Study of Groundwater Management in Aurangabad District

Jyoti Siddharth Malwar
Research Student
Department of Geography
Dr. Babasaheb Ambedkar Marahtwada
University, Aurangabad
malwarjyoti@gmail.com

Abstract

Management of ground water resources should involve a combination of supply side and demand side. We also need to consider groundwater management, the regulation and control of water levels, pollution, ownership and use of groundwater. Preventing contamination of groundwater which causes the groundwater water supply to not be able to be used as resource of fresh drinking water. In study of ground water management plan of Aurangabad we have study how to implemntaion on our management and how that give result its very important management of every aera of the land. We also need to consider groundwater management, the regulation and control of water levels, pollution, ownership and use of groundwater. Preventing contamination of groundwater which causes the groundwater water supply to not be able to be used as resource of fresh drinking water.

Keywords - Hydrogeology ,Ground Water Management Plan, CGWB ,

Introduction

Ground water is often neglected in planning, being an essentially invisible resource. However, it is also a shared resource that is high in demand, especially for irrigation and human consumption. That makes it vulnerable to stakeholders who act based on their short-term individual interests instead of long-term communal requirements. Ground water is also particularly vulnerable to pollution. Contaminants from the surface can move through the soil and into the aquifer below, such as pesticides and fertilizers from agriculture, toxic substances from mining sites, and used motor oil and so on. Since ground water can move great distances through underground aquifers, ground water pollution is particularly hard to clean up resource (in terms of quantity, quality, and relevant links to other natural resources) with the increasing demand for water for broad economic development and livelihoods. This balance has to take into account efficiency, equity, and long term sustainability in terms of maintaining both quality and quantity at desired levels.

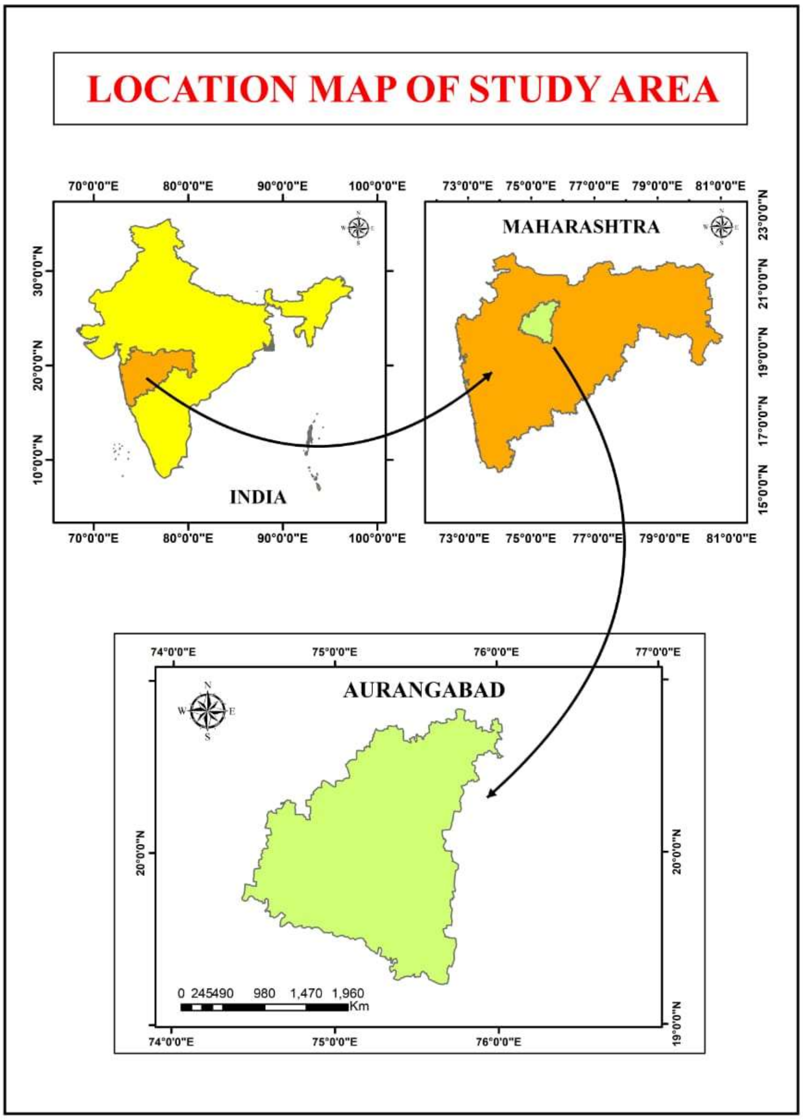
In practice, ground water is often managed separately from: surface water, though it is part of the overall hydrological cycle, both in quantity and quality; urban wastewater, though it simultaneously represents an additional resource and a potential pollution threat to ground water; land management, though aquifers are threatened by pollution from urbanization, industrial development, agricultural activity and mining enterprises.

