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Conceptualization and Design of an Efficient Groundwater Recharge system for NIT Kurukshetra

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Abstract

National Institute of Technology (NIT) Kurukshetra is a 292-acre campus, having more than 7000 residents on the campus. Due to lack of an efficient drainage system, the campus turns into a system of pools at important locations. This accumulation of water for long durations creates an unhealthy environment for the inhabitants besides damaging the roads, pavement and foundation of buildings. Hence, keeping in view all the above problems and status of the campus, rainwater harvesting can be considered as one of the solutions for addressing the problem of accumulated rainwater in the NIT Kurukshetra. The total area of the campus is 11,79,607 sqm, out of which 1,15,941 sqm is built up area and rest of the plain area can be utilized for artificial recharge. In this paper, an efficient design of rainwater harvesting system for the campus is proposed. The detailed design of the components of rainwater harvesting through artificial recharge i.e. filter gallery, recharge well, recharge pit, inspection pit etc are provided. It is expected that the result of the study if implemented will certainly fulfill the dual objective of addressing the menace of water logging in the campus besides enriching the groundwater aquifer.

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Keywords: Rainwater harvesting; artificial recharge; aquifer; average annual rainfall; water logging; catchment area;

1. Introduction

India is rapidly growing its population to almost five times since five decades from 1951 (62.44 million) to 2001 (286.08 million). Today, with this growing population water demand is not met and water is required in vast amount. Although essential, but freshwater is unevenly distributed. Only 2.5% of earth's water is freshwater and almost three quarter of it is frozen in the ice caps. In today's world, much water is wasted or used inefficiently; often demand is growing faster than the supply can be replenished by nature. While competition over water resources can be a source of conflict, history has shown that shared water can also be a catalyst for cooperation. By 2025, it is estimated that about two thirds of the world's population about 5.5 billion people will live in areas facing moderate to high water stress.

In India, usually this growing problem is taken for granted because of its availability; but in scarcity it becomes our most precious resource. Therefore, by knowing the importance of water to our thriving industries and growing population, India has been trying to find ways to meet the increasing demand and the rainwater harvesting technique is adopted.

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Today, In India, if we particularly talk about “Kurukshetra city” then the city receives an annual rainfall of 582 mm and area is 1530 km^2. Thus it can be a potential act to catch rainwater and hence rainwater harvesting is done and later many benefits can be drawn out of this technique.

2. Components of rainwater harvesting

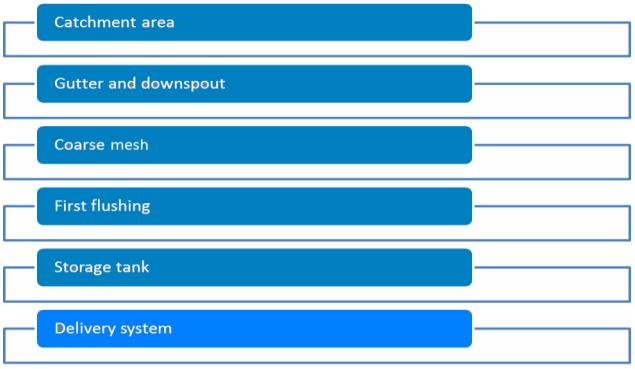

Figure 1: Component of Raimwater Harvesting

3. Methodology

3.1 Study area

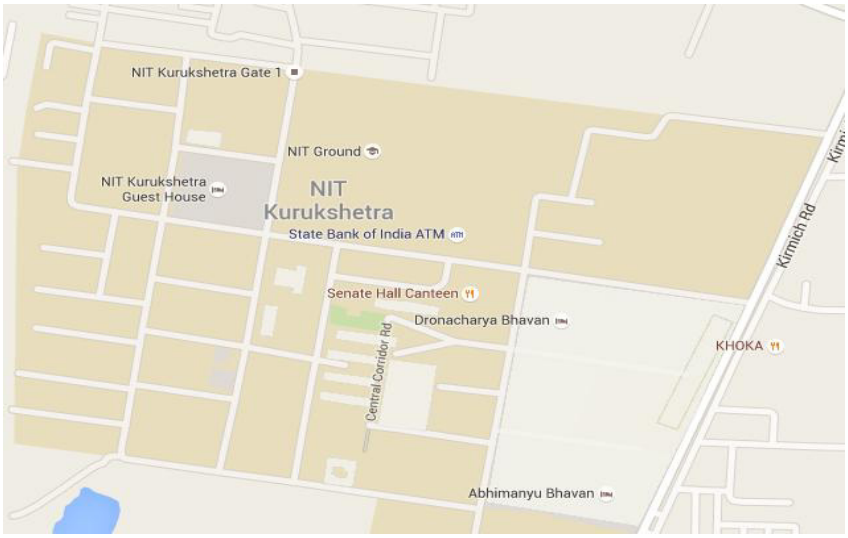

Figure 2: Satellite view of the study area

3.2 Hydrogeology

This campus area is underlain by silty clay of low plasticity. Here there were total 7 boreholes drilled at site upto 10 m depth below ground level. There are 5 aquifer systems within the explore depth of 10m. The first aquifer is lying within the depth of 1.9m and it is under unconfined to semi-confined conditions. Transmissivity of the aquifer varies from 1000 to 1500 m^2/ day. The result of exploratory drillings reveals the existence of five tier aquifer systems in the city area within the depth of 10 m as detailed below: