

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, industrial use, irrigation, power generation, navigation and recreation. The development, use and conservation of water, therefore, play a vital role in the country's developmental 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 in space and time. As a result, some parts of the country are affected by frequent droughts whereas the other parts are affected by floods. Nearly one third of the country is drought prone. Water will become a scarce resource by the turn of the century due to increasing demands of water for various uses. Therefore, the water resources are to be harnessed in a scientific and efficient manner.

The monsoon flood waters should be conserved and utilised for irrigation, power generation etc. The water availability and requirements in the various river basins should be assessed realistically and the requirements should be met adequately. Thus the surplus water, if any, should be transferred to the needy areas. The National Water Policy evolved by the Government of India in 1987 lays emphasis on inter-basin transfer of water from water rich areas to water short areas.

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 Krishna (Srisailam) - Pennar Link

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

The aim of Krishna (Srisailam) - Pennar link is to transfer a part of the additional water available at Srisailam by partial exchange of the surplus waters of the Mahanadi and the Godavari rivers proposed to be brought to the Krishna river. The diversion of the water is proposed by utilising the existing Srisailam reservoir and Srisailam Right Main Canal (SRMC). The water will be drawn into SRMC through Pothireddipadu head regulator and is proposed to be let-off into Nippulavagu stream through the existing Banakacherla cross regulator and the escape channel. Thereafter, the water will reach the Pennar river through the natural streams of Nippulavagu, Galeru and Kunderu. The total length of the link canal is about 204 km out of which 180 km is through natural streams.

No irrigation is proposed enroute of this link, as the area in the vicinity of the conveyance system is being served/proposed to be served by the existing Kurnool-Cuddapah canal, ongoing Srisailam Right Branch Canal, Telugu Ganga and Mylavaram north canals.

1.4 Description of the Project Area

1.4.1 Location of Project Area

The Krishna (Srisaillam) - Pennar link canal lies entirely in Andhra Pradesh state. Srisaillam project was constructed by the Govt. of Andhra Pradesh for harnessing the waters of Krishna river for power generation. This project is located near the famous Srisaillam temple in Kurnool district. It is situated at about 100 km upstream of Nagarjunasagar dam and at a distance of about 200 km from Hyderabad. The dam is accessible by road from Markapur, Kurnool and Nagarjunasagar dam, which are about 95 km, 180 km and 220 km away respectively. Markapur is the nearest railway station and is located on Guntakal - Vijayawada MG line. The construction of the dam and power house have been completed and put to operation.

The Srisaillam Right Main Canal is constructed to carry water from Srisaillam reservoir through a deepcut across Mittakandala ridge. This canal irrigates areas in Kurnool and Cuddapah districts of the Rayalaseema region of Andhra Pradesh. The head works are located in the foreshore of Srisaillam reservoir near Pothireddipadu village of Nandikotkur taluk in Kurnool district. The head regulator is situated between Nandikotkur and Atmakur towns. The regulator is accessible from Kurnool by road and is located about 4 km to the left of the state highway connecting Kurnool - Guntur towns. The nearest railway station is Kurnool on the South - Central railway, which is about 44 km from the head regulator.

The additional water available in exchange at Srisaillam reservoir is proposed to be diverted through the head regulator at Pothireddipadu and Srisaillam Right Main Canal. At Banakacherla, on Srisaillam Right Main Canal, a system of three cross regulators is under construction, from which the right cross regulator regulates the flows into Srisaillam Right Branch Canal while the left one regulates the flow into Telugu Ganga Canal and the central cross regulator is for letting water into natural streams through an escape channel in case of emergency and during closure of canals. Banakacherla cross regulator system is situated at a distance of about 8 km from Atmakur town. The Banakacherla cross regulator is under construction near the village Kotta Banakacherla located to the right side at about 5 km away from the Kurnool - Guntur state highway connecting the towns Nandikotkur and Atmakur.

