

Analyzing the water supply system for small towns in Gujarat

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Introduction to Dholka City

- Dholka is located in the Ahmedabad district of Gujarat, situated around 48 kilometres southwest of Ahmedabad city. It is one of the prominent municipalities in the region and forms an important urban settlement within the district.
- The city of Dholka lies at 22.72°N latitude and 72.47°E longitude, positioned on the plains of central Gujarat. It is bordered by Bavla to the north, Dhandhuka to the south, Barwala to the west, and Kheda district to the east. Dholka is situated at an average elevation of approximately 17 meters (56 feet) above sea level.



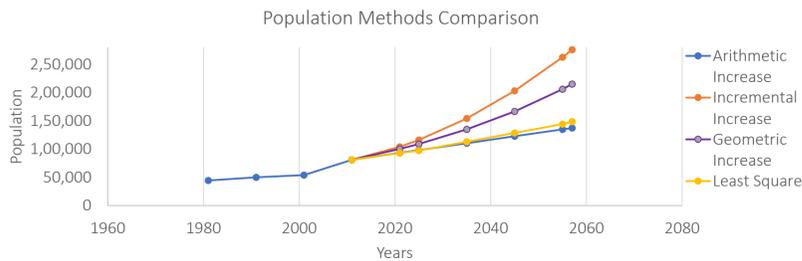
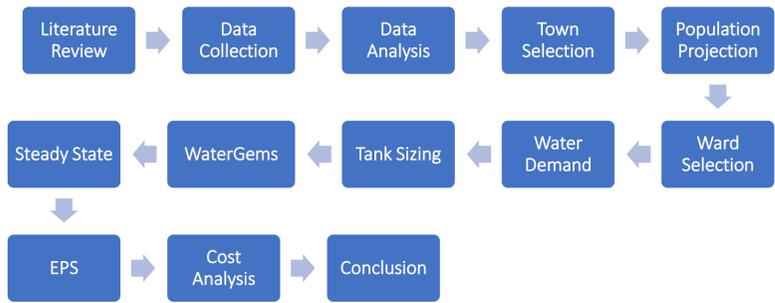
Abstract

Water supply is a fundamental requirement for urban development and public health, yet Tier-II and Tier-III towns in India often face significant challenges in delivering adequate and reliable water services. While metropolitan cities have adopted advanced planning and management practices, smaller towns continue to struggle with intermittent supply, ageing infrastructure, pressure imbalance, and increasing demand due to rapid population growth. This Directed Research Project analyzes the existing water supply system of a small town in Gujarat, with Dholka selected as the case study. The study evaluates key engineering aspects such as water sources, storage capacity, population projection, demand estimation, and distribution network performance. Hydraulic modelling is carried out to assess the system's ability to supply water with sufficient quantity and pressure under present and future demand conditions. The concept of District Metered Areas (DMA) is incorporated to improve monitoring, pressure management, and reduction of non-revenue water. Deficiencies in the existing network are identified, including pressure variation and inefficiencies in distribution. Based on the analysis, design improvements and network optimization strategies are proposed in accordance with CPHEEO guidelines. The study aims to demonstrate how systematic analysis and DMA-based planning can enhance the efficiency, reliability, and sustainability of water supply systems in small towns of Gujarat.

Current Situation of Water Supply in Dholka

- In dholka there are a total 16 Borewells and water is supply through borewell directly where ESR is not available for approximately 1 hour.
- They are using a 45-55 HP pump to supply water from the borewell.

