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An Overview of the Water Resources in Karnataka

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ABSTRACT: In large parts of the world, the fresh water resources which can be used for domestic, industrial and agricultural purposes are quite limited. Therefore water resources management has become a public and popular topic in India as well in Karnataka. The Karnataka State is the eighth largest state in the Country and is located in the Deccan Plateau. Agriculture is the main occupation of the State. Irrigation place utmost significant part in obtaining increased yields from the land. The development of irrigation in the State was slow and unsystematic during the pre independence era. However, Groundwater contamination is a serious, but relatively ignored issue in the state. This paper presents the overview of various water resources and the key issues of water demand and supply gap in Karnataka.

Keywords: Population, surface water, ground water, demand, supply, substantial, rainfall.

I. INTRODUCTION

Karnataka is situated in the south western region of India. It is one of the most prosperous states in India. Karnataka has made tremendous progress in the fields of education, industry, agriculture, literature and tourism. Bengaluru is the capital of Karnataka. Bengaluru is known as the Silicon Valley of Asia due to its flourishing Information Technology industry. In Karnataka with development, the demand for water is increasing both in urban and rural areas. This may create increased tension and dispute between these areas for sharing and command of water resources. The emerging scarcity of water has also raised a host of issues related to the sustainability of the present kind of economic development, sustanious water supply, equity and social justice, water financing, pricing, governance and management.

II. NEED AND SIGNIFICANCE OF STUDY

Karnataka accounts for about six percent of the country's surface water resources of 17 lakh million cubic meters. With rapid growing population and improving living standards the pressure on the water resources is increasing and per capita availability of water resources is reducing day by day, it has become an important and dependable source of water supplies in all climatic regions including both urban and rural areas of developed and developing countries. Of the 37Mkm^3 of freshwater estimated to be present on the earth, about 22% exists as groundwater, which constitutes about 97% of all liquid freshwater potentially available for human use.

III. OBJECTIVE OF STUDY

The objectives of study are as following:
(a) To study the Current status of water resource in Karnataka
(b) To study Demand for water (current and next 10 years)
(c) To study the Supply demand gap for water (current and next 10 years)

IV. WATER RESOURCES IN KARNATAKA

Water resources of Karnataka primarily constitute surface and groundwater. Rainfall is the basic source of water in the state.

A. Surface water

It is available in Karnataka in the form of rivers, lakes, waterfalls, reservoirs, etc. Karnataka has surface water potential of around 102 km. Being the seventh largest state in India (area-wise), Karnataka possesses about six percent of the country's total surface water resources of about 17 lakh million cubic metres (Mcum). Karnataka is blessed with seven river basins. There are 36,753 tanks in the state and they have a capacity of about 684518 hectares. The rivers, along with their tributaries, account for much of Karnataka's surface water resources. About 60 percent of the state's surface water is provided by the west flowing rivers while the east flowing rivers account for the remaining portion. The annual average yield in the seven river basins of the state is estimated to be around 3,475 TMC. The yield in the six basins, excluding the west flowing rivers is estimated to be 1,440 TMC.

B. Groundwater resources

Karnataka has groundwater resources estimated to be around 485 TMC. Ground water resources have not been exploited evenly across the state. In areas where adequate surface water is available, exploitation of ground water resources is minimum. Exploitation of ground water in the dry taluks of North and South interior Karnataka is higher as compared to Coastal, Malnad and irrigation command areas of the state. In about 43 taluks there is over exploitation of ground water resources. Further, groundwater exploitation has exceeded 50% of the available ground water resources in 29 taluks of the State. These 72 taluks are critical taluks from the point of view of the ground water exploitation. In the 72 critical taluks about 4 lakh wells irrigate an area of 7.5 lakh ha.

