INTERNATIONAL RESEARCH FELLOWS ASSOCIATION

Impact Factor – 6.261 ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

RESEARCH JOURNEY

Multidisciplinary International E-research Journal

PEER REFREED & INDEXED JOURNAL

December-2018 Special Issue – LXXX[A]

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'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal
Impact Factor - (SJIF) – 6.261, (CIF) - 3.452(2015), (GIF)–0.676 (2013)
Special Issue 80 [A] :
UGC Approved Journal
ISSN : 2348-7143
December-2018

Problems and Prospects of Ground Water Resources in Pune District of Maharashtra

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Abstract

Based on the data obtained from Central Ground Water Board, Ministry of Water Resources and empirical data collected personally and attempt has been made in this paper to identify the status of ground water level in Pune District of Maharashtra. In order to suggest remedies for elevating ground water levels and improve upon the water quality, a careful investigation of exciting problems has been made. It is found that, the potential yield of ground water is medium at most of the places while, ground water is suitable for irrigation with low level risk. Low rainfall and heavy use of ground water in the study area lead to decline of ground water level. The industrial influent and domestic sewage release are responsible for deteriorating the quality of ground water at some places. Over irrigation is responsible for salinization of ground water. Thus various measures have to be taken in view of qualitative and quantitative improvement of ground water. The present study may prove to be of some help in ground water management of the study area.

Keywords: Pune, Ground water level

Introduction

Groundwater, which is in aquifers below the surface of the Earth, is one of the Nation's most important natural resources. The importance of groundwater for the existence of human society cannot be overemphasized. Groundwater is the major source of drinking water in both urban and rural India. Groundwater is the source of about 33 percent of the water that county and city water departments supply to households and businesses (public supply). It provides drinking water for more than 90 percent of the rural population who do not get their water delivered to them from a county/city water department or private water company. Besides, it is an important source of water for the agricultural and the industrial sector. About 42 percent of the water used for irrigation comes from groundwater. Being an important and integral part of the hydrological cycle, its availability depends on the rainfall and recharge conditions. Till recently it had been considered a dependable source of uncontaminated water. Withdrawals of groundwater are expected to rise as the population increases and available sites for surface reservoirs become more limited.

Study Area

Pune district is located between 17°54' to 19° 24'North latitude and 73°10' to 75°10' East longitude. The district has geographical area of 15,642 sq.km (Census, 2011). Pune district is bound by Ahmadnagar district on north-east, Solapur district on the south-east, Satara district on south, Raigad district on the west and Thane district on the north-west. The landscape of Pune district is distributed triangularly in western Maharashtra at the foothills of the Sahyadri Mountains and is divided into three parts: "Ghatmatha", "Maval" and "Desh". Pune district forms

a part of the tropical monsoon land and therefore shows a significant seasonal variation in temperature as well as rainfall conditions. Climate of the western region of Pune is cool whereas the eastern part is hot and dry. The density of Pune district is 603. Pune district is a one of the most urbanized district having 60.99 percent of its population in urban area. Pune district is divided in to 14 administrative regions.

The Western Ghat from the western boundary of the district. Maximum altitude of more than 1200 meters is found in the western part of the district. The general slope of the land is from West to East. In the South-Eastern corner of the district the average altitude is less than 600 meters. The northernmost among the important rivers of the region is Bhimaand flow in the South-east direction. The southern part of the region is drained by river Nira, forming the southern boundary of the district. Shallow, medium and deep black are the major soils of the district.

Objectives

1. To study the ground water status of Pune District.
2. Suggest remedies to enhance the ground water resources.

Methodology

The present study is based on the ground water information of Pune District available with the office of central region, Central Ground Water Board, Ministry of Ground Water Resources and Government of India. It also uses the empirical information on quality and levels of ground water in the district.

Results and Discussion

5.1 **Water Level Scenario**

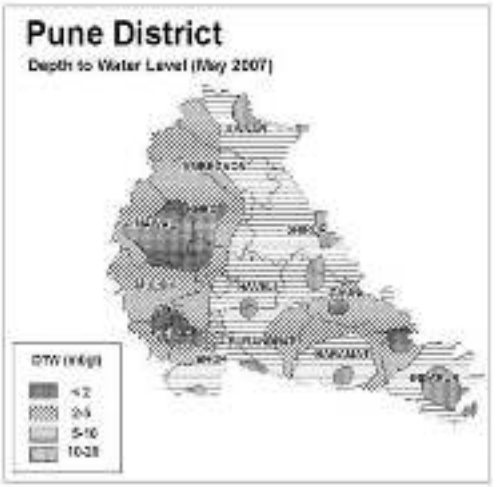
Central Ground Water Board monitors water levels in 49 National Hydrograph Network Stations (NHNS) stations in the district. These NHNS are measured four times in a year viz., January, May (Pre-monsoon), August and November (Post-monsoon).

