

## **Chapter - 2**

### **Physical features**

#### **2.1 Geographical Disposition**

The Krishna (Almatti) – Pennar link canal off-takes from the Almatti dam, located across the Krishna River near Almatti village in Karnataka State. The canal is proposed to run through Raichur and Bellary districts of Karnataka and Anantapur district of Andhra Pradesh. The canal alignment passes through Middle Krishna, Tungabhadra and Vedavathi sub-basins of the Krishna basin and Upper Pennar sub-basin of Pennar basin.

The link canal is 587.175 km long, and It off-takes from the right bank of Almatti Reservoir with a full supply level of 510.00 m. It joins the proposed Kalvapalli Reservoir at RD 386.40 km and the existing Bukkapatnam tank at RD 536.20 km and finally outfalls into Maddileru river near Malkavemula village in Pennar basin at RD 587.175 km. The major rivers that would be crossed by the canal are Malaprabha, Tungabhadra and Vedavathi. The canal crosses the Tungabhadra River just downstream of the Tungabhadra dam. The districts that would be benefited by the link canal through enroute irrigation are Raichur and Bellary in Karnataka and Anantapur in Andhra Pradesh.

#### **2.2 Topography of the Basins**

##### **2.2.1 Krishna Basin**

The Krishna basin is bounded on the north by the common ridge separating it from Godavari basin, on the south and east by Eastern Ghats, and on the west by Western Ghats. Except for the hills forming the watershed around the basin, the entire drainage basin of the river comprises rolling and undulating country and soils of ridges and valleys interspersed with low hill ranges. Vast flat areas as seen on the Indo-Gangetic plains are scarce except on the deltas. The basin is approximately triangular in shape with its base along the Western Ghats, the apex at Vijayawada and the river Krishna itself forming the median.

The interior of the basin is a plateau, the greater part of which is at an elevation of 300 to 600 m. Its general slope is eastwards. Great undulating plains divided from each other by flat-topped ranges of hills

are the chief gravitensites of this plateau. The hillsides are marked by conspicuous wide terrain except in the southern part of the plateau where the hills are frequently crowned with great 'tors' or rounded hummocks of bare rock as the result of constant weathering.

### **2.2.2 Pennar Basin**

The Pennar basin is a fan shaped basin and is bounded on the north by Erramala range, on the east by the Nallamala and Velikonda range of Eastern Ghats, on the south by the Nandidurg hills and on the west by the narrow ridge separating it from Vedavathi valley of the Krishna basin. The other hill ranges in the basin to the south of the river are the Seshachalam and Paliconda ranges. Its maximum length east to west is 433 km. The maximum width of 226 km from north to south is attained in the middle of the basin.

There are a number of hills and peaks of varying heights in the Pennar basin. A few notable hill ranges are Nallamala on the east of the basin, Erramala on the north, Paliconda ranges on the south of the river. The highest hill appears to be Horsely hill with an altitude of 1314 m. The interior of the Pennar basin has long ridges with isolated hills and small streams.

## **2.3 Geology of the Basins**

### **2.3.1 Krishna Basin**

The Krishna basin consists largely of Archean formations, part of which are covered by Deccan trap lavas, Cuddapah and Vindhya basins and faulted blocks of Gondwanas. Hydro geological investigations for assessment of ground water potential in Krishna basin have been carried out by the Ground Water Departments of the respective States and the Central Ground Water Board (CGWB). These studies indicate that ground water occurs in all geological formations and the occurrence and maintenance of ground water in these rocks are controlled by the nature and the extent of weathering and presence of joints and fractures. In areas underlain by crystalline rocks like granites, the quality of water is unsuitable for domestic purposes due to the presence of fluorides in excess of the prescribed safe limits.

### 2.3.2 Pennar Basin

The basin consists mainly of red, black, sandy and mixed soil. The important rock formations are hard or crystalline rocks of Archean age Dharwar Super Group, Cuddapah series of rocks belonging to Proterozoic age, soil comprising of Guvalacheruvu quartzite, Vempally dolomites, lime stones and shales of Papagni series and Cheyyeru series. The Nallamala series comprise of cumbum shales, which are metamorphosed to slates and phyllites.

## 2.4 River System and Catchment Area

### 2.4.1 Krishna Basin

The river Krishna is the second largest east flowing river in the peninsular India, which drains into Bay of Bengal. The river rises in the Mahadev range of the Western Ghats near Mahabaleshwar at an altitude of about 1337 m and flows through the States of Maharashtra, Karnataka and Andhra Pradesh. The total length of the river from source to its outfall into Bay of Bengal is about 1400 km, of which 305 km is in Maharashtra, 483 km in Karnataka and 612 km in Andhra Pradesh. The important tributaries of Krishna are Bhima, Ghataprabha, Malaprabha, Tungabhadra, Musi, Palleru and Muneru.

The Krishna basin extends over an area of 258948 km<sup>2</sup>, which is nearly 8% of the total geographical area of the country. State-wise break up of the drainage area of Krishna basin is given in Table 2.1.

