

Enhancing Groundwater Sustainability through the Application of Deep Aquifer Replenishment Techniques Using Rainwater

Rapid urbanization and excessive groundwater extraction have led to severe depletion of deep aquifers, particularly in densely populated and hard rock regions where conventional rainwater harvesting systems fail to provide effective recharge. Existing surface-level recharge techniques are unable to address drawdown effects and do not facilitate water flow to deeper aquifer layers, resulting in land subsidence and long-term water insecurity. This project proposes a **novel borewell-integrated rainwater harvesting technique** that creates a direct recharge pathway alongside existing borewell structures, enabling rainwater to reach deep-seated aquifers. By utilizing a controlled channel mechanism, the system enhances deep aquifer replenishment, mitigates drawdown effects, and improves groundwater sustainability. The solution is scalable, cost-effective, and suitable for deployment in urban and water-scarce regions.

the rain water to get collected in the aquifer in the very bottom of the ground surface.

Technology Readiness Level (TRL 3) – Completed (

- Analytical and experimental proof-of-concept of the borewell-integrated recharge mechanism has been completed.
- System feasibility validated through conceptual design, hydraulic flow analysis, and lab-scale modeling.
- Key technical assumptions, recharge pathways, and risk factors have been identified, establishing readiness for prototype development (TRL 4).