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Original Article

Geographical Analysis of Surface and Ground Water Availability in West Vidarbha Region

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Abstract

Water is an essential tool in agriculture as well as various industrial processes. With the exception of the river Brahmaputra in India, there is a huge competition on water resources in all interstate rivers. In addition, water sharing controversy is not only confined to the states of India but also arises with neighboring countries of Nepal, China, Pakistan, Bhutan and Bangladesh. (World Bank Report, 2006) Present paper reveals the analysis of surface and ground water availability in West Vidarbha region.

Key Words-*Surface, Ground, Water, West Vidarbha*

Introduction

There are two different types of water to meet the water supply needs of a community, including surface water and groundwater water. The surface of the surface includes the water, the flow system, and any of the sweetness left in the ponds. On the other hand, groundwater reservoirs contain groundwater water. Most groundwater water is obtained from the melting of the ice and the rain falling from the surrounding soils. As the water flows down, it stabilizes the cavities and fractures found in the layers of rocks. The present research paper studies the district wise availability of surface and ground water in West Vidarbha region in the year 2001, 2011 and 2021 respectively

Objectives of the Study

The specific objectives of the present study as follows,
To study the district wise distribution of surface water availability in the stdy region.
To study the district wise distribution of ground water availability in the stdy region.

Data Source and Methodology

Present research paper is based on the secondary source of data, The data is collected from 'Water Conservation Department', 'Aquifer Maps and Ground Water Management Plan", and related websites. The collected data is presented in a table and its distribution is shown in a map. The analysis is based on the year 2001, 2011 and 2021.

Study Area

West Vidarbha is located in the central part of India and this division consists of five districts, namely Amravati, Akola, Yavatmal, Washim and Buldhana.

The latitudinal extent of West Vidarbha is between $19^0$24' north latitude to $21^0$41' north latitude and the longitudinal extent is between $75^0$55' east longitudes to $78^0$56' east longitude. The total geographical area of West Vidarbha is 46,547 sq km which is 14.75% of the total area of Maharashtra state.

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Surface Water

Surface water refers to anybody of liquid water found on the Earth's surface. This includes the ocean water and the water deposited in the inland repositories, e.g., rivers, streams, lakes, wetlands, reservoirs and creeks (Dooge 2009).

The following table no. 1 shows the availability of surface water in Western Vidarbha district-wise.

Table No. 1

West Vidarbha - Surface Water Availability (2001-2021)

	Availability (Million Cubic Meter)					
	2001		**2011**		**2021**	
District	**Availability**	**%**	**Availability**	**%**	**Availability**	**%**
Amravati	343.25	37.30	443.03	31.33	378.77	29.93
Akola	51.80	5.63	132.2	9.35	168.35	13.30
Washim	42.11	4.58	38.25	2.70	111.42	8.81
Buldhana	135.72	14.75	176.46	12.48	122.45	9.68
Yavatmal	347.38	37.75	624.28	44.14	484.40	38.28
Total	**920.26**	**100%**	**1414.22**	**100%**	**1265.39**	**100%**

Source - Water Conservation Department, Regional Office, Amravati

The total surface water storage available in Western Vidarbha in the year 2001 was 920.26 million cubic meters. During this period, the maximum water storage was available in two districts, Yavatmal (347.38 MCM) and Amravati (343.MCM). Out of the total surface water resources in the study area, 37 to 38% of the water resources were available in each of these districts. Washim district had the lowest water resources, i.e. only 4.58% of the total water resources in the study area In Akola district too, the surface water storage was only 52.80 MCM which was low. The water storage capacity of Buldhana district is 135.72MCM and this is 14.75% of the total water storage capacity of the study area. Since most of the area of Buldhana district is hilly, the water storage capacity is found to be low.

In the year 2011, the surface water storage in Western Vidarbha had increased compared to 2001. During this period, the total surface water storage in the study area was 1414.22 MCM, the highest amount of which was in Yavatmal district at 624.28 MCM. Yavatmal district has the highest number of projects. Also, the number of large projects is more than other districts. Also, this district is large in area. Therefore, the surface water storage here is found to be more than other districts. During this period, the surface water storage of every district except Washim district had increased. During this period too, the lowest surface water storage was available in Washim district (38.25 MCM). After Yavatmal, Amravati district had surface water storage of 443.03 MCM. In the remaining two districts, namely Buldhana and Akola, this water storage is found to be available in the range of 100 to 200 MCM.

