

Original Article

Sustainable Water Resource Enhancement and Rejuvenation of Lake

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Abstract: *The Lake Rejuvenation Project at Thuraiyur focuses on restoring a damaged urban lake by removing silt to increase water storage, fixing weakened bunds with both built structures and natural methods, and improving water flow control to prevent flooding. It includes a system to divert untreated sewage to a treatment plant, ensuring cleaner water that can be reused to keep the lake healthy and support activities like boating. The project also creates public spaces such as walking paths, cycle tracks, parks, and children's play areas, making the lake accessible and enjoyable for the community. Climate-friendly actions like controlling erosion, managing floods, and boosting local wildlife are part of the plan to cope with changing weather. Overall, the project aims to improve groundwater recharge, support farming, enhance city life, and provide a sustainable, ecological, and recreational area for people to enjoy while protecting the environment.*

Keywords: *Urban Water Restoration, Siltation Removal, Bund Strengthening, Hydraulic Structure Redesign, Interception And Diversion System, Sewage Treatment Plant.*

I. INTRODUCTION

The Lake Rejuvenation Project in Thuraiyur Municipality aims to restore and enhance a vital urban water body that supports flood control, groundwater recharge, and irrigation for surrounding agriculture. Over time, the lake has degraded due to siltation, encroachment, sewage inflow, and weakened embankments, worsened by rapid urbanization and poor wastewater management. This comprehensive project focuses on desilting to restore storage capacity, strengthening bunds with structural and nature-based methods, upgrading hydraulic structures, and implementing a system to divert sewage to prevent pollution. Additionally, it promotes public access and community engagement through recreational amenities like walking and cycling paths, boating, and green spaces. The initiative strives to create a sustainable, climate-resilient ecosystem that improves water quality, mitigates flood risks, and delivers environmental, social, and economic benefits to the local community.

II. LITERATURE REVIEW

Lake rejuvenation is widely recognized as an essential strategy for sustainable urban water management, focusing on restoring storage capacity, improving water quality, and enhancing ecological balance. Reports by Central Pollution Control Board indicate that urban lakes are severely degraded due to siltation, sewage inflow, and encroachment, necessitating interventions like desilting and wastewater diversion. Guidelines from Tamil Nadu Water Supply and Drainage Board emphasize upgrading hydraulic structures such as weirs and sluices for efficient water regulation and flood control. Additionally, United Nations Environment Programme highlights the effectiveness of nature-based solutions like vetiver grass and coir geotextiles in erosion control and bund stabilization. Studies by Indian Institute of Technology Madras further suggest that integrating engineering measures with ecological restoration and community participation improves groundwater recharge, biodiversity, and climate resilience, making lake rejuvenation projects more sustainable and beneficial for urban environments.

III. MATERIALS AND METHODS

The Lake Rejuvenation Project employs a mix of conventional construction materials like cement, sand, aggregates, reinforced steel, bricks, and stones, alongside eco-friendly resources such as geotextile fabrics, coir mats, and native vegetation for sustainable bund stabilization and erosion control. Key infrastructure uses HDPE or PVC pipes for sewage interception and diversion, steel for bridges and fencing, and precast concrete for pathways and seating, complemented by amenities like lighting, aerators, and park equipment. The construction process begins with site preparation and desilting to restore storage capacity, followed by bund regrading and strengthening through both structural and nature-based methods. Hydraulic structures including weirs and sluices are rehabilitated to improve water management, while an interception and diversion system prevents sewage pollution by channeling wastewater to a treatment plant. Public infrastructure enhancements such as walkways, cycle tracks, and recreational areas are developed, alongside utility installations like

lighting, CCTV, and waste management, ensuring the lake's environmental sustainability, safety, and accessibility for the community.

IV. RESULTS AND DISCUSSION

A chute fiber platform is a lightweight structure made using fiber-reinforced materials, installed near water chutes or outlets for access and maintenance. It is designed to withstand moisture, corrosion, and harsh environmental conditions. The use of fiber materials makes it durable, low-maintenance, and long-lasting. It supports sustainable construction by reducing material usage, waste, and environmental impact. The root of the vetiver grass, which is commonly used for soil stabilization, cooling, and fragrance purposes.

The Lake Rejuvenation Project is expected to restore the lake's original storage capacity through desilting, enhancing rainwater storage and stormwater management. Strengthening bunds with structural and nature-based methods improves slope stability and reduces erosion risks, while upgrading hydraulic structures ensures efficient water regulation, flood safety, and better irrigation support. Water quality will improve significantly by diverting untreated sewage to a treatment plant, reducing pollution and eutrophication, and aeration systems will boost dissolved oxygen to support aquatic life. Socially, the project transforms the lake into a safe, accessible public space with pathways, cycle tracks, boating, and recreational areas, fostering community engagement, eco-tourism, and local economic growth. Overall, this integrated approach combines engineering and ecological restoration to tackle water scarcity, pollution, and climate impacts, making the lake a sustainable, climate-resilient urban asset that supports environmental protection, flood control, groundwater recharge, and socio-economic development.

V. CONCLUSION

The project recommends constructing an RCC retaining wall along residential areas encroaching on the lake to enhance bund stability and safety. Encroachments add extra loads from buildings, walls, people, and vehicles, increasing stress on the embankment and risking slope instability and failure. Altered drainage and concentrated water flow cause erosion and scouring, weakening the embankment's toe and compromising slope stability. Unauthorized service lines and drains create seepage pathways, leading to internal erosion or piping, which can cause sudden bund failure. Encroachments also reduce bund width and height, increasing overtopping risk during floods, while uneven loading causes differential settlement, cracks, and weak zones prone to erosion. Given the proximity to residences, embankment failure poses severe risks to life and property. The RCC retaining wall provides a strong solution to resist surcharge loads, control erosion and seepage, and maintain structural integrity, making it essential for the long-term safety and sustainability of the lake and surrounding community.

IV. REFERENCES

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