



ASSESSMENT OF GROUNDWATER LEVEL FLUCTUATION IN KARJAT TEHSIL IN AHMEDNAGAR DISTRICT OF MAHARASHTRA STATE USING GIS TECHNIQUE

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Abstract-

Groundwater is a precious and widely distributed resource of the planet earth. The depletion of groundwater level has become Sevier problem in rural and drought proven area. The present research work is deduced on groundwater level fluctuation and assessment of Karjat Tehsil. The spatial and temporal distribution of groundwater fluctuation was mapped and classified in to different zones by using ArcGIS10.1 tools. The spatial analysis techniques were used for interpolation of groundwater level function in Karjat tehsil. The groundwater level map prepared for 2014-2019 on the basis of pre and post groundwater level data.

The data of groundwater level is gathered by using random sampling method. The nineteen waters well and borewells are observed in pre and post monsoon for determine fluctuation of groundwater. The groundwater table obtained values of these region was observed ranging from the 2.55m to 22.5m. The groundwater level significantly increases in post monsoon season and it is decline toward the pre monsoon period. The result indicates that the different effective strategies and conservation methods are recommended

Keywords- Groundwater, Seasonal Variation, Water Level Fluctuation, GIS.

Article History

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Introduction-

Groundwater is compressive source of water supply schemes all over the world, exclusively in rural areas. It is major and significance source for ecosystem and irrigation. (P. J. Sajil Kumar, 2020) This resource can be optimally used and sustained only when the quality of groundwater evaluated properly. It is crucial to maintain a proper balance between the available groundwater resource and its exploitation (Todd 1980).

Geographical information system is one such a tool, which has the capability of modelling groundwater potential (L. Yeshodha et al. 2010) In this study, Karjat tehsil of Ahmednagar district, Maharashtra, is selected as study area for assessing the groundwater fluctuation. This area is a dominated by agriculture, which has been

facing the difficulties of depleting levels in its fresh groundwater superiority girdle. The groundwater level fluctuation help us to understand the depletion and recharging situation of an aquifer.

Study Area-

The Karjat tehsil of Ahmednagar district has been selected for current research. The geographical location of Karjat Tehsil is 18°19'86''N to 18°49'86''N latitude and 74°43'20'' to 75°13'20'' E.

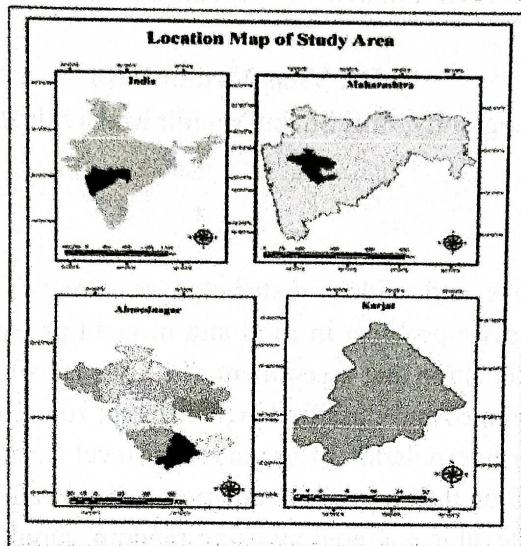


Fig-1 Location Map of Study Area

The study area locating on the number of toposheet these are 47J/11, 13, 14, 15, 47N/1, 2, 3. The Karjat Tehsil having 1503.61 Sq. kms area. The average height of Karjat tehsil 594 Mts from mean sea level. Administratively this area comes under the Sothern part of Ahmednagar district. The mean annual rainfall in the study area is 54 cm. Near about 80 percent precipitation is contributed by south west monsoon in June to September and remaining 20 percent is received during return monsoon Season. It is entirely reliant upon the rainfall but lately some part of Karjat is occupy by canal irrigation system. The present study areas belong to drought prone area.

Database and Methodology-

This study involved with primary and secondary data. The primary groundwater data was obtained from direct observation and secondary data have been downloaded from Groundwater Survey and Development Agency, government of Maharashtra for the duration of six year (2014-2019) of two different seasons that is Pre-monsoon and post-monsoon season. The total 16 wells were selected and observed for current and future studies. The water level measured by using manual measurement method and well locations were recorded with the help GPS (Garmin GPS MAP 86i).The fluctuation of groundwater level were calculated in Microsoft office Excel version 2016.

