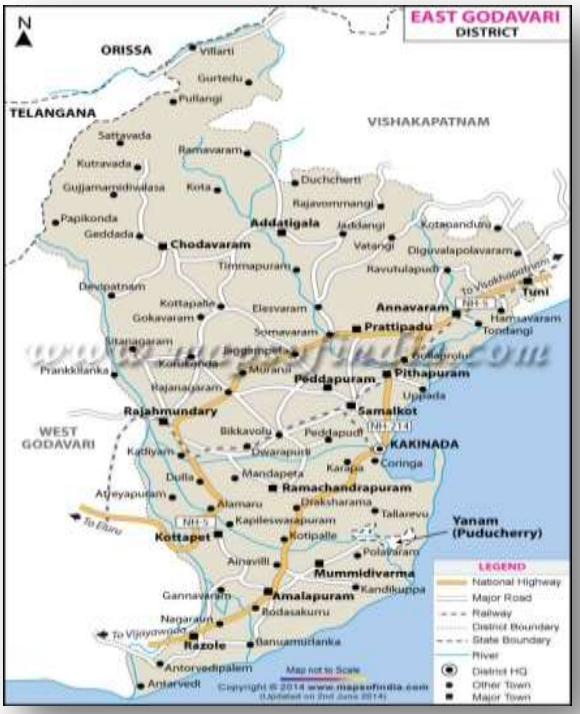
A BRIEF REPORT ON

HYDROLOGICAL ASPECTS OF EAST GODVARI DISTRICT, A COASTAL DISTRICT IN ANDHRA PRADESH

(For fulfilment of the Course on "International Distance Learning Program in HYDROLOGY- Basic Hydrological Sciences", organised by NWA, PUNE during 16th October to 30th November 2017)



BY

VIJAY TEEPARTHI
DELTAIC REGIONAL CENTRE
NATIONAL INSTITUTE OF HYDROLOGY
KAKINADA
ANDHRA PRADESH
NOVEMBER 2017

e-mail: vijayt.nihr@gov.in

INTRODUCTION

In this Assignment, the Hydrology and Hydrological problems related to East Godavari District, a coastal area of Andhra Pradesh are discussed. The district is having major Hydrological problems like Sea water intrusion, Sea coast erosion, Urban runoff, Sand mining in Rivers and Water quality issues.

DESCRIPTION OF THE STUDY AREA:

The East Godavari District of Andhra Pradesh has a coast length of 974 km. lying on the East coast of India with Bay of Bengal one side and Eastern Ghats on the other side as boundaries and having the Coastal Plains in between with fertile alluvium soils. The district lies between 16 ^{0}30' N to 18^0 20' N Latitude and between 81^0 30' E to 82^0 30'E Longitude. The capital of the district is Kakinada. The general elevation of the district varies from a few feet near the sea to 1500m at the hills of Eastern Ghats.

The District is traversed by many water courses, like River Godavari, River Pampa, Yeleru, Tandava etc and number of tanks in almost all villages. It is a rice bowl of Andhra Pradesh, due to its potential availability of water resources and the fertility of the land. The major dam on Godavari River was constructed by Sir Arthur Cotton, a British Engineer, 150 years ago and it is called Dowleswaram Anacut. After this barrage, river Godavari bifurcates into 3 branches, namely Gautami, Vasista and Vynateyam. The State's major Polavaram project is coming up in the upstream of this barrage to control the excess water which is joining the sea.

