

Chapter 1

Introduction

1.1 General

Water is the most essential natural resource next to air, required for sustaining life on the earth. It is required for drinking and industrial uses, for irrigation to meet the growing food and fiber needs, for power generation, navigation and recreation. The development, use and conservation of water, therefore, play a vital role in the country's development planning. The water resources in the country are, however, limited considering the future demands. The rainfall in the country is mostly confined to monsoon season and is unevenly distributed with respect to both space and time. As a result, some parts of the country are affected by frequent droughts at the same time other parts are affected by floods. Nearly one third of the country is drought prone. In the very near future, water will become a scarce resource due to increasing thrust of population and increasing demands for various uses. Therefore, it need not be emphasized that water should be harnessed in the most scientific and efficient manner.

The monsoon flood waters should be conserved to the maximum extent possible to meet the demands for irrigation, power generation, domestic and other uses. The water availability and requirements in the various river basins need to be assessed realistically. The reasonable basin requirements should be provided for and the surplus water, if any, should be transferred to the needy areas. The National Water Policy adopted by the Government of India in September, 1987 emphasizes that water should be made available to water short areas by transfer from other areas including transfers from one river basin to another, based on a national perspective.

1.2 National Perspective Plan for Water Resources Development

The erstwhile Union Ministry of Irrigation (now Ministry of Water Resources) and the Central Water Commission in the year 1980 formulated the National Perspectives for Water Resources Development, which comprises two main components, viz. Himalayan Rivers

Development and Peninsular Rivers Development. Himalayan Rivers Development envisages construction of storage reservoirs on the main Ganga and the Brahmaputra and their principal tributaries in India and Nepal alongwith 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. Peninsular Rivers Development of the National Perspectives Plan includes interlinking of major rivers flowing in the Peninsular India including the southern tributaries of Yamuna. The major parts of this components are (i) interlinking of Mahanadi-Godavari-Krishna-Pennar-Cauvery, (ii) interlinking of west flowing rivers, north of Bombay and south of Tapi, (iii) interlinking of Ken with Chambal and (iv) diversion of west flowing rivers. The interlinking of these rivers will envisage construction of storage reservoirs at potential sites and canal systems for transferring the waters from surplus to deficit basins/areas. The canals will also include tunnels and lifts, wherever necessary.

1.3 Aims of the Project & Description of Works

The Pennar (Somasila) – Palar - Cauvery (Grand Anicut) link forms a part of the scheme of transfer of the surplus waters of river Mahanadi and Godavari to the deficit basins of Krishna, Pennar, Cauvery and Vaigai is an important part of the various proposals for inter-basin water transfer under the Peninsular Rivers Development component of the National Perspective Plan.

The project envisages construction of a link canal from the existing Somasila reservoir across Pennar River in Andhra Pradesh to existing Grand Anicut across Cauvery River in Tamil Nadu.

The project comprises of the following components:

- i) A head regulator on the right side of existing head regulator for Kandaleru Flood Flow Canal with a design discharge capacity of 603.33 cumecs.
- ii) A 529.190 km long link canal taking off from the above head regulator with FSL at 95.420 m and designed capacity of 603.33 cumecs.

It is proposed to divert a quantity of 8565 Mm³ from Somasila reservoir through the proposed link canal. It is envisaged that this link canal will provide enroute irrigation to a culturable command area of 491200 ha

utilising 3048 Mm³ of water besides providing 1105 Mm³ of water for meeting domestic and industrial requirements enroute/Chennai city and 3855 Mm³ of water to meet the part demands of Cauvery delta and further diversion.

1.4 Description of the Project Area

1.4.1 Location

(a) Somasila dam

The Pennar (Somasila) - Palar – Cauvery (Grand Anicut) Link Project lies in Andhra Pradesh and Tamil Nadu states. The existing Somasila dam is located just down stream of the confluence of Cheyyeru River and Kallettivagu River with Pennar River. The dam is in Atmakur taluk of Nellore district in Andhra Pradesh state. The drainage area of Pennar basin up to the existing Somasila dam site is 50492.5 km².