Due to over exploitation of ground water resources, more than 3 lakh dug-wells have dried. Shallow bore wells have failed and yield in deep bore wells are declining. Area irrigated by ground water extraction structures is decreasing. Consequently, more than Rs. 2000 crores of investment made by the individual farmers on the construction of wells, pumping equipment, pipelines, development etc., have become infructuous.

Central Ground Water Board, South Western Region, Bangalore, is monitoring water levels in the State of Karnataka from the established network of 1538 monitoring stations, as a part of 'Ground Water Monitoring' programme. The monitoring is carried out four times in a water year during May, August, November and January for water level. Water samples from these stations are collected once in a year, during the month of May to assess the ground water quality.

C. Rainfall in Karnataka

Karnataka primarily enjoys a tropical climate that is largely dependent on its physio-graphic and geographic location with respect to the Arabian Sea and the monsoons. The state receives the benefit of two monsoons: the North-East monsoon and the South-West monsoon. Karnataka receives mean annual rainfall of around 1,355 millimeters. More than 73 percent of this rainfall is received due to the South-West monsoon. The state can be earmarked into three meteorological zones, namely, North Interior Karnataka, South Interior Karnataka and Coastal Karnataka. The occurrence and distribution of rainfall in the state is not uniform. The region that receives the maximum rainfall is Coastal Karnataka. It gets an average annual rainfall of 3,456 mm. South Interior Karnataka receives only 1286 mm average rainfall while North Interior Karnataka receives the least rainfall with 731 mm average figure annually.

D. River Systems

There are seven river systems in Karnataka which with their tributaries drain the state. The names of these river systems and area drained by them are given below as shown in Table 1 and in Fig. 1.

Godavari River. The river Godavari rises in the Nasik district of Maharastra about 80km from the shore of Arabian sea, at an elevation of 1067m, after flowing for about 1465km in a general south-easterly direction, through Maharastra and Andhra Pradesh, Godavari falls into the Bay of Bengal above Rajamun dry.

Table 1: River Systems of Karnataka.

S.No.	River System	Drainage System	
		1000 Sq Km	Percentage
1	Godavari	4.41	2.31
2	Krishana	113.29	59.48
3	Kaveri	34.27	17.99
4	North Pennur	6.94	3.64
5	South Pennur	4.37	2.29
6	Palar	2.97	1.56
7	West flowing rivers	24.25	12.73
	Total	190.50	100

The Godavari has a drainage area of about 3,12,813 sq.kms. The principal tributaries of Godavari are the Pravara, the Purna, the Manjra, the Pranahita, the Indravathy and the Sabari.

Krishna River. The river Krishna is an Inter-State river in Southern India. It is the second largest river in Peninsular India, rises in the Western Ghats at an altitude of 1337 m. near Mahabaleshwar in Maharashtra State. It flows across the whole width of the peninsula, from west to east, for a length of about 1400 km, through Maharashtra, Karnataka and Andhra Pradesh.

The entire catchment area of Krishna basin is 2,58,948 sq km. including the other basin states, and their catchment. The principal tributaries of Krishna in Karnataka are Ghataprabha, Malaprabha, Bhima and Tungabhadra. All these rivers except the Malaprabha River having their catchment area both in Karnataka and Maharastra.

Cauvery River. The river Cauvery is an Inter-State river in Southern India. It is one of the major rivers of the Peninsular flowing east and running into the Bay of Bengal.

