The intent of this document is to review and make recommendations on approaches to Urban Climate Resilience to the Government of Gujarat, based on the work done in the field under the Capacity Building for Low carbon and Climate Resilient City Development in India (CapaCITIES) project, supported by the Swiss Development Corporation (SDC), particularly in Rajkot.

In Gujarat, the CapaCITIES project has, with the Rajkot Municipal Corporation, successfully outlined the Rajkot Climate Resilient City Action Plan (CRCAP), implemented pilot ‘Quickwin’ projects and developed long term ‘Bankable’ projects in the prioritized themes of solid waste management (SWM), air quality and transportation (AQT) and waste and wastewater management (WWM). The actual interventions under each, can be referred in the thematic briefs published separately. This brief looks at the Climate Change projections and impacts on Gujarat, gaps in the current policy and implementation space, and makes policy recommendations at State and City level for scaling and replication of lessons from CapaCITIES across the State.

Introduction: Climate Change in Gujarat and need for Urban Climate Action

Gujarat has always been one of the most urbanised states in the country with 46 percent of the population residing in urban areas. In Gujarat as in other Indian States, urbanisation is a result of increase in and rural-urban migration and population. There is a need to keep up with urbanization and the fast pace of economic growth including the demand and supply of essential goods, services and infrastructure while mitigating greenhouse gas (GHG) emissions that cause adverse impacts of climate change both in urban and rural conditions. Appropriate policy relating to urban planning in an integrated manner that considers in addition to operational, developmental and restorative planning and also climate projects and vulnerability mapping is essential to keep to a low carbon development pathway that builds climate resilience in cities. The State of Gujarat has undergone climate change over the last few decades and is projected to further undergo a warming trends as well as a shift in rainfall patterns and intensity. It is an imperative to understand what climate change the State has undergone and is projected to undergo in order to design a data driven, scientific policy based action plan. The information below is clear in its mandate, to adequately inform policy makers and provide the guidelines needed to design policy interventions where the fast growing urban spaces can successfully adapt and mitigate enhancing their resilience to a changing climate.

The all India assessments in the INCCA report (MoEF, 2010) indicates a warming trend over the Gujarat State for annual mean, maximum and minimum temperatures and also shows a possible increasing trends in extreme rainfall.

An increase of 0.07°C in mean temperatures has occurred over Gujarat in the past 40 years (1969- 2005) with a comparative higher increase over Coastal Saurashtra region (1969-2008) observed. An analysis (1969-2008) also indicates to an increase in temperatures over Saurashtra region as compared to other regions of the State. Rajkot being nested in Saurashtra was selected as a CapaCITIES project city from Gujarat. Heat wave conditions have shown an increase over the southern part of the Gujarat and a decrease over the northern parts. Along the coastal stations of Saurashtra an appreciable rise in heat wave conditions have been observed.

Additionally, rainfall extremes have also shown an increasing trend in the past decade for Southern Gujarat region and Saurashtra. The severe flooding in Saurashtra and Kutch due to incessant rains over Rajkot in August 1979, flooding of river Narmada in 1970 and river Mahi in 1973 are few of the extreme flooding events that Gujarat have witnessed in the past.

High resolution regional climate model (PRECIS) simulations for 2030’s indicate an all round warming over the Indian Subcontinent and the State of Gujarat shows a projected rise in the range of 1.5 to 2.5°C for the period of 2030’s. The spatial pattern of the change in lowest daily minimum and highest maximum temperature from the three simulations suggests a warming of 1 to 40°C in 2030’s for the entire Indian region with Gujarat depicting high positive changes for minimum and maximum temperatures indicating warming under the projected temperature extremes.

Over the West Coast of India, the 2030’s projections indicate to an increase in rainfall by 6 to 8 per cent (MoEF, 2010). The monsoon months (June, July, August and September) show an average increase of 8 mm of rainfall in 2030’s with respect to 1970’s, however, the months of March, April and May and winter months of January and February show a decrease in the average rainfall with respect to 1970’s (MoEF, 2010).
Current Policies in Gujarat and Primary Challenges in Building Urban Climate Resilience

Currently in Gujarat there are a number of policies (Central and State) applicable for the thematic areas of Solid Waste Management, Air Quality & Transport and Water & Wastewater Management. As illustrated in Figure 4, typically, Central Ministries direct, mandate and support the execution of policies, programmes and schemes, while the State Government in turn works with Urban/Rural Local Bodies to action interventions at the ground level ensuring improvement measures.