CLIMATE OF THE DISTRICT

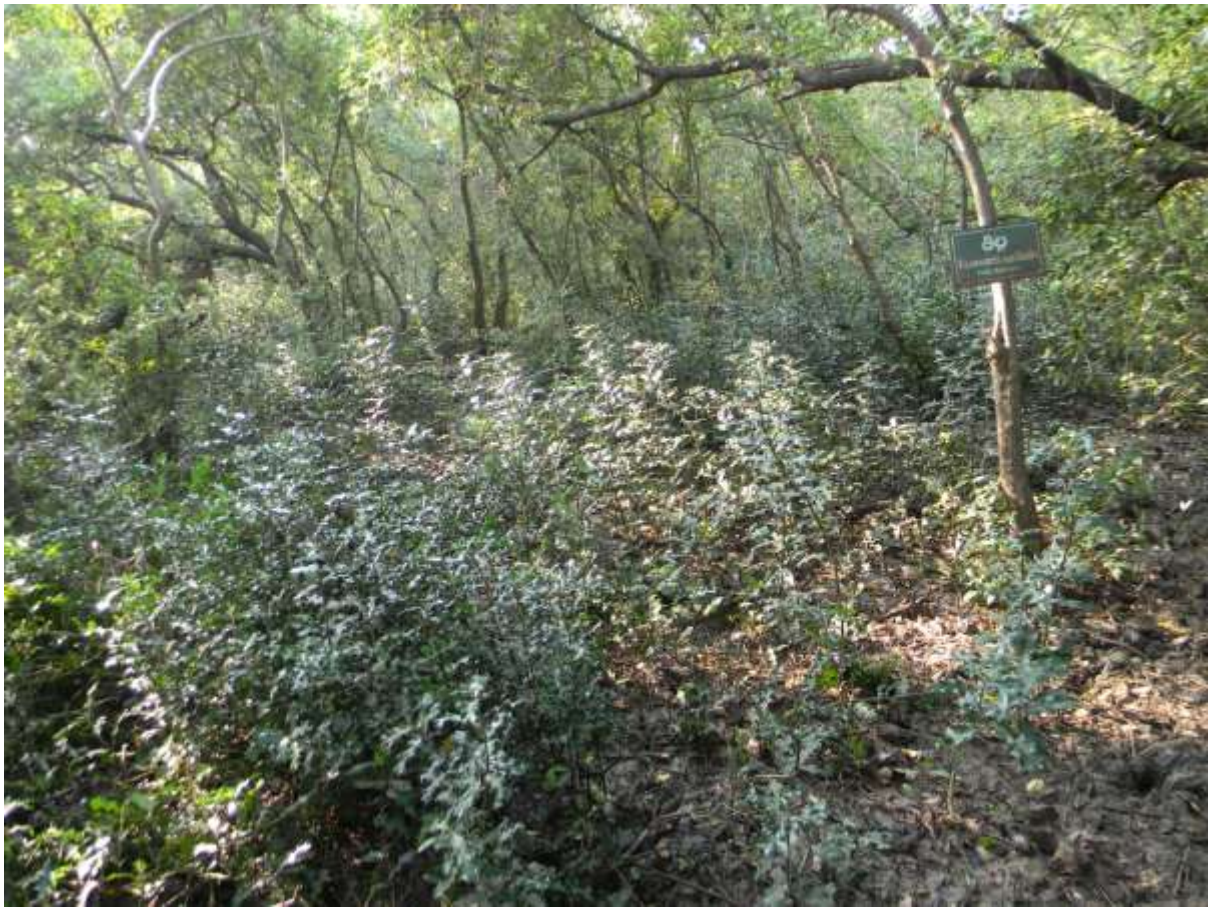
The average annual rainfall of the district is 1100 mm. In winter the minimum temperature is around 16^0 C and in summer the mercury touches 46 ^{0}C. Because of the sea coast, the relative humidity reaches up to 95%. The average evaporation rate varies from 3mm to 9mm/day.

There is a sand spit, naturally formed in Bay of Bengal, called Hope Island, just 20 to 30 kms from Kakinada sea shore aerially. This area is famous for the Mangrove forest near Korangi village, is having a variety of species of flora and fauna and animals.

