INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

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SPECIAL ISSUE FOR
NATIONAL LEVEL CONFERENCE
"Recent Trends and Development in Civil Engineering"

# SITE SELECTION FOR ARTIFICIAL GROUNDWATER RECHARGE OF GANDHINAGAR DISTRICT

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**Accepted Date: 27/01/2018; Published Date: 01/03/2018**

**Abstract:** Water is essential for the existence of all forms of life for human consumption, agriculture and industrial. This is the reason why the man has moved and settled only in areas of rich water resources. As the population has started growing and unregulated usage of surface water resources has been initiated in multiple fronts the available water is not able to cope up to human needs. So, the man has aggressively and competitively started mining the ground water reservoirs all over the world using all the possible and available modern technologies. Water resources of the world in general and in India are under heavy stress due to increased demand and limitation of available quantity. Since urbanization, the demand for water is increasing day by day and the sources of fresh water are depleting rapidly. Groundwater is not only an important component of the hydrological cycle but also the most important source of water for drinking, domestic, industrial and agricultural uses. In a densely populated country like India, ground water resource is of extreme importance. Gujarat Government announced that the Gandhinagar district is under the heavy stress of water availability. All four talukas are over exploited due to the excessive withdrawal of groundwater. So, it's necessary to takes steps against this problem in these study artificial groundwater recharge process is applied on Gandhinagar district. Artificial groundwater recharge is a process by which the groundwater reservoir is reduced at a rate exceeding the augmentation rate under natural conditions of replenishment. The work aims to understand the ground water scenario from the geological point of view as geology of the area concerned is the main control of ground water recharge, and potentiality. This study aims that recharging the groundwater of and tries to overcome the scarcity of water in Gandhinagar district.

**Keywords:** Water scarcity, Groundwater, Artificial recharge, Techniques

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**Access Online On:**

www.ijpret.com

**How to Cite This Article:**

Naishadkumar Jagdishbhai Sutariya, IJPRET, 2018; Volume 6 (7): 52-58

*PAPER-QR CODE*

**INTRODUCTION**

India is now facing a water situation that is significantly worse than any that previous generations have had to face. All Indian water bodies within and near population centres are now grossly polluted with organic and hazardous pollutants. Interstate disputes over river waters are becoming increasingly intense and widespread. Not a single Indian city can provide clean water that can be consumed from the tap on a 24×7 basis. In India, groundwater has come to occupy an enviable position in terms of meeting 55% of irrigation, 85% of rural and 50% of urban and industrial needs. Almost 90%of drinking water needs are met from groundwater.

Surface water conditions are bad. However, the groundwater situation is even worse.

Groundwater extraction is growing and has become increasingly unsustainable. Consequently, in many parts of the country, groundwater levels are declining steadily. In some parts, the levels are declining by more than one meter per year. A lack of proper wastewater treatment from domestic, industrial, and mining sources has meant that groundwater is being progressively contaminated by known and unknown pollutants, increasing the potential health risks to humans and ecosystems.

The Gujarat government has declared 14 districts and 152 talukas of the state as "scarcity hit" due to deficient rains and announced a stimulus package with fodder subsidies and out-of-turn power connections among other measures. Every taluka in districts of Kutch, Surendranagar, Rajkot, Jamnagar, Junagadh, Amreli, Porbandar, Bhavnagar, Ahmedabad, Gandhinagar, Patan, Banaskantha, Mehsana and Bharuch falls under this category.

**Need of study**

- In Gandhinagar net annual groundwater availability is 45300.05 ha.mand Existing Gross Ground Water Draft for irrigation is 51272.00 ha.m, Existing Gross Ground Water Draft for All uses is 54384.00Ha.m. on the other side, Allocation for domestic and industrial requirement supply upto next 25 years is 4257.00 Ha.m . Net Ground Water Availability for future irrigation development is Zero.
- For confined aquifers, In the year 1995-2000 water level of Gandhinagar is nearer to 80 m, in present condition it is reaches to the 93 m.
- For unconfined aquifers, water level is 12m in 1995 and in present time it’s reached upto 18m. Based on the present scenario groundwater water levels of Gandhinagar are depleting rapidly at the Gandhinagar can cause heavy stress of water in future.

