

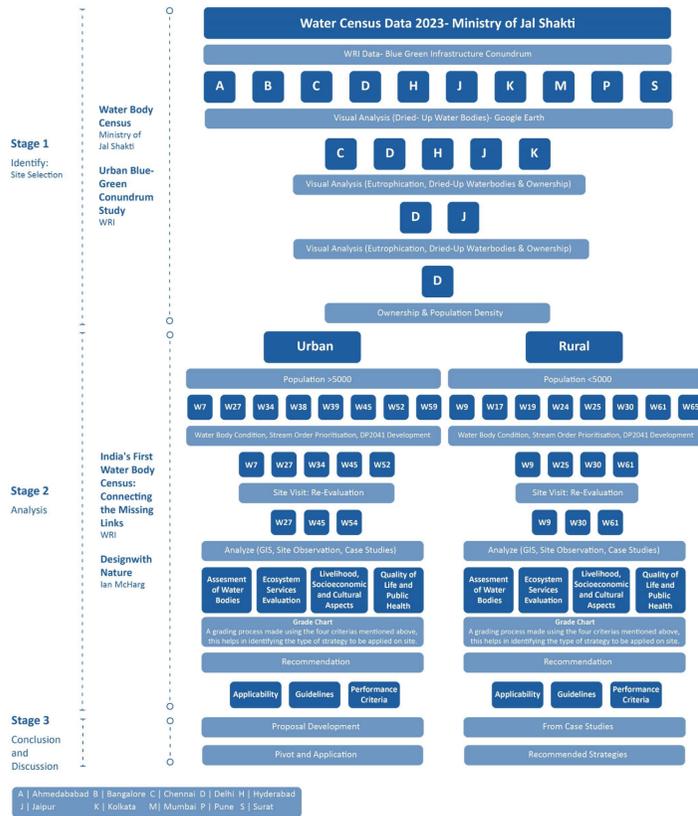
# Assessment of Co-Benefits of Water Bodies in India

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## Research Aim and Methodology

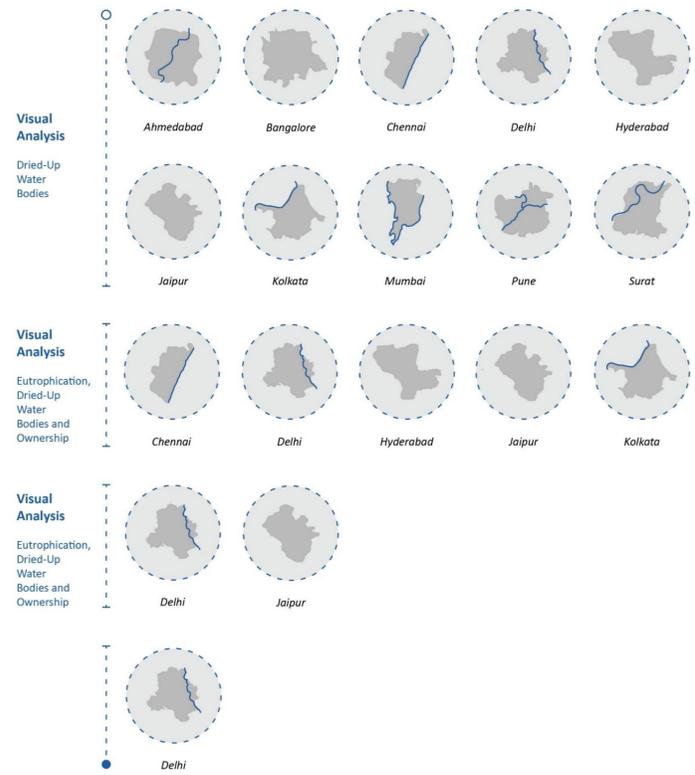
This research aims to develop a **multi-criteria evaluation framework** to identify and prioritize critical water bodies requiring protection and restoration in the context of **rapid urbanization, climate stress, and water scarcity**. Using **urban and rural Delhi** as a case study, the research assesses dried-up and degraded water bodies through GIS-based analysis and on-site mapping, evaluating their **physical, spatial, social, ecological, and governance parameters**.