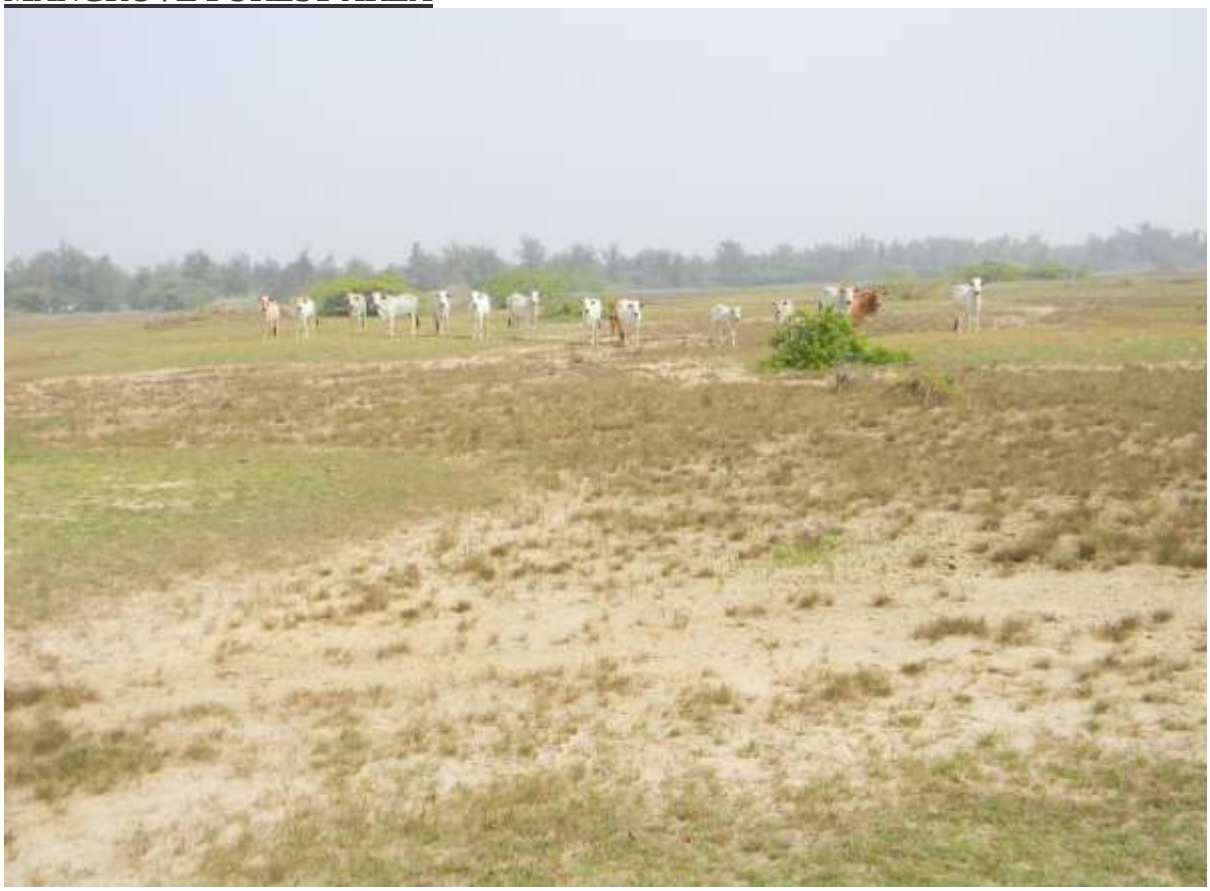
Because of the Hope Island and mangrove forests, Kakinada is being protected from the tsunamis and heavy cyclones. The tidal action near Kakinada coast is very less predominant due to this island. But the wave action is very severe at Uppada beach, just 15 kms from Kakinada beach and this area is facing lot of wave action eroding the coast and built up area of the village. Geo synthetic tubes and Boulder Packs were laid along the coast but all are washing away within few years.

EAST GODAVARI DISTRICT AT A GLANCE

Geographical Areas	10,818 sq. km
GEOMORPHOLOGY	Major Physiographic Units : Deltaic Plain Upland Region Hilly Region
LAND USE (Area in Ha.)	Forest Area : 3,23,244 Net Area Sown : 419433 Cultivable waste : 16886
SOIL TYPE	Clayey Soil Deltaic Alluvial Soil Coastal Sandy Soil Lateritic Soil
GEOLOGICAL FORMATIONS	Recent : Alluvium Sub-recent : Laterite Miocene : Rajahmundry Sandstones Eocene : Deccan Traps Jurassic : Tirupati Sandstones Archaean : Migmatites Charnockites Khondalites
HYDROGEOLOGY	Water Bearing Formations : Hard Rock : Granitic gneisses, Charnockites, Khondalites & Basalt Soft Rock : Sandstones, Alluvium



MANGROVE FOREST AREA



A VIEW OF CATTLE GRAZING ON THE HOPE ISLAND

HYDROLOGICAL PROBLEMS OF THE DISTRICT

Though, sea is very nearer to the coast of the district, some parts are not affected by sea water intrusion as there is a predominant recharge is occurring to the groundwater due to the heavy rains in monsoon seasons and the cyclonic storms. The backwater through the streams and rivers, aquaculture practices, excessive pumping of groundwater are the main sources of salinity contamination in the shallow aquifers of Konaseema area. The ground and surface water is also deteriorating due to industrial effluents, poorly treated sewage, irrigation return flows, and unsatisfactory household and community sanitary conditions. Water resources management requires a holistic and integrated view that considers the surface and groundwater together. There is need to promote the integration of all aspects of planning, management and protection of water resources by developing plans which aim to satisfy basic needs and promote equitable and effective distribution of water resources, ecosystem protection and maintenance of the water cycle.

