City of Surat

Building Surat’s Water Resilience by Enhancing Tapi River
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CHAPTER 1 – INTRODUCTION

Surat’s selection in Temasek Foundation Urban Resilience Programme (TFURP) happened due to its involvement with Resilient Cities Network as a member city. The City of Surat released its City Resilience Strategy in 2017, and since its strategy release the city has consistently worked on the city’s Tapi river initiative and water resilience agenda. Like many other urban cities across the globe, Surat faces urban challenges such as mobility, water, air quality, affordable housing, social cohesion, economic resilience, and public health issues. The team under the leadership of the Mayor and Municipal Commissioner attended training under TFURP, which not only helped Surat to identify its present challenges but also to be more focused on resolving the priority. Surat is facing rapid urbanization and increasing water and wastewater treatment challenges. Considerations around industry and water demands for economic activities to ensure that improved resilience in one sector is not creating challenges in another are kept in the center while designing the proposal in TFURP.

Augmenting fresh water through barrage construction and enhancing wastewater management to tertiary treatment will accrue considerable resilience benefits, by engaging with key stakeholders to make sure that the improved infrastructure resilience also supports economic resilience and quality of life for citizens.

CITY CONTEXT

Situated in the State of Gujarat in Western India on the banks of river Tapi, Surat is a coastal city with a 474.52 sq. km area inhabiting over 6.5 million people. It experienced a decadal population growth of 64%, making it the fastest-growing city in Asia. Oxford Economics report indicates that Surat will be the fastest-growing city in the world with an average GDP growth rate of 9.2% between 2019 and 2035.

25% of the City’s population are below 25 years of age, while another 65% are between 26 to 65 years. The main economic sectors consist of 25% manufacturing, 65% services, and 10% agriculture. The current GDP of the city is estimated at US$40 billion. People from various states of India migrate to this city for livelihood in textiles, diamonds, chemicals and engineering sectors. Surat produces around 40 million mts of synthetic fabric daily, employing over 1 million people and it also cuts and polishes over 80% of the world’s diamonds employing over 800,000 people.
Surat is ranked 2nd most performing city on India’s Climate Smart Cities Mission list. As a member city in the Asian Cities Climate Change Resilience Network (ACCCRN), Surat presented its Climate Resilience Strategy in 2011, and as a member city of Resilient Cities Network (precursor – 100 Resilient Cities), it released its City Resilient Strategy in 2017. Surat is considered a model city for good governance and effective service delivery compared to many other Indian cities. Surat also has the advantages of efficient city administration, strong political consensus, and community participation.

Surat faces risks of both sea-level rise and flooding. The Ukai multipurpose dam built upstream, 94 km. from Surat, is meant for flood control management, besides irrigation and power generation. Surat and the surrounding metropolitan region have witnessed major floods during the last two decades. The city is prone to high tides, flooding, extreme heat, and subsequent health risks.

Inputs from multi-stakeholder groups led by the Surat Municipal Corporation (SMC) can not only address various issues at the city level, but also influences policy at the state and central
levels. Therefore, any progress in this city will be keenly observed and can act as an example for urban resilience in other Indian cities. To meet the increasing demand for water and wastewater infrastructure, the local government has a plan to reuse 100% of total sewage by the year 2030 by augmenting the current capacity of 319 MLD to 784 MLD by 2025. City also plans to increase the freshwater storage reservoir of capacity by 19.172 MCM from 31 MCM to 50.172 MCM.

The combined strategy of re-using treated wastewater and construction of freshwater reservoirs through barrage takes well into account the needs of Surat city for the near future with a fast-growing freshwater demand. This practice will contribute to the circularity of natural resources by presenting an opportunity for improved environmental outcomes as less wastewater will be disposed to the environment improving the resilience of the city, while the freshwater reservoir will keep the demand for future growth of the city in command.

![Figure 2 Tapi River © Resilient Cities Network](image)
CHAPTER 2 – PROPOSED PROJECT DESIGN

CITY WATER RESILIENCE

City water resilience is defined as the capacity of the city water system – including the human, social, political, economic, physical and natural assets – to anticipate, absorb, adapt, respond to, and learn from shocks and stresses, in order to protect public health, wellbeing, the natural environment and minimise economic disruption. In the context of Surat, the key focus is to enhance the resilience against stresses such as the growing water demand from urbanization, and against shocks such as the extreme rainfall and floods from both upstream of Tapi River and the city.