The research further aims to propose **restoration and protection strategies** that integrate ecological functions with urban and peri-urban lifestyles, supporting **urban resilience and sustainable water resource management**. The methodology is divided into **three stages: identification, analysis, and conclusion-discussion**.



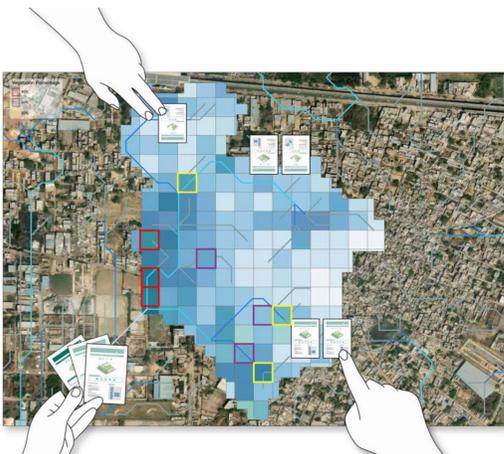
## Site Selection

- Countrywide data from the **Water Census 2023** was filtered to ten cities, based on the **Urban Blue-Green Conundrum: A 10-City Study on the Impacts of Urbanization on Natural Infrastructure in India by the World Resources Institute (WRI)**.
- Delhi** was selected as the site, and water bodies were analyzed across urban and rural contexts using **GIS mapping and the Draft Development Plan (DP) 2041 framework**, leading to the selection of three sites per context.

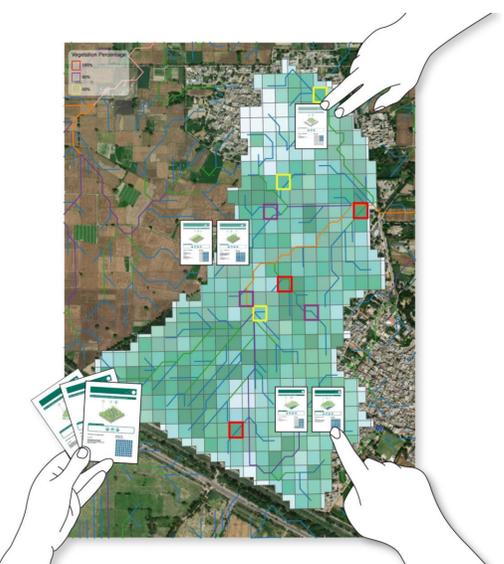


## GIS Framework for Cell Selection

- ArcGIS Pro was used to overlay **DEM, vegetation cover, and open space distribution** to identify strategic intervention zones.
- A **30 x 30 m DEM** from Bhoondhi was processed using the **Hydrology toolset** to delineate the catchment.
- A **50 x 50 m fishnet** was generated and assigned elevation values (from DEM), visualised using a gradient where darker blues indicate lower elevations.
- LISS-IV imagery** was further classified using **supervised classification with 700 - 900 samples per class**.
- Vegetation and Open Space layers were overlaid with fishnet layer, and vegetation density was classified into **100%, 80%, 60%, 40%, and 20%** cover categories.
- Cells in the range of **40% to 80%** were prioritized in the **urban context**, whereas cells in the range of **100% to 60%** were prioritized in the **rural context**.