**Table 2.1**  
**State-wise drainage area of the Krishna basin**

Sl.No.	Name of the State	Drainage area (km <sup>2</sup> )	Percentage to total basin area (%)
1.	Maharashtra	69425	26.80
2.	Karnataka	113272	43.80
3.	Andhra Pradesh	76251	29.40
	<b>Total</b>	<b>258948</b>	<b>100.00</b>

### 2.4.2 Pennar Basin

The Pennar River is one of the major rivers of the Indian peninsula flowing eastwards and draining into the Bay of Bengal. The Pennar River rises in Chennakesava hills of the Nandidurg range in Kolar district of Karnataka state. The total length of the river from the

source to its outfall into the sea is 597 km, of which about 61 km is in Karnataka and the remaining 536 km is in Andhra Pradesh. Important tributaries of the Pennar river are Jayamangali, Chitravati, Kunderu, Papagni, Sagileru, Cheyyeru and Buggeru.

The basin area lies in the States of Karnataka and Andhra Pradesh. State-wise break up of the drainage area of Pennar basin is given in Table 2.2.

**Table 2.2**  
**State-wise drainage area of the Pennar basin**

<b>Sl.No.</b>	<b>Name of the state</b>	<b>Drainage area (km<sup>2</sup>)</b>	<b>Percentage to total basin area (%)</b>
1.	Karnataka	6937	12.60
2.	Andhra Pradesh	48276	87.40
	<b>Total</b>	<b>55213</b>	<b>100.00</b>

## **2.5 Basin Characteristics**

### **2.5.1 Krishna Basin**

#### **2.5.1.1 Rainfall**

The catchment mainly experiences the south-west monsoon from mid June to mid October. The rainfall in non-monsoon period is not significant. The annual rainfall over the catchment varies from 377 to 3048 mm.

#### **2.5.1.2 Temperature**

The climate of the basin remains dry except in the monsoon months. From the climatological data observed at various IMD stations, it is seen that the mean daily maximum temperature in the basin varies from 27.7° to 40.4° C and the mean daily minimum temperature varies from 20.6° to 27.2° C.

#### **2.5.1.3 Relative Humidity**

In general, humidity is high during the monsoon period and comparatively low during the post monsoon period. In summer the weather is dry and the humidity is low. The relative humidity in the basin ranges from 17 to 92 percent.

#### **2.5.1.4 Wind Speed**

Wind velocity is generally low and increases during the later half of the summer. The catchment is influenced by winds from the south-west monsoon season. In the post monsoon season, they blow from north-west to north direction. In the winter season the winds blow from north-west and south-west direction. The mean wind speed in the basin varies from 4.0 to 21.7 km/hr.

#### **2.5.1.5 Cloud Cover**

Generally, the sky is heavily clouded during the monsoon season. During the post monsoon months, the cloud cover decreases. The rest of the year, the sky is clear or partially clouded. The cloud cover in the basin varies from 0.8 to 8.0 oktas.

### **2.5.2 Pennar Basin**

#### **2.5.2.1 Rainfall**

The catchment receives rainfall, both during the south-west and north-east monsoon. The rainfall during the non-monsoon period is not significant. The normal rainfall over the basin varies from 550 to 900 mm.

#### **2.5.2.2 Temperature**

People in Pennar basin area experiences cool and hot weather. In the cool weather, the temperature falls as one advances from Nellore towards Kurnool. The mean maximum and mean minimum temperature are 34.6° C and 15.2° C respectively at Cuddapah and Arogyavaram. During hot weather, the mean maximum and the mean minimum temperature at representative places like Cuddapah and Arogyavaram are 40.9° C and 16.9° C, respectively.

#### **2.5.2.3 Relative Humidity**

In general, the humidity is high during the monsoon period and moderate during the non-monsoon period. The relative humidity in the catchment ranges from 21 to 84 percent.

#### **2.5.2.4 Wind Speed**

Wind velocity is generally low to moderate and increases in monsoon season. The catchment is influenced by winds from south-west and north-west during the period from May to September and by winds from north-east and south-east during the period from October to April. The average wind speed in the catchment varies from 4.3 to 21.3 km/hr.

#### **2.5.2.5 Cloud Cover**

Generally, the sky is heavily clouded during the monsoon period. During the post monsoon period, the cloud cover decreases and the rest of the year, the sky is clear or partially clouded. The cloud cover in the catchment ranges from 1.3 to 7.1 oktas.

### **2.6 Characteristics of the Command Area**

The command area of the link canal is spread over Raichur and Bellary districts of Karnataka State and Anantapur district of Andhra Pradesh. The climate of command area is characterised by oppressive hot weather during summer. The area is particularly dry especially in Bellary and Anantapur districts, which experience severe heat wave. The major part of the command area receives its rainfall from the south-west monsoon followed by retreating monsoons during October and November.

The predominant rock groups found in command area are the Archeans and Dharwars. The Archeans consist of Peninsular gneisses and closepel granites while Dharwar system is composed mainly of a complex series of crystalline schists, igneous rocks and sedimentary rocks like quartzites, conglomerates, limestones, etc. As per the records of studies conducted by Ground Water Resources of India during 1970 for Anantapur district, it is revealed that ground water is being developed from granites, gneisses and schists, and ground water potential in the area is generally poor and highly variable. The quality of ground water is generally good and fit for irrigation.

The soils of the command area consist mainly of red, black and mixed soils. Red loamy soils have developed from granite-gneissic complex and at times from quartzites and coarse-grained stones. Black cotton soils are gray to dark brown in color. At present, irrigation to the crops

is provided from the wells and tanks in the proposed command area of the link project.

The food crops usually grown in command area are paddy, jowar, maize, ragi, millet, groundnut and oil seeds. There are two main crop seasons, the kharif and the rabi. The kharif crops are paddy, millets, pulses and groundnut. Rabi crops are chilli, garlic, onion, cotton, and oil seeds.