Research Methodology



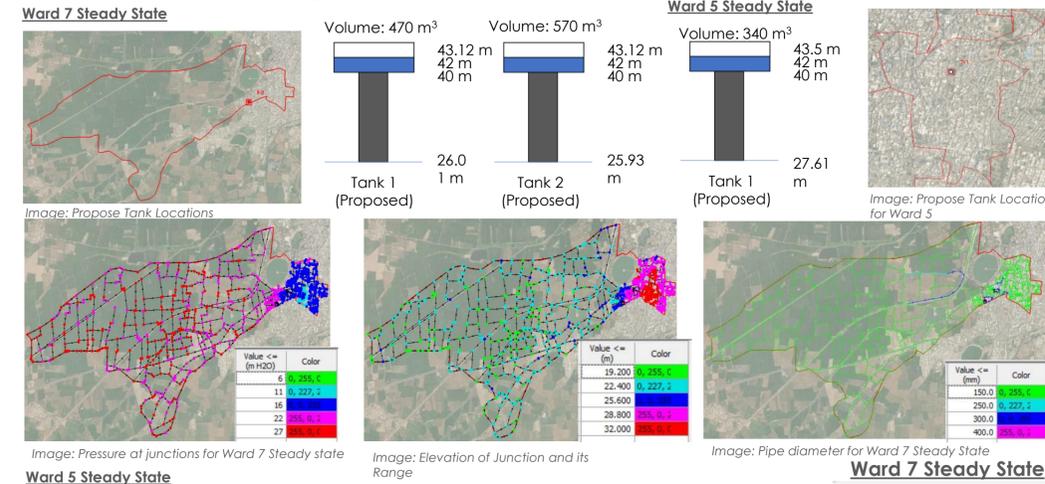
Water Demand for Ward - 7

Year	Population	Water Demand W7			Water Demand MLD
		Fire Demand 1800 litres/min for every 50,000 population (LPD)	Maximum Water requirement According to CPHEEO = 135 LPD	Unaccounted for water (UFW) According to CPHEEO = 15% of Max. water Requirement	
2011	9950	315436	1343250	201488	1.86
2021	15678	395953	2116508.728	317476	2.83
2025	17068	413128	2304113.781	345617	3.06
2035	21105	459399	2849138.529	427371	3.74
2045	26097	510852	3523085.72	528463	4.56
2055	32270	568067	4356451.209	653468	5.58
2057	33670	580257	4545428.004	681814	5.81

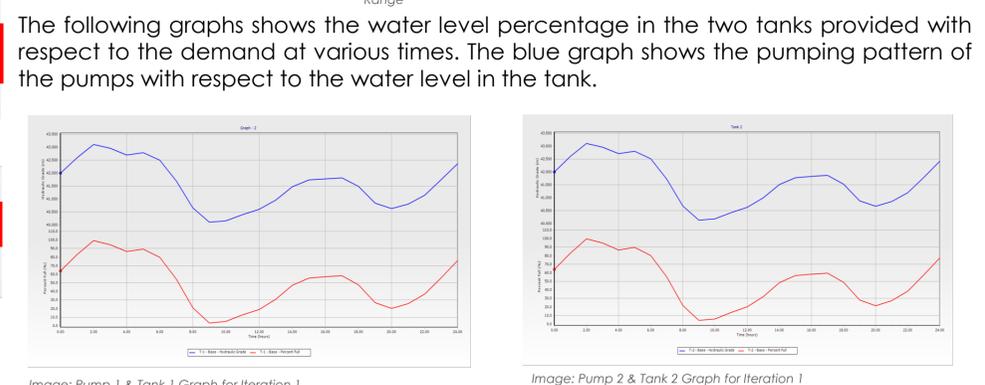
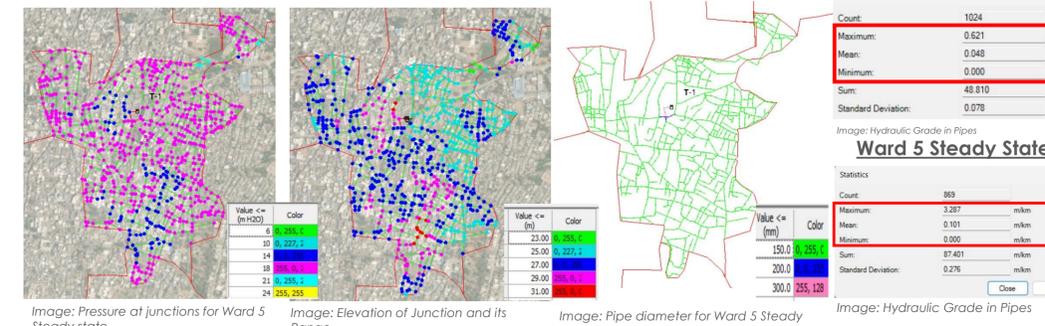
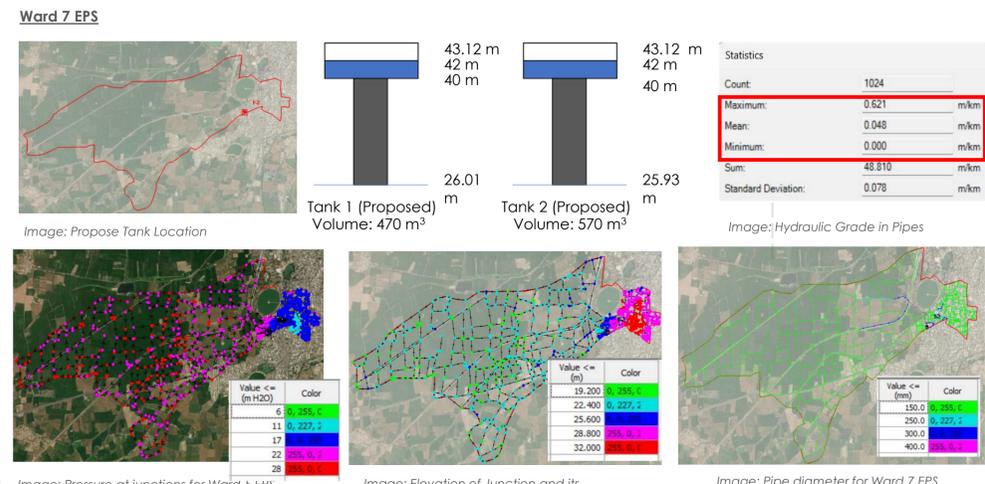
Water Demand for Ward - 5

