URBAN CLIMATE CHANGE RESILIENCE STRATEGY
PROJECTS IN ACCCRN CORE CITIES

ACCCRN Projects in Surat, Indore and Gorakhpur: A Brief Summary

This documentation summarizes the projects undertaken by the three ACCCRN core cities in India. These projects have been successful due to the meticulous efforts of ACCCRN partners, and persistent engagement with local institutions and community. The success of these projects demonstrates how resilience can be achieved by taking measures at different scales.

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Under

ACCCRN
Asian Cities Climate Change Resilience Network

Asian Cities Climate Change Resilient Network (ACCCRN) is a unique initiative by The Rockefeller Foundation to sensitise and engage cities on building climate change resilience. Resilience is the ability of a system, service or an institution to adjust to the changing realities of climate change and bounce back after a major disaster. ACCCRN project initiated in 2008 was implemented in four countries – India, Indonesia, Thailand and Vietnam, covering 10 cities from these countries, with an aim to become a regional network of cities and professionals who would focus on inclusive and sustainable development to build urban resilience. The network identified cities in phase 1, engaged with the cities to identify projects in phase 2, implemented projects in cities with the help of local champions in phase 3, and now focuses on replicating the processes, strategies and measures in other cities in phase 4.

Under ACCCRN, 42 projects in ten core cities have been funded till 2014 which have built resilience of cities against climate change. These projects are at different scales (community level to city level), and demonstrate community engagement as well as the sustenance and modularity of the projects. These projects have also helped in minimizing the negative impacts of climate change on city infrastructure and services, and have improved the well being of citizens.

India is at high risk of climate change impacts, mainly due to the projected rise in temperature, climate variability, increase in short duration high intensity rainfall events, shift in seasons, increase in extreme weather events, sea level rise and retreat of Himalayan glaciers due to warming climate. Anthropological stressors add to the problems in India like – population pressure, lack of infrastructure, and lack of capacity of urban local bodies to handle climate change impacts. Recognising these risks, the ACCCRN programme helped cities to build resilience to climate change. In India, three cities were identified under the initial phase of ACCCRN programme i.e. Surat in Gujarat, Indore in Madhya Pradesh and Gorakhpur in Uttar Pradesh. The ACCCRN partner institutions – TARU Leading Edge Pvt. Ltd., I-S-E-T, Gorakhpur Environment Action Group (GEAG), The Energy Research Institute (TERI) worked in these cities with the city municipalities and local communities to come up with city specific climate change resilience strategies and projects. A brief description of these projects is presented in the following sections.

SURAT

The Surat Municipal Corporation (SMC) is a well organised and well functioning urban local body with dedicated staff. The present day efficient functioning of SMC is in part due to two major events that happened in the city resulting in heavy economic losses to business in the city. The first was the outbreak of Plague in 1994 and the second the devastating floods in 2006. The first event changed the way SMC functioned and brought in major administrative changes in the ULB to make it efficient. The second event led to putting in place systems that has helped the city in reducing the impact of floods – both manmade and natural.

Surat city has added to its resilience by taking up the following measures and institutionalizing them to address long term gradual and sudden impacts of events driven by climate change.

1. **Formation of Surat Climate Change Trust**
   Recurring floods, high population density, changing rainfall pattern, lack of safe and adequate water supply, location along riverside and sea, and rapid industrial development make Surat highly conducive to diseases. To provide an integrated solution to these problems led to the formation of The Surat Climate Change Trust (SCCT).

   SCCT is promoted by multiple city and state level stakeholders led by Surat Municipal Corporation (SMC). It includes members from various institutions including Gujarat State Disaster Management Authority (GSDMA), Narmada, Water Resources and Water Supply Department (NWRWS), South Gujarat Chamber of Commerce & Industries (SGCCI) and Academic Instructions (SVNIT and CSS). The main activity of the Trust is flood information management with Ukai Dam.

   The SCCT also spearheads two key interventions within the city: the End to End Early Warning System (EWS); and the Urban Health and Climate Resilience Centre (UHCRC).

