**

### **1.12.1 Cropping pattern**

The cropping pattern comprises crops viz Paddy, Jowar, Maize, Ragi, Pulses, Oilseeds, Cotton, Vegetables, Chillies. Sugarcane is the perennial crop in the state.

### **1.12.2 Socio-economic aspects**

The proposed command area of 4.48 lakh ha under the link project is spread in 7 districts of Karur, Tiruchirappalli, Pudukkottai, Sivaganga, Ramanathapuram, Virudhunagar and Thoothukudi in Tamil Nadu. Based on the available district-wise statistics in the state, certain socio-economic aspects are furnished in **Table 1.6**.

**Table 1.6**  
**Socio-economic aspects in Tamil Nadu state**

Sl.No.	Aspect	Tamil Nadu
1.	Area ('000 km <sup>2</sup> )	130.06
2.	Population (lakh)	721.47
3.	Rural (lakh)	372.30
4.	Urban (lakh)	349.17
5.	% of Urban	48.40
6.	Population density/Km <sup>2</sup>	555.00
7.	Literacy rate (%)	80.09
8.	Scheduled Caste (%)	20.01
9.	Scheduled Tribe (%)	1.10
10.	Total workers (lakh)	328.85
11.	Cultivators (lakh)	42.48
12.	Agricultural labourers (lakh)	96.07
13.	Workers in House hold industry (lakh)	13.65
14.	Other workers (lakh)	176.65

*Source: Census statistics, 2011*

### 1.12.3 Drought prone area

Tamil Nadu has 9 drought-prone districts (before reorganization of districts in 1990's) covering 83,997 km<sup>2</sup> which is about 64% of the total area of the state. The drought-prone districts are Coimbatore, Dharmapuri, Kanyakumari, Madurai, Pudukkottai, Ramanathapuram, Salem, Tirunelveli, and Tiruchirappalli. Some of these drought prone districts in the state viz., Ramanathapuram, Pudukkottai and Tiruchirappalli will get relief from the assured water supplies through the proposed link canal.

### 1.12.4 Ground water

The groundwater resources of India are assessed by Central Ground Water Board (CGWB) following Groundwater Estimation Methodology, 2015, which takes care of all the relevant parameters contributing to the net annual ground water recharge and extraction for various uses. Ground water resources and utilization in districts falling in the command area were compiled from the "Dynamic Groundwater Resources Assessment of India - 2017". The annual

total replenishable ground water resource of various districts falling in the command area is 4765 Mcum of which the annual extractable resource is 4290 Mcum. The ground water draft for irrigation is 1895 Mcum and allocation for domestic use is 185 Mcum which indicates about 49% of average ground water development in the region. However, it is seen that groundwater is over exploited in Karur, its development is critical in Tiruchirappalli while being and safe in other districts. The district wise ground water potential & draft is furnished in **Table 1.7**.

**Table 1.7**  
**Ground water resources and utilization in districts**  
**falling in the project command area** **Unit: Mcum**

Sl. No.	District	Annual Replenishable GWR	Annual extractable GWR	Annual GW draft for irrigation	Projected demand for M&I uses up to 2025	GW available for future irrigation use	Stage of GW development (%)
1.	Karur	310	279	275	12	49	102
2.	Tiruchirappalli	687	619	480	76	170	90
3	Pudukkottai	1025	922	413	20	488	47
4.	Ramanathapuram	615	554	57	17	480	13
5.	Sivaganga	995	896	149	17	730	18
6.	Virudhunagar	583	525	323	24	200	65
7.	Thoothukudi	550	495	198	19	289	43
<b>Total</b>		<b>4765</b>	<b>4290</b>	<b>1895</b>	<b>185</b>	<b>2406</b>	<b>54</b>

*Source: Dynamic Groundwater Resources of India, July, 2019, CGWB (As in March, 2017)*

### 1.12.5 Water quality

Ground water is an essential and vital component of our life support system. The ground water resources are being utilized for drinking, irrigation and industrial purposes. There is growing concern on deterioration of ground water quality due to geogenic and anthropogenic activities. Increase in overall salinity of the ground water and/or presence of high concentrations of fluoride, nitrate, iron, arsenic, total hardness and few toxic metal ions have been noticed



in large areas in several states of India. The ground water development in Ramanathapuram district only 13% as major part of the ground water in phreatic aquifers is brackish or saline. The ground water resources in some parts of Sivaganga district is affected by fluoride.

