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Original Article

Improvement of Water Storage and Renovation of Summer Storage Tank

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Abstract: *Water is an essential natural resource for human survival and sustainable development. However, increasing population, urbanization, and climate variability have placed significant stress on available water resources. This project focuses on the improvement of water storage and renovation of Summer Storage Tanks in the 6th Mile Reservoir at Rajapalayam. The existing system has reduced efficiency due to sedimentation, infiltration losses, and inadequate conveyance systems. Detailed investigations such as drone survey, total station survey, bathymetry survey, soil analysis, infiltration study, and water quality assessment were carried out. Rainfall data and watershed analysis were also performed to estimate surface runoff potential. Based on the study, suitable measures are proposed to enhance storage capacity, improve water conveyance, and reduce water losses. The project aims to ensure sustainable water management and reliable potable water supply.*

Keywords: *Water Storage, Reservoir Rejuvenation, Surface Runoff, Watershed Analysis, Infiltration Loss, Water Resource Management, Rainfall Analysis.*

I. INTRODUCTION

Water resources refer to all available freshwater sources essential for sustaining life and supporting domestic, agricultural, industrial, and environmental needs. Although water covers about 71% of the Earth's surface, only around 3% is freshwater, with a large portion locked in glaciers and ice caps. The limited accessible freshwater is unevenly distributed, making its management a critical global concern. Rapid population growth, urbanization, and industrialization have significantly increased water demand, placing immense pressure on available resources. Additionally, water pollution, inefficient usage, and climate change—through altered rainfall patterns and increased frequency of floods and droughts—have further reduced both the quality and availability of water, leading to widespread water scarcity.

In India, water resources are under severe stress due to high population density and limited supply, with the country possessing only about 4% of global water resources while supporting nearly 17% of the world's population. This imbalance has led to declining per capita water availability, especially in states like Tamil Nadu, which faces frequent droughts and acute water stress. In this context, the initiative by Sri Ramanalayam Trust, Rajapalayam, to rejuvenate the 6th Mile Reservoirs and develop a comprehensive Surface Water Management Plan is highly significant. It focuses on improving water conservation, enhancing efficiency, and ensuring sustainable management of water resources for future needs.

II. STUDY AREA

The study area is the 6th Mile Reservoir located near Rajapalayam in Virudhunagar district, Tamil Nadu. Located about 12 km from Rajapalayam town Situated near the foothills of the Western Ghats Consists of two Summer Storage Tanks. Tank 1: ~71.70 acres ,Tank 2: ~86.24 acres. Primary source of drinking water for the town The region has a semi-arid climate and depends heavily on rainfall and surface water sources.

III. MATERIALS AND METHODS

Materials

- Survey instruments (Drone, Total Station)
- Bathymetric equipment
- Soil testing tools
- Water quality testing kits
- GIS software (ArcGIS, ERDAS)

- Rainfall data (IMD – 31 years)

Methods

1. Data Collection

- Primary data: Field surveys, soil investigation, water testing
- Secondary data: Rainfall, DEM, land use data

2. Field Surveys
- Drone Survey (topography & DEM)
- Total Station Survey
- Bathymetry Survey

3. Soil & Water Analysis
- Geotechnical investigation
- Infiltration analysis
- Water quality testing

4. Rainfall Analysis

- 31 years rainfall data analysis
- IDF curve development
- Dependability analysis

5. Watershed Analysis
- Catchment delineation
- Flow direction & accumulation
- Stream order analysis

6. Runoff Estimation
- SCS-CN method used to calculate surface runoff

7. Optimization Plan
- Improve storage capacity
- Redesign intake structures
- Reduce water losses
- Identify additional water sources

IV. RESULTS AND DISCUSSION

The study of the 6th Mile Reservoir system shows that the storage capacity of the summer storage tanks has decreased due to sediment accumulation and lack of periodic maintenance. Bathymetric analysis confirmed a reduction in effective depth, directly affecting water storage. Soil investigation revealed the presence of sandy and gravelly layers, which contribute to high infiltration and seepage losses, particularly in Summer Storage Tank 2.

Rainfall analysis over 31 years indicates moderate but variable rainfall, mainly during the northeast monsoon. Watershed analysis identified significant surface runoff potential; however, due to inefficient intake structures and conveyance systems, much of this runoff is not utilized effectively.

The findings suggest that measures such as desilting, lining to reduce seepage, and improvement of intake and conveyance systems can enhance storage efficiency. These improvements will help in better utilization of available water resources and ensure a sustainable water supply.

V. CONCLUSION

The study concludes that the existing Summer Storage Tanks have reduced efficiency due to seepage losses, sedimentation, and inadequate infrastructure. Through detailed analysis, it is evident that significant improvement can be achieved by: Enhancing storage capacity Improving conveyance systems Reducing infiltration losses Utilizing additional watershed sources The proposed measures will help in sustainable water management and ensure a reliable water supply for Rajapalayam town.

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