POLICY BRIEF

The Energy and Resources Institute

The ROCKEFELLER FOUNDATION

CONTENTS

The Energy and Resources Institute
Darbari Seth Block, IHC Complex,
Lodhi Road, New Delhi- 110 003

Tel. 2468 2100 or 4150 4900
Fax. 2468 2144 or 2468 2145
India +91 Delhi (0) 11

www.teriin.org

Road map for Mainstreaming Urban Climate Resilience in Goa

Preface

This policy brief is based on the learning that emerged from The Energy and Resources Institute's (TERI) two-year long program on 'State-level policy engagement for mainstreaming urban climate resilience' in Goa and Uttarakhand, with support from the Rockefeller Foundation under its Asian Cities Climate Change Resilient Network (ACCCRN) initiative. ACCCRN—a 9-year initiative (2008–16)—has been instrumental in bringing forth the urban climate change resilience agenda to cities in Asia. In India, with ACCCRN's support, various cities, namely Surat, Indore, Gorakhpur, Guwahati, Mysore, and Bhubaneswar, among others, have developed and demonstrated effective processes and practices for addressing urban climate vulnerabilities using participatory planning as well as implementing targeted intervention projects. Panaji City has also been part of the initiative and has been working towards building climate resilience. The ACCCRN experience, however, has revealed that owing to lack of an enabling policy environment, institutional and financial arrangements, and statutory backing, all these cities are facing challenges in implementing the City Resilience Strategy (CRS) in a comprehensive manner (ACCCRN 2013). Given that urban development is a state subject as per the Constitution of India, a state-level policy mandate

would be instrumental in building climate resilient cities. It is in this context that TERI conducted the engagement program in the two states with the objective for generating awareness and interest amongst state governments and state-level departments, and facilitating a dialogue to bring the agenda of urban climate change resilience in the foreground. The program led to the formulation of a policy road map for building urban climate resilience in the two states. This policy brief synthesizes the key messages from the policy road map prepared, in particular, for Goa. It may be noted here that although the brief is prepared in the context of Goa, the overarching lessons from the program would hold true for many cities in India, especially in the context of coastal states. The brief, therefore, is intended as a reference point for development of similar state-level policy frameworks in other parts of the country.

Need for a state-level policy framework on urban climate resilience

Climate change is one of the foremost emerging global challenges, the impacts of which are increasingly manifesting themselves through highly erratic instances of weather deviations and induced extreme events. While both urban and rural areas are vulnerable to climate change, its impacts on cities and towns are of particular concern due to high concentrations of people and infrastructure in these areas (TERI 2014a). While urban centers in India are the new engines of economic growth, yet they are grappling with issues, such as infrastructure deficits and inadequate basic service provision, clubbed with multiple climate hazards. Recent climate calamities and the accompanied loss and damage have caused calls for a deeper look at the preparedness and adaptive capacity of the regions that are vulnerable to climate-induced disasters and extreme events. The damage assessment figures for the Cyclone Hudhud in 2014 indicate a total loss of INR 90,000 crore ($20 billion) in Visakhapatnam alone. Similarly the floods in Jammu & Kashmir in September 2014 caused a total damage of INR 6,000 crore ($1 billion). The floods in Mumbai in the year 2015 caused a direct loss of about INR 550 crore (approx. $100 million) (TERI 2015a). These calamities are grim reminders of the need to factor in extreme events that are predicted to increase as a result of climate change. However, currently cities do not have a policy or legal mandate for initiating and implementing climate resilience efforts.

With the global policy discourse increasingly stressing on the role of cities for strengthening climate change resilience, TERI's research has strong policy relevance in the absence of any mechanism or mandates at the state level that can steer building climate resilience of urban areas. United Nations' 2030 Agenda for Sustainable Development identifies a standalone goal on 'Sustainable cities and Communities—Goal 11—Make cities inclusive, safe, resilient and sustainable'.[1] Similarly, cities are among the non-nation entities called upon to make efforts to address and respond to climate change as part of the Paris Climate Agreement.[2] As urban India is gearing up for major transformations through the recently launched Smart Cites Mission and AMRUT schemes, it is important that the need to integrate climate resilience be recognized and integrated into the urban policy and planning process at the state level to equip cities to withstand the impacts of climate change and extreme events.

With a population of 1.45 million (Census 2011) and land area of 3,702 sq. km, Goa is India's smallest state. Although, traditionally, Goa has been a rural economy, with a strong mining base, it now has a fast growing industrial sector. More than half (62.5 per cent) of the state's population resides in urban areas, thus, making Goa a highly urbanized state. According to the Census of India 2011, there are 14 municipal towns, with seven each in north and south Goa, and 30 census towns with 20 in north Goa and 10 in south Goa. It is observed that the bulk of the population resides in the four coastal talukas of Mormugao, Salcette, Bardez, and Tiswadi, thus, giving rise to various regional imbalances and straining of the state's coastal resources such as land and water. One of the major factors accounting for increased urbanization is the rise in the tourism sector, which is one of the major economic activities in the state. The total tourist arrivals have more than doubled in the last decade (TERI 2015b). The economic and urban growth in Goa is also increasing the pressure on its natural resources, ecosystems, and infrastructure, such as sewerage, waste disposal facility, electricity

1 http://www.un.org/sustainabledevelopment/cities/
2 http://bigpicture.unfccc.int/#content-the-paris-agreement

supply, water supply, transport, roads, etc. Moreover, uncontrolled construction and growth in and around the ecologically sensitive khazan lands has affected the capacity of these wetlands to contain floods caused by sea water inundation, storm surges, and extreme weather events. Climate change and the resultant stress on Goa's coastal ecosystems due to sea-level rise (SLR) and the stress on rain-fed river systems pose additional threats. The draft State Action Plan for Climate Change has identified coastal erosion as one of the main issues, arising primarily due to climate change. Panaji city has been identified as one of the coastal cities vulnerable to flooding due to the predicted sea-level rise. Based on the projected SLR scenarios and vulnerability assessment conducted for Panaji, a large share of its key infrastructure assets, service networks, and ecologically sensitive areas, including khazan lands, salt pans and creeks are likely to be affected due to climate change impacts like SLR and coastal flooding (TERI 2014b).

Goa's development vision and challenges to building urban climate resilience

Goa 2035—a vision document for the state—highlights that 'Goa should stand out globally as a model of development without destruction'. This is a laudable goal and illustrative of the recognition in Goa's policy circles that there is a need for alternative development pathways to meet the sustainability challenge. Goa is one of the pioneering states in India that acknowledge emerging concerns, such as climate change and sea level rise in urban development. Goa State Action Plan for Climate Change is an important beginning in this direction. The capital city of Panaji has been involved, in the recent past, in international initiatives, such as the Asian Cities Climate Change Resilient Network (ACCCRN) and the study on 'Climate Resilient Infrastructure Services' by TERI and USAID. Nonetheless, there is a growing need to replicate such initiatives and upscale them at the state level to come up with a 'Climate esilient Development' Agenda. To this end, the Urban Development Department of Goa joined hands with TERI to prepare a detailed road map for preparing and instituting an urban climate resilience policy framework in the state. However, there are some critical policy and institutional barriers that restrict the city governments to bring in climate resilience as one of the development parameters. These have been listed as follows:

- **Lack of decision support systems**—Cities do not maintain a comprehensive and up-to-date data required for urban resilience planning. Besides, the data on infrastructure and assets in a city is spread across various departments. Similarly, there is a dearth of fine resolution assessments of climate parameters such as change in temperature and rainfall, at the city level, to base their planning decisions. A knowledge repository of climate data should be established at the state level which can disseminated to the cities for developing their Master Plans. It is also important that data and information is spatially translated (e.g. GIS maps) and is utilized for the purpose of urban planning. To create an enabling environment to mainstream climate resilience, it is important that disaster and climate risk assessment are the key inputs to urban and infrastructure planning. To this end, the focus should be on developing detailed hazard, risk, and vulnerability studies. The outcome should be a detailed risk profile of the state in terms of climate impacts and extreme events. It is also important to consider locally identified parameters, such as slope gradient, distance from the river, angle of dip, embodied geology, etc., for defining vulnerabilities.
- **Lack of capacity at city level**—Climate resilience is a new concept in India, requiring specific technical know-how and data for cities to draw up their resilience plans, which is currently not available with the urban local bodies. Sensitization and skill development of urban practitioners and decision makers is an absolute necessity for bringing about requisite changes in the existing urban governance mechanisms and systems.
- **Lack of enabling guidelines and institutional mechanisms at city level**—In the absence of a local mandate and policies at the city level, the mechanisms and institutions are currently not aligned to account for future vulnerabilities, such as those of climate change. Various state level departments are responsible for all matters pertaining to development and management of urban infrastructure under the purview of sector-specific policies and regulations. However, urban climate resilience planning would