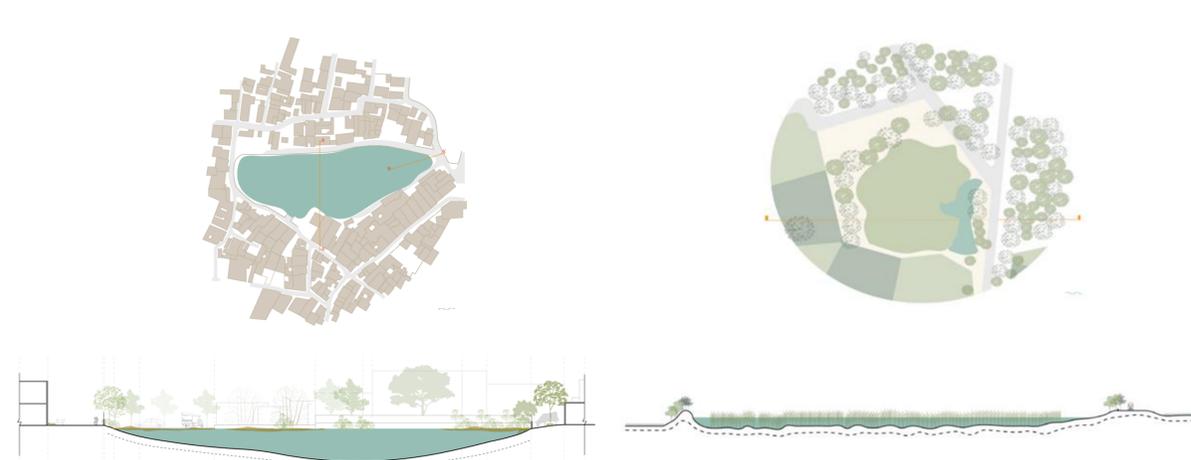


GIS Application over a Waterbody in an Urban Context



GIS Application over a Waterbody in a Rural Context

## Existing Conditions and Recommendations for Restoration

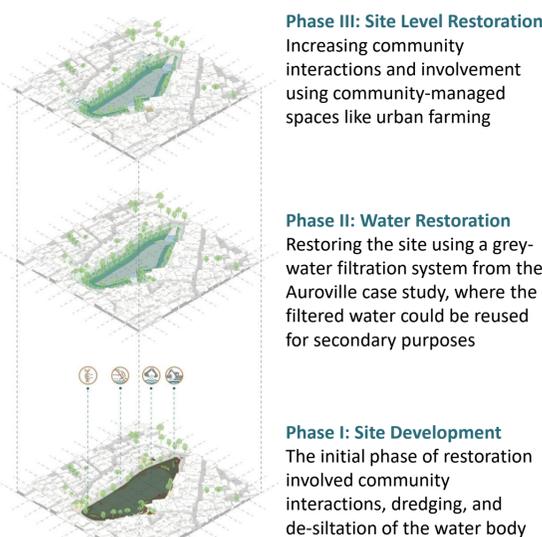


### Major challenges at the existing site:

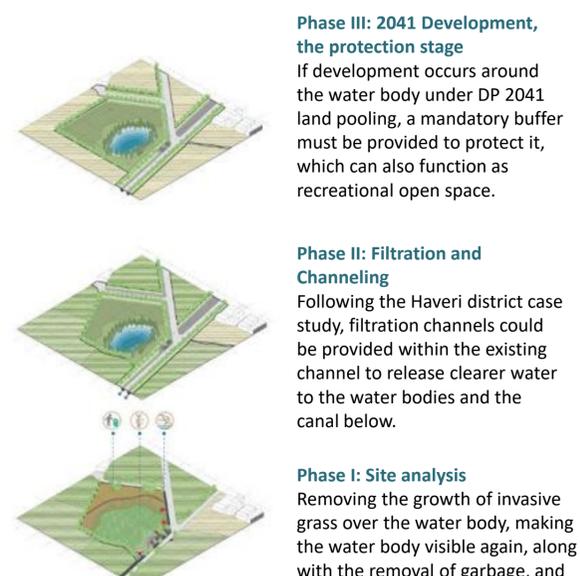
- The water body is used as a **dumping site and sewage outfall**, leading to siltation, reduced water depth, and lower groundwater recharge.
- Rapid urbanization and encroachment** have eliminated the buffer zone and cut off public access, despite the site being part of a previous restoration project.

### Major challenges at the existing site:

- Dense wild vegetation obscures the water body, making it difficult to assess water depth, condition, and groundwater interaction despite its identification under the **National Hydrology Project**.
- The site lies at a **junction of farmlands and roads** in a rapidly urbanizing peri-urban area, increasing the risk of future encroachment and unregulated development.



Selected Waterbody in an Urban Context



Selected Waterbody in a Rural Context

## Conclusion and Discussion

- The study develops a **replicable, GIS-based MCDA (multi-criteria decision analysis) framework** to systematically identify and prioritise vulnerable water bodies across urban and rural contexts.
- Water bodies are framed as **integrated socio-ecological systems**, where restoration delivers multiple co-benefits including groundwater recharge, ecological connectivity, and community well-being.



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