2. **End-to-End Early Warning System**
   An End-to-End Early Warning System has been set up in Surat to prevent/manage flooding in the city due to release of water from Ukai Dam. As a part of this system 10 automatic weather stations have been set up. The automatic weather stations monitor rainfall, wind velocity and direction and send automatic real time information to the processing centre. This system integrates meteorological, hydrological and reservoir modelling system to improve reservoir operations for flood mitigation. The model predicts rainfall in the Tapi catchment area and the inflow of rain water into Ukai Dam, based on which a decision is taken when to release water and how much to release. The Surat Municipal Corporation is then informed accordingly. Before this system was developed, Surat used to get only 6-8 hours warning about the release of water from Ukai Dam. With this system in place, the warning period has increased to 72 hours, which allows the city administration and the citizens to plan their evacuation and manage response.

3. **Weir-cum-Causeway**
   The Surat Municipal Corporation (SMC) in association with the major industrial establishments constructed a Weir-cum-Causeway across the Tapi River near Singanpor (see picture 1). The weir has improved the water supply for Surat city by providing a standing pool of freshwater. It has also prevented the ingress of tidal water and drifting silt entering infiltration well area during the high tides.

   The purpose of constructing the Weir-cum-Causeway was to conserve excess water flowing away from Weir-cum-Causeway, provide for long term water supply requirement of Surat city and surrounding areas, prevent tidal silting and pollution in Tapi river (down stream of Weir-cum-Causeway), prevent salinity intrusion in downstream areas, and recharge ground water from the sweet water reservoir and improve ground water quality.

Picture 1: Weir-cum-Causeway Surat (saline water from sea is on the right side)

Urban Health and Climate Resilience Centre (UHCRC) at Surat

Urban Health and Climate Resilience Center (UHCRC), Surat was launched in March 2013 and supported by Rockefeller Foundation through Surat City Climate Trust in which Surat Municipal Corporation is a main stakeholder. The objective of UHCRC is "developing and sharing the evidence base to recommend more effective health services that improve resilience to climate change impacts on urban citizens, particularly poor and vulnerable communities".

- UHCRC thrives to become the knowledge hub in the subject of Urban Health and Climate Change Resilience
- UHCRC is the first center of its kind and is conducting quality research in area of urban health and climate change resilience.
- UHCRC aims include piloting assistance programs for city authorities in India and beyond to improve urban health services.

Understanding the need to generate city based scientific evidence and to assess the local vulnerability, researchers from the Urban Health and Climate Resilience Center, Surat study the impact of climate change on health and work closely with the city authorities to improve urban health services, particularly for poor and vulnerable city-dwellers.

The Centre has been established within an existing institution, the Surat Municipal Corporation's Health Department, and is the first of its kind in the country to address public health and climate change adaptation issues.

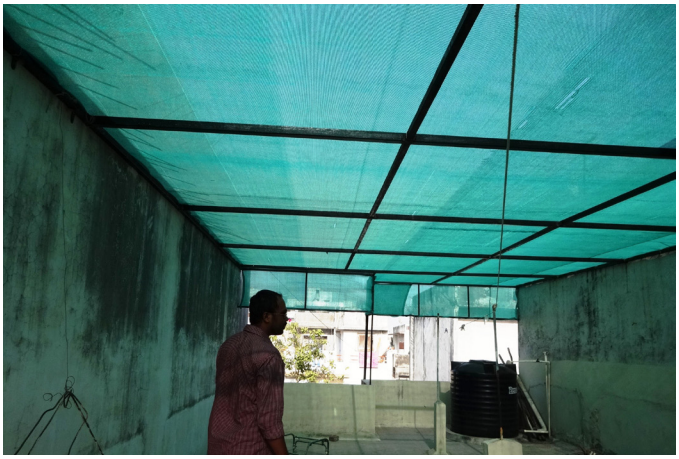
Other Sustainable features which add to resilience of Surat city:

A. Singanpor sewerage treatment plant (STP)

The Sewage Treatment Plant at Singanpor has a gas based power plant. This plant, like some other STPs in Surat, produces power from sewage and helps in cost saving on energy bill of Surat Municipal Corporation. The treatment technology used in the STP is the conventional activated sludge process. This is a Clean Development Mechanism project that is eligible for carbon credits.

