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Management of Ground Water Resources in India

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Abstract: Everything is originated in water; everything is sustained by water. The presence of water on earth makes earth the home for all living organisms. History reveals that all major world civilizations flourished around the water resources. Two percent of the water is locked up in ice caps and glaciers leaving only one percent available as portable fresh water. India is a country of plentiful natural resources including numerous streams, lakes and other water bodies. If the utilization of water is not planned and overseen economically, the nation would confront an extreme water emergency in the near future which may negatively influence the fate of the country.

Key words: Ground water, Resources, Management, India, Rocks

Introduction:

Groundwater has emerged as the primary democratic water source and poverty reduction tool in India's rural areas. On the account of its universal availability, dependability and low capital cost. It is the most preferred source of water to meet the requirements of various user sectors of India. Groundwater has made important contribution to the growth of India's economy development and has been a significant catalyst for its socio-economic development. It's significant as a precious natural resource in the Indian context can be gauged from the fact that more than 85% of India's rural domestic water requirements, 50% of its urban water requirements and more than 50% of its irrigation requirements are being met from ground water resources. The increasing dependence on ground water as a reliable source of water has resulted in its large scale and often indiscriminate development in various parts of the country.

In order to address various issues related to ground water, keeping in view the climatic changes. There are need to prepare a comprehensive road map with identified strategies for scientific and sustainable management of the available ground water resources in the country so as to avert the looming water crisis in addition to addressing the issues of declining water level, the strategies should also focus on the imbalances in ground water development in the country. The reasons there of and suggesting measures including accelerated development of ground water in areas with low stage of ground water development.

Hydrogeological set-up of the country

India is a vast country with a highly diversified hydrologic set-up, the ground water behavior in the Indian sub-continent is highly complicated due to the occurrence of different geological formations with considerable lithological and chronological variations. The major geological formations are-

1. Consolidated formations represented by igneous and metamorphic rocks with major rocks types of granites and quartzite.
2. The unconsolidated formations are represented by Pleistocene period with the major rock types are boulders and silt-clay.
3. The semi consolidated formations are represented by Mesozoic and tertiary period with the major rock types of limestone and sandstone.

The distribution of these rock types are given in geological map.