![Figure 3 Surat on Tapi River](image)

Arup’s city water resilience framework provides a guidance for systematic review of Surat’s water problem at the catchment scale, and identification of resilient dividends beyond the water sector. Managed properly, flooding water can be turned into valuable resources, and the infrastructure enables place-making for the community. There are also increasing opportunities to recycle and re-use water through sewage treatment.

In the short term, the ongoing river cleaning project will improve the water quality at Tapi River and the proposed barrage will stop storm surge, flooding, and creating an additional reservoir for clean water. In the long term, water treatment facilities will be further upgraded to allow 100% recycling of treated effluent, and the waterfront development can revitalised the development along the river.
Figure 4 City Water Resilience Framework ©Arup

VISION / IMPACT
In the long run, Tapi River will be clean and conserved. The riverfront will be rejuvenated, and create multiple benefits to the city including enhanced water security as well as social inclusivity.
We are encouraging a ‘rethink’ at the feasibility study to consider factors that may affect the successful implementation of program and action plan on integrated water management for Tapi River. The project will contribute to the potential for sustainability to be integrated upstream and be mainstreamed into the project design as listed below.

STAKEHOLDER WORKSHOP

During the development of a ‘project logic’ to address Surat’s resilience challenges, TFURP brought together local stakeholders with in-depth understanding of Tapi River to brainstorm ideas. The program team obtained valuable input from the community for finalising the project logic. The learning from the workshop was used to improve the project design for improving integrated water management of Surat.
Common concerns raised by the stakeholders include:

- Water salinity challenges for River Tapi;
- Integration of the barrage project and wastewater management;
- Natural hazards and the requirements for disaster management; and
- Integrating mobility and pedestrian movement across the barrage.

The agreed project outputs after the discussion is summarized in the following section.
OUTPUT

The Resilience Approach responds to a demand for innovative approaches and tools that help stakeholders and communities involved in the water cycle collaboratively build water resilience for Surat. The resilience values are being captured in the Project Logic. Developing the project logic can help demonstrate how different outputs or activities are able to contribute to multiple outcomes; that can help demonstrate what activities are going to have a higher resilience dividend.

Figure 6 Marina Barrage as an Exemplar Project for Providing Inspirations to Surat ©Photo by Mark C (Left) and Aparna Johri (Right) on Unsplash
Output 1: Feasibility study and design for the additional barrage to enhance water security

Feasibility study entails analyzing factors that may affect the successful implementation of barrage project to avail water security. The potential study to be conducted includes:

- Engineering studies to understand multi-risks associated with the barrage;
- Model studies with respect to sedimentation, evaporation and navigation;
- Hydraulic and hydrology studies to optimise the barrage sizing.

Resilience Opportunities
- Incorporating the best examples locally and internationally so as to ensure that the proposed water strategy is robust to withstand the long-term stress from changing climate and urbanisation, and any short-term shocks such as seasonal floods or drought.

Resilience Quality:

Initiators:
Surat Municipal Corporation, Environmental department, Engineering Department

Proposed Activities:

Survey and modelling: Optimized sizing of the Barrage and Risk and Hazard Mapping

Integrated and Inclusive approach for riverfront development, barrage and wastewater management

Review of potable water supply strategy to optimise supply and demand

Engineering studies to understand multi-risks associated with barrage
Output 2: Wastewater treated to be suitable for industrial use

Upgradation of Tertiary Treatment Plant (Asana STP) for industrial use will result in implementing circular economy of water in Surat. With the addition of treated effluent as supply source, use of groundwater and River Tapi water can be stopped. This can improve the use of water resources of River Tapi, restricting the river water to drinking use only and unleashing the potential of water resources for other uses.