require multi-sectoral linkages through coordination and dialogues amongst the concerned departments and agencies, especially with respect to data sharing. Moreover, efforts need to be directed towards improving the existing state of affairs by updating and refining disaster management plans, climate change action plans, reviewing and formulating improved building bylaws, and strengthening operational efficiency of state and district emergency centers.

- **Implementation support and enforcement of existing plans, policies, and regulations**—Reinforcing and climate proofing existing infrastructure requires additional funds, however, presently there are no financing mechanisms marked for urban climate resilience at the city or the state level. Therefore, financial allocation for resilience building and adaptation projects also needs to be addressed in the urban resilience policy. At the same time, it is also important to implement and enforce existing plans, policies and regulations, namely the State Climate Change Action Plan, State Disaster Management Plan, and Flood Management Plans, which are all effective instruments for climate adaptation planning.

There is a need to address these barriers in a systematic manner by creating clear roadmaps and action plans; creating mandates and enabling mechanisms, and institutional arrangements. Besides, the consideration of cost and investment, both short- and long-term, are critical to build resilience of cities.

Road map for State Urban Climate Resilience Policy in Goa

A dedicated component on stakeholder engagement was inbuilt in the program with an objective of understanding and prioritizing the state-specific context and the need for coming up with a policy on urban climate resilience (Figure 1). These stakeholder engagement workshops helped in understanding the following:

- Scoping the relevant sectors in the context of resilience planning in urban areas
- Role of existing institutions and their functions and mandates
- Key challenges and barriers to urban climate resilience in the state
- Feasible approaches and timeline for formulation and implementation for a new resilience policy
- Key components to be addressed by the new urban climate resilience policy
- Mechanisms for implementation and financing

This stakeholder engagement led to the preparation of the road map to guide the formulation and operationalization of the policy framework on urban