Year	Population	Water Demand W5			Water Demand MLD
		Fire Demand 1800 litres/min for every 50,000 population (LPD)	Maximum Water requirement According to CPHEEO = 135 LPD	Unaccounted for water (UFW) According to CPHEEO = 15% of Max. water Requirement	
2011	8439	290500	1139265	170890	1.60
2021	4453	211015	601120.2005	90168	0.90
2025	4847	220169	654402.8473	98160	0.97
2035	5994	244828	809198.0446	121380	1.18
2045	7412	272248	1000609.148	150091	1.42
2055	9165	302740	1237297.437	185595	1.73
2057	9563	309237	1290969.679	193645	1.79

Results of Steady State



Results of Ward 7 EPS



As per CPHEEO manual ideal hydraulic grade in pipes should range between 1 to 4 m/km. As you can see in the below statistic image maximum and minimum hydraulic grade value is 3.287 & 0 m/km which is in range and ideal.

Conclusion

This Directed Research Project evaluated the existing water supply system of a Tier-II/III town in Gujarat, with Dholka selected as the case study, to understand its ability to meet present and future water demand. The study highlights that although Dholka has access to multiple water sources and storage facilities, the existing system is constrained by ageing infrastructure, uneven pressure distribution, limited storage capacity in certain zones, and dependence on intermittent supply. These issues become more critical with increasing population and urban expansion. Population forecasting and ward-wise demand assessment revealed a significant rise in future water requirements, which the current network is not fully equipped to handle. Hydraulic modelling of selected wards showed pressure variations and undersized pipelines, particularly during peak demand conditions. The analysis demonstrated that redesigning pipe diameters, optimizing storage capacity, and improving network layout can substantially enhance system performance. The introduction of District Metered Areas (DMA) was identified as a key strategy for improving pressure management, monitoring water flow, and reducing non-revenue water. DMA-based zoning enables better operational control and supports a gradual transition toward continuous water supply. Overall, the study concludes that systematic analysis, hydraulic modelling, and DMA-based planning—aligned with CPHEEO 2023 guidelines—are essential for achieving a reliable, efficient, and sustainable water supply system in small towns like Dholka.