**Objectives:**

- To maximize long-term & seasonal storage of water under the ground surface.
- Maintaining declining ground water levels.

- To demarcate the area and depth of groundwater recharged by different recharge methods.
- To suggest measures to enhance recharging rate of groundwater level.

**Scope of study**

The information given by the data of Gandhinagar district, the most suitable areas for the recharge has been found and the rise of groundwater level by the various groundwater recharge methods, like direct methods, indirect methods and combination methods. Due to the successive analysis of data and implementation of the recharge methods, groundwater is rise and that water is used for the various purpose.

**Study Area**

Gandhinagar District is an administrative division of Gujarat, India, whose headquarters are at Gandhinagar, the state capital. It was organized in 1964.

It has an area of 649 km², and a population of 1,334,455 of which 35.02% were urban (2001 census). The district includes Gandhinagar with three Suburbs - Chandkheda, Motera, Adalaj. The four tehsils are - Gandhinagar, Kalol INA, Dahegam and Mansa - and 216 villages.

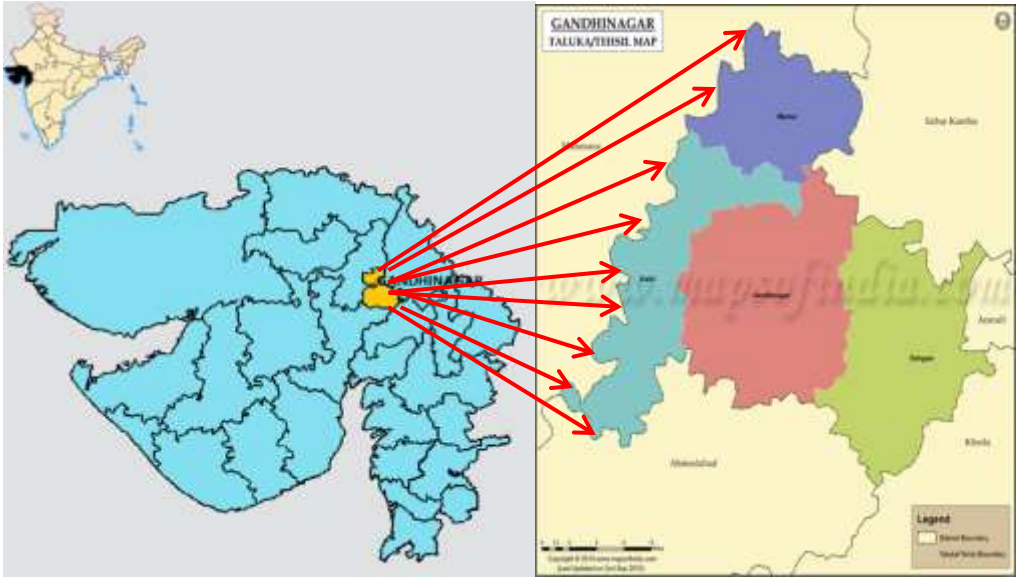
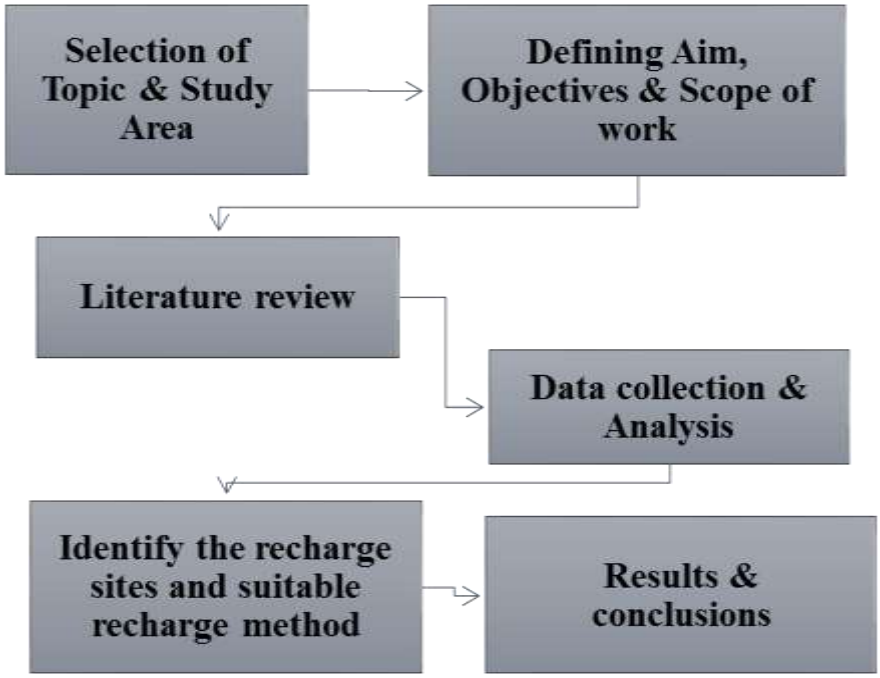