Cosmos Multidisciplinary Research E-Journal Online Available at www.cmrj.in
Recognized International Peer Reviewed Journal Impact Factor 4.94 ISSN No. 2456-1665

Water management is the control and movement of water resources to minimize damage to life and property and to maximize efficient beneficial use. Good water management of dams and levees reduces the risk of harm due to flooding. Irrigation water management systems make the most efficient use of limited water supplies for agriculture

Study Aera

Aurangabad district is situated in the north central part of Maharashtra between North Latitude 19° 15’ and 20° 40, and East Longitude 74° 37’ and 75° 52’. It covers an area of 10,107 sq. km falling in parts of Survey of India Toposheet No. 46 L & P and 47 I & M. The district is bounded by Jalgaon district in north by Nashik district in west, Ahmadnagar and Beed districts in south and Parbhani and Buldhana districts in east. According to the 2011 census, Aurangabad District has a population of 3,701,282 inhabitants and a population density of 365 inhabitants per square kilo metre (950sq mi). It is the 72nd most populous district in India out of 640 total districts, and the population growth rate between 2001 and 2011 was 27.33%. The population of the district is 37.53% urban as of 2001



HYDROGEOLOGY

The major part of the district is constituted by a sequence of basaltic lava flows (Deccan Trap) while alluvium occupies a small portion. The alluvium cosisting of clay, Silt, Sand and Gravel occur along the course of major rivers. The thickness of alluvium varies from few meters to 28 m. The alluvium lies directly over the Basaltic lava flows. Ground water occurs in alluvial areas of Godavari, Shivana, Purna river basins under unconfined to semi confined conditions. In Alluvial deposits, inter pore spaces constitute the potential water bearing zones and prevalence of sand and gravels renders them a high degree of porosity and permeability and make them a potential ground water reservoir. However lithological variation results in varying water yielding capacity depending upon the predominance of sand-clay ratio. The exploration of shallow alluvial areas of the Shivana basin reveals that the saturated thickness of the alluvium comprising clay, silt, sand and gravel ranges from 1-7 meters. The depth of alluvium- basalt contact ranges between 16.25 to 28 mbgl. The aquifer horizons were encountered up to 28.00 mbgl, comprising of coarse sand mixed with clay and silt, which constitute the potential aquifers in the area with discharge varying up to 4.50 lps. In general depth of dug wells is found up to 20 mbgl and yields varying between 60 and 120 m 3 /day.

Deccan basalts are hydro geologically in-homogeneous rocks. The weathered and jointed /fractured parts of the rock constitute the zone of ground water storage and flow. The existence of multiple aquifers is characteristic of basalt and is indicative of wide variation in the joint/fracture pattern and intensity. The yield of wells is a function of permeability and transmissivity of aquifer and it depends upon the degree of weathering, intensity of joints\fractures and topographic setting of the aquifer. Due to wide variation in secondary openings, the potential areas for ground water are generally local. In general Ground water occurs under phreatic/unconfined to semi-confined conditions in basalts. Shallow Aquifer is generally tapped by the dug wells and average depth of dug wells ranging between 12.00 to 15.00 m and yield varies up to 100 m3 /day. The deeper Aquifer is being tapped by bore wells with depth ranging from 40 to 90 m. However, the maximum numbers of bore wells are limited up to 60 m depth. The yield ranges up to 2.5 lps. Potential Aquifer are generally encountered at the contact of two flows.

Ground Water Resources

Central Ground Water Board and Ground Water Survey and Development Agency (GSDA), Govt of Maharashtra have jointly estimated the ground water resources of the district based on GEC-97 methodology as on March 2009. The same are presented in Table 5, whereas graphical representation is presented in Figure-5. As per the estimation, the annual replenishable groundwater resource is 125631 ha. m with the natural discharge of 6442 ha.m. The net annual ground water availability is 119189 ha.m The annual gross draft for all uses is estimated at 73893 ha.m with irrigation sector being the major consumer having an annual draft of 70131 ha.m. The allocation domestic and industrial water requirement is at 7404 ha.m for next 25 years. The net annual ground water availability for future irrigation is estimated at 42220 ha.m. The stage of groundwater development in the district is 62 % and it falls under

"Safe" category. The watershed wise resource estimation was also done and it indicated that 47 watersheds out of 52 fall under "Safe" category. The 4 watersheds that fall under "Semi-Critical category" are GP-11, GP-15, GP-9 and TE-36B whereas 1 watershed i.e., GV-41 falls under "Critical" category. In all these watersheds, future ground water development is not recommended without adhering to the precautionary measures i.e., artificial recharge to ground water resources and adoption of ground water management practices.

Ground Water Management Plan

The management plan has been proposed to manage the ground water resources to arrest further decline in water levels. The management plan comprises two components namely supplyside management and demand side management. The supply side management is proposed based on surplus surface water availability and the unsaturated thickness of aquifer whereas the demand side management is proposed by use of micro irrigation techniques and change in cropping pattern.

