

CHAPTER – IV

Summary and Conclusions

4 Summary

Despite having relatively abundant surface water resources, India faces significant water scarcity due to overexploitation and pollution of rivers, lakes, and groundwater. The per capita availability of water has almost decreased by more than 75% since independence and by 2030, we might not have enough water for everyone. Factors like rapid population growth, industrialization, and climate change worsen the water crisis. Urbanization further exacerbates water scarcity by reducing the ability to recharge groundwater through the expansion of urban areas over agricultural land and open spaces.

India is the world's largest user of groundwater, and many cities heavily depend on it. However, rapid urbanization and population growth have led to severe groundwater depletion in cities like Hyderabad, Delhi, and Chennai. Excessive groundwater extraction without replenishment has caused aquifer depletion, saltwater intrusion, and land subsidence. As India's population and economic development increase, the demand for groundwater is expected to rise, posing a critical challenge for sustainable water management.

Currently, Delhi is encountering difficulties in managing its water supply due to both inadequate rainfall and the expansion of urban areas. As a result, the city depends on water sources from neighboring states. Consequently, the excessive use of groundwater has resulted in a drop in the water table. To tackle these problems, it is imperative to adopt water conservation, rainwater harvesting, recycling, and holistic water resource management practices across various sectors within the city. Furthermore, safeguarding the city's water resources and advocating for sustainable practices are vital to ensure the quality and availability of water for future generations.

Since last few years government is emphasizing on adoption of rainwater harvesting at community level as a solution to mitigate water scarcity. However the effective water resource management practices remains a challenge for the city.

The working paper analyzes water resource management in India, focusing on Delhi's water issues. It explores the potential of community participation in rainwater harvesting as a water conservation method. The paper is divided into three sections, providing an overview of India's water resources, examining water management challenges in Delhi, and assessing the Delhi Government's Financial Assistance Scheme for Promoting Roof Top Rainwater Harvesting using field observations and surveys.

Overall, the paper emphasizes the urgency of addressing water scarcity in urban India and suggests rainwater harvesting as a decentralized approach to improve groundwater levels in Delhi. This research paper focuses on an empirical investigation of the Delhi Government's Financial Assistance Scheme for Promoting Roof Top Rainwater Harvesting (RWH) Systems. The study involved fieldwork examining 11 RWH systems installed in residential and office spaces across Delhi. Data was collected through interviews, focus group discussions, and questionnaires with scheme beneficiaries and stakeholders. The evaluation aligns with the scheme's objectives, and the research offers recommendations for its enhancement. The effectiveness of the scheme was assessed through a primary survey with closed-ended questions, and on-site inspections of RWH systems were conducted. The level of community participation in achieving the success of RWH was also studied.

4.1 Findings

- As for Delhi, the extraction of groundwater far exceeds its recharge rate, resulting in a decline in the groundwater table. Since 1991, total groundwater extraction has consistently exceeded recharge, causing a significant drop in groundwater levels, with some areas experiencing a decline of up to 2 meters per year, totaling over 50 meters in recent decades.

- The Ministry of Jal Shakti's Report indicates that Delhi has 893 water bodies, with 24.19% of them encroached upon, the highest among all Indian states. The 'others' category had the most encroached water bodies (149 out of 349), while none of the identified lakes were encroached.
- The Delhi government has made rainwater harvesting mandatory for new buildings and offers financial assistance for installation. Recent guidelines by the Ministry of Housing and Urban Affairs emphasize rainwater harvesting in government buildings, residential societies and in other institutions. For that the Delhi Jal Board provides incentives and rebates to encourage RWH implementation.
- The Delhi Jal Board participates in IEC activities and conducts specialized training programs to promote rainwater harvesting and water conservation. They collaborate with different organizations to organize workshops for community members/RWAs, conduct training programs for colleges, sensitize citizens through media channels, and provide information on rebates and penalties related to rainwater harvesting systems.
- RWH system installation aims to adopt sustainable water management practices and reduce reliance on conventional water supplied by the Delhi Government.
- The research study selected 11 sites in North and North West districts of Delhi, including 9 residential societies and 2 schools, to understand community engagement patterns and explore their participation in rainwater harvesting initiatives.
- Roof-top RWH installation is a new concept for many residents, leading to a lack of awareness regarding its benefits and functionality. However, none of the surveyed societies faced resistance from their residents before implementing RWH systems in their premises.
- All surveyed societies and organizations have constructed pit tanks within their premises and channelize rainwater to replenish groundwater levels and promote sustainable water management practices.

