SUSTAINABLE WATER MANAGEMENT FOR CUET: DESIGNING AN EFFICIENT WATER SUPPLY SYSTEM

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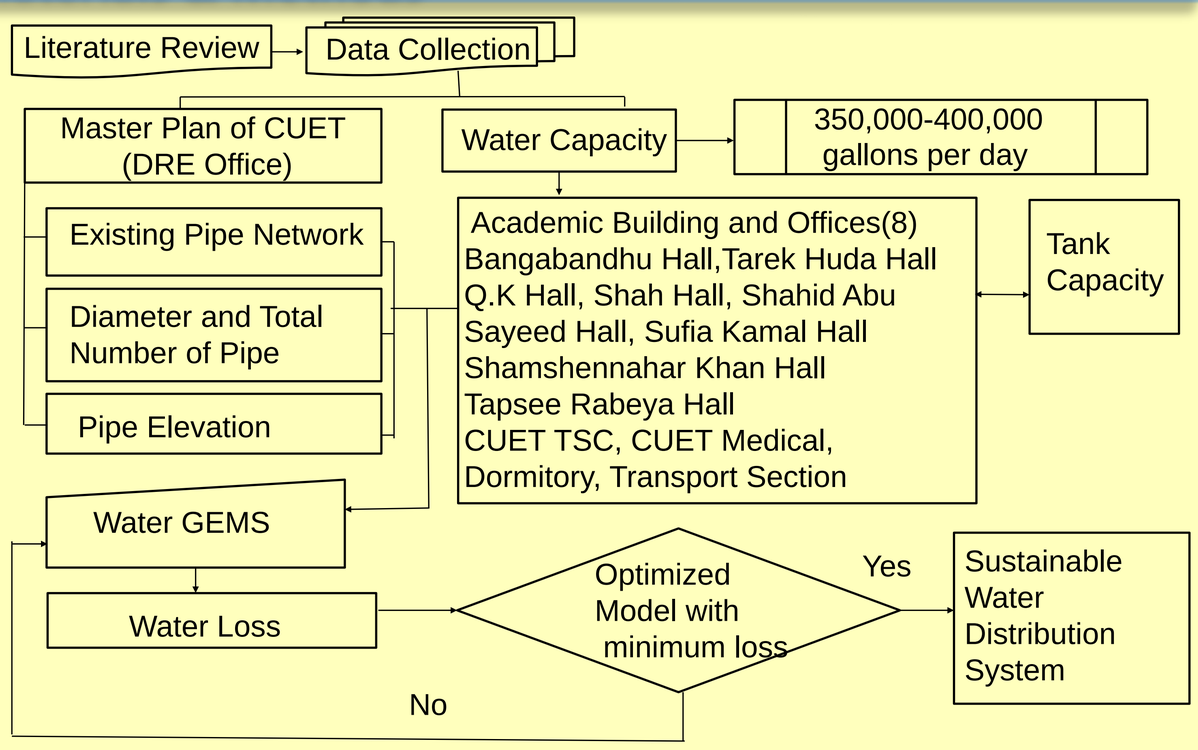
Introduction

Chittagong University of Engineering and Technology (CUET) requires around 350,000-400,000 gallons of water per day to cover the needs of academic buildings, residential halls, faculty dorms, and critical facilities such as the library, mosque, and hospital. However, substantial water loss results from inefficiencies in the current water distribution system, which has an impact on resource optimization and sustainability (Rashid & Kumari, 2024). Our study intends to use WaterGEMS software to analyze, detect, and address these problems, allowing for a thorough evaluation of leakage locations and inefficiencies. We suggest an optimized network (Hołota et al., 2020) that reduces losses and improves water conservation by creating a sustainable and well-organized water supply system. This project ensures a durable, economical, and environmentally friendly water management system for CUET's future while also aligning with worldwide sustainability standards.