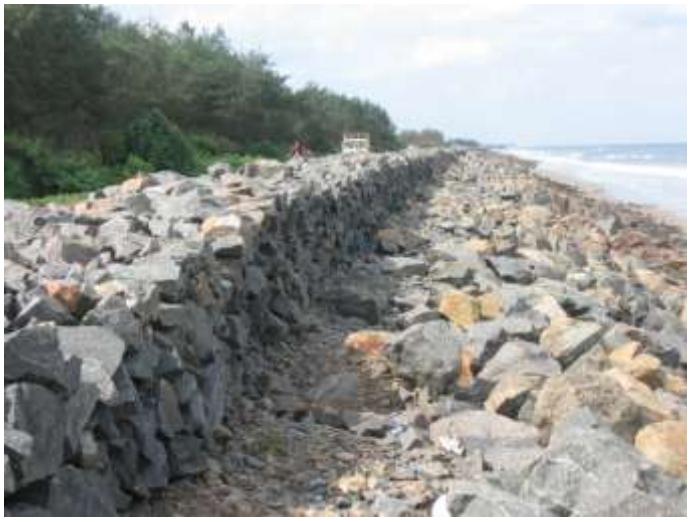
Sand mining in the Rivers is a big issue in the district. Indiscriminate mining of sand in the rivers reduces the ground water recharge. This leads to the decline of groundwater table drastically in the areas near the river banks.

The ground water is fit for drinking as far as considering for Physical and Chemical properties, but in some areas, it is affected by the pathogens due to the shallowness of the water table, and lack of proper draining system in the district. The water table varies from few feet in coastal areas to hundreds of feet in the upland areas.

The Kakinada city is prone to urban flooding due to the low elevation wrt to msl and gentle slope. Due to present urbanisation and industrialisation the city has no place for groundwater recharge, particularly during heavy rains of monsoons and cyclones. Urban flooding is a common phenomenon for Kakinada city, as the drains and natural channels were choked or closed due to the urbanisation. This urban flooding has a great impact on the ground water as well, as the shallow ground water is contaminated due to water logging and reaching of the organic waste into the ground water. So, the ground water in the coastal areas, are more prone to bacteriological contamination due to shallowness. So most of the villages and cities are dependent on the Godavari River Water.

A VIEW OF HOPE ISLAND PROJECTING INTO BAY OF BENGAL
AND MANGROVE FOREST

EFFECT OF BEACH EROSION IN UPPADA VILLAGE



ROCK PACKING NEAR SEA COAST TO PROTECT EROSION IN UPPADA

SALIENT FEATURES OF POLAVARAM PROJECT:

The Polavaram Project is another major project in the East Godavari/West Godavari district located on the river Godavari, near Polavaram village about 34 KM upstream of Kovvur and 42 KM upstream of Sir Arthur Cotton Barrage, where the river emerges out of last range of the Eastern Ghats and enters the plains. The longitude and latitude of the Project site are 81^0 39' 46" E and 17 ^{0}16' 53" N respectively. The Polavaram Project is contemplated as Multi-purpose Project envisaging Irrigation benefits to an extent of 7.20 Lakhs acres for the upland areas of East Godavari, Visakhapatnam Districts under Left Canal and West Godavari, Krishna Districts under Right Canal and generation of 960 MW Hydro Electric Power. In addition, this project under its left canal envisages 23.44 TMC of Water supply for industries in Visakhapatnam Township and Steel Plant, besides domestic water supply to villages and towns en route and diversion of 80 TMC. of water through the right canal to Krishna river to augment the supplies of Krishna Basin and indirect benefits such as development of Pisciculture and providing recreation and other benefits besides urbanisation etc.