2310 Mm³ of water, proposed to be diverted from Srisaillam reservoir to Pennar will be let off into Nippulavagu stream using the central cross regulator at Banakacherla and escape channel. The water thus let off will be carried through the natural streams viz. Nippulavagu, Galeru and Kunderu and finally reaches the Pennar river near Elur village, upstream of Adinimmayapalli anicut. These natural streams flow entirely through Kurnool and Cuddapah districts. Two controlling structures are located on the natural streams viz., Santajutur anicut on Galeru river and Rajoli anicut on Kunderu river. The Santajutur anicut is located near Santajutur village on the right of the road connecting Atmakur and Nandyal towns about 22 km from Atmakur. The nearest railway station to Santajutur anicut is Nandyal on Guntakal-Vijayawada line. The Rajoli anicut on river Kunderu is located about 12 km west of the village Chagalamarri on the National Highway No.14 between Kurnool and Chittoor. The nearest railway station to this is Kamalapuram on Guntakal-Cuddapah line. These anicuts are presently used as part of Kurnool - Cuddapah canal system.

1.4.2 Climatic Conditions

The project falls in Kurnool and Cuddapah districts of Andhra Pradesh. The climate in the region may be divided into four seasons. The period from December to February is the dry, comparatively cool season. The summer season is from March to May which is followed by the south-west monsoon season from June to September. October and November constitute the post monsoon or the retreating monsoon season. The average annual rainfall in Kurnool district is 636 mm and the same in Cuddapah district is 747 mm. September is the month with highest rainfall. Variation in the annual rainfall from year to year is large.

In October and November, storms originating in the Bay of Bengal, sometimes cross the east coast of India and move in westerly to north-westerly direction across Peninsula and affect the area causing wide spread rain. Thunder storms occur in summer and post monsoon months.

1.4.3 Topography, Physiography and Geology

The project area lies between the Nallamala and the Erramala hills which constitute the principal hill ranges of Kurnool and Cuddapah districts. The river Kunderu rises on the westerly side of the Erramala, where an ancient tank called Kunducheruvu existed.

The entire region of the link canal is situated in Indian Peninsula and is a stable shield made up of the geologically ancient rocks. The oldest rocks exposed are a group of metamorphic rocks belonging to the Lower Pre-Cambrian or Archaean era and comprising quartzites, phyllites, schists and amphibolites.

1.4.4 Forest

The forest composition of the area stands in direct relation to the climatic conditions and the biotic influence in various locations. The major parts of the forest area are confined mainly to Nallamala including its extensions, Erramala and a part of Velikondas. The forests covering the Erramala and Velikondas are of inferior type. Bamboo with timber species occur over fairly extensive areas in the region. Tamarind and beedi leaves are the important minor forest products of the region.

1.4.5 Human Population

The population of Kurnool and Cuddapah districts as per 1991 census was 29.7 lakh and 22.61 lakh respectively. The density of population in Kurnool and Cuddapah districts was 168 per km² and 147 per km² respectively according to 1991 census.

1.4.6 Irrigation

The entire region of the project lies in the Rayalaseema zone which is prone to frequent famines and is comparatively imbalanced in its irrigation potential. This is considerably aggravated by the inadequate and uneven distribution of rainfall and its distressing climate. The major source of irrigation in the region is Kurnool - Cuddapah canal. The scenario will change once the Srisailem Right Branch Canal becomes operational, which has already been cleared by Central Water Commission and Planning Commission. The Telugu Ganga Canal which is under construction will further increase the irrigation potential in the area. Further the existing Kurnool - Cuddapah canal is being modernised, which will enable to bring more area under its command. Most of the area in the vicinity of the proposed Krishna (Srisailem) - Pennar link is proposed to be covered by these canal systems. In addition, many pump sets are also used for irrigating the areas adjacent to the natural streams.

1.5 Water Resources

a) Surface Water

Surface water balance studies in Krishna basin has been carried out upto Srisaillam dam site and for Pennar basin upto Somasila dam site. According to these studies, surface water balance available at these dam sites have been worked out after considering the future upstream demands upto 2025 AD. Details are given in Table 1.1.