Surat City Resilience Strategy

Surat has been one of the three cities in India which has been a part of Rockefeller Foundation’s Asian Cities Climate Change Resilience Network. Under the program Surat city vulnerability to Climate Change impacts was analysed and a citywide resilience plan was developed. There is strong potential for replication and scaling up of Surat vulnerability analysis exercise and resilience strategies preparation exercise to other cities in Gujarat. The State has the R&D potential to integrate environmental and sustainability issues in its development planning process through various reputed institutions offering expertise to do so. The Surat Resilience Strategy had a multi-sectoral approach, due to which sectoral analyses are available for key urban sectors and offer a range of interventions and adaptation options in response to climate risks in the city and to its inhabitants and are available for
reference and implementation by the concerned departments. Although the strategies suggested by the Surat resilience plan do not form part of the Surat City Development Plan (CDP), as it was prepared much earlier, they offer potential to do so.

Rajkot ClimateResilientCITIES Action Plan (CRCAP)

Rajkot is one of 4 cities as part of the ‘Capacity Building for Low Carbon and Climate Resilient City Development in India’ or CapaCITIES project funded by the Swiss Agency for Development and Cooperation (SDC). In addition to pilot projects (quickwins) and financially feasible projects (bankables) that are supported by technical studies, through the CapaCITIES project the Rajkot ClimateResilientCITIES Action Plan (CRCAP) has been developed. The Rajkot CRCAP focuses on providing real world strategies based on the analysis of data driven science and cooperation between the consortium of partners and the City Authority to identify interventions in various thematic areas that are identified as priorities by the city in order to develop a low carbon development pathway that is both adaptive and mitigates climate change to enhance city level climate resilience.

In line with national priorities, the CapaCITIES project also aims to strengthen the capacities of Indian cities to identify, plan and implement measures for reducing GHG emissions and for enhancing resilience to climate change in an integrated manner. ClimateResilientCITIES methodology is an action planning process tailor made for local governments, providing step by step guidance for the development of a ClimateResilientCITIES Action Plan that addresses both climate change adaptation and climate change mitigation and the success from the project in Rajkot has the potential to be scaled up across the State of Gujarat.

The key agencies legislating and executing policies in the three thematic areas are shown in Figure 5.

Solid Waste Management


The Urban Local Bodies (ULBs) of the state of Gujarat failed to comply the Hon. Supreme Court’s Order that made mandatory the scientific treatment and disposal of solid waste as per Municipal Solid Waste Rules, 2000 due to lack of finance and technical assistance. The SWM Rules of 2016 state that citizens are responsible for segregations of house hold waste into wet and dry waste while the local bodies are responsible for the collection, treatment and disposal of solid waste. Therefore the Government of Gujarat has decided to implement the project centrally for all ULBs utilizing their own resource and by seeking the assistance from Government of India where Gujarat Urban Development Company (GUDC) Ltd. is appointed as a nodal agency to implement the Solid Waste Management project for the ULBs of the State of Gujarat.
Challenges

CH₄ emissions from solid waste disposal sites are the largest source of GHG emission in the waste sector. A study published in the journal 'Nature' observed that the net annual emission of CH₄ from landfills in India increased from 404 Gg in 1999–2000 to 990 Gg and 1084 Gg in 2011 and 2015, respectively. The study also found that CH₄ emissions were highly correlated with the gross state domestic product (GSDP) of states and the gross domestic product (GDP) of the country, which is an indicator of human well-being. The solid waste management (SWM) policy of India needs to be reviewed in a current policy context, as the management and efficient utilization of SWM technologies might help increase the use of CH₄ as an energy source and thereby improve its sustainable and cost-effective management.