POLAVARAM PROJECT

1.	1)	AYACUT	:	2.91 lakh hectare (7.20 lakh acre)
	2)	DEMAND	:	273.034 TMC
	3)	DISCHARGE	:	Right Main Canal - 397.10 cumec
			:	Left Main Canal - 230 cumec
2.		MINIMUM DRAW DOWN LEVEL	:	+ 41.15 m (+135.00 ft)
		i) LONGITUDE	:	81^{0}46'-00'' E
		ii) LATITUDE	:	17^{0}13'-00'' N
3.		HYDROLOGY		
		i) CATCHMENT AREA	:	3,06,643 sq.km.
		ii) DESIGNED FLOOD DISCHARGE	:	1,41,435 cumec (49.93 lakh cusec)
		iii) MAXIMUM OBSERVED FLOOD DISCHARGE AT POLAVARAM PROJECT (1986)	:	0.87 lakh cumec 30.81 lakh cusec
4.		COMPONENT WORKS		
		i) LENGTH OF EARTH CUM ROCK FILL DAM	:	2310 m
		ii) LENGTH OF SPILLWAY ON RIGHT FLANK INCLUDING END PIERS	:	906.50 m
		iii) POWER HOUSE ON LEFT FLANK	:	12 units each of 80 MW
		iv) LENGTH OF LEFT MAIN CANAL	:	181.50 km
		v) LENGTH OF RIGHT MAIN CANAL	:	174.00 km
5.		DAM & APPURTENANT WORKS		
		i) FULL RESERVOIR LEVEL	:	+ 45.72 m (+150.00 ft)
		ii) M.D.D.L	:	+ 41.15 m (+135.00 ft)
		iii) GROSS STORAGE AT FRL	:	5.511 TMCm (194.60 TMC)
		iv) STORAGE AT MDDL	:	3.381 TMCm (119.40 TMC)
		v) LIVE STORAGE ABOVE MDDL	:	2.13 TMCm (75.20 TMC)

	A)	EARTH CUM ROCK FILL DAM ACROSS THE RIVER		
		i) LENGTH (IN GAP GG')	:	1,750 m (5742 ft)
		ii) LENGTH (IN GAP G'D)	:	560 m (1837 ft)
		iii) T.B.L	:	+ 53.32 m (+175 ft)
		iv) TOP WIDTH	:	12.50 m (41 ft)
		v) DEEP BED LEVEL	:	+3.00 m (10 ft)
	B)	SPILLWAY ON RIGHT FLANK		
		i) DESIGNED FLOOD	:	1,41,435 cumec (49.93 lakh cusec)
		ii) TOP LEVEL OF GATES	:	45.72 m
		iii) CREST LEVEL	:	25.72 m

		iv) NO & SIZE OF GATES	:	44 Nos.; 16 m X 20 m
6)	A)	CANALS:		
		LEFT MAIN CANAL (LINED)		
		i) LENGTH OF MAIN CANAL	:	181.50 km
		ii) FULL SUPPLY DISCHARGE	:	226 cumec
		iii) FS DEPTH AT START	:	4.27 m
		iv) F.S.L. AT START	:	+ 40.54 m (+133 ft)
		v) BED WIDTH	:	51.50 m
		vi) BED FALL	:	1 in 20,000
		vii) AYACUT	:	1.62 lakh hectare (4.00 lakh acre)
		viii) WATER DEMANDS a) IRRIGATION	: :	 84.808 TMC
		b) WATER SUPPLY TO VIZAG	:	23.44 TMC
	B)	RIGHT MAIN CANAL (LINED)		
		i) LENGTH OF MAIN CANAL	:	174 km
		ii) F.S.DISCHARGE	:	342 cumec
		iii) F.S.L	:	+ 40.232 m
		iv) BED WIDTH	:	56 m
		v)F.S. DEPTH AT START	:	5.00 m
		vi) BED FALL	:	1 in 20,000
		vii) AYACUT	:	1.29 lakh hectare (3.2 lakh acre)
		viii) WATER DEMANDS		
		a) IRRIGATION	:	80.09 TMC
		b) DIVERSION TO KRISHNA BASIN (INCLUDING	:	84.70 TMC
7.		WATER DEMAND FOR THE PROJECT		
		i) LEFT MAIN CANAL	:	84.808 TMC
		ii) WATER SUPPLY TO	:	23.44 TMC 273.038 TMC
		iii) RIGHT MAIN CANAL	:	80.09 TMC
		iv) DIVERSION TO KRISHNA INCLUDING	:	84.70 TMC
		i) ALLOCATION TO CHATTISGARH &	:	6.50 TMC
		ii) REQUIREMENT OF GODAVARI DELTA	:	266.30 TMC
		iii)SAMLKOT CANAL	:	8.27 TMC
		TOTAL	:	554.108 TMC