5.1.1 **Depth to Water Level – Pre-monsoon (May 2007)**

The pre-monsoon depth to water levels monitored during May 2007 ranges between 0.20 m bgl (Bhadalwadi) and 12.30 m bgl (Otur). The depth to water levels during pre-monsoon has been depicted in Figure-1. It is observed from map that in major parts of the district the water levels are within 5 m bgl in almost entire western part and south eastern part of the district. The water levels in the range of 5 to 10 m bgl are observed in central, eastern and north eastern parts of the district. The deeper water levels of more than 10 m bgl have been observed around Otur village in northern part of the district where as at village Shirur in east and village Nimbgaon in south eastern part of the district.

5.1.2 Depth to Water Level – Post-monsoon (Nov. 2007)

The depth to water level during post-monsoon (Nov.2007) ranges between 1.00 m bgl(Ranjangaon) and 15.60 m bgl (Otur). Spatial variation in post-monsoon depth to water level is shown in Figure-2. The water levels between 2 and 5 m bgl have been observed in major parts of the district in the south, south eastern, central and north western parts occupying almost entire Purandar, Bhor, Mulshi, Maval and Khedtalukas and parts of Daund, Baramati, Velhe and Shirur. The water levels in 5 to 10 m bgl range are mainly seen in three isolated pockets i.e., in northern, central and south eastern parts of the district in parts of Junnar, Ambegaon, Haveli, Daund and Indapurtalukas. Very shallow water levels of less than 2 m bgl are observed in isolated patch in central part of the district.



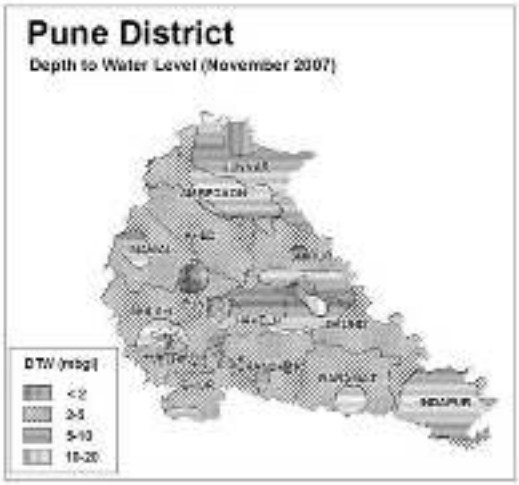


Figure-1: Depth to Water Level Figure-2: Depth to Water Level
(Pre-monsoon- May 2007)(Post monsoon- Nov. 2007)
(Source :Central Ground Water Board, Division Nagpur)

5.1.3 Seasonal Water Level Fluctuation (May to Nov. 2007)

Seasonal water level fluctuation between premonsoon and postmonsoon of 2007 have been computed. Rise in water level in range of 0.10 (Mulshi) to 8.00 m (Zendewadi) is observed in the district. However, fall in water level was also observed at 8 locations ranging between 0.05 (Kalamb and Kolwan) to 4.55 m (Bhadalwadi) in a longitudinal patch extending from north to central western part of the district in parts of Junnar, Ambegaon, Khed and Mavaltalukas and also in south eastern part covering parts of Daund and Indapurtalukas. Rise in the water levels up to 4 m have been observed in

major part of the district. While rise in water levels of more than 4 m is seen in isolated patches in southern part of the district in parts of Purandhartaluka and in central eastern part of the district in parts of Shirurtaluka.

5.1.4 Water Level Trend (1998-2007)

Trend of water levels for premonsoon and postmonsoon periods for last ten years (1998-2007) have been computed for 42 NHNS. Analysis of long term trend water level data indicates that rise in water levels in premonsoon period has been recorded at 18 NHNS and its ranges from negligible to 0.97 m/year (Otur) and fall in water levels has been observed in 24 NHNS and it ranges between negligible to 0.48 m/year (Zendewadi). During postmonsoon period rise in water levels has been recorded at 12 NHNS ranging from negligible to 0.41 m/year (Ale) while at 30 NHNS fall in water level have been recorded and it ranges between negligible to 0.44 m/year (Otur). Thus in major parts of the district, both during premonsoon and postmonsoon seasons declining water level trend has been recorded.

The premonsoon trend map was also prepared and the same is presented in Figure-3. It shows that the fall in water level trend of up to 20 cm/year is observed in major parts of the district, occupying north, central, western and southern parts of the district in entire Purandhar, Bhor, Haveli, Mulshi, Maval, Ambegaon and parts of Junnar, Khed, Shirur, Daund, Baramati and Indapurtalukas. Thus the situation is quite critical in almost entire district and the future ground water conservation and recharge structures needs to be prioritized in these areas. The rise of up to 20 cm/year has been observed in 2 to 3 isolated patches in south eastern, southern and northern parts occupying parts of Indapur, Baramati and Daundtalukas entire Velhe and parts of Junnartaluka.