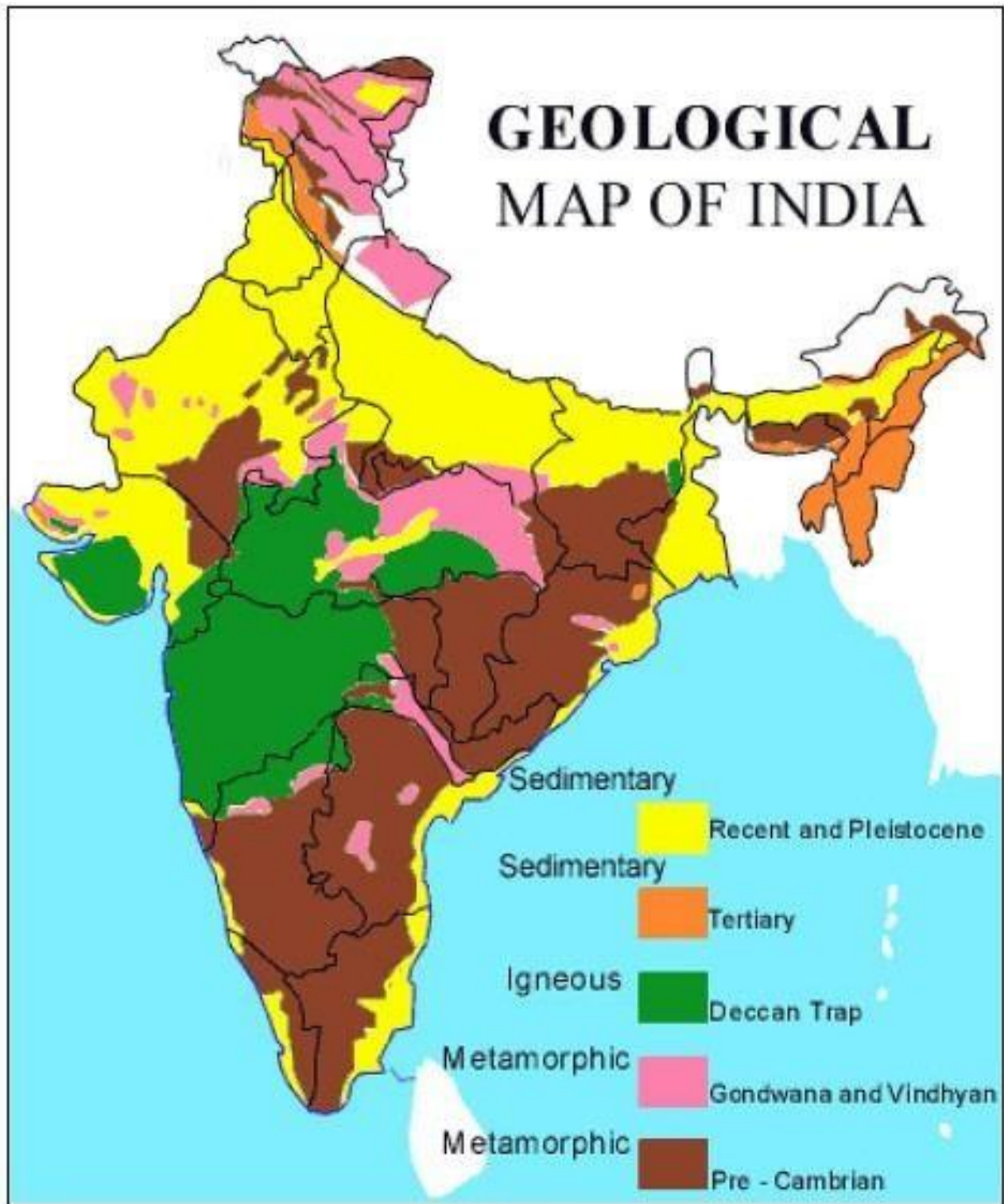


Figure 1: Geological Map of India (Source: GSI)

The hydrogeological map showing the broad group of consolidated and unconsolidated water bearing formations along with their field prospects are shown in second diagram. Physiographic and geomorphologic settings are among the important factors that control the occurrence and distribution of ground water. Based on these. the country has been broadly divided into five distinct regions as below-

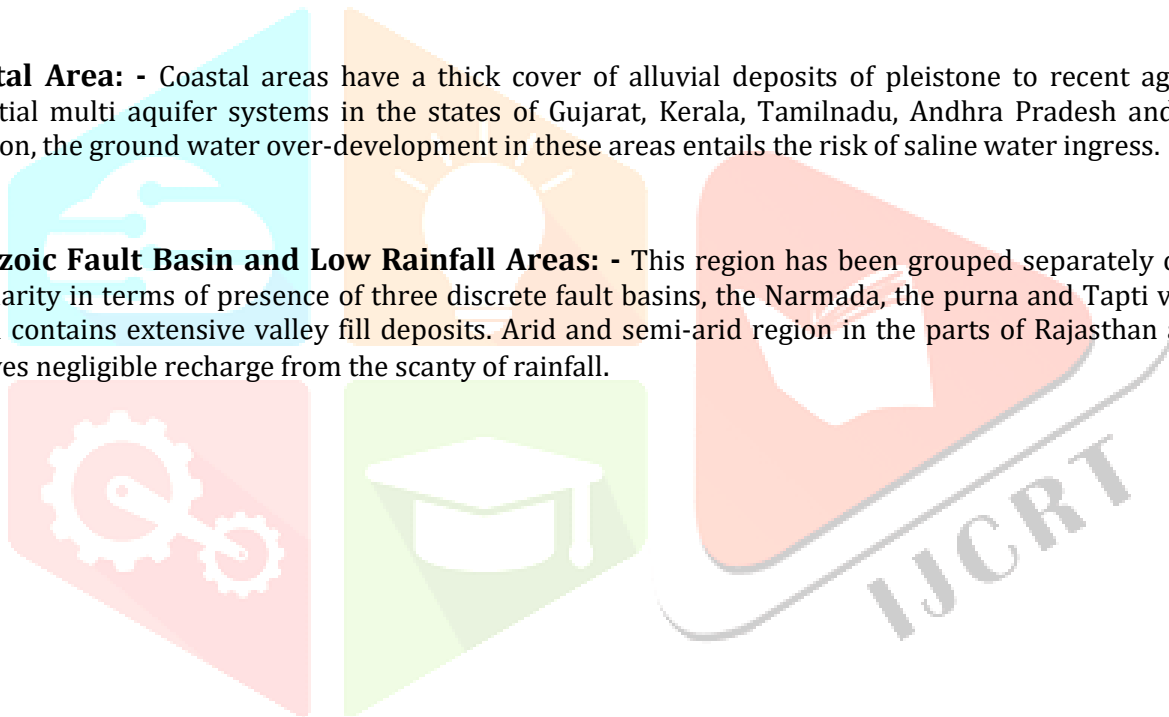
Northern Mountainous Terrain and Hilly Areas: - The highly rugged mountainous terrain in the Himalayan region in the northern part of the country extending from Kashmir to Arunchal Pradesh is characterized by steep slopes and high runoff. This region under in mostly by rocks such as granite, slate and sandstone ranging in age from Paleozoic to Cenozoic

Indo-Gangetic-Brahmaputra Alluvial Plains: - This region encompasses an area of about 850,000 square kilometers covering states of Punjab, Haryana, U.P, Bihar and west Bengal The vast plains of Ganges and Brahmaputra rivers and are underlain by thick of piles of sediments of tertiary and quaternary age. These are characterized by regionally extensive and highly productive multi- aquifer systems.