- Awareness to enhance segregation and the characterization of solid waste
- Urbanization and lack of appropriate level of funding as well as the implementation of rules at ground level monitored with financial auditing and work study
- Resistance for notification of new landfill site and the lack of coordination among Centre and State
- Appropriate technological solution, outsourcing and PPP and the involvement of organized sector
- Failure of waste-to-energy projects

Air Quality and Transportation

Extant Policy framework: Emission trading schemes (ETS)

Emission trading scheme pilot, launched on World Environment Day in June 2019 replicates a market-based system. It has been developed and enforced for large industries for control of industrial pollution. This parallels carbon trading schemes wherein a cap on emissions is assigned for a region and allocations for each of the contributing large industries are made. The stacks are monitored on continuous basis and the performers beyond compliance are able to trade the emission credits earned in the process to units that find it difficult to comply on their own. The programme is being tried out in India in three states—Gujarat, Tamil Nadu, Maharashtra—under the pilot ETS programme launched by the Ministry of Environment, Forests and Climate Change. The state pollution control boards (SPCBs) are to determine the caps for industries based on desired pollutant concentrations and emission permits can then be allocated to capped industries, which can either comply with their caps or buy credits from the market sold by the better performers.

National Urban Transport Policy

The National Urban Transport Policy (NUTP), 2006, departing from the traditional practice, focuses on mobility of people and goods, sustainable modes, multimodal solutions, integrated land use and transport planning towards making cities liveable, economically vibrant and environmentally sustainable. To achieve the stated objective, a set of strategies has been presented in the policy. The actions under NURM are directly linked to these strategies. The focus of the strategies is to reduce the need for travel on the one hand and direct investments in transport infrastructure in alignment with sustainability and thereby make cities liveable and support improved functioning of social and economic systems.

Jawaharlal Nehru National Urban Renewal Mission (JnNURM)

The Government of India announced the National Urban Renewal Mission as a reform linked urban infrastructure investment support programme in the year 2005. Under JnNURM, setting up of a city level Urban Metropolitan Transport Authority for all the 1 million+ cities, duly backed by legislation for facilitating coordinated planning and implementation of projects relating to urban transport was also specified.

Challenges

Spatial distribution of emissions of PM2.5 shows that emission intensity is highest in the Indo-Gangetic plains as well as in the states of Gujarat, Tamil Nadu, and Maharashtra. The number of registered motor vehicles in the State has increased from 129.93 lakh in 2010-2011 to 144.14 lakh in the year 2011-12, showing a growth of 10.93 per cent. About 72.86 per cent of the total registered vehicles were motor-cycle class vehicles (two wheelers).

- Financing sustainable urban transport and facilitating adequate cost recovery of large public transport undertakings which have the potential to finance the maintenance and expansion of newer public transport networks.
- Coordination between different stakeholders working to address air and noise pollution.
- Appropriate balancing of near, medium, and long-term objectives for actions addressing air pollution such as updating current lacunae’s in public transportation systems and addressing institutional inadequacies.
- Recognition and navigation of the health impacts of poor air quality on vulnerable segments of the population and incorporating relevant health interventions in state policy.
- Uniform enforcement of pollution control norms on both public and private transport.
Water and Wastewater Management

Extant Policy framework: Policy for Reuse of Treated Waste Water

The policy for the promotion of the Reuse of Treated Waste Water is prepared with a vision to maximise the collection and treatment of sewage generation and reuse of treated wastewater on a sustainable basis, thereby reducing dependency on freshwater resources. Further, the policy promotes use of treated wastewater as an economic resource. The policy subsumed the policy ‘Gujarat State Policy for Promotion of Waste Water Recycle and Reuse’ in June 2017. The policy outlines a time bound and systematic plan with the ultimate goal of reusing treated wastewater fully by 2030.

Challenges

The groundwater table in Gujarat is depleting at the rate of 3 to 5 m per year as the abstraction of groundwater is more than the recharge in certain regions and Saurashtra, North Gujarat and Kutch are undergoing water stress conditions. High fluoride concentrations and salinity levels in ground-water, the main source of drinking water supply, were also detected in Gujarat’s 25 districts in the early 2000s. As a result, quantity of groundwater resources goes on decreasing and quality also goes on deteriorating in some areas along with coastal areas. Climate change may also increase the sea levels. This may lead to salinity intrusion in ground water aquifers / surface waters and increased coastal inundation in coastal regions, adversely impacting habitations, agriculture and industry in such regions. Characteristics of catchment areas of streams, rivers and recharge zones of aquifers are changing as a consequence of land use and land cover changes, affecting water resource availability and quality.