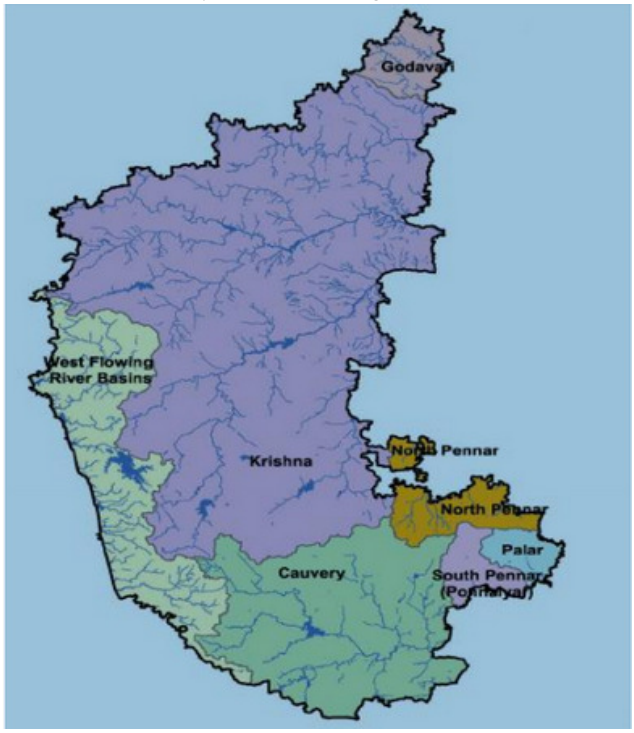

Fig. 1. River system of Karnataka.

The Cauvery rises at Talakaveri on the Brahmagiri Range of Hill in the Western Ghats, presently in the Coorg district of the State of Karnataka, at an elevation of 1.341m (4,400 ft.) above mean sea level.

North Pennar. The north Pennar raises Nandi hills of Kolar Karnataka State at an elevation of about 597 Mts. It drains catchment area of 6337Sq kms in Karnataka and Andhra Pradesh.

South Pennar. The south Pennar raises Talagavara village in Kolar, 900 meters in Karnataka State. It drains catchment area of 4370Sq kms in Karnataka and Tamil Nadu.

Palar River. The south Pennar raises Nandi hills of Kolar Karnataka State. It drains catchment area of 2813 Sq kms in Karnataka, Andra Pradesh and Tamil Nadu.

West Flowing Rivers. The Western Ghats provides a principal geographical barrier in the path of the Arabian Sea branch of the Southwest monsoon, and is principally responsible for the heavy rainfall over the western coastal belt. The Southwest monsoon season (June to September) is the principal rainy season, over 90 % of annual rainfall is realized in this period.

The rivers in the Western Ghats region generally originate at an elevation ranging from 400 meters to 1,600 meters above the mean sea level, close to the Western Ghats ridge. The rivers generally flow westward and meet the Arabian Sea after a short run varying from 50 kms to 300 kms. the rivers are very steep in the upper reaches and fairly steep in the middle reaches. It is only near the sea that they have relatively flat gradients and some sort of flood plain.

Stressful situation of water resources in Karnataka

The state of Karnataka enjoys a substantial amount of rainfall and has a significant quantity of water resources but it is not enough to meet the ever increasing water requirement of the state.

1. Karnataka suffers repetitive droughts. In spite of the availability of water from the river systems and tanks, Karnataka faces the serious issue of 67 percent of its land marked for irrigation falling under dry tracts.

2. Increasing population and living standards. With a rapidly increasing population and improved living standards, the pressure on the water resources is constantly on the rise.

The per capita availability of water resources is reducing day by day.

3. Rainfall and water deputes. The erratic behaviour of rainfall and the Inter-State River Water disputes aggravate the problem. The impact of climate change on the water resources also cannot be ignored.

4. Misuse and poor management. Siltation of water bodies, misuse of resources, poor management of catchment area all add to the stressful water resource situation in the state.

5. Fast decline of ground water resources. The groundwater is the major source of drinking water in Karnataka.

Over 90 percent of the drinking water supply schemes in the rural areas of the state are based on ground water. This over exploitation is causing the fast decline of ground water resources in the state. The result is the scarcity of safe drinking water across many parts of Karnataka. In order to cater to the water requirement of the expanding population, the existing water resources must be conserved and prevented from further degradation and depletion. As a conclusion the judicious and economic use of water resources for agricultural, industrial and domestic purposes can help in solving the problem to a large extent.

