# IMPACT OF LANDUSE LANDCOVER CHANGES AND THEIR INLUENCE ON GROUNDWATER IN PALLIKARANAI WETLAND USING GEOSPATIAL TECHNOLOGY


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## Introduction

Wetlands are critical for maintaining ecological balance, regulating water cycles, and preserving biodiversity. The Pallikaranai Wetland, located in Chennai, India, is one of the few remaining natural wetlands in the city. However, it has been increasingly threatened by rapid urbanization, industrial growth, and infrastructure development. These changes in Land Use and Land Cover (LULC) have disrupted natural groundwater recharge patterns, raising concerns about long-term water sustainability. Geospatial technologies are utilized to monitor and analyze the observed changes and helps in understanding the impacts of urban expansion on environmentally sensitive ecosystems.

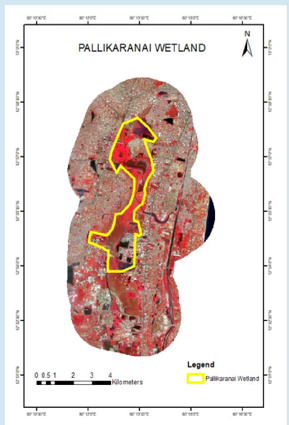
## Need for study

- Identifying areas influenced by wetlands is essential for implementing effective conservation strategies to protect their ecological functions.
- Understanding land use changes and human encroachments is crucial to protecting wetlands from degradation.
- Increasing urbanization has significantly impacted groundwater recharge patterns, making it essential to understand how LULC changes influence groundwater availability in the wetland.

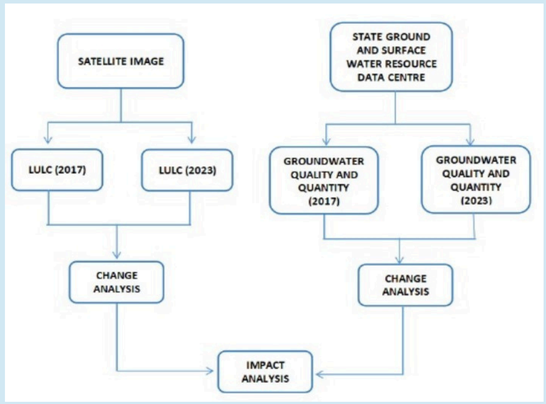
## Objectives

- To assess the Land Use Land Cover change between 2017 and 2023 from Sentinel-2 satellite imagery.
- To analyze the groundwater quality and level of Pallikaranai wetland area from the State Ground and Surface Water Resource Data Centre.
- To study the impact of LULC changes on groundwater quality and level between 2017 and 2023.

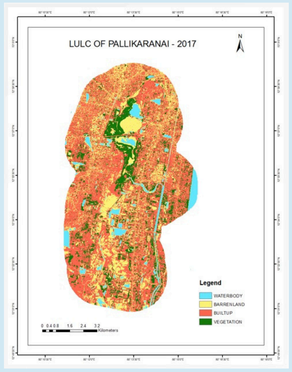
## Study Area

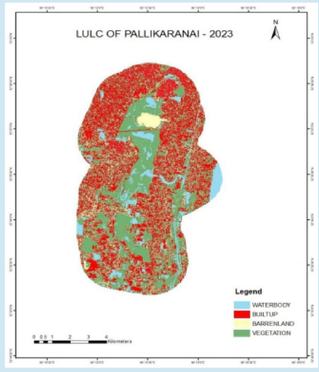


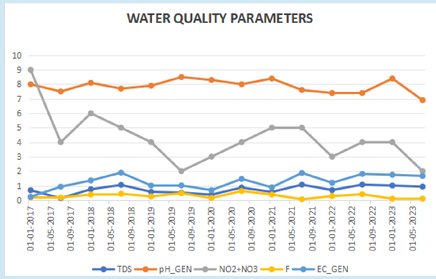

## Methodology

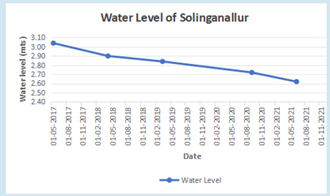


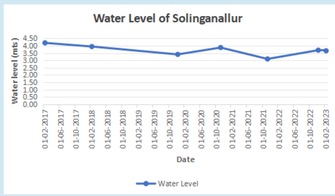

## Findings

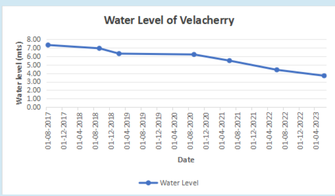



## Result

| LULC Class | Area 2017 (ha) | % Area 2017 | Area 2023 (ha) | % Area 2023 | Change in Area (ha) | Percentage Change |
|---|---|---|---|---|---|---|
| **Built-up** | 394.21 | 45.45 | 488.26 | 56.26 | 94.05 | 10.81 |
| **Waterbody** | 87.6 | 10.1 | 69.08 | 7.96 | -18.52 | -2.14 |
| **Vegetation** | 133.66 | 15.41 | 208.72 | 24.05 | 75.06 | 8.64 |
| **Barrenland** | 251.88 | 29.04 | 101.8 | 11.73 | -150.08 | -17.31 |

## Conclusion

The Pallikaranai wetland exhibited significant Land Use/Land Cover (LULC) transformations, marked marked by a 10.81% increase in built-up areas and a 17.31% decline in barren land. The waterbody extent reduced by 2.14%, while vegetation cover expanded by 8.64%. The graphs collectively show a consistent decline in water levels from 2017 to 2022, with initial levels ranging between 3.10 to 7.00 meters and dropping to around 2.50 to 3.50 meters. Despite some fluctuations, the overall trend indicates a significant reduction in groundwater availability over the five-year period. These changes reflect rapid urbanization, leading to wetland shrinkage, reduced groundwater recharge, as a result Sustainable land use planning, wetland protection, and restoration, along with continuous geospatial monitoring, are essential to mitigate these impacts.