**Fig.1 Location of Gandhinagar District**

**Methodology**




**Data Collection**

Data required for the implementation of the project are following:

- Rainfall Data
- Existing & past groundwater level(pre-monsoon/post-monsoon data)
- Aquifer system
- Available water resources

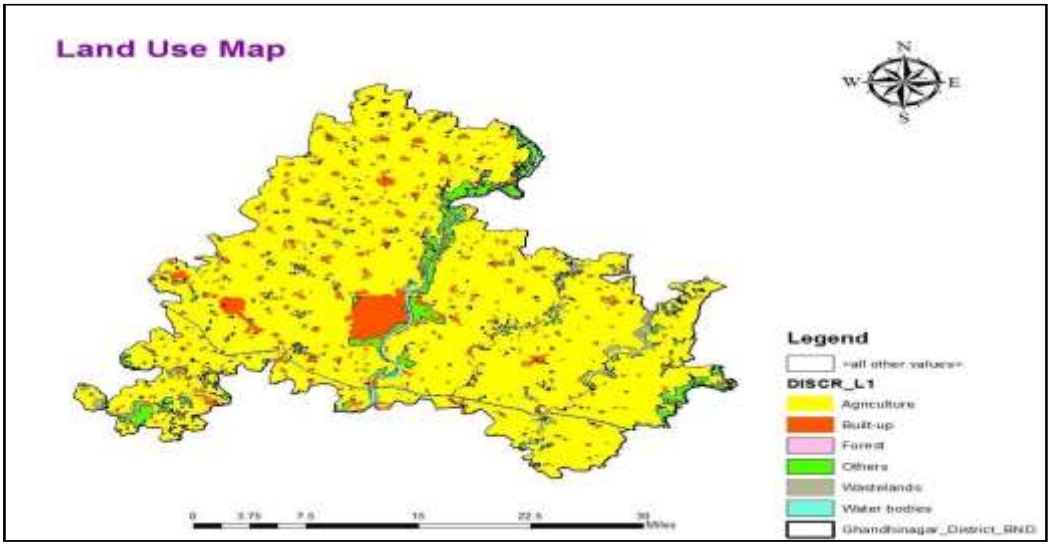



**Fig 2: Land use Map**

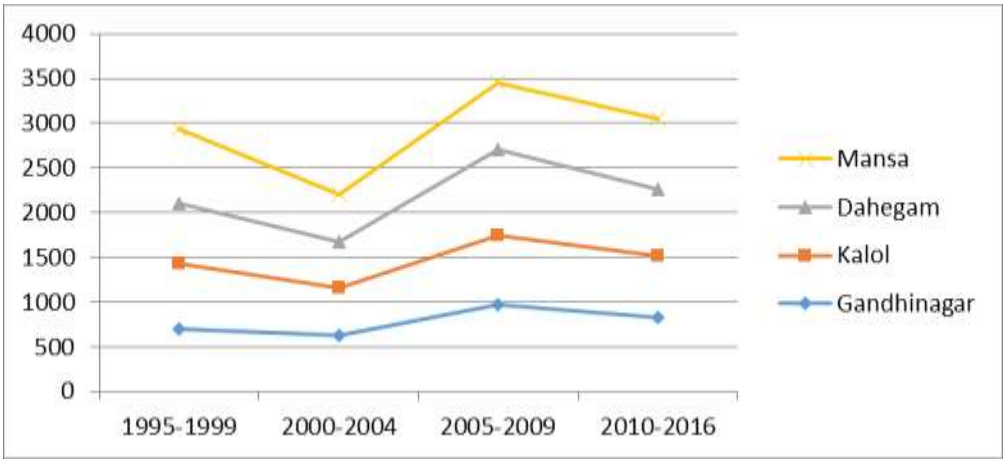



**Fig 3: average annual Rainfall**

**Groundwater scenario**

It includes pre-monsoon and post-monsoon data of groundwater level of Gandhinagar distrct it helps to understand the groundwater level fluctuations.

**Confined aquifer**

**Table 1- Confined Aquifer (2000)**

| Location | Groundwater level | |
|---|---|---|
| | Pre-monsoon | Post-monsoon |
| Gandhinagar | 80.63 | 78.38 |
| Dahegam | 68.31 | 65.7 |
| Mansa | 97.11 | 96.27 |
| Kalol | 102.08 | 101.025 |

**Table 2- Confined Aquifer (2016)**

| Location | Groundwater level | |
|---|---|---|
| | Pre-monsoon | Post-monsoon |
| Gandhinagar | 93.37 | 92.09 |
| Dahegam | 64.70 | 63.32 |
| Mansa | 102.12 | 99.3 |
| Kalol | 108.73 | 102.51 |

**Unconfined Aquifer**[22]

**Table 3- Unconfined Aquifer (2000)**

| Location | Groundwater Level |
|---|---|
| Gandhinagar | 13.57 |
| Dahegam | 11 |

| | |
|---|---|
| Mansa | 35 |
| Kalol | 42 |

**Table 4 Unconfined Aquifer(2016)**

| Location | Groundwater level |
|---|---|
| Gandhinagar | 18 |
| Dahegam | 14 |
| Mansa | 37 |
| Kalol | 36 |

**Existing aquifer System**

The studies carried out by CGWB under UNDP project, which also covered the northern part of Gandhinagar district, a multi-aquifer system was established. A total of 7 aquifers zones, each separated by aquiclude of varying thickness, were identified as “A”, “B”, “C”, “D”, “E”, “F” and “G”. The aquifers being tapped are “B and/or C” in