### **1.13 Choice of the project**

The water balance studies of the Cauvery basin up to the Kattalai barrage reveal that, at ultimate stage of development by 2050 AD, there will be surface water deficit of 12635 Mcum at 75% dependability. The river basins lying south of Cauvery basin viz., basin area covered by the streams between Cauvery and Vaigai, Vaigai basin and basin area comprising streams between Vaigai and Vaippar are also deficient in water resources. Similarly, basins in the northern side of Cauvery basin viz., Pennar basin and Krishna basin are also indicated to be deficit in terms of water resources potential. Hence there is no scope of bringing water to Cauvery and other basins south of Cauvery indicated above from adjacent river basins. Hence the search for identifying suitable source to meet the demands of these basins has gone further north. The immediate river basins located north of Krishna basin in Peninsular India are the Godavari basin and the Mahanadi basin. The Mahanadi and Godavari basins are found to be surplus in water resources at the ultimate development scenario as per the water balance studies of NWDA.

Hence, the only option available to meet the deficits of Cauvery and other southern basins is by bringing surplus waters of Mahanadi and Godavari rivers to Krishna and from there to Pennar and further south. The Cauvery (Kattalai) - Vaigai - Gundar link, which off takes from Cauvery is the tail end link in the overall peninsular rivers link proposal from Mahanadi to Gundar in order to provide irrigation, drinking and industrial water supply benefits in some of the drought prone areas of Tamil Nadu.

#### **1.13.1 Project planning and optimisation of benefits**

The link project envisages diversion of 2252 Mcum from the Kattalai barrage for meeting the irrigation, domestic and industrial needs in various enroute river basins upto Gundar river.

The link canal will provide irrigation to a total command area of about 4.48 lakh ha of new area. The water allocated for irrigation is about 1931 Mcum. The link canal will provide 218 Mcum of water for municipal and industrial water supply to the enroute villages/towns lying in the command area in the vicinity of the link project. About 103 Mcum of water is estimated to be lost in transmission.

Though, not explicitly quantified as part of the present DPR, many other tangible and intangible benefits like development of agro based industries, food processing units, employment generation during construction period and thereafter, development of infrastructure, improvement of water table and quality of ground water etc. will accrue from the implementation of the link project. In all likelihood, the living standards and socio-economic status of the people of the region are set to be improved.

#### **1.14 Stages / phases of development of the link project**

The development of the Cauvery (Kattalai) - Vaigai - Gundar link project can be planned in the following stages in sequence or simultaneously.

1. First stage may include most needy areas keeping in view the irrigation and domestic water requirement.
2. Second stage may include the remaining areas including irrigation and M&I needs of the whole area after duly developing command area and distributary network.
3. Third stage may include integration of existing infrastructure for domestic and industrial water supply.

Integration of existing projects/ irrigations tanks may be the prominent feature of the project as there are several tanks in the command area. In each stage of development, these structures play vital role in supplying the waters to the command area. The benefits of the project can be partially accrued right from the completion of first stage of development.

### **1.15 Fitment of the scheme in overall development of the region**

There are vast tracks of culturable area in Tamil Nadu which need to be brought under irrigation. Further, the commands under several minor irrigation tanks are also deprived of reliable water supply due to monsoon vagaries. Farmers are mostly dependent on open wells, tanks and other sources which usually fail during dry years. The usual practice among the farming community is to irrigate the fields through pumping of water which often leads to groundwater depletion. All these factors suggest that a water resources development project like Cauvery (Kattalai) - Vaigai - Gundar link project is essential so as to provide the necessary impetus to the irrigation development in the southern part of the state. The link project will fit well in contributing to the overall development of the region, like the spoke in a wheel.

### **1.16 Intimation to other development authorities regarding the scheme**

The feasibility report of the link project was prepared and circulated to all concerned states and authorities in the year 2004. The Govt of Tamil Nadu extensively studied the proposal. The Kattalai barrage is already constructed by the state. The state is keen to accelerate the implementation of the link project.

### **1.17 Public announcements and public hearings**

The benefits to be accrued from the proposed project have been brought to the notice of the general public during the field surveys and other investigations of the scheme by the NWDA officials from time to time bringing out its importance to meet the water shortage of the region. Thus, the people in the vicinity are well conversant of the link project. The public hearings will be taken up at appropriate time during environmental impact assessment study of the link project.

### **1.18 Interlinking of the scheme with neighbouring schemes**

The dependence of the link project on the operation of the existing reservoirs Nagarjunasagar and Somasila reservoirs is a major strength for the link project as far as reliability considerations. The link project will be able to

stabilize the command areas under the existing projects and irrigation tanks in the command area through proper integration. The link project crosses several streams enroute and appropriate planning in the upstream catchments of these streams can be taken up by the respective states/ project authorities in exchange wherever feasible, due to supplementation of water through the link project.