Materials & Methods



Data Analysis

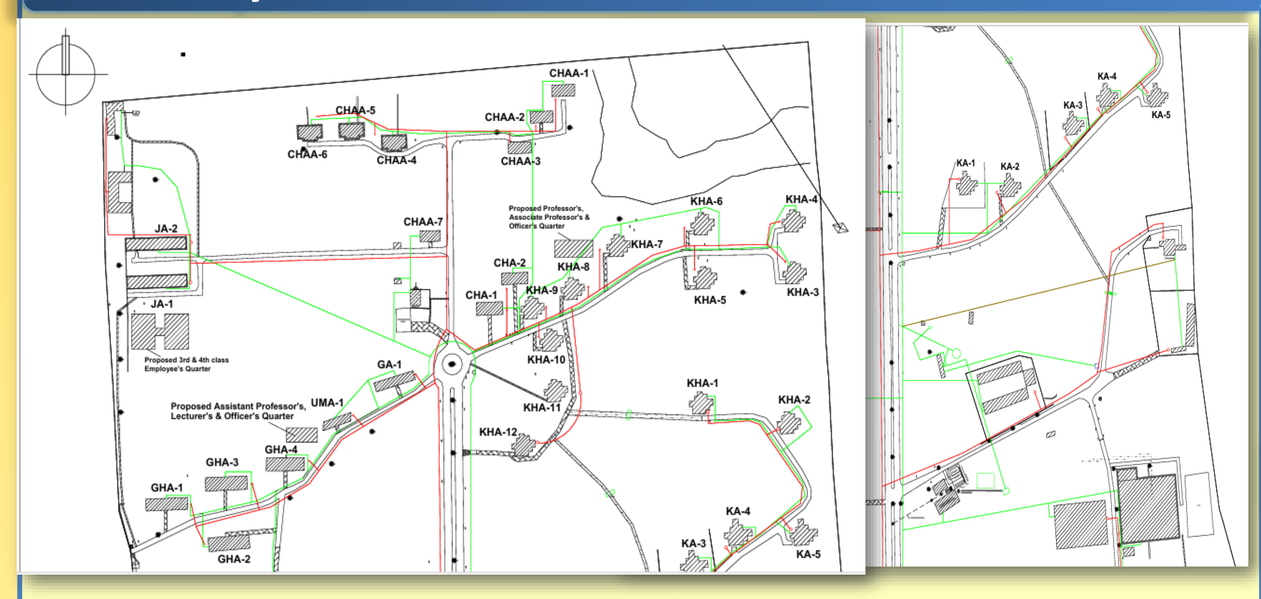


Figure 1: CUET Master Plan of Exiting Water Distribution Network

The master plan for CUET, existing water demand, and storage capacity were all evaluated in considering student, professor, and staff requirements. In order to simulate the current water network and find inefficiencies and losses, the data was entered into WaterGEMS. The basis for creating an efficient, sustainable water distribution system is this analysis.

Table 1: Water Demand of CUET

Hall/Office/Academic Building	Tank Number	Water Demand (Daily)	Students/Teachers/Officers/Staffs
Halls	32	37500L	3600
Academic Buildings	36	60000L	4000
TSC/Medical/DSW/Transport Section	13	20500L	350
Others	10	28400L	200

Results

The **optimized model** demonstrates a percentage **reduction in water loss**, with an **elevation change pipe length**

Table 2: Optimized Model and Existing Model Details

Hall/Academic/Dorm/ Others	Pipe Diameter	Number of Pipe Analysis	Optimized Model Pipe Number	Optimized Model Pipe Length Increase (in Percentage)	% Water Loss Reduction
Shamshen Nahar Hall,Shahid Abu Sayed Hall	6''	182	245	6%	34%
Sufia Kamal Hall, Tapasee Rabeya Hall,	4''	87	104	19%	22%
Teachers Dorm	6''	67	84	67%	28%
TSC, Incubator	6''	78	93	26%	12%
Academic	1.5'' 2'' ,3'',4''	567	772	57%	31%
Others	4''	123	217	11%	21%

Significant water losses in CUET's current distribution system were found using the WaterGEMS model, which also revealed inefficiencies in flow patterns. The model's optimization resulted in a decrease in water loss, while elevation changes improved the pressure distribution by percentage increase of pipe length and pipe number. Changes to the pipeline and storage tank capacity further increased efficiency (Rameshrao Yennawar & Yennawar Assistant Professor, 2024) and ensured better water distribution with less leakage. The updated system supports an economical and sustainable water network, which is in line with long-term objectives for water management and conservation.

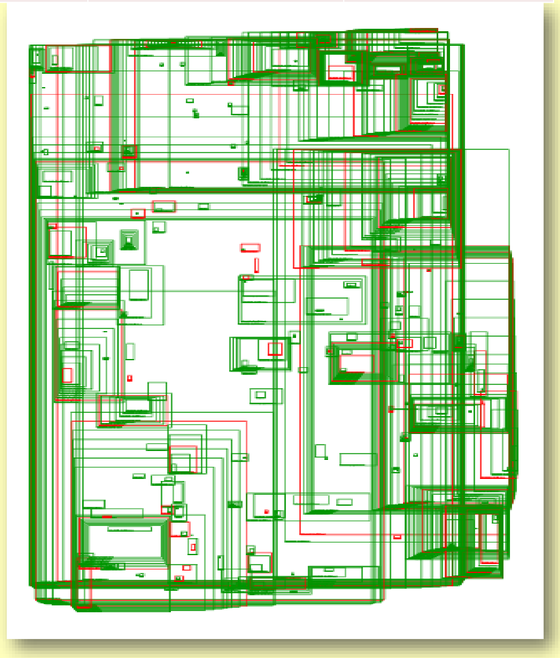


Figure 2: WaterGEMS Optimized Model Water Distribution Network.

Conclusions

CUET's water distribution system was optimized using WaterGEMS, which effectively detected inefficiencies and drastically reduced water loss. The updated model guarantees improved flow regulation and resource allocation through pressure adjustments, elevation changes, and pipeline improvements. The upgraded system is a sustainable and economical solution because it reduces leakage while simultaneously increasing storage capacity and overall supply efficiency. These results highlight how crucial data-driven water management is to cutting down on resource waste and enhancing long-term resilience. This study lays the groundwork for CUET's infrastructure to grow sustainably and expand in the future by incorporating smart water distribution technologies. In the end, this improved model acts as a guide for sustainable water management, supporting international conservation initiatives and guaranteeing dependable water supply for coming generations

References

Hołota, E., Kowalska, B., & Kowalski, D. (2020). Localization method for water quality monitoring points using chlorine concentration measurements in real water network. *Desalination and Water Treatment*, *199*(September 2019), 227–233. https://doi.org/10.5004/dwt.2020.25716

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