B. Cool Roofs

Cool Roofs is an initiative of TARU to help Surat make living comfortable for its citizens, especially the poor. TARU held a competition to get ideas for cool roofs and has selected over a dozen ideas for cool roofs that are now in the process of being implemented in the city. Three different kinds of cool roofs have been tested - one that uses reflective paint, the second uses green net covering for reducing temperature, and third used Chinese tiles to reflect the heat back.



Picture 2: Some pilot sites where cool roof is being tested.

C. Health Surveillance System

A form has been developed for the surveillance and each urban health centre sends report of various diseases and health problems to the SMC on a daily basis. SMC also gets information on health problems and diseases from private medical practitioners and these are also fed into the system. The information is compiled centrally at SMC and the report shared with the Municipal Commissioner, who takes necessary action to tackle any health problem in the city. For instance, if there is an outbreak of malaria or diarrhoea in any part of the city, immediate action is taken to spray disinfectants or fumigate the area in the first case and get water tested in the second case. Public health is thus handled in a very systematic and effective manner at SMC.

INDORE

Indore is one of the core cities in the ACCRN project. The city is vulnerable to climate change impact for various reasons, both natural and anthropogenic. Indore is geographically located on a higher elevation (Malwa Plateau) than its surrounding areas and is not a natural recharge zone; therefore it mainly depends on surface water for its water supply or sudden heavy rainfall event. Due to the combined

effect of natural and anthropogenic causes, the city has become highly vulnerable to climate change impacts.

The city is working upon diverse sectors (water supply, heat island mitigation, health surveillance and lake conservation) for an integrative approach of developing urban climate change resilience. With an aim to build resilience for the city TARU started with a visioning exercise for the year 2020. It conducted vulnerability assessment by communities and sectors, held discussion with different stakeholders and came out with scenario planning using the output of these studies. TARU implemented four projects as part of building climate change resilience in Indore:

1. **Conjunctive Water Management**
   The water supply in Indore suffers from three major issues – seasonal scarcity, quality and high cost. Slums and peri-urban areas are mostly served by groundwater. With the depleting ground water, seasonal scarcity (especially during summers) has become a major issue with water supply in these areas.

   To address these various issues pertaining to water supply, TARU performed a community context analysis (CCA) through community consultations, household surveys and data collection through participatory GIS. Based on the results 4 case studies were taken up by TARU in collaboration and coordination with Indore Municipal Corporation. These are:

i. Community Managed RO plant at Rahul Gandhi Nagar (to address water quality issue among poor)
ii. Individual water tank storage at Narwal Kankad (to solve the problem of individuals who had to collect water from distant places)
iii. Community water storage tank at Devashree Nagar (to solve the issues of storage and collection conflicts and have assured water in case of emergency or crisis).
iv. Rainwater harvesting and recharging at Ganesh Nagar (for rain water storage at household level and quality monitoring).

2. **Cool Reflective Roofs**
   Cool reflective roof is being implemented in Economically Weaker Section (EWS) houses in Nainod and Niranjanpur areas. Both of the housing projects have not been occupied so far. An experimental set up has been done to compare treated and non-treated roofs and the data has been plotted for winter months (December 2013 and January & February 2014). Automated weather monitoring stations have also been installed to study the effect on indoor as well as outdoor air temperature and humidity measurements.

Picture 3: Reflective coating on roof in Niranjanpur

3. **Urban and peri-Urban Lake restoration project**
   Indore city has 26 seasonal and perennial water bodies, but in the last few decades the city has experienced rapid urbanization and increased migration which has taken its toll on these city lakes. The lakes of the city used to serve as source of water for household activities and even drinking, but the neglect and lack of management of these local water resources, have led them to become defunct.

   TARU along with Indore Municipal Corporation (IMC) and Indore Development Authority (IDA) and ACCRN worked to achieve: stabilized improved water quality and perennilaity of the restored lakes and multi stakeholder owned lake restoration.

   TARU has restored and worked on 2 water bodies demonstrating methods and process required to revive a lake/water body which has a co-benefit of ground water recharge, aesthetic enhancement of the area, cool micro-climate and possible livelihood restoration. The names of the lakes restored are: Khajrana talab and Lasudiya Mori talab.