- Only three societies/organizations reported receiving full government support for installing and maintaining their RWH systems.
- There is a lack of communication between the government and societies/institutions regarding water conservation efforts in Delhi. Only 3 out of 11 societies/organizations reported regular communication with the government, while 8 others mentioned non-existent or rare communication.
- Many societies/institutions express dissatisfaction with the amount of financial support or subsidies provided to them. Concerns arise about the full implementation of financial aid and subsidies on water bills.
- Almost all surveyed RWH systems are operational, which is very encouraging.
- In studied societies, RWH systems primarily focus on recharging groundwater, with some societies utilizing the conserved water for cleaning, domestic tasks, and gardening.
- Nine essential maintenance measures for RWH systems are listed, with some societies facing delays due to funding constraints. Regular water quality monitoring is reported by only three societies/organizations.
- Cleaning RWH systems once a year is common, with some societies cleaning every six months or within the last year.
- Many societies struggle to secure funds and qualified personnel for RWH system upkeep, compromising system efficiency and risking potential failures.
- Limited awareness among citizens hampers effective operation and maintenance, while limited space restricts system capacity in shared societies.
- 10 out of 11 surveyed locations have fully functional RWH systems, with no fines imposed on any society, indicating compliance and positive outcomes.

- A lack of communication and coordination between the government and the community regarding rainwater collection is evident in the survey.
- Savings on water bills are reported by various societies, with some experiencing consistent savings.
- Training on RWH systems is provided by the government to some representatives, while others report no such training.
- Awareness campaigns about rainwater harvesting are lacking in many societies, leaving responsibility for planning, managing, and maintaining the RWH system solely to the members of the RWA or managing committee.
- Significant improvement in water security due to RWH initiatives is not reported, with only a few societies acknowledging partial increases in water availability.
- The 11 analyzed locations face common challenges in maintaining RWH systems, including insufficient financial resources, low technical knowledge, maintenance difficulties, and a lack of coordination and cooperation.

4.2 Suggestions:

The paper emphasizes the complexity and contextual nature of rainwater harvesting as a water management practice. It underscores that effective rainwater harvesting cannot be approached with a one-size-fits-all strategy. Instead, it requires tailored and thoughtful management considering both geographical and socio-economic factors.

- **Conservation strategies:** It includes adoption of runoff harvesting from slopes, utilization of drainage flow, and groundwater recharge for the better outcome of the RWH system. Water logging is still happening at some places due to not taking care of the slopes.
- **Location specific solutions:** To enhance water availability and management, it is crucial to develop location-specific solutions based on comprehensive research. This entails creating reliable hydrological databases and monitoring essential factors such as rainfall,

temperature, stream flow, and groundwater recharge potential. By implementing these measures, we can make informed decisions and optimize water resources for each specific location.

- **Integrated Urban Planning:** It is crucial to integrate the protection and conservation of water bodies into the framework of urban planning. Equally important is the recognition of designated buffer areas surrounding water bodies, which must remain free from development, thus ensuring the implementation of sustainable land utilization strategies.
- **Changing institutional strategies:** To enhance community participation in rainwater harvesting, it is essential to increase administrative, financial, and technical support to civil society, institutions, organizations, and urban land use management. By offering greater assistance, we can encourage more community members to embrace rainwater harvesting initiatives and actively contribute to water conservation efforts.
- **Continuous engagement with local community:** Regular communication through IEC initiatives keeps the community engaged over time. It can provide updates, share maintenance tips, and address any queries, fostering a sustained commitment to rainwater harvesting practices.
- **Highlighting success stories:** Sharing success stories of rainwater harvesting implementation within the community or in similar contexts can inspire and motivate others to follow suit. These stories demonstrate the tangible benefits and outcomes that can be achieved through active participation.
- **More attention to awareness and training activities:** Need for regular awareness campaigns and training programs for residents to promote the benefits of rainwater harvesting and educate them on system operation and maintenance.
- **Timely release of fund:** Timely release of funds encourages RWAs to initiate the installation process promptly and ensures that the system is set up efficiently. Adequate funds allow RWAs to conduct

routine inspections, cleaning, and repairs, ensuring the system's longevity and optimal performance.

- **Mandatory 10% rebate on water bill for Functional RWH:** The long-term sustainability of RWH systems relies on ensuring a consistent rebate on water bills to those societies/institutions who are complying the directions of Delhi Government. With this assurance, RWAs can effectively plan for future investments, upgrades, or expansions to cater to increasing water demands and adapt to changing environmental conditions.
- **Revival of traditional water resources:** To tackle water scarcity and promote sustainable water resource utilization, it is imperative to revitalize traditional water harvesting structures. This requires conducting a comprehensive study to assess their quantity and storage capacity. By reviving these structures, the city government can efficiently store rainwater and recharge Delhi's water aquifers, leading to enhanced water availability and conservation measures.
- **Adoption of sustainable water resource management strategies:** It is essential to establish comprehensive rainwater harvesting management plan, incorporating sustainable water usage practices and well-designed storage facilities. This responsibility should be undertaken by city-level and community-based institutions to ensure efficient water management and conservation.
- **On-site Grey-water Recycling Solution:** The implementation of recycling and reuse measures has already been initiated in select cities. However, these strategies should be incorporated into all urban master plans to establish a comprehensive system for supplying recycled water, designated for non-human consumption purposes. Simultaneously, the use of Information, Education, and Communication (IEC) activities should be harnessed to foster a shift in people's perceptions towards the utilization of recycled water.

The study also suggests that further research is required to explore additional opportunities and possibilities related to community led rainwater harvesting and its potential benefits for water in the study area.

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