- **SUPPLY SIDE MANAGEMENT**

The supply side management of ground water resources can be done through the artificial recharge by utilization of surplus runoff available within river sub basins and micro watersheds. Also, it is necessary to understand the unsaturated aquifer volume available for recharge.The unsaturated volume of aquifer was computed based on the area feasible for recharge, unsaturated depth below 5 mbgl and the specific yield of the aquifer.

Table 1 - gives the block wise volume available for the recharge.

Block	Geographical Area (sq. km.)	Area feasible for recharge (sq. km.)	Unsaturated Volume (MCM)
Aurangabad	1622.08	909.2	1818.4
Phulambri	510.55	94.46	188.92
Gangapur	1280.19	1280.19	2560.38
Kannad	1393.27	1280.47	2560.94
Khultabad	509.87	255.14	510.28
Paithan	1504.78	1384.82	2769.64
Sillod	1284.14	542.68	1085.36
Soygaon	741.69	29.48	58.96
Vaijapur	1373.84	1343.66	2687.32
Grand Total	**10220.41**	**7120.1**	**14240.2**

The total unsaturated volume available for artificial recharge is 14240 MCM ranging from 58.96 MCM in Soygaon block to 2769 MCM in Paithan block. The available surplus runoff can be utilized for artificial recharge through construction of percolation tanks and Check dams at suitable sites. Thus, after taking into consideration all the factors, only 149.31 MCM of surplus water can be utilised for recharge, which is given in table 7.2. This surplus water can be utilized for constructing 400 percolation tanks and 1063 check dams at suitable sites. The number of feasible artificial recharge structures was calculated by considering 0.20 MCM per percolation tanks and 0.03 MCM per check dam.This intervention should lead to recharge. 75% efficiency of about 111.89 MCM/year. Tentative locations of these structures are given in

- **DEMAND SIDE MANAGEMENT**

The Demand Side Management is proposed in areas where the Stage of Ground Water Development is relatively high and adopting micro-irrigation techniques for water intensive crops (Sugarcane/Citrus/Banana) or change in cropping pattern or both are required to save water. In the district, micro-irrigation techniques, like drip irrigation techniques are proposed to be adopted in 87.85 Sq. km. area in all blocks and that would save a total of 37.4 MCM water .Change in cropping patterns is not proposed in any of the blocks.

Table 2 - Details of Ground Water

Block	Sugarcane Area proposed (Sq. km.)	Citrus Area proposed (Sq. Km.)	Double crop Area proposed (Sq. km.)	Cotton crop Area proposed (Sq. km.)	Volume of Water saved (MCM
Aurangabad	1		11	10	0.57
Phulambri	1		7	5	7.75
Gangapur	18				14.36
Kannad	1				0.57
Khuldabad	2				1.14
Paithan	2				1.14
Sillod	5				2.85
Soygaon		3.85			1.345
Vaijapur	5		6	10	7.85
Grand Total	35	3.85	24	25	37.395

Groundwater is a vital resource for drinking water, and for industrial, commercial, and agricultural uses. Best practices in groundwater management and its use are critical to keeping water supplies available and safe for future generations.

Result and Discussion

The impact of implementation of groundwater management plans on the groundwater system in the district is evaluated and the outcome shows significant improvement in groundwater scenario in all blocks The Stage of ground water development gets reduced and comes below 70%. If we are very good management of ground water then we can rapid developed our city , contry, and the global world because water is kye of the development.

Conclusion

- Groundwater Management Plan is very essential
- We have studied of ground water management plan of the Aurangabad district . This makes the protection of groundwater supplies through management, pollution control and remediation essential.
- The ground water development plan has been proposed with the view of developing the additional ground water resources available after supply side interventions to bring the stage of ground water development up to 70%. The 52.79 MCM volume of ground water generated can bring additional 81.22 sq. km. Kharif Crop area under assured ground water irrigation with average crop water requirement of 0.65 m by constructing 3167 Dug wells and 528 Bore wells.
- These interventions also need to be supported by regulations for deeper aquifer and hence it is recommended to regulate/ban deeper tube wells/bore wells of more than 60 m depth in these blocks, so that the deeper ground water resources are protected for future generation and also serve as ground water sanctuary in times of distress/drought.

Reference

- Jha B.M.. (2007) , Management of Ground water resources for Ensuring Food Security in India, National Ground Water Congress, New Delhi
- Central Ground Water Board (2002), Master Plan for Artificial Recharge to Groundwater in India. New Delhi
- Romani, Saleem (2006), Groundwater Management – Emerging challenges. Groundwater Governance – Ownership of Groundwater and its Pricing. Proceedings of the 12th National Symposium on Hydrology. November 14-15, 2006. New Delhi.
- Shah, Tushaar and Shilp Verma (2007), Real-time Co-management of Electricity and Groundwater: An assessment of Gujarat's Pioneering Jyotigram Scheme - Discussion paper. International Water Management Institute (IWMI).
- Ground water governance in the Indo-Gangetic and yellow River Basins - Realities and Challenges. Edited Vol. Aditi Mukherjee et.al, IAH selected papers.