The dam is accessible by road from Chennai, Nellore, the distances being approximately 210 km, 88 km respectively. Nellore is the nearest railway station located on Chennai - Vijayawada Broad Gauge line.

(b) Canal Head Regulator

The existing Kandaleru Flood Flow canal (KFFC) takes off from a head regulator located on the right bank of the dam. The North feeder canal takes off from the left bank of the dam. Considering the size, FSL and slope of the KFFC, it's head regulator cannot be used as the off-take of the link canal. Hence, it is proposed to have an independent off-take for the proposed link canal at a location just abutting the existing head regulator of KFFC on the right bank of the river. The proposed head regulator would have 5 bays of 3.0 m x 7.50 m each.

(c) The Link Canal

The Pennar (Somasila) - Palar – Cauvery (Grand Anicut) Link Project (PPC link) is proposed as a contour canal running for a total length of 529.190 km from Somasila dam to Grand Anicut. The link canal is proposed to pass through the Kaluvaya, Rapur, Dakkili, Venkatagiri mandals of Nellore district, Srikalahasti, Thottambedu, Pitchattur, Nagari mandals of Chittoor district of Andhra Pradesh state; Tiruttani taluk of Tiruvallur district; Arakonam taluk of Vellore district; Cheyyar and Vandavasi taluks of Tiruvannamalai district; Kancheepuram, Uthiramerur taluks of Kancheepuram district; Tindivanam, Gingee, Villupuram,

Tirukoilur taluks of Villupuram district; Ulundurpettai, Vridhachalam, Tittagudi taluks of Cuddalore district; Udaiyarpalayam, Ariyalur taluks of Perambalur district; and Lalgudi taluk of Tiruchchirappalli district of Tamil Nadu state.

(d) Grand Anicut

The Grand Anicut, the terminal regulating structure across Cauvery River is an existing project. It is located on the border of Tiruchchirappalli and Thanjavur districts of Tamil Nadu and is approachable by road from Thanjavur and Tiruchchirappalli towns.

1.4.2 Climate

The climate of the command area, through which the link traverses, is basically tropical in nature.

The mean daily maximum temperature in the command area ranges from 29.3°C to 37.5°C. During the hottest month, i.e., May, the temperature varies from 37.1°C to 37.5°C. Mean daily minimum temperature varies from 20.6°C to 26.5°C. During the coolest month, i.e., January, the temperature varies from 20.6°C to 20.9°C. The annual rainfall in the command area varies from 635 to 1019 mm.

1.4.3 Topography, Physiography and Geology of the Area

The initial reach of the link canal from RD 0 to 14 km mostly consists of forest areas of the Eastern Ghats. There after, the canal runs in plain area except at the crossings of ridges between various river basins enroute. Major soil types encountered along the alignment are black cotton and red sandy soils.

The link canal between RD 0.000 to 2.800 km cuts across the steep easterly dipping quartzite with phyllite inters calations of Bairenkonta Formation. The canal passes through talcose phyllities, micaceous schists and granite gneisses of Peninsular Gneissic Complex running almost collateral and closely to the eastern margin of Cuddapah basin, which has a thrust contact with the basement rocks of Archaean age. From RD 2.800 km to 200.125 km passes in basement gneisses, schists and other acid and alkali intrusive rocks with NNW-SSE to ENE-WSW trending foliation with easterly dips of more than 60°. In this reach the

rocks are inferred to have weathered to depths varying from 10 to 18 m from surface as observed from the local open wells.

In the reach between Palar and Cauvery rivers, the canal runs in Archaean terrain for 75% and the balance in Gondwana sediments like cretaceous, mio-pliocene (Cuddalore group) sediments.

Preliminary geo-technical appraisal studies carried out have revealed that no major adverse geological features encountered along the alignment and the proposed alignment is suitable prima facie.