V. WATER DEMAND AND SUPPLY DEMAND GAP

Karnataka's water resources are fast dwindling due to population explosion and increased utilization of water for the rapidly growing economic activities. Water demand on the one hand for consumptive (drinking, health and sanitation needs) and productive uses (agriculture, industrial production, power generation, mining operations and navigation, and recreational activities) has increased tremendously, and on the other hand, water supply has declined with depletion and degradation of water resources causing water distress or scarcity in the state. Depletion of quantity and degradation of quality of water has restricted the availability of water for consumptive and productive uses and has consequently caused "negative externality" which imposes economic and social cost on society.

The Considering domestic and non-domestic water requirement including wastage totaling 140 liters per capita per day, the recommendation made at the conference of Secretaries, Chief Engineers responsible for Urban Water Supply and Sanitation at Mysore during 1989 (Million liters per day) the water demand projections have been made. For Krishna basin, it is estimated that the population for Karnataka for 2050 will be 59.90 million for rural areas and 21.08 million for urban areas. Considering the per capita requirement of 150 liters per day for rural and 220 liters per day for urban, the drinking water needs are 115.62 TMC for rural and 59.78 TMC for urban population. The total requirement for water is 150.31 TMC for rural and 77.71 TMC for urban including the T and D losses of 30 percent. The total demand for the State including all areas can be conveniently taken as twice that of the demand for Krishna basin. Accordingly the total requirement for domestic water needs for urban and rural population in Karnataka in 2050 is 456.04 TMC.

The estimated demand and supply is subject to limitation of methodology used and the source of data used. The positive gap shown is due to lack of infrastructure to store the rain / river water. Groundwater utilization according to volume exceeds 70 percent of supply or availability.

There are obvious differences between the sources of data as well as between volumetric measurement and the area measurement regarding supply and demand for water As a thumb rule, usually 1 TMC of water can irrigate 4000 ha of semi dry crops or 1000 ha of paddy or 1600 ha of sugarcane.

VI. FINDINGS AND SUGGESTIONS

The state of Karnataka enjoys a substantial amount of rainfall and has a significant quantity of water resources but it is not enough to meet the ever increasing water requirement of the state.

1. Karnataka suffers repetitive droughts. In spite of the availability of water from the river systems and tanks, Karnataka faces the serious issue of 67 percent of its land marked for irrigation falling under dry tracts.

2. Increasing population and living standards. With a rapidly increasing population and improved living standards, the pressure on the water resources is constantly on the rise. The per capita availability of water resources is reducing day by day.

3. Rainfall and water deputes. The erratic behaviour of rainfall and the Inter-State River Water disputes aggravate the problem. The impact of climate change on the water resources also cannot be ignored.

4. Misuse and poor management. Siltation of water bodies, misuse of resources, poor management of catchment area all add to the stressful water resource situation in the state.

5. Fast decline of ground water resources. The groundwater is the major source of drinking water in Karnataka. Over 90 percent of the drinking water supply schemes in the rural areas of the state are based on ground water. This over exploitation is causing the fast decline of ground water resources in the state. The result is the scarcity of safe drinking water across many parts of Karnataka.

VII. CONCLUSION

In order to cater to the water requirement of the expanding population, the existing water resources must be conserved and prevented from further degradation and depletion. Deficiencies in water management have resulted in inequitable distribution of water, under utilization of the irrigation potential created and problems of land degradation due to excessive use of water. Unauthorized use of irrigation water, excess usage of water by farmers in the head reach and pumping of water from canals are depriving the tail-end farmers their due share of water. Karnataka is endowed with limited surface and ground water resources that need to be systematically developed and properly utilized adopting new approaches for the overall development of the State. Therefore there is a need to formulate a State Water Policy, which is responsive to the States future needs.

As a conclusion the judicious and economic use of water resources for agricultural, industrial and domestic purposes can help in solving the problem to a large extent.

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