Resilience Opportunities

- Conducting wide consultation among different stakeholder groups to ensure inclusivity and equity in the distribution
- Relevant authority should take a wholistic view and coordinate the distribution scheme so as to enhance overall resilience while striving for efficiency

Resilience Quality:

Initiators:
Surat Municipal Corporation, Surat Urban Development Authority, Public Works Department, Irrigation Department

Proposed Activities:

- Upgradation of Tertiary Treatment Plant for industrial use
- Reduction in the usage of groundwater pumping activities
- Periodic testing of TDS to confirm the reduction in the salinity of River Tapi (At operational Stage)

Output 3: Integrated development of barrage and wastewater management

In order to strengthen the capacities, the city authorities and responsible agencies involved for performing various activities, should have proper coordination and integration in order to execute the barrage development and wastewater management to save River Tapi.

Resilience Opportunities

- Integrating the water supply from both sources in the overall strategy to enhance the overall robustness and redundancy of water supply.
- Coordinating the short-term and medium-term development strategies to support inclusive and sustainable development of Surat

Resilience Quality:

Initiators:
Surat Municipal Corporation, Environmental department, Engineering Department

Proposed Activities:

- Adopting and utilizing the result from Outputs 1 and 2 Water resources from both barrage storage and treated effluent should be considered wholistically to optimize the water supply network.
- Proper coordination and collaboration from the government to the community for barrage development and wastewater management
- Community engagement for management under government programme
Output 4: Integrated Plan for Riverfront Development and Social Inclusion

The city plans to have an integrated development such that provisions of waterways and riverfront development would bring result in a socially inclusive environment. Several initiatives are listed as follows:

- Provision of waterways and ferries connecting important city locations, utilizing electric boats to minimize pollution;
- Recreational activities for people; and
- Infrastructure for pedestrians.

Resilience Opportunities
- Using the water improvement works as catalysts to unlock development opportunities for a more inclusive Surat
- Exploring the co-development opportunities between water and social infrastructure to improve redundancy in relevant social services

Initiators:
- Surat Municipal Corporation, Surat Urban Development Authority, Environmental Board

Resilience Quality: Reflective, Resilient, Inclusive, Integrated

Proposed Activities:

- Integrated and inclusive approach for riverfront development, barrage and wastewater management
- Detailed study and coordination of riverfront development proposals
- Events at barrage waterfront promoting active and healthy lifestyle
## CHAPTER 3 - IMPLEMENTATION PLAN

### TIMELINE

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<thead>
<tr>
<th>Project Description</th>
<th>Expected Output</th>
<th>Activity Date</th>
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<tbody>
<tr>
<td>Design and construction for the additional barrage</td>
<td>Barrage detailed engineering design (incl. government approval and surveying works)</td>
<td>2022–2023</td>
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<tr>
<td></td>
<td>Barrage construction</td>
<td>2024–2026</td>
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<tr>
<td>Feasibility study, design and construction for tertiary sewage treatment plant</td>
<td>Data collection and feasibility study</td>
<td>2023</td>
</tr>
<tr>
<td></td>
<td>Sewage treatment plant upgradation design</td>
<td>2024</td>
</tr>
<tr>
<td></td>
<td>Sewage treatment plant construction</td>
<td>2025–2026</td>
</tr>
<tr>
<td>Integrated Plan for Riverfront Development and Social Inclusion</td>
<td>Community-based campaign for planning visioning</td>
<td>2023</td>
</tr>
<tr>
<td></td>
<td>Integrated planning for riverfront development</td>
<td>2023</td>
</tr>
<tr>
<td></td>
<td>Provision of riverfront social infrastructure for placemaking</td>
<td>2026–2027</td>
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### INDICATIVE BUDGET

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<th>Project Description</th>
<th>Expected Output</th>
<th>Indicative Budget (million USD)</th>
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</thead>
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<td>Operation for the next 6 years</td>
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<td>Sewage treatment plant upgradation design</td>
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<td>Project Description</td>
<td>Expected Output</td>
<td>Indicative Budget (million USD)</td>
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<td>Sewage treatment plant construction</td>
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<td>Integrated Plan for Riverfront Development and Social Inclusion</td>
<td>Community-based campaign for planning visioning</td>
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*Figure 7 Surat Presenting at World Cities Summit 2022*