The base map of study area prepared by using Survey of India's topographical sheet 1:50,000 scale. The seasonal groundwater level and fluctuation map were prepared by using geostatistical toolbox in ArcGIS10.7 software.

Result and Discussion-

1. Spatio-temporal distribution of groundwater level from 2014-2019

The groundwater level is a significant parameter to comprehend the existing potential of groundwater of an area. The groundwater level can be estimated by deepness of the water. If the groundwater level is shallow, then condition of groundwater is good. But if the depth is profound then the level of groundwater is poor. On the base of field observed data the analysis was done by spatial interpolation method in ArcGIS10.7.

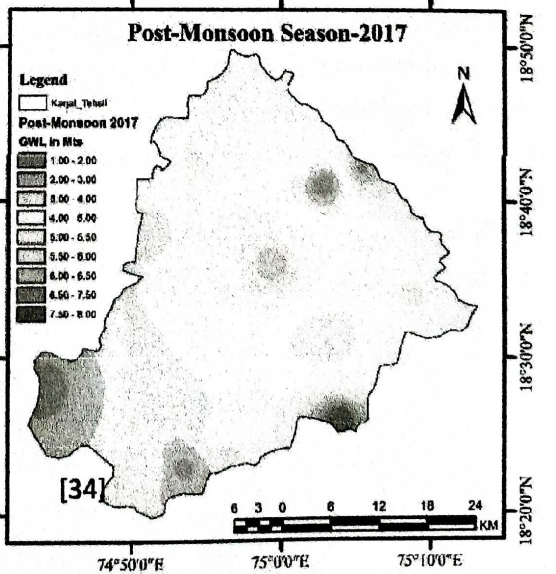
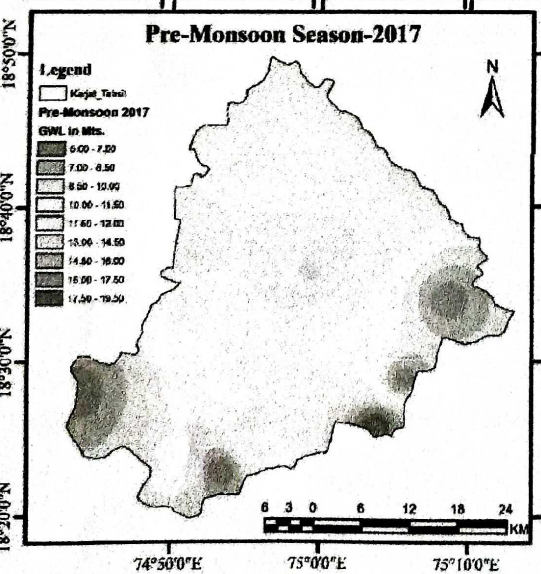
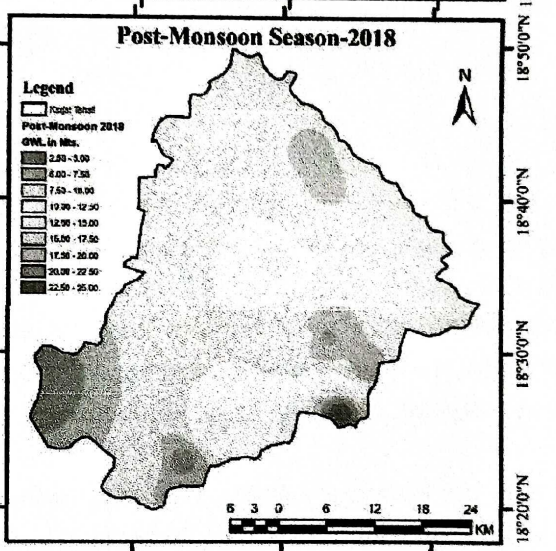
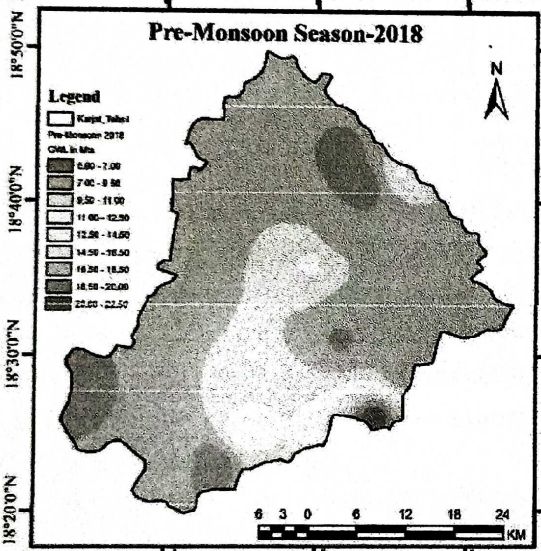
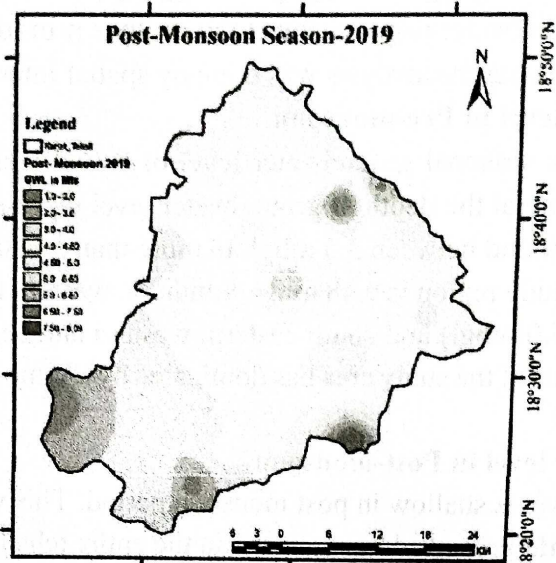
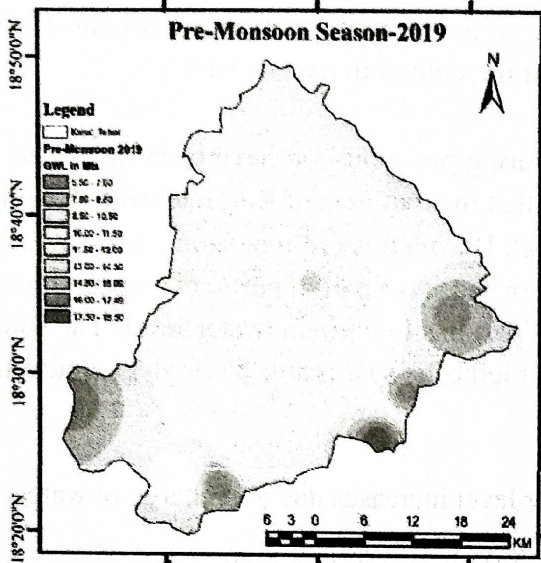
a. Groundwater level in Pre-monsoon