### 1.19 Inter-state / international aspects

There are no international boundaries concerning the project area and hence no such issues are involved. Cauvery is an inter-state river involving Karnataka, Kerala, Puducherry and Tamil Nadu states. Hence, the prevailing Awards, Acts, Agreements are duly considered while planning for diversion. The link project will not affect the provisions regarding inter-state adjudication on sharing the waters of Cauvery basin by Cauvery Water Dispute Tribunal. The inter-state issues are dealt in detail in **Chapter 3: Inter-state aspects**

### 1.20 Cost and benefits of the scheme

#### 1.20.1 Cost of the project

The total cost of the Cauvery (Kattalai) - Vaigai - Gundar link project is furnished in **Table 1.8**.

**Table 1.8**

**Abstract of cost of the Cauvery (Kattalai) - Vaigai - Gundar link project**

Sl.No.	Unit	Cost component	Amount (Rs lakh)
1	I	Head works	2077
2	II	Conveyance system	808905
3	VI	Command Area Development	16734
		<b>Total project cost</b>	<b>827716</b>

The annual cost of the project including cost of maintenance of head works, depreciation, interest on capital cost etc. for the link project is summarized in **Table 1.9**.

**Table 1.9**  
**Annual cost of the Cauvery (Kattalai) - Vaigai - Gundar link project**

Sl.No.	Item	Amount (Rs lakh)
I	<b>Capital cost</b>	
	Estimated cost of the project	827716
II	<b>Annual costs</b>	
a)	Interest @ 10%	82772
b)	Depreciation @ 1% headworks	21
	Canal	5433
	Pipe distribution	7968
e)	Annual O & M 1500/ ha of command (448340 ha)	6725
f)	Annual O & M charges of head works	21
	<b>Annual cost</b>	<b>102940</b>

### 1.20.2 Benefits from the project

The benefits from the link system include revenue from agriculture produce, irrigation service fee, domestic and industrial water supply, pisciculture and plantations on canal banks. The details are furnished below in **Table 1.10**.

**Table 1.10**  
**Annual Benefits of the Cauvery (Kattalai) - Vaigai - Gundar link project**

Sl No.	Component	Annual benefits (Rs lakh)	Remarks
1	Irrigation	428064	Secondary benefits such as Animal Husbandry are not included
2	Municipal	1580	
3	Industrial	101470	
4	Irrigation cess	6725	
5	Pisciculture	232	
6	Canal plantation	2035	
	<b>Total</b>	<b>540106</b>	

The benefit - cost ratio (BCR) and internal rate of return (IRR) of the Cauvery (Kattalai) - Vaigai - Gundar link project are worked out considering the annual cost and the annual likely benefits at 2019-20 price level for 100

years life of the project. The BCR is worked out as 5.25 and the IRR is worked as 38.18

### **1.21 Public cooperation and participation**

The project will provide impetus to all-round development of the region and reduce the socio-economic imbalance by enhancing agricultural production and employment opportunities. Hence, good co-operation and whole hearted participation is anticipated from the beneficiary areas. The link project has an added advantage of not having any major R&R problems as the existing Kattalai barrage is utilized as headworks barring some displacement due to land acquisition for canal. Moreover, it has been perceived while carrying out the topographical surveys that the farmers are in favour of such a large water resources project in the region keeping in view the chronic and continuous spell of droughts and ever-growing irrigation, domestic and industrial water needs in the region.

### **1.22 Provision for domestic and industrial water supply**

The link canal will provide 218 Mcum of water for domestic (79 Mcum) and industrial water supply (139 Mcum) to the enroute villages/towns lying in the command area in Karur, Tiruchirapalli, Pudukkottai, Ramanathapuram, Sivaganga, Virudhunagar and Thoothukudi districts of Tamil Nadu state.

### **1.23 Methodology**

The feasibility report of Cauvery (Kattalai) - Vaigai - Gundar link project prepared by NWDA in 2004 formed the basis for the preparation of detailed project report (DPR).

#### **1.23.1 Survey & investigations**

The topographical surveys were carried out earlier departmentally for preparation of the feasibility report of the link project. The same data has been used for preparation of DPR. The link alignment needs detouring at some places to avoid traversing through certain settlements and the same will be considered while firming up of final DPR along with complete Phase II of the

peninsular component. Topographical surveys were carried out based on the then prevailing guidelines, which are more conservative than the prevailing “Guidelines for Preparation of Detailed Project Reports of Irrigation and Multipurpose Projects” of Ministry of Water Resources (Now Ministry of Jal Shakti), Govt of India, 2010.