Picture 4: Khajrana Talab covered with water hyacinth

Picture 5: Experimental set up to chemically treat the lake water

4. **Integrated and real-time vector / water – borne disease surveillance and response system**
   Indore is experiencing increased disease occurrences mainly due to deteriorated water quality and solid waste management. The slum areas, built along the natural drainage remain perpetually water logged due to lack of sewerage. Stagnant water causes increased vector borne/ water borne diseases.

   The health workers are provided with a mobile based application which helps them mark the area where the disease is reported, date, symptoms of the disease and this data gets updated automatically in the database. This real-time monitoring reduces the turn-around time and helps in preventing outbreaks and epidemics in the city.

Gorakhpur

Gorakhpur is one of the three core cities of ACCCRN project and has been a major node in eastern Uttar Pradesh serving the region. As per city resilience strategy report on Gorakhpur, its predicted that the city will experience more intensive rainy seasons and higher temperatures in the near future. The flooding and water-logging that the city currently

faces, is likely to aggravate with increased rainfall, if the catalyst factors like mismanagement of solid waste, waste water, storm water drainage and alarming expansion of the urban area in its peri-urban flood plains and water bodies are not addressed today.

To prepare the city and demonstrate methods and process, Gorakhpur Environmental Action Group (GEAG), an NGO in Gorakhpur has implemented two projects at Gorakhpur, with assistance from TARU and other institutions like Mahanagar Paryavaran Manch and City Steering Committee, which has members from Gorakhpur Municipal Corporation, Medical College and Hospital and Chamber of Commerce. The projects are discussed as following:

1. **Micro Level Planning in Mahewa Ward, Gorakhpur city.**
   Under the Micro Planning project the ward is divided into 6 mohallas (neighbourhoods) with each mohalla having 2 representative volunteers forming a thematic group like water sanitation, solid waste management, drainage, community health and climate resilient agriculture. From all 6 mohallas these would combine to form a thematic sub-committee, which would then be a part of the Ward Level Committee.

2. **Climate Resilient house built by GEAG** with technical support by SEED India at a cost of Rs. 1 lakh. The structure and masonry skills used to construct this house make it an example one of its kind. The plinth of the house is raised, to protect it from flooding. It has walls in which bricks are arranged in such a way that it has hollow spaces within, working as an insulator, making the interior of the house cooler during hot summers and warmer during cold winters. Furthermore, the roof of the house is higher than 10 feet which helps in cooling the house in summers. The design of the windows and doors is such that it gives proper ventilation and light inside the house.

3. **Decentralised Solid Waste Management project in Mahewa.**
   Mahewa ward has a site where kitchen waste is being converted into bio manure and leachate, which is used as a bio pesticide by the local farmers. This initiative is a break through as it is sustainable and is run by community. Waste is segregated and wet waste is composted. The lechate collected is given to nearby farmers and they use it as pesticide, while dry waste is sold to scrap dealers. This is a sustainable model of solid waste management project.

4. **Peri-Urban Agriculture in Sanjhai Village, north Gorakhpur city.**
   Sanjhai village is one among the cluster which has been facing land conversion, as it is located on one of the two main axis along which the Gorakhpur city is expanding. GEAG's intervention aims at making the existing livelihood, which is agriculture, more economical and lucrative so that it will discourage them from selling their land to developers, saving crucial open spaces required to prevent flooding in the urban area.

Picture 7: NIUA team having discussion with Sanjhai villagers, in peri-urban area of Gorakhpur

Gorakhpur has begun its journey by introspecting and now needs to learn from what other cities are doing in the areas of Solid Waste Management and Waste Water Treatment, as solid waste and waste water are root causes of several other problems. A decentralized approach should be adopted instead of one city-wide approach. Ecological Sustainable Agriculture is the way forward for villages in urban fringes and peri-urban areas. Livelihood diversified by relying on different methods of agriculture, types of crops and awareness of weather events helps increase capacity and decrease vulnerability.

The above documentation is based on field visits of NIUA project team to Surat, Indore and Gorakhpur in 2014, facilitated by TARU.

Picture 6: Demonstration unit of Climate resilient housing in Mahewa