Key Recommendations for building Climate Resilient Policy in Gujarat

Need for Integrated Planning

In order to bring about a rejuvenation to the urban space in the country, and is bringing about a change, not just in the urban governance set up and the mindset of the states and ULBs but has also created an awareness, raised expectation among the people for a better quality of life and a sustainable environment in the urban areas it is necessary to conduct climate smart planning in an integrated manner considering all aspects. The Gujarat State Action Plan on Climate Change (SAPCC) is focused on rural climate resilience more than the urbanscape. Gujarat with 42% of its population living in cities, is one of the States with the highest level of urbanization, and is projected to have 66% of its population living in cities. It is therefore essential to account for climate adaption, mitigation of GHG emissions while planning a low carbon development pathway.

According to a report by the National Sample Survey Organisation (NSSO), the fast pace of urbanization in Gujarat is due to intra-State migration with large sections of rural people migrating to urban areas, within the State. With increasing climate change impacts such as water scarcity, and climate induced fluctuations in agricultural output is highly likely that as a coping mechanism rural to urban migration will further occur in Gujarat. The critical issues that would need to be taken care of with the increasing trend of urbanization include adequate provision of housing facilities (including land use planning), access to energy and water supply, proper sewerage, solid waste management, transport infrastructure, employment generation etc.

The State Government, ideally through the Commissionerate of Municipal Administration under the Urban Development and Housing Department, must work on a State-wide Urban Climate Resilient Policy and Action Plan (SUCRPAP) and frame the necessary Guidelines to guide the ULB actions for all tiers or classes of cities as climate resilient development is under the purview of the State Government of Gujarat. The Policy should bear in mind the major climate change impacts listed in above (specially as a coastal state) and set specific targets and responsibilities at regional and city administration levels. The Guidelines should function as an approach for low carbon and climate resilient development.
development at the State level which can be implemented by Cities
- Strategies to strengthen institutional capacity of the involved State departments to implement the Roadmap
- Sensitisation programme for key stakeholders within State departments on green growth of the State which can be taken forward by the cities.

The SUCRPAP to update/amend the Gujarat SAPCC and existing State schemes and State Action Plans for Central schemes, to facilitate easier implementation based on the SUCRPAP and benefit from Central and State Missions and Schemes. The policy and action plan would list applicability and incentives under State and Central schemes, potential funding from Environment and Climate focussed agencies, and SOPs for applying for the same.

The SUCRPAP can capitalize on existing tools that have been tried and tested at the city level to factor in long-term climate resilience measures, in terms of level-wise progression. The Climate Smart Cities Assessment Framework sets out such step-wise measures in 5 thematic areas, and can act as a reference.

Institutionalizing Climate Action in Urban local bodies

The vision is for an integration of adaptation and mitigation planning, and a mainstreaming of adaptation planning into other long-range and sectoral plans. Currently, many critical municipal agencies – including those responsible for water, waste water, health, and building codes – remain on the margins of urban adaptation efforts.

Internal institutional networks of governance are inextricably linked to efforts to address challenges such as adaptation, which does not fit neatly into individual institutional silos. Interdepartmental networks need to be created with structures mandated to outline how they have been created, and which local government actors have yet to be effectively engaged.

The links between local climate change policies and other key urban sectors needs to be explored as adaptation to climate change is a nexus, not a single isolated issue. Strong adaptation measures require crosscutting action across multiple sectors of urban life carried out by a variety of actors. The degree to which local governments succeed at mainstreaming adaptation planning (and climate change planning more generally) has in large part to do with the institutional structures that they create to drive adaptation work forward. In the case of Rajkot, the ClimateResilientCITIES methodology is an action planning process tailor made for local governments, providing step by step guidance for the development of a Climate Resilient City Action Plan towards the mainstreaming of a climate smart city action plan. Another method is that rather than creating stand-alone adaptation or climate change plans, it is more common for local governments to integrate adaptation planning into other types of plans.