Peninsular Shield Area: - They are located south of Indo-Gangetic- Brahmaputra plains and consist mostly of consolidated sedimentary rocks, Deccan trap basalts and crystalline rocks in the states of Karnataka, Maharashtra, Tamilnadu, Odisha and Kerla. Occurrence and movement of ground water in these formations are restricted to weathered residuum and interconnected fractures at deeper levels and they have limited ground water potential.

Coastal Area: - Coastal areas have a thick cover of alluvial deposits of pleistone to recent age and form potential multi aquifer systems in the states of Gujarat, Kerala, Tamilnadu, Andhra Pradesh and Odisha. In addition, the ground water over-development in these areas entails the risk of saline water ingress.

Cenozoic Fault Basin and Low Rainfall Areas: - This region has been grouped separately owing to its peculiarity in terms of presence of three discrete fault basins, the Narmada, the purna and Tapti valleys, all of which contains extensive valley fill deposits. Arid and semi-arid region in the parts of Rajasthan and Gujarat receives negligible recharge from the scanty of rainfall.



HYDROGEOLOGICAL MAP OF INDIA



Legend

Ground Water Potential (Yield Litres/sec)

>40 25-40 10-25 <10

1-25 1-10 1-5

<1

Unconsolidated Formations

Consolidated /Semi-Consolidated Formations

Hilly Areas

Ground Water Resources Availability: - Rainfall is the major source of ground water recharge in India, which is supplemented by other sources such as recharge from canals, irrigated fields and surface water bodies. The ground water draft for the country as a whole has been estimated as 231 billion cubic meter, about 92% of which is utilized for irrigation and the remaining 8% for domestic and industrial uses. As per the assessment, out of the total 5723 assessment units in the country, groundwater development was found to exceed more than 100% of the natural replenishment in 839 units (14.7%) which has been categorized as critical. 550 assessment units with the stage of groundwater development in the range of 70 to 100% and long term decline of water levels either during pre- or post-monsoon period have been categorized as 'semi critical'. 4078 assessment units with stage of ground water development below 70% have been categorized as 'safe'. 30 assessment units have been excluded from the assessment due to the salinity of ground water in the aquifer in the replenishable zone. Salient detail of ground water resource availability, utilization stage of development and categorization of assessment units for the above regions of the country is given in table -1

Table- 1 Ground Water Resources Availability and Status of its utilization in India

Sr. No	Region	Annual Replenishable Ground Water Resource (bcm)	Natural Discharge during non-monsoon season (bcm)	Net Annual Ground Water available (bcm)	Annual Ground Water Draft (bcm)	Stage of Ground Water development (%)	Categorization of Assessment		
							Units (Blocks/Mandals)	Total Assessment Units	Over Exploited Nos/%
1	Northern Himalayan states	5.4	0.48	4.92	1.84	37	30	2/6.6	0
2	North Eastern Hilly States	33.99	3.02	30.98	5.63	18	118	0/0	0
3	Eastern Plain States	111.63	9.03	102.5	43.97	43	1895	1/0.05	2/0.11
4	North Western Plain States	80.78	6.92	73.85	72.17	98	277	201/72.56	28/10.01
5	Western arid Region	27.38	1.97	25.4	24.48	96	462	172/37.23	62/13.42
6	Central Plateau States	90.723	5.19	85.53	36.11	42	985	31/3.15	6/0.61
7	Southern Peninsular States	82.78	7.14	75.65	46.4	61	1946	432/22.2	128/6.58
8	Islands	0.34	0.01	0.32	0.01	04	10	0/0	0
	Country Total	433.02	33.77	399.26	230.63	58	5723	839	226

Note:-

Southern peninsular states -	Andhra Pradesh, Karnataka, Kerala, Tamilnadu.
North Eastern Hilly States- Tripura.	Arunachal Pradesh, Manipur, Assam, Mizoram, Nagaland
Eastern Plain States-	Bihar, West Bengal, Eastern Uttar Pradesh.
Central Plateau States-	Madhya Pradesh. Maharashtra, Jharkhand, Chhattisgarh.
North Western Plain States-	Haryana, Punjab, Delhi, Chandigarh.
Northern Himalayan States-	Jammu & Kashmir, Himachal Pradesh. Uttarakhand.
Islands-	Andaman & Nicobar, Lakshadweep
Western Arid States-	Gujarat, Rajasthan

Management of Ground Water Resources: - Management of ground water resources the Indian context is an extremely complex proposition as it deals with interaction between the human society and physical environment. The uneven distribution of ground water availability and its utilization indicates that no single management strategy can be adopted for the country as a whole. On the other hand, each situation demands a solution which takes account the geomorphic set up, climatic, hydrologic and hydro geologic settings, ground water availability, water utilization pattern for various sectors and the socio-economic set up of the region.