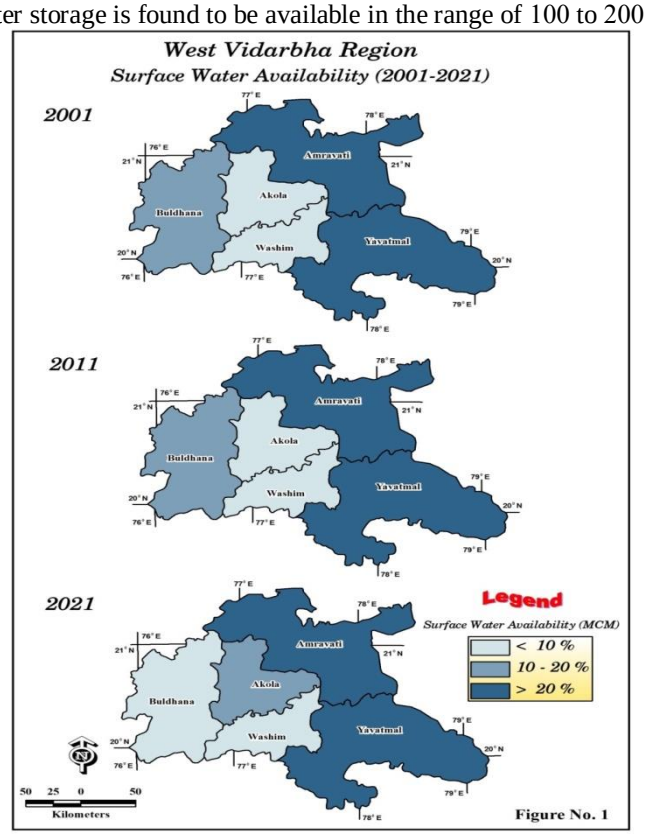

Figure No. 1

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In the year 2021, the surface water storage in Western Vidarbha is found to have decreased compared to 2011. During this period, the total surface water storage in the study area was 1265.39 MCM, with the highest amount in Yavatmal district at 484.40 MCM. Yavatmal district has the highest number of projects, as well as the number of large projects, compared to other districts in the study region. Therefore, the surface water storage in Yavatmal district is seen to be higher than other districts. During this period, the surface water storage in all districts except Akola and Washim districts has decreased. Even during this period, Washim district (111.42 MCM) had the lowest surface water storage. After Yavatmal, Amravati district had a surface water storage of 378.77 MCM. The other two districts of the region, namely Buldhana and Akola, had a surface water storage of 122.45 MCM and 168.35 MCM respectively.

Ground Water

Most of the groundwater in the earth is half a mile from the surface or less. Once the water reaches the impenetrable layer of the earth, the water starts to flow up and up. When the groundwater is stored, it can appear on the surface as groundwater ponds and springs.

The West Vidarbha region is an important region in terms of water resources in the state of Maharashtra and a large number of groundwater water supply for agriculture, industrial and urban water supply is dependent on the water. Due to the increasing pressure on water resources, irregularities in the climate and increasing population, water scarcity is getting serious. The groundwater storage in the region is an important indicator for sustainable water management. Due to climate change, disruptive distribution of rain, population growth, increasing need for irrigation and encroachment on water resources, groundwater reservoirs are constantly changing.

The following table No. 2 shows the availability of groundwater in the study area during the study period from 2001 to 2021.

When looking at Table No.2 above, it is seen that in the year 2001, the total groundwater storage in Western Vidarbha was 3833.6 MCM. Yavatmal district had the highest groundwater storage of 1224.68 MCM (31.95%), meaning that the water resources of this district were relatively abundant. While the lowest groundwater storage was found in Akola district with only 412.2 MCM (10.75%).

Table No. 2

West Vidarbha - Ground Water Availability (2001-2021)

	Availability (Million Cubic Meter)					
	2001		**2011**		**2021**	
District	**Availability**	**%**	**Availability**	**%**	**Availability**	**%**
Amravati	965.24	25.18	931.77	23.08	935.7	21.99
Akola	412.2	10.75	404.28	10.01	448.2	10.53
Washim	582.98	15.21	570.33	14.13	561.87	13.20
Buldhana	648.5	16.92	944.48	23.39	948.52	22.29
Yavatmal	1224.68	31.95	1186.27	29.38	1361.65	31.99
Total	**3833.6**	**100%**	**4037.13**	**100%**	**4255.94**	**100%**

Source - Aquifer Maps and Ground Water Management Plan (Respective Districts)

Also, after Yavatmal, Amravati district has 965.24 MCM (25.18%) of groundwater reserves, while Buldhana and Washim districts have between 550 MCM and 650 MCM. The availability of groundwater in Akola district was low. During this period, rainfall in the western Vidarbha region was relatively stable and the impact of water conservation schemes was limited.