Institutionalizing climate action in ULBs will require developing capacity and increasing personnel dedicated to the cause. The support of the highest level of governance at both the City and State level are essential in identifying an a climate resilient action at both the City or State. As currently, adaptation and mitigation planning is being driven by individuals rather than institutionalised structures and therefore institutional weakness needs to be addresses.

The City Climate Action Plan should
- Be developed by the City Authorities with inclusion of Academia, Industry and Non-State players of repute in Climate Action and go through a theory of change or revision matrix.
- Have a Climate Focus and use-specific targets. These should include adaptation and mitigation measures, and the objective can be GHG emission reduction or improvement in any of the performance metrics or indices by Central or State Governments.
- Include the three sectors expanded on in this brief as well as additional sectors such as commercial, corporation and residential buildings and open spaces while identifying resilience interventions.
- Identify relevant data, through an urban systems analysis (based on a GHG inventory or other climate targets) but which is especially done for the city.
- Include a vulnerability mapping exercise identifying wards that are at risk and hotspots for climate induced hazards or extreme events, such as floods and droughts that may hit the city.
- Include a fragility statement which indicates the priorities to mitigate and adapt to climate change in the form of climate smart interventions.
- As with all plans, finally to have a list of strategic interventions / projects, prioritized based on Climate impacts and benefit analysis.
Therefore City Governments must augment their capacity with technical positions specialized in urban, climate change and environmental planning, to conduct the following activities:

- Prepare the City Climate Action Plan (pointers in Box 1) and get approval of the elected body.
- Check for and incorporate climate perspective (from the action plan) into existing detailed project reports (DPRs) of proposed infrastructure projects, so as to enhance climate resilience.
- Develop specific projects in the thematic areas with focussed objectives, classifying into short-term and long-term projects. In the CapaCITIES projects these were ‘quick-win’ and ‘bankable’ projects.
- Evolve specific response actions for critical events (in conjunction with Disaster Response Cell) and medium & long-term actions to mitigate the effects and reduce vulnerability.

**Setting a Financial approach**

Urban areas have potential advantages in building resilience to Climate Change impacts in terms of the economies of scale and proximity that they present for key protective infrastructure and services and for risk-reducing governance innovations. In tandem with the Revising policy frameworks: Cities supported by States through various missions and activities such as the Smart Cities Mission and Swachh Sarvekshan, for example, to develop integrated systems across thematic areas. City governments must set a financial approach for Climate Action. These can be seen broadly as:

- **Generic**: related to city-level and systemic actions, including preparation of the plans with necessary background studies, surveys, mapping and analysis. Such pan-city actions can be funded through regular budget lines in city budgets (HR and technical in each department) and through A&OE budget lines of particular Missions / Schemes. The City government can also explore technical assistance funding through bi-lateral and multi-lateral organizations for this purpose.

- **Particular**: related to specific projects in thematic areas related to Climate Change. These can be classified as per financial size into:
  - Those that can be met solely through city project budgets (prioritized annually as per urgency) or under State and Central schemes, and
  - Those that need external financial leveraging. These would typically be longer-term, cross-thematic, complex and larger impact projects, needing feasibility studies and detailed workings

Financial workings should consider capital and recurring (O&M) expenses and indicate budgetary sources and viabilities. Hence, any projects that can show any revenues (e.g. recovery from waste in terms of energy, gas, compost, etc., or water treatment / re-charging) including savings in current expenses should be particularly highlighted. The bankable projects developed under the CapaCITIES project, and inclusion of quick-win projects under city budgets provide a template for the same.

**Conclusion**

The State aims to create core competencies for addressing the challenge of Climate Change. Some of the focus areas include generating strategic knowledge for informed decision making, creating public awareness and education and empowering communities for participatory and decentralized action on Climate Change. This will require capacities to be built; research to be coordinated; dissemination of best practices; and innovative actions on the ground. The aim is to effectively incorporate communication and education through a participatory process that will ensure two-way communication with contribution and awareness from people in the State, who will be able to accept ownership and guide corrective processes themselves. The Government of Gujarat will add to or strengthen programmes for outreach activities, capacity building and expansion of the knowledge network, in a structured manner, in both urban and rural areas. These programmes will cover a broad range of climate issues that will ensure adequate planning, improved quality and extensive outreach actions. The Government also aims to strengthen research capacity by enhancing the institutional capacities.