NON-REVENUE WATER REDUCTION STRATEGIES FOR AN URBAN WATER SUPPLY SCHEME: A CASE STUDY FOR GAMPAHA WATER SUPPLY SCHEME

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The urban water supply industry faces numerous challenges, including inadequate water supply relative to public demand, outdated infrastructure causing water loss, substandard services throughout the distribution process, and management and staff mindset towards service provision. Rapid urbanisation and population growth have further strained water resources and infrastructure, exacerbating these challenges. The presence of high levels of Non-Revenue Water (NRW), which encompasses both physical losses (leakages) and commercial losses (unauthorised consumption and inaccurate metering), further exacerbates these challenges, coupled with limited availability of funds for infrastructure improvement and maintenance. NRW poses a barrier to sustainability not only due to energy and water loss but also due to revenue loss for water utilities, impacting their financial viability. Therefore, this research aims to focus specifically on the issue of NRW to contribute to sustainable water management, addressing both environmental and economic concerns. The research objectives include not only exploring and discussing water losses in the transmission and distribution system but also analysing the socio-economic factors that contribute to NRW. By delving into the socio-economic aspects, the study aims to provide a holistic understanding of the issue, considering factors such as affordability, consumer behavior, and illegal water tapping. To accomplish these objectives, the study employs the Analytic Hierarchy Process (AHP), a widely recognised decision-making tool that allows for a structured evaluation of complex multi-criteria problems. By utilising AHP, the research assesses various factors contributing to pipe leakages and NRW. The AHP methodology enables the identification and prioritisation of key factors influencing pipe leakages, providing valuable insights for enhancing the performance and maintenance of water distribution systems. By identifying the factors contributing to pipeline leakage and NRW, proactive measures can be implemented to prevent and control leaks at an early stage, thereby shifting from a reactive to a proactive approach in water management. This transition will enable the industry to detect and address leakage issues more effectively, leading to improved overall water management and a reduction in NRW. The research also acknowledges the importance of public awareness campaigns and community engagement in reducing NRW, as informed consumers can play a crucial role in leak detection and reporting. The research focuses on the Gampaha Water Supply Scheme as a case study due to its relevance to the challenges faced by urban water supply systems in many developing countries. The findings of this research will provide practical recommendations for policymakers and water management authorities to optimise water supply systems, minimise losses, and enhance sustainability in urban water supply schemes. This research contributes to the ongoing discourse on sustainable urban water management by addressing the critical issue of NRW. Through these efforts, the research aims to pave the way for more resilient and efficient water supply systems that can cater to the needs of growing urban populations while minimising resource wastage and financial losses.

Keywords: Non-Revenue Water; Urban Water Distribution; Water Leakage; AHP Analysis

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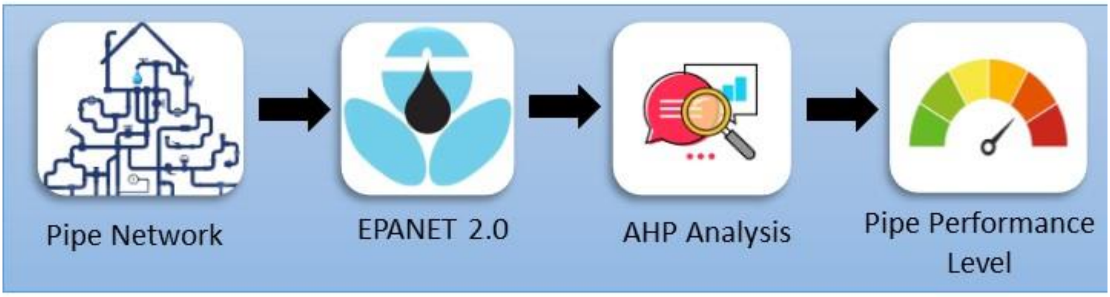
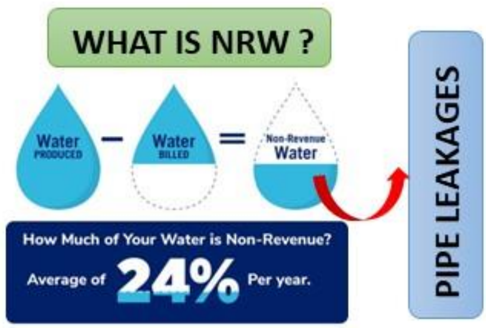
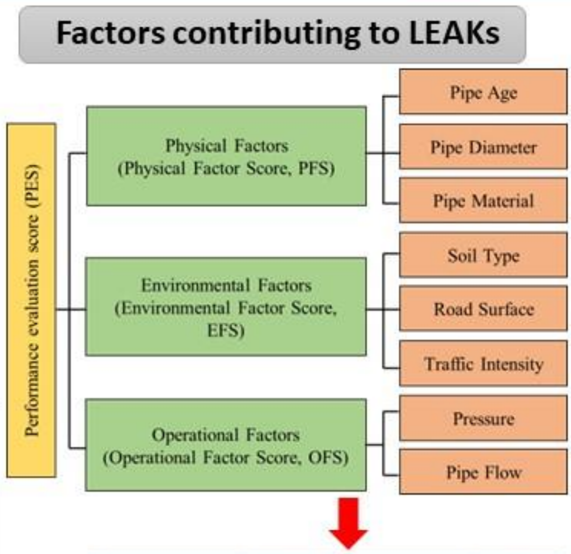
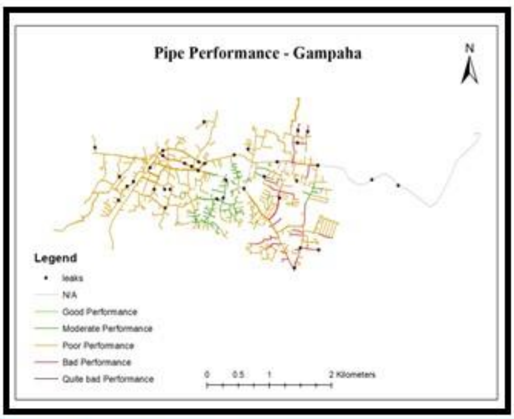






Main factors	Weights (W_i)	Sub factors	Weights (W_j)
Physical	0.43	Pipe Age	0.68
		Pipe Diameter	0.14
		Pipe Material	0.18
Environmental	0.14	Soil Type	0.57
		Road surface	0.14
		Traffic Intensity	0.29
Operational	0.43	Max. Pressure	0.88
		Max. Flow	0.12



CONCLUSIONS: The model considered various main factors, including physical, environmental, and operational factors, as well as their corresponding sub-factors. Among the main factors, the physical and operational factors obtained the highest weight coefficient of 0.43, while the environmental factor had a coefficient of 0.14. High pressure values leads to leaks than other sub factors.