The year wise seasonal groundwater level of Karjat tehsil during pre-monsoon have been displayed in fig.no. 2 and 3. In general the depth of groundwater level represents that most of area of Karjat tehsil had varied water level which is found between 3.5 mbgl. to more than 19.50 mbgl. During this pre-monsoon season average groundwater of the study region is 9.48 mbgl. Southern, western eastern and some part of northern area has higher groundwater level (5.0 mbgl) and south eastern, western and central part has low groundwater level. The south and south western part of the study area has dominated by Bhima River left bank so this area has high groundwater level.

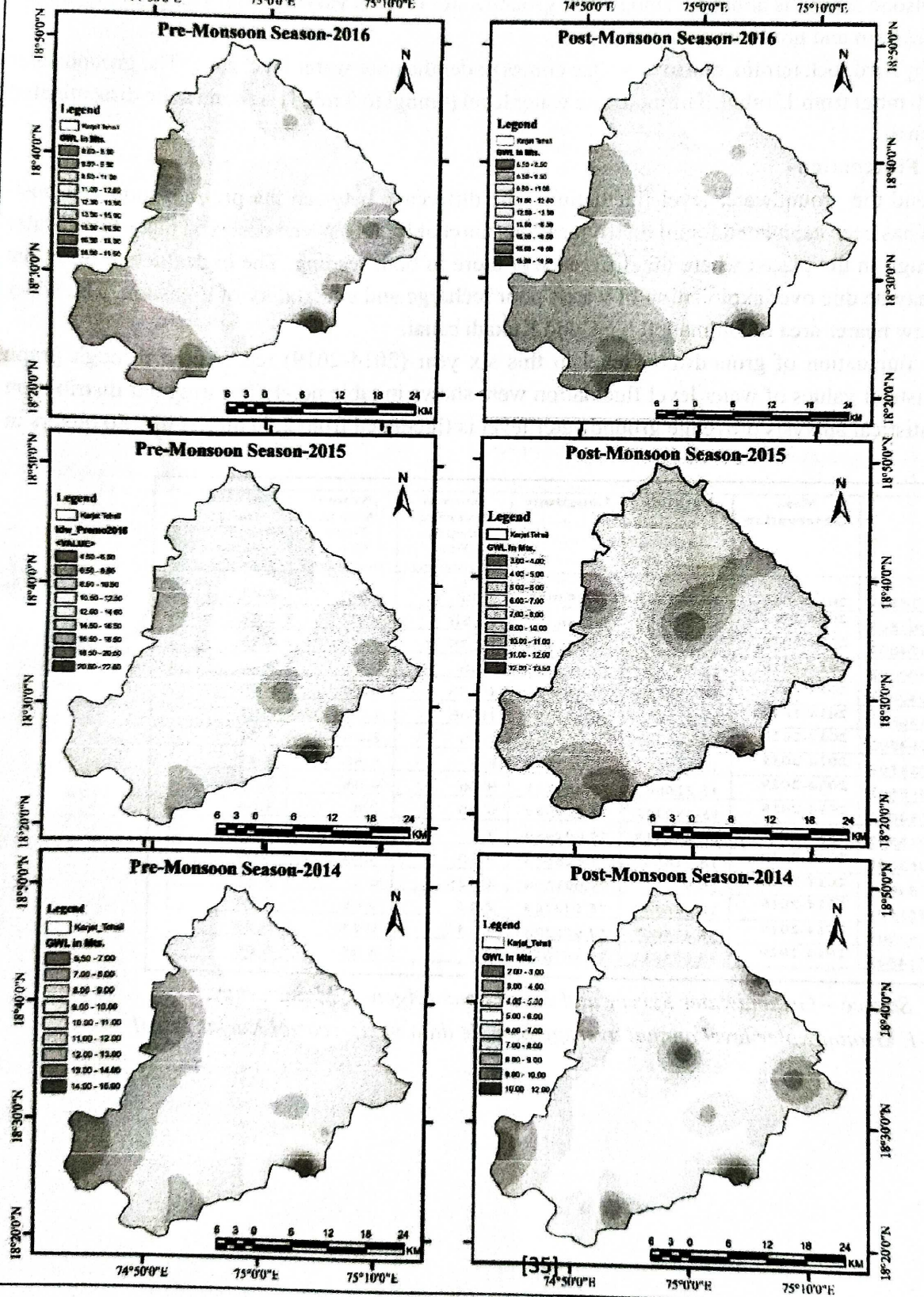
b. Groundwater level in Post-monsoon

The groundwater level is shallow in post monsoon period. This water level increases due to recharge of water table, due to the rainfall received by monsoon in the entire tehsil.

Groundwater Level Fluctuation From Year 2017 - 2019



Groundwater Level Fluctuation From Year 2014 - 2016



The October, November and December these months are post monsoon months. The average water level of study area during post monsoon season is about 5.77mbgl. The groundwater level is varying from 1mbgl to 20.50mbgl this area. The south eastern and north western part of Karjat is covered by hard rock terrain, due to this zone comes under the poor water level zone. The groundwater level is found up to 20 mbgl from 12mbgl. The moderate water level (4mbgl to 8 mbgl) is found to be disseminated in most part of the tehsil.