1.4.4 Population

a) Affected & Benefitted

Since the Somasila reservoir already exists and will be used for storing the diverted waters from the upper links, no fresh area of submergence is anticipated.

b) Occupation

The human population in the command area is 46.80 lakh of which 28.41 lakh in urban. Considering Kancheepuram, the largest district lying in the command, as a representative district, out of the total workforce, 34% are agricultural workers, 16% are cultivators, 4% are workers of house hold industry, and 46% are other workers. Similarly, the people living in the districts situated further south, which will be benefited by the diverted water, are mainly dependent upon agriculture.

1.4.5 Natural Resources

No significant mineral resources available in the command areas. However, small traces of minerals like granite, quartz, lime shell, felspar, silica, laterite, etc. are indicated to exist in the command area. In the Neyveli area of Cuddalore district, Lignite deposits are also available.

1.4.6 Land use and Socio-Economic Aspects

The command area lies in the districts of Nellore, Chittoor, Tiruvallur, Kancheepuram, Vellore, Tiruvannamalai, Villupuram, Cuddalore and Pondicherry (U.T) and the gross command area of the project is assessed to be 840218 ha, of which the total cropped area is 485928 ha cultivated during south west and north-east monsoons. Apart from the

above, fallow land is estimated to be 138567 ha and forest area 33571 ha.

People comprising more than 35% of the population in the command area are dependent on agriculture. The literacy rate is less than 70%. More than 93% of the agricultural land holdings are small.

1.5 Choice of the Project

The water balance studies of the Pennar basin up to the Somasila dam site reveal that, at ultimate development by 2050 AD, there will be surface water deficit to an extent of 3822 Mm³ at 75% dependability. The river basins located south of Pennar basin viz. area covered by the streams between Pennar and Palar basins, Palar basin and area covered by streams between Palar and Cauvery basins are deficient in water resources. Similarly, basin in the northern side of Pennar basin viz., Krishna basin is also indicated to be deficit in terms of water resources potential. Hence, there is no scope of bringing water to Pennar and other basins south of Pennar indicated above from nearer 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 substantially surplus in water resources at its ultimate development scenario as per the water balance studies of NWDA. Hence, the only option available to meet the deficits of Pennar 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 Pennar (Somasila) – Palar – Cauvery (Grand Anicut) link, which takes off from Somasila dam to Grand Anicut, is a vital “Link” in the overall peninsular rivers link proposal from Mahanadi to Gundar.

1.6 Stages of Development of the Project

As mentioned above, the proposed link is an integral part of the Peninsular Rivers Development component under the NPP. As such, the link project has to be constructed and brought into operation together with its connected links from Mahanadi to Godavari, from Godavari to Krishna, from Krishna to Pennar. The construction work of this link project is proposed to be completed in ten years. It is proposed to complete all the preliminary works such as additional surveys, design studies, laboratory tests, construction of approach roads, etc. in the first

two years. The process of land acquisition and thereafter rehabilitation and resettlement, if any, procurement of machinery and T&P are proposed to be taken-up from the first year itself and can be completed by the end of third year. Construction of colonies and approach roads for the same and erecting of electric lines shall also be commenced from first year onwards. Construction of head regulator is to start from the fifth year and would be completed by the end of eighth year. The excavation of canals and construction of the cross drainage and cross masonry (CD and CM) works are proposed to commence from second year and to be completed by the end of tenth year. The lining work of the entire length of canal will be started in third year and the same will be completed by the end of tenth year. The distributory system as well as drainage including command area development are programmed to be taken-up simultaneously in the second year and can be completed by tenth year. The proposed diversion of waters towards Cauvery will be started by the end of tenth year.