Table 1.1
Surface water balance

Unit : Mm³

| basin/dam site | Water balance at | |
|------------------------------------|------------------|-----------|
| | 75% dep. | 50% dep. |
| Krishna basin up to Srisaillam dam | (+) 6017 | (+) 15047 |
| Pennar basin up to Somasila dam | (-) 3820 | (-) 3590 |

It can be seen that the surface water available at Srisaillam dam at 75% dependability is 6017 Mm³, out of which it is proposed to divert 2310 Mm³ to the river Pennar. However, this diversion is in exchange of the water brought from Mahanadi and Godavari to the river Krishna.

b) Ground Water

The details pertaining to the ground water particulars in Kurnool and Cuddapah districts as on March, 1993 are given in Table 1.2.

Table 1.2
Groundwater particulars in Kurnool and Cuddapah districts

| District | Utilisable Ground water (Mm ³ /year) | Net Draft (Mm ³ /year) | Balance (Mm ³ /year) | Level of Groundwater Development (Percentage) |
|----------|--|--------------------------------------|------------------------------------|--|
| Kurnool | 980.43 | 172.02 | 808.41 | 18 |
| Cuddapah | 898.63 | 314.85 | 583.78 | 35 |

Source : Central Ground Water Board

It can be seen that abundant groundwater potential is still available for development in these two districts.

c) Soils

The region is rich in black (regur) and red ferruginous soils, each being sub divided into clay, loam and sand. The soils are of metamorphic lime stone, slate, quartzite varieties of great minerological value. The pure black soil is very fertile and highly retentive of moisture, while the mixed black soils stand next to infertility. These soils, however, require manuring for high yielding of crops. The red soils are generally poor in fertility. However, some crops can be successfully grown even with minimum rainfall. According to the state Agricultural department, the black soils found in the area respond well to combined application of Nitrogen and Phosphorus and give maximum yield. Jowar is widely grown in the area under rainfed conditions and cotton is also grown as it suits the black soils present in the area.

1.6 Choice of the Project

Various alternatives were studied to transfer water from Krishna to Pennar with Srisaillam reservoir as off-take point. As the Gandikota reservoir was shelved due to various reasons, the Srisaillam - Mylavaram link canal was proposed and was studied in detail. The Srisaillam - Mylavaram link canal for most of its length runs parallel to the ongoing Srisaillam Right Branch Canal.

Subsequently, the link alignment was modified and it was proposed to utilise the natural streams of Nippulavagu, Galeru and Kunderu for the water transfer. An anicut was proposed at Proddatur on Pennar river and an independent link canal was proposed from Rajoli anicut on Kunderu river to Proddatur anicut. The pre-feasibility report of the Krishna (Srisaillam) - Pennar (Proddatur) link was prepared accordingly. Now, it is proposed to transfer the water entirely through natural streams and the study has been carried out accordingly. It is found that this proposal is more attractive than all other proposals studied earlier.

1.7 Stages of development of the Project

As there is no irrigation enroute the link canal and the transfer is through natural streams, the scheme can be executed in single stage.

1.8 Inter-state Aspects

The Krishna(Srisaillam)-Pennar link project lies entirely in the Andhra Pradesh State. However, this link is an integral part of the main 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, Vaigai etc. Hence, a broad consensus amongst the states of Orissa, Maharashtra, Madhya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu and Pondicherry has to be reached before taking up the project. More details about interstate aspects are given in Chapter on “Inter-state aspects”.

1.9 Cost and Benefit of the Scheme

The Krishna (Srisaillam)-Pennar link is the integral part of the Peninsular Component under the National Perspective Plan. The surplus flows of Mahanadi & Godavari rivers to be received in Krishna basin through the links proposed between Godavari & Krishna are proposed to be diverted by exchange from Srisaillam reservoir through Krishna (Srisaillam)-Pennar link for onward use in Pennar, Cauvery & Vaigai basins. As such B.C. ratio for the Krishna (Srisaillam)-Pennar link has been worked out, considering the benefits of power generation enroute and the cost of the development of hydel schemes and conveyance system which works out to 2.50.

The estimated cost of the project is Rs. 81.29 crore based on 1998-99 schedule of rates.