Figure-3: Water Level Trend (Premonsoon 1998-2007)

Table No.1: Ground Water Resources (March 2004)

Taluka	Net annual ground water availability (* ham/yr)	Annual ground water draft (ham/yr)			Stage of ground water development	Category
		Irrigation	Domestic & industrial uses	Total		

					(%)	
Maval	8593.76	1305.11	139.18	1444.29	16.81	Safe
Mulshi	7238.80	520.39	108.16	628.55	8.68	Safe
Velhe	5570.86	212.79	46.74	259.53	4.66	Safe
Bhor	4023.84	1177.65	113.99	1291.63	32.10	Safe
Haveli	12986.15	7338.14	242.63	7580.77	58.38	Safe
Baramati	15960.08	15150.90	236.47	15387.37	96.41	**Semi-Critical**
Indapur	18608.81	13018.72	288.96	13307.68	71.51	Safe
Purandhar	10191.32	8696.94	190.39	8887.33	87.20	**Semi-Critical**
Daund	12599.95	9245.89	168.97	9414.86	74.72	Safe
Khed	11973.53	8171.35	340.56	8511.91	71.09	Safe
Junnar	13585.18	13172.61	373.47	13546.08	99.71	**Semi-Critical**
Ambegaon	9019.60	8626.93	190.27	8817.20	97.76	**Semi-Critical**
Shirur	13936.04	12159.61	298.44	12458.05	89.39	Safe
Total	144287.92	98797.04	2738.23	101535.27	70.37	

Problems:

Parts of Pune district falls under rain shadow zone of Maharashtra State. It is seen from long term rainfall data that the eastern, southern, south eastern, central and north western parts around Indapur, Baramati, Jujuri, Daund, Talegaon, Dhamdhare, Alandi, Shirur and Bhor covering around 50% area of the district experiences drought conditions for more than 20% of the years. Therefore, these areas are classified as drought areas.

The pre-monsoon water level trend shows fall in water level up to 20 cm/year in major parts of the district, occupying north, central, western and southern parts of the district in entire Purandhar, Bhor, Haveli, Mulshi, Maval, Ambegaon and parts of Junnar, Khed, Shirur, Daund, Baramati and Indapurtalukas. Similarly as per current assessment of ground water resources it is also seen that the ground water development in Baramati, Ambegaon, Purandhar and Junnartalukas have already reached up to 100% and these talukas fall under "Semi-Critical" category. Thus the situation is quite critical in almost entire district and the future ground water conservation and recharge structures needs to be prioritized in these areas.

Suggesations:

1. Almost entire district is underlain by Deccan Trap Basalt, where only dugwells are most feasible ground water abstraction structures for development. However the bore wells are another alternative but their construction requires special technical and scientific attention while pin pointing of site.
2. Bore wells generally tap deeper fracture which may not be sustainable throughout the year. Hence the bore well should only be used for drinking purpose, not for irrigation purposes.
3. The overall stage of ground water development for the district has already reached about 70%. Therefore, future development of ground water resources should be carried out with proper care and planning.

4. In the "Semi-Critical", "Critical", "Over-Exploited" watersheds and 4 "Semi-Critical" talukas viz., Baramati, Ambegaon, Purandhar and Junnar the stage of ground water development indicates a very limited scope for further ground water development unless ground water recharge exceeds the ground water draft by artificial means. Therefore future ground water development is not recommended without adhering to the precautionary measures i.e., artificial recharge to augment the ground water resources and adoption of ground water management practices in these areas.
5. Haveli, Shirur and Daundtalukas have medium to high yield potential and the suitable abstraction structures recommended for ground water development are dugwell and borewells.
6. The scope exists for construction of suitable artificial recharge structure in the district. The structure recommended particularly for the hilly area in the west and northwestern part are contour bunds, gully plugs, nala bunds and check dams etc. For other hard rock areas of the district, nala bunds, check dam, KT weirs and percolation tanks at suitable sites are suggested. The existing dug wells may also be used for artificial recharge of ground water by insuring that the water used for recharge should be free from silt and other impurities.
7. The existing percolation tanks and village ponds need to be rejuvenated to act both as water conservation and artificial recharge structure.
8. To enhance the ground water resources and for sustainable development, mass awareness programmes should be organized in large scale by district administration. Such programmes are necessary so as to educate the user regarding yielding capacity of aquifer and declining trend of water levels in the district. Similarly farmer should also be encouraged to adopt appropriate crop planning and irrigation practices.

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