1.7 Fitment of the Scheme in Overall Development of the Region

The Mahanadi - Godavari - Krishna - Pennar - Cauvery – Vaigai - Gundar link proposal will be a boon to the entire peninsular region covering the states of Orissa, Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu and Pondicherry (U.T.). The main aim of the project is to divert the waters from surplus basins to the deficit basins, for the overall development of the region and the Pennar (Somasila)-Palar-Cauvery (Grand Anicut) link project is proposed to serve as the carrier from Pennar to Cauvery to divert the surplus waters of Mahanadi and Godavari that would be brought by successive substitution and irrigating new areas enroute the link. Thus, the Pennar (Somasila)-Palar-Cauvery (Grand Anicut) link project forms an integral part of the whole Peninsular Rivers Development component and the enroute irrigation component of the link would enhance the overall development of the region.

1.8 Integrating the Scheme with Neighbouring Basin Schemes

The existing Somasila dam across Pennar and the Grand Anicut across Cauvery are proposed to be integrated with the proposed Pennar (Somasila)-Palar-Cauvery (Grand Anicut) link. It has been proposed to divert the flows to be delivered by the upper links (Srisaillam – Pennar link and Nagarjunasagar – Somasila link) at Somasila reservoir for

enroute irrigation, domestic and industrial water requirements enroute/Chennai city, and to meet the part requirement of Cauvery delta. The scheme proposes to bring about 491200 ha under irrigation in the Pennar delta sub-basin and basin areas covered by the streams between Pennar and Cauvery rivers. By providing outlets in the shape of escapes in the link canal at all the other important river crossings in between Pennar and Cauvery, the demands of downstream could be met with as and when required. Similarly, the needs of the water supply schemes enroute the canal could also be taken care of. Further, the existing command areas of Palar Anicut system, Tirukoilur Anicut system and Toludur Project could be integrated with this link canal for efficient use of water.

1.9 Inter-State/International Aspects

The Pennar (Somasila) – Palar - Cauvery (Grand Anicut) link lies in Andhra Pradesh and Tamil Nadu States. However, this link is an integral part of the Mahanadi - Godavari - Krishna - Pennar - Cauvery – Vaigai - Gundar link, which envisages transfer of surplus Mahanadi and Godavari waters that would be brought into the Krishna river to Pennar and from there to Palar, Cauvery, Gundar etc. Hence, a broad consensus amongst the states of Orissa, Maharashtra, Madhya Pradesh, Chhattisgarh, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala and Pondicherry has to be reached before taking up the project.

1.10 Cost and Benefits of the Scheme

The Pennar (Somasila) – Palar - Cauvery (Grand Anicut) link is an integral part of the Peninsular Rivers Development component under the National Perspective Plan proposals. The surplus flows of the Mahanadi and Godavari, to be received through the Inchampalli - Nagarjunasagar link are proposed to be diverted from Nagarjunasagar reservoir to the water-short Pennar and Cauvery basins. The diversion proposed through Pennar (Somasila)-Palar-Cauvery (Grand Anicut) link is by way of drawl of water to be delivered by the upper links at Somasila reservoir. As such, it will be more appropriate to assess the benefits of Pennar (Somasila) – Palar - Cauvery (Grand Anicut) link only after the overall economics of the entire inter Basin Water Transfer proposal under Peninsular Rivers Development i.e., Mahanadi - Godavari - Krishna - Pennar - Cauvery - Vaigai - Gundar link is finalised, since the benefits from this link project will be realised not only in area covered by the

streams between Pennar and Cauvery basins, but also in the basins of Pennar, Vaigai, Gundar and few other intermediate small basins. However, to reflect a broad general idea of the economic viability of the scheme, the B.C. ratio of this link has been estimated on the basis of apportioned cost (i.e. excluding 3855 Mm³, to be delivered at Grand Anicut) and benefits that accrue due to irrigation and water supply for domestic and industrial uses contemplated under the link.

While working out the total cost, cost of head works, link canal and cost of command area development are considered. The total cost is estimated to be Rs. Rs.6769 crore based on 2003-04 price level. The net annual benefits from irrigation for an area of 491200 ha have been worked out to be Rs. 871 crore and that of water supply for domestic and industrial uses to be Rs. 771 crore. The B.C. ratio works out to be 3.93.