In the year 2011, the total groundwater storage was 4037.13 MCM, an increase of 203.53 MCM over the year 2001. This increase is attributed to water conservation and recharge programs and to some extent to higher rainfall in the region. Yavatmal district has the highest groundwater storage at 1186.27 MCM (29.38%) while Akola district has the lowest groundwater storage at 404.28 MCM (10.01%). Similarly, Amravati district has groundwater storage of 931.77 MCM (23.08%). This shows that the demand for water in this district has increased and the storage has remained relatively low. Both Buldhana and Washim districts show a slight increase, especially Buldhana district which has reached the second position with a storage of 944.48 MCM (23.39%).

In the year 2021, the total groundwater storage in Western Vidarbha was 4255.94 MCM, an increase of 218.81 MCM (5.4%) over the previous decade. However, there is a large disparity in district-wise groundwater reserves. The highest groundwater reserves in the region are found in Yavatmal district, which is 1361.65 MCM (31.99%). From this, it can be assumed that the rainfall in this district has improved and the water conservation projects have been effective to some extent. Similarly, the groundwater storage in Buldhana district has increased to 948.52 MCM (22.29%) and in Amravati district to 935.7 MCM, but its percentage share has decreased to 21.99%. This shows that the demand for water in Amravati district is high and recharge or storage is not effective. However, there has been a slight increase in Akola and Washim, The groundwater storage of Akola district is 448.2 MCM (10.53%), while that of Washim is 561.87 MCM (13.20%).

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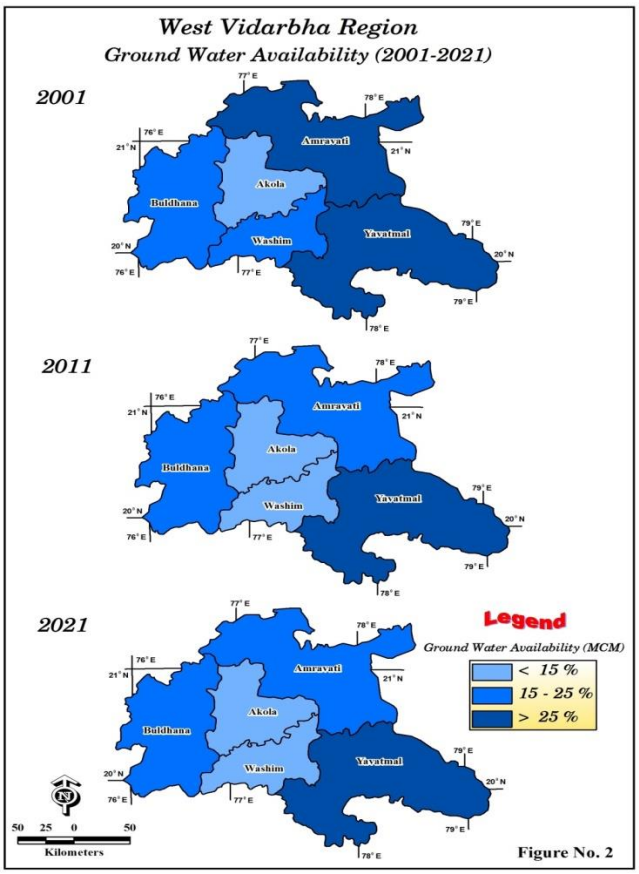

Figure No. 2

Conclusions and Suggestions

. Washim district is a drought prone district and the rainfall in this district is less than other districts. The surface resources in Washim and Buldhana in the study area are found to be very low. This is because the main reasons for this are inadequate rainfall, runoff from rivers and canals, and lack of water management.

The total groundwater storage in the study region has increased by about 11% in the last two decades, which is attributed to the water conservation schemes of the state and central governments, the 'Jalyukt Shivar Abhiyan', and water literacy of farmers. Similarly, Yavatmal and Buldhana have consistently seen an increase in groundwater reserves, which is an indication of improved rainfall and water management in these areas. However, despite the numerical increase in Amravati district, there has been a decrease in the percentage. This shows that the demand for water has increased due to the growing population of the area, industrial development, and production of perishable crops such as soybeans and oranges. Additionally, the situation in Akola district of the region, although improving, is limited: there has been a slight increase in reserves but the percentage is still low, meaning that expansion of water conservation and storage capacities is needed.

The study of groundwater reserves from 2001 to 2021 shows that water availability in Western Vidarbha is gradually increasing, but the decline in the percentage of groundwater reserves in Amravati and Akola districts is a matter of concern. Considering the possibility of further increase in water demand in the future, it is essential to formulate a district-wise water management policy, increase groundwater recharge capacity, emphasize water conservation in cropping systems, and improve rainwater storage capacity.

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