major part of the district. However, aquifer “A” and “D” are also being developed either in isolation or in combination of other aquifers in the eastern and western parts respectively. It provides the location of aquifers so we have to select the aquifer recharge site as per their locations.

**Available water source**

Based on this data we have to aware the location of ponds, canals and rivers. It can helps to estimates the directly percolation of surface water.
Rivers:- 03 (Sabarmati, Meshwo, Khari)
Canals:- 01 (Narmada main canal)
Water conservation structures:- 01( Santsarovar)

**CONCLUSION**

In present study, the data collected of study area and analyzed as per requirement. It help to select suitable recharge site and recharge method. As per the guidelines given in manual of artificial recharge to groundwater site selection for artificial recharge is selected. Mostly all area of Gandhinagar is under water stress but At that location, where levels of groundwater is high are most suitable for recharge. Study area covers mostly alluvial plain landform so, the suitable recharge methods in Gandhinagar district are percolation tanks, injection wells and recharge shafts.

**ACKNOWLEDGEMENT**

Apart from the efforts of me, the success of any project depends largely on the encouragement and guidelines of many others. I take this opportunity to express my gratitude to the people who have been instrumental in the successful completion of this project. I wish to express my deep sense of graduate to my guide, Mr. Jitendrasinh raol for their able guidance and useful

suggestions. Finally, yet importantly, I would like to express heartfelt thanks to my beloved parents for their blessings, my friends for their help and wishes for the project.

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