

Optimal Uses of Rainwater to Maintain Water Level in Gomti Nagar, Uttar Pradesh, India

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Abstract : Water is nature's important resource for survival of all living things, but freshwater scarcity exists in some parts of world. This study has predicted that Gomti Nagar area (49.2 sq. km.) will harvest about 91110 ML of rainwater till 2051 (assuming constant and present annual rainfall). But 17.71 ML of rainwater was harvested from only 53 buildings in Gomti Nagar area in the year 2021. Water level will be increased (rise) by 13 cm in Gomti Nagar from such groundwater recharge. The total annual groundwater abstraction from Gomti Nagar area was 35332 ML (in 2021). Due to hydrogeological constraints and lower annual rainfall, groundwater recharge is less than groundwater abstraction. The recent scenario is only 0.07% of rainwater recharges by RTRWHs in Gomti Nagar. But if RTRWHs would be installed in all buildings then 12.39% of rainwater could recharge groundwater table in Gomti Nagar area. But if RTRWHs would be installed in all buildings then 12.39% of rainwater could recharge groundwater table in Gomti Nagar area. Gomti Nagar is situated in 'Zone-A' (water distribution area) and groundwater is the primary source of freshwater supply. Current scenario indicates only 0.07% of rainwater recharges by RTRWHs in Gomti Nagar. In Gomti Nagar, the difference between groundwater abstraction and recharge will be 735570 ML in 30 yrs. Statistically, all buildings at Gomti Nagar (new and renovated) could harvest 3037 ML of rainwater through RTRWHs annually. The most recent monsoonal recharge in Gomti Nagar was 10813 ML/yr. Harvested rainwater collected from RTRWHs can be used for rooftop irrigation, and residential kitchen and gardens (home grown fruit and vegetables). According to bylaws, RTRWH installations are required in both newly constructed and existing buildings plot areas of 300 sq. m or above. Harvested rainwater is of higher quality than contaminated groundwater. Harvested rainwater from RTRWHs can be considered water self-sufficient. Rooftop Rainwater Harvesting Systems (RTRWHs) are least expensive, eco-friendly, most sustainable, and alternative water resource for artificial recharge. This study also predicts about 3.9 m of water level rise in Gomti Nagar area till 2051, only when all buildings will install RTRWHs and harvest for groundwater recharging. As a result, this current study responds to an impact assessment study of RTRWHs implementation for the water scarcity problem in the Gomti Nagar area (1.36 sq.km.). This study suggests that common storage tanks (recharge wells) should be built for a group of at least ten (10) households and optimal amount of harvested rainwater will be stored annually. Artificial recharge from alternative water sources will be required to improve the declining water level trend and balance the groundwater table in this area. This over-exploitation of groundwater may lead to land subsidence, and development of vertical cracks.

Keywords : aquifer, aquitard, artificial recharge, bylaws, groundwater, monsoon, rainfall, rooftop rainwater harvesting system, RTRWHs water table, water level

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