Rainwater harvesting: a study for potential of artificial recharge in Mumbai

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Abstract

Like the rest of the world, India is a rapidly urbanizing country. With population growth & increased urbanization, industrialization and agricultural modernization, demand for water will only grow in the future. In this scenario, cities must secure their water supply by harvesting every drop of rainwater within their physical boundary, and reduce dependence on the hinterland. The primary advantage of collecting and storing rainwater in urban areas is not only producing additional water but also controlling runoff and thereby preventing urban floods. Rainwater harvesting has been suggested as the solution to water crisis of cities – collecting and using rainwater where it falls. However, in a city like Mumbai where spaces is a premium, and construction of decentralized storage tanks is not cost-effective, recharging ground water possibilities need to be explored.

This research is an analytical approach to study the potential for artificial recharge of ground water for rainwater harvesting in Mumbai. Geological criteria for artificial recharge of groundwater were validated by expert interviews viz., permeability, soil type and nature of rock. These were then rated based on their influence on groundwater recharge in different areas. Geographic Information System (GIS) was used as a tool to analyze and grade areas by overlay of rated criteria, secondary information and thematic maps. Well inventory and case studies of artificial recharge were also used to substantiate zones demarcated.

The result of GIS overlays showed that most parts of all wards in Mumbai have moderate potential for artificial recharge. There is a need for recharging confined aquifers in western and eastern suburbs drawing water from large number of tube wells. Possibility / good scope for shallow artificial recharge structures is found in almost all the wards. The case studies validate the potential areas demarcated by overlay analysis as well as show potential for recharge over reclaimed areas. Selecting suitable areas for application of artificial recharge is critical for effective recharge leading to improved water management.

Keywords: rainwater harvesting, urban, artificial recharge, run-off, aquifer, ground water, geology, permeability, Geographic Information System (GIS), Mumbai
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Charvie Mehta studied architecture at Late Bhausaheb Hiray College of Architecture (2007). This research was part of dissertation completed for the Master’s in Environmental Architecture (2013) at Rachana Sansad's Institute of Environmental Architecture. Through the Institute’s Design Cell she is working on the projects of preparing roadmap for ECBC implementation in Maharashtra. She has also worked on projects related to rainwater harvesting and passive architecture in Mumbai.

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Roshni Udyavar Yehuda is Head of the Postgraduate Dept. of Environmental Architecture at Rachana Sansad’s Academy of Architecture since June 2003. An architect specializing in environmental design practice and education, she has worked in rural and urban remediation projects in areas of watershed management, rainwater harvesting, passive solar architecture, waste water treatment, efficient & eco-friendly building materials and ecological landscape design. Has worked locally and internationally in the field of environmental research, pedagogy and implementation since 1997.