### 1.23.2 Special studies by other Agencies

Various other surveys and investigations required for preparation of DPR were got done through expert organizations/ outside agencies during preparation of the feasibility report as enumerated below in **Table 1.11** and the same results are considered in the report.

**Table-1.11**  
**Investigations carried out by other organisations /agencies**

Sl. No.	Survey/ Investigation	Organisation/Agency
1	Geological mapping and investigations	Geological Survey of India (GSI)
2	Geophysical surveys	College of Engineering (CoE), Pune
3	Geotechnical investigations	College of Engineering(CoE), Pune
4	Construction Material Investigations	CSMRS, New Delhi
5	Borrow area surveys	National Institute of Technology, (NIT), Tiruchirappalli

*CSMRS-Central Soil and Materials Research Station*

### 1.23.3 Technical studies

#### *Hydrological Studies*

The hydrological studies are carried out for the whole peninsular component. A part of the surplus water available through the nine link system from Mahanadi to Cauvery at Grand Anicut is planned to be diverted from Kattalai barrage by substitution, i.e. releasing the link waters from Grand Anicut to Cauvery delta and diverting a part of that water from Cauvery to Vaigai and Gundar. The transferable quantity is estimated at 2252 Mcum as per monthly demands.

### ***Irrigation planning and command Area***

The link is proposed to provide irrigation to an area of 4.48 lakh ha in Karur, Tiruchirappalli, Pudukkottai, Sivaganga, Ramanathapuram, Virudhunagar and Thoothukudi districts of Tamil Nadu. In all, 25 direct sluices and 12 branch canals are proposed all along the alignment to serve the intended area. The crop water requirements in the command areas are worked out by climatological approach considering the adopted cropping pattern in the feasibility report.

### ***Design of important project components***

The Kattalai barrage across Cauvery river is the headworks from where the 256.82 km long link canal takes off with FSL of 100.75m. The link canal is provided with several CD/ CM works enroute. The project involves design of i) Canal head regulator, ii) Tunnels and iii) Link canal sections and various CD/CM works. All the above designs have been carried out following the guidelines laid down in the respective BIS codes.

### ***Construction program, man-power and plant planning***

The details of construction programme, man-power deployment and plant planning are evolved keeping in view the construction period as five years and furnished in **Chapter 12: Construction programme, manpower deployment and plant planning.**

### ***EIA, EMP and Socio-economic survey***

These studies will be carried out through the expert agencies on consultancy basis after obtaining the approval for the proposed Terms of Reference (ToR) to take up the comprehensive EIA studies including socio-economic survey of the link project from Ministry of Environment, Forests and Climate Change (MoEF&CC). The details of the study will be incorporated later in the DPR.

The link project has no major proposed reservoir and there is no submergence of land or villages under head works. While fixing the canal alignment, due care has been exercised to avoid traversing through the



habitations to the extent possible. However, few villages need relocation along the alignment as new development has taken place at places along the alignment and the same will be avoided during implementation of the project by appropriately detouring the link alignment. These aspects are discussed in detail in **Chapter 10: Environmental, ecological and socio-economic aspects.**

### *Cost estimate*

The cost estimate has been prepared considering the quantities worked out based on the field surveys & investigations and the designs of various structures involved in the project. The estimates for the project are prepared based on the 'Guidelines for Preparation of Detailed Project Report of Irrigation and Multipurpose Projects' (2010) of the then Ministry of Water Resources (Now Ministry of Jal Shakti), Govt. of India. The cost estimates have been framed on the basis of latest available Schedule of Rates of WRD/PWD of various States and are brought to year 2019-20 price level with appropriate escalation.

### **1.23.4 Clearances required**

The Cauvery (Kattalai) - Vaigai - Gundar link project will require the clearances from the Govt. Departments/ Agencies as indicated below in **Table 1.12.**

**Table 1.12**  
**Clearances Required from Govt. Departments/Agencies**

Sl. No.	Clearance	Department/Agency
(i)	Techno-economic clearance	Central Water Commission/TAC, Ministry of Jal Shakti, Govt. of India
(ii)	Environmental clearance	Ministry of Environment, Forest and Climate Change, Govt. of India
(iii)	Forest Clearance	
(iv)	R&R plan of Tribal population	Ministry of Tribal Affairs (MoTA)

The above clearances shall be obtained by NWDA, as the project proponent, before taking up the implementation of the project.