

Improving SURAT'S FLOOD RESILIENCE



Surat, the eighth largest city in India and second-largest in Gujarat state, is one of India's fastest-growing cities. This rapid rise and its location on the Tapi River, however, make it vulnerable to climate-change associated risks such as devastating floods and their accompanying outbreaks of disease. **Dr Isher Judge Ahluwalia**, Chairperson of the Indian Council for Research on International Economic Relations, and **Kamlesh Yagnik**, immediate past president of the Southern Gujarat Chamber of Commerce and Industry, explain how the city has strengthened itself against floods and climate hazards.





Surat, India



The Challenge

In August 2006, the city of Surat suffered devastating floods after three consecutive days of rain. Then, an emergency release of water from the upstream Ukai Dam into the Tapi River inundated nearly 80 per cent of the city, leaving 2 million of its residents trapped in their homes without food or drinking water. The episode was the latest in a series that highlights Surat's geographical vulnerabilities. In 1994, a flood had triggered a plague epidemic that caused 56 deaths, while flooding also affected lives of the residents in 1998 and 2004.

Located on the banks of the Tapi River, directly downstream from the Ukai Dam, Surat is particularly susceptible to floods. In the dry season, the dam supplies water to city-dwellers, farmers in the region, and the Hazira industrial district. During the wet season, however, emergency water releases have to be carried out in response

to heavy rainfall, and this can result in downstream flooding. Rapid urban growth has also put pressure on water resources. The Tapi's carrying capacity shrank from 1.2 million cubic feet per second in the 1970s to 0.35 million cubic feet per second in 2015 because of bridges, embankments, encroachments and siltation as Surat expanded to three times its original size. Currently, 75 per cent of Surat's more than five million people are vulnerable to floods. In particular, the 450,000 residents living along riverbanks, tidal creeks and between drainage lines are most at risk.

Today, climate change poses new threats to Surat. Rising winter temperatures and high humidity could lengthen the mosquito-breeding period and create conditions favourable for malaria, dengue and other vector-borne diseases. Higher rainfall in Tapi's upper catchment will also mean larger volumes of water in the river, while rising sea levels will cause saltwater intrusion into aquifers and contaminate groundwater.

01 A flooded Surat.



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01 Drainage works.

02 The water treatment plant at the Vesu area provides 35 million litres of piped water per day.

The Solution

After the 2006 floods, Surat began to overhaul its stormwater and sewerage infrastructure, put in place urban health initiatives, and implement a comprehensive city resilience strategy.

Infrastructure Renewal

The Surat Municipal Corporation accessed funds from India's massive city modernisation scheme, the Jawaharlal Nehru National Urban Renewal Mission, to augment its stormwater drainage network and sewerage network and treatment plants. They also installed a modern, SCADA (Supervisory Control and Data Acquisition)-based industrial control system in 2009, which brought about significant savings in sewage-treatment energy consumption. Today, Surat treats over 90 per cent of its wastewater, well above the average of 30 per cent for Indian cities. The Corporation also strengthened river embankments, built new floodgates and a weir. These improvements allow stormwater to drain more easily and prevent the spread of diseases.

Urban Health Initiatives

Urban health initiatives implemented by the Surat Municipal Corporation between 2006 and 2009 include regular medical camps in low-income locales, and health exhibitions to build awareness on disease-prevention.

Surat Climate Change Trust

In 2011, the Surat Municipal Corporation developed its City Resilience Strategy to address the challenges of climate change in general, and flood vulnerability,

in particular. This work was done in partnership with the Rockefeller Foundation's Asian Cities Climate Change Resilience Network and local experts such as TARU Leading Edge, an Indian urban development consultancy.

As a result, the Surat Climate Change Trust was set up as a multi-stakeholder body which pulls together city authorities across various sectors, from water management to urban development, as well as the private industry and the community. A major objective of the trust is to safely rehabilitate the poor and most vulnerable populations living in low-lying, flood-prone parts of the city.

The first major accomplishment by the trust was an early warning system that uses satellite data and hydrological models to forecast weather conditions two to three days in advance such that the water authorities can release smaller installments of rainwater over a longer period. Mobile phone messages are sent to citizens 48 hours in advance of the release of water, which gives them time to react and evacuate, if necessary.

Another important development was the setting up of the Urban Health and Climate Resilience Center (UHCRC) in 2013 to monitor the impact of extreme health events. The centre further built on earlier work done on an Internet-based Urban Service Monitoring System, which had enabled city officials to generate data on the disease trends in Surat regularly. Work at UHCRC involves close interaction with the Southern Gujarat Chamber of Commerce and Industry, the Surat Municipal Corporation, and the Health and Family Welfare Department.

These measures do not come cheap, but the city has paid for them through property and commercial taxes – thanks to a prosperous industrial base – and cross-subsidies in a water-tariff structure which charges industrial users four times the residential rate. Industrial units at Hazira also partly financed the building of a weir. Additional revenue is raised through the sale of recycled domestic wastewater to industrial units based in Pandesara – some 35 million litres of tertiary treated wastewater per day.

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The Outcome

While many of Surat's resilience initiatives are works in progress, their impact has already been felt. The early warning system was critical in preventing large-scale devastation by the flood in 2013.

In 2006, the sudden release of almost 900,000 cubic feet per second had left the entire city flooded. In contrast, 700,000 cubic feet per second released in 2013 did no damage to the city. Information on water inflow and outflow from the dam was published on the Surat Municipal Corporation website and via a mobile application. No evacuation effort was needed in 2013.

In the past few years, Surat has won numerous awards in India, as well as internationally, for governance, inclusion, and conservation. It received the Best Performing City award from the Ministry of Urban Development in 2009 and the Best City Award from India Today, a news weekly, in 2014. Moving forward, the Surat Municipal Corporation is working with Microsoft CityNext to develop Surat as a smart city with advanced urban planning and citizen-empowerment processes.



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- 01 Gaurav Path submerged during the 2006 floods.
- 02 Gaurav Path on a sunny day.
- 03 Majura Gate, one of the few multi-layer flyovers in India.



Kamlesh Yagnik has three decades of experience in business and consulting. He is the past president of the Southern Gujarat Chamber of Commerce and Industry and a founder trustee of the Surat Climate Change Trust. He has studied vulnerabilities, impact and adaptation strategies for climate change in Surat, and previously collaborated with the local government to create an end-to-end early-warning system for river floods. An engineer by training, he is director of two companies in the energy and information technology sectors.



Dr. Isher Judge Ahluwalia is a renowned economist and Chairperson, Board of Governors, the Indian Council for Research on International Economic Relations (ICRIER). She has written several books on India's industrial growth and productivity, including the recently published "Transforming Our Cities: Postcards of Change" (Harper Collins), which is a collection of stories on innovation across the country's urban landscape.