Groundwater level Fluctuation-

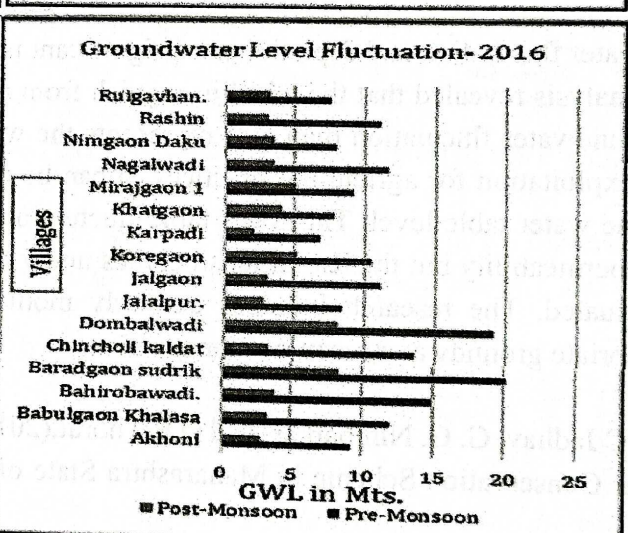
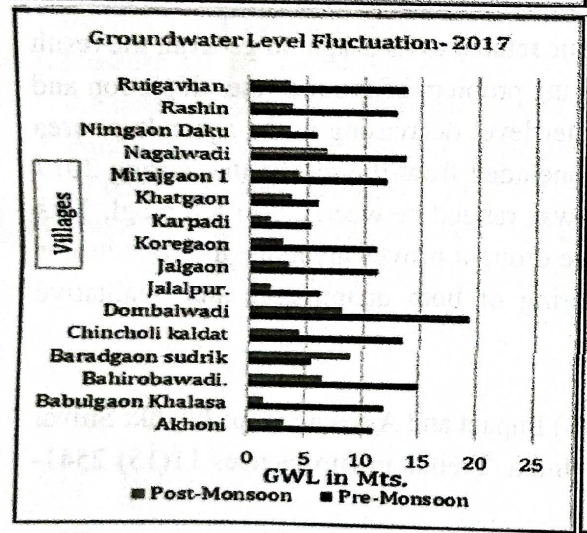
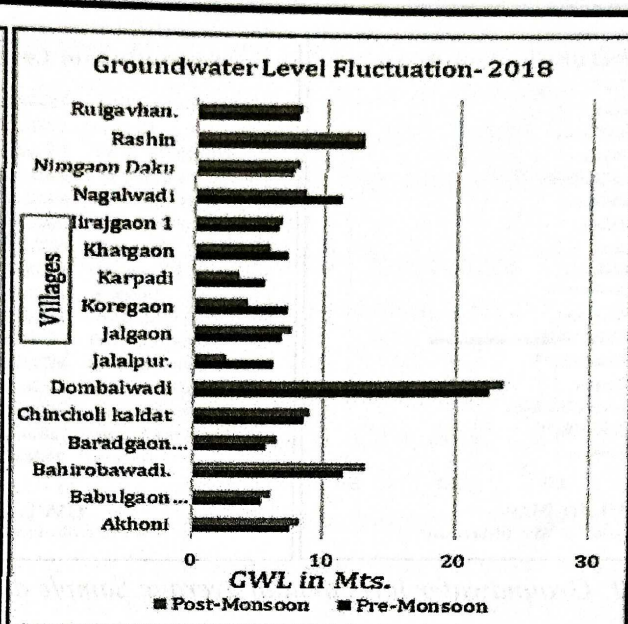
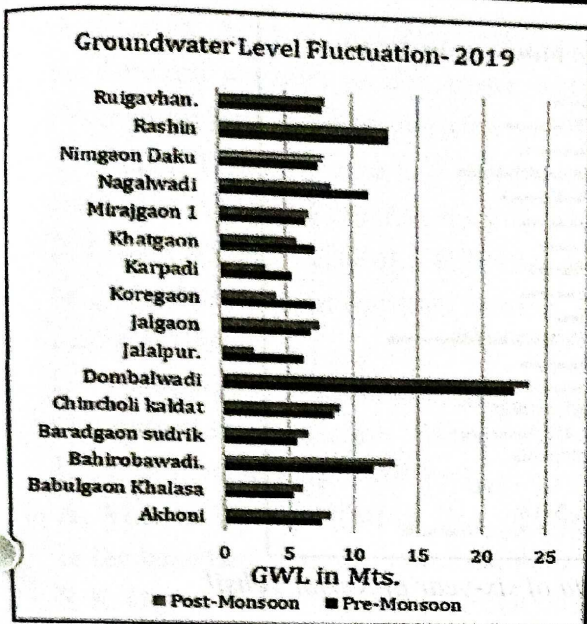
To comprehend the groundwater level fluctuations, the difference between the pre-monsoon and post-monsoon water level has been calculated for all the 16 locations unreliably. It has been observed that groundwater level fluctuation is high in the places where the difference is more in both reading. The high fluctuation in the groundwater level may be due over exploitation of water, poor recharge and uncertainty of monsoon. The water level fluctuation is low nearer area of Bhima left bank and Kukadi canal.

The average fluctuation of groundwater level in this six year (2014-2019) represented through graph (Figure-4-9) the statistical values of water level fluctuation were shows in table no.-1. The irregular distribution as observed from statistical analysis prove the groundwater level is fluctuated from 2.50 meters to 5.50 meters in study region.