1. **Supply Side Measures:-** These measures are aimed at increasing the ground water availability taking the environment, social economic factors into consideration. These are also known as structural measures, which involves scientific development and augmentation of ground water resources.

A) Scientific Development of Ground Water Resources:-

- a. Ground water development in alluvial plains.
- b. Ground water development in coastal areas.
- c. Ground water development in water- logged areas.

2. **Demand Side Measures:-** Apart from scientific development of available resources, proper ground water resources management requires to focus attention on the judicious utilization of the resources for ensuring their long term sustainability. Ownership of ground water, need based allocation pricing of resources, involvement of stake holders in various aspects of planning, execution and monitoring of projects and effective implementation of regulatory measures.

Groundwater Development Prospects in India:- A close examination of the ground water resource availability in different geomorphologic terrains of the country and its utilization as presented in table-1, indicates that out of the total of 433 bcm of annual replenishable ground water resources available in the country the share of alluvial areas covering eastern plain states of Bihar, Odisha eastern U.P. and West Bengal, and north western plain states of Haryana Delhi Punjab and Chandigarh is about 192 bcm which is work out to be 44% of the total available resource. The enigma is in the eastern plain states the overall stage of ground water development is about 43%, whereas the overall stage of ground water development in north western plain states covering Punjab, Delhi and Haryana is 98% except western part of U.P, a major part of the area is overexploited.

The time has come to focus our attention on analyzing the imbalances on the use of ground water. There is no doubt that overuse of ground water is occurring in isolated areas, and it can have devastating effects on communities.

Rainwater Harvesting and Artificial Recharge: - Rainwater harvesting and artificial recharge have now been accepted worldwide as cost- effective methods for augmenting ground water resources and for arresting the decline trends of ground water levels. Artificial recharge techniques are highly site- specific. Rainwater harvesting and artificial recharge schemes implemented by various organizations in the country including central ground water have shown encouraging results in terms of augmentation of ground recharge, check in rate of decline of ground water levels and reduction of surplus runoff. Increased sustainability of existing abstraction structures, increase in irrigation potential, revival of springs, soil conservation through increase in soil moisture and improvement in ground water quality are among other benefits of the schemes. In the coastal tracts, tidal regulators, constructed to impound the fresh water upstream and enhance the natural recharge are effective in controlling salinity ingress.

Regulation of Ground Water Development: - Regulation of over- exploitation of ground water through legal means can be effective under extreme situations if implemented with caution. Ground water regulatory measures in India are implemented both at central and state level. The central ground water authority, constituted under environment Act of 1986 is playing a key role in regulation and control ground water development in the country. Central ground water authority initially notifies over exploited areas in a phased manner for registration of ground water abstraction structures. Based on data thus generated, vulnerable areas are notified for the purpose of ground water regulation. In these areas, construction of new ground water abstraction structures is regulated.

Conclusions: - The highly diversified hydrologic settings and variations in the availability of ground water resources from one part of the country to other call for a holistic approach in evolving suitable management strategies. The emphasis on management needs does not imply that ground water resources in India are fully developed. Effective management of available ground water resources requires an integrated approach, combining both supply side and demand side measures. There is a vast area in the Indo Gangetic plain where ground water development is sub optimal and there is sufficient scope for future development. Urgent action is required to augment the ground water in the water stressed areas. Focus on development activities must be balanced by management mechanisms to achieve a sustainable utilization of ground water resources. There is urgent need for coordinated efforts from various central and state government agencies, non- governmental and social service organizations, academic institutions and the stakeholders for evolving and implementing suitable ground water management strategies in the country.

References

- 1- Ministry of water resources (2002), National water policy, New Delhi.
 - 2- Minor irrigation division (2001, 2005), report on census of minor irrigation schemes- 2000- 01. 1986- 1987 ministry of water resources, New Delhi.
 - 3- Central ground water board (2006), dynamic ground water resources of India. New Delhi.
 - 4- Central ground water board (2002), master plan for artificial recharge to groundwater in India. New Delhi.
- Das, S. (2006), groundwater overexploitation and importance of water management in India-vision 2025. Tenth IGC foundation lecture. The Indian geological congress, Roorkee.
- Government of India (2012) National water policy. Ministry of water resources, New Delhi.
- Central Ground water Board (2009) report of the group for suggesting New and Alternate methods of ground water resources assessment. Ministry of water resources, Government of India.