Sr. No.	WID	Year Observation	Latitude	Longitude	Annual Average Depth (Pre-monsoon)	Annual Average Depth (Post-monsoon)	Fluctuation (mbgl)
1	W182345074514501	2014-2019	18.383333	74.854022	9.35	4.91	4.43
2	W183550075001501	2014-2019	18.683333	75.048397	10.58	5.25	5.33
3	W182645074484801	2014-2019	18.6	74.991508	13.35	9.2	4.15
4	W182655074490901	2014-2019	18.433333	74.080517	8.56	5.41	3.15
5	W182550075040001	2014-2019	18.633333	75.018917	11.25	6.15	5.09
6	W182845074440501	2014-2019	18.433333	75.064553	19.65	12.03	7.61
7	W183845075054501	2014-2019	18.466667	74.733761	7.05	2.83	4.21
8	W183145075031501	2014-2019	18.516667	75.027547	8.8	5.38	3.41
9	W183520074515501	2014-2019	18.516667	75.050781	9.46	4.38	5.08
10	W182940075054001	2014-2019	18.383333	74.888944	6.06	2.4	3.66
11	W184345075013502	2014-2019	18.483333	75.094489	7.1	4.65	2.45
12	W184215075053001	2014-2019	18.716667	75.028558	9.68	5.61	4.06
13	W183420075084001	2014-2019	18.7	75.091306	12.25	8.1	4.25
14	W182626074551501	2014-2019	18.566667	75.143364	7.13	4.85	2.28
15	W182600074552001	2014-2019	18.416667	74.922278	11.4	6.11	5.28
16	W182345074514501	2014-2019	18.633333	74.857036	9.4	4.35	5.05

Source – Groundwater Survey and development Agency, Maharashtra

Table-1. Groundwater level annual average Sample data of six-year of Karjat Tehsil



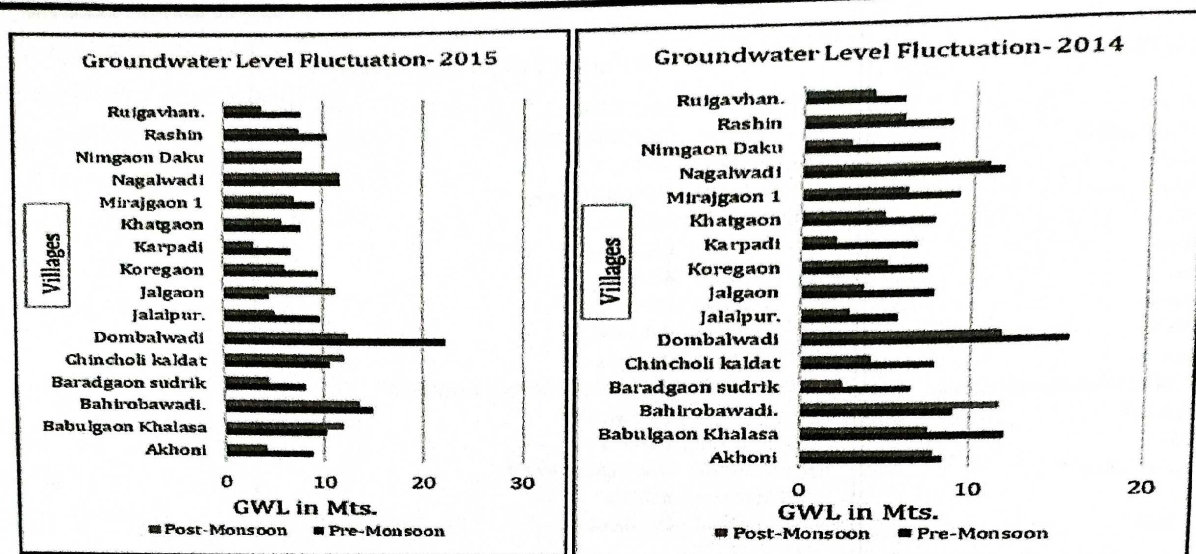


Table-1. Groundwater level annual average Sample data of six-year of Karjat Tehsil

Conclusion-

The groundwater fluctuation and depletion are a significant issue related to its usage. In general, the result obtained from this analysis revealed that the tehsil is anguish from acute problem of groundwater depletion and fluctuation. The groundwater fluctuation map also represents the water level decreasing in the agriculture area due to highly over exploitation for agriculture practices. It can be concluded from the results that during 2017 water level below the water table level. The water table fluctuation was ranged between 2.5 to 5.8 mbgl. This study area has high permeability but the Karjat tehsil comes under the drought proven area, due to groundwater is very highly fluctuated. The research indorses quarterly monitoring of both quantitative and qualitative monitoring to appropriate groundwater resource management.

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