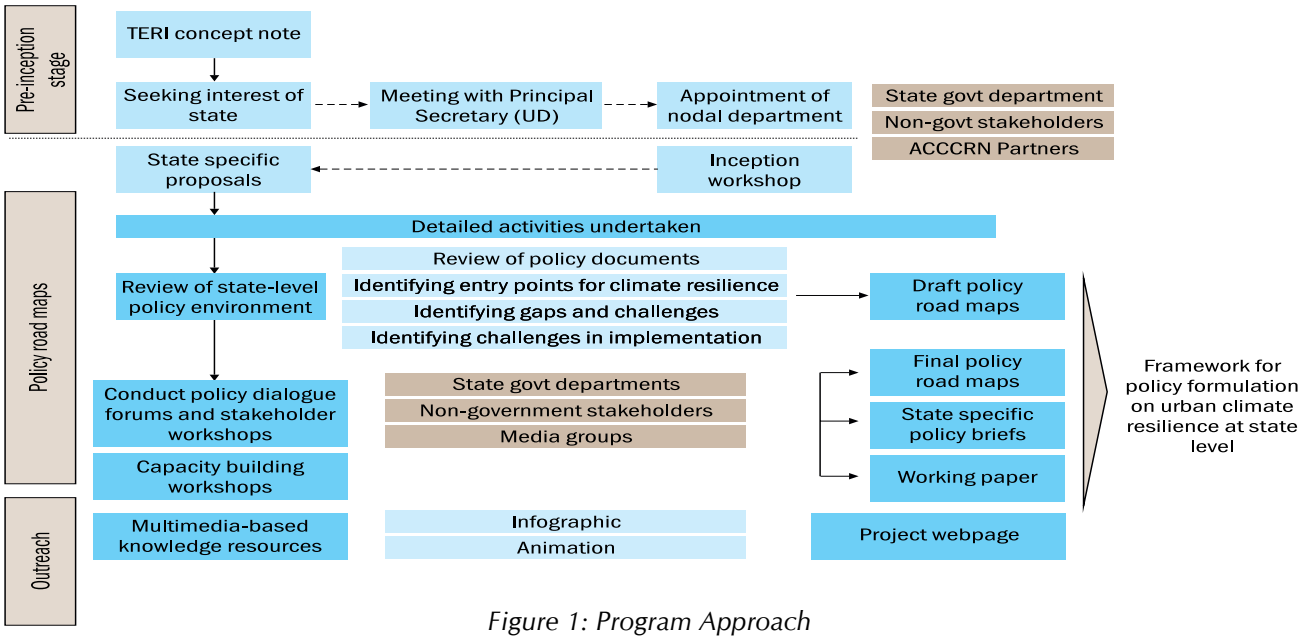


Figure 1: Program Approach

climate resilience in the state of Goa. As per the recommendations given in the stakeholder consultation that took place in January 2015. In Goa, it was proposed that the road map should allow for a multi-sectoral resilience policy that would focus on urban climate resilience but includes and integrates other relevant sectors as well, such as environment, disaster management, water resources, and parastatal bodies. To this end, a two-pronged approach to foster climate-resilient development is recommended in Goa. This would involve formulation of a specific new policy pertaining to urban climate resilience, at the same time identifying entry points for amendment of the existing laws, policies, and regulations governing urban development. The following sections present a detailed discussion on the action points needed for implementing these two measures.

Formulating a New State Urban Climate Resilience Policy in Goa

Action to address climate change in urban areas should be multi-level, involving national-, state-, and city-level governments, as well as multi-sectoral, including sectors, such as infrastructure and services, urban planning, transport, disaster risk reduction, and housing and construction. For cities to internalize resilience planning into the urban development process, an effective policy will be one which provides for capacity building, facilitating data, tools, and techniques to enable risk assessment and climate projections (TERI 2014a). The policy should also inform the sector-specific interventions needed for resilience building and interdepartmental coordination that would be needed to achieve the same. The policy on urban climate resilience for the state of Goa should therefore bring forth the importance of and need to introduce urban climate resilience into the urban planning framework and should be able to draw out a broad structure of the institutions and regulations needed to implement the same and identify windows for financing. The following components should be well-defined within Goa's new policy on urban climate resilience for easy implementation and institutionalization of the same in the government framework:

- **Background:** The policy would outline the background in terms of urbanization levels, climate change analysis for the state and its impacts on various critical sectors, such as water, transport, communications and sanitation, to name a few. An inherent link has to be drawn up between the urbanization level, patterns of urban development and the challenges and pressures thereof, and climate change impacts affecting the same in varied ways. It should also bring out the interconnectivity between various sectors in terms of adaptation and mitigation interventions and should set out a case of the need for the policy and benefits that could be derived from the same.
- **Goal:** The inherent goal of the policy is to mainstream climate change-related concerns into the urban development planning and urban project design to achieve mitigation objectives and to be able to adapt to the climate change that is inevitable.
- **Objectives:**
  - To introduce a clear time-bound implementable agenda for mainstreaming climate change concerns into urban development planning
  - To identify stakeholders who would be responsible for implementation of the program under the policy
  - To present a model institutional mechanism to be adopted at the state-level to facilitate implementation of the policy
  - To identify technical assistance needed to plan for climate resilience and identify sources for knowledge and capacity development
- **Preparation of a detailed risk profile for the state in the context of urban areas and vulnerability analysis of cities**: The policy should call for preparation of detailed risk profile of the state in terms of climate impacts and extreme events. This requires past climate data and future projections of climate and various other sectoral datasets, to help assess the vulnerability and coping capacity of city systems to climate events. This requires engagement and communication among various institutions, departments, and stakeholders to complement the multi-sector needs and requirements of such an exercise. While the regional information on climate impacts and its sector-specific connotations could

be found from Goa's state action plan on climate change, the 4X4 assessment report of the Ministry of Environment, Forest and Climate Change, Government of India, could also come in handy in understanding regional climate assessments on which the policy recommendations could be based.

- **City resilience strategy:** While the state-level risk profile will outline the importance of sectoral interventions and would make a case for state level actions to address regional issues related to climate change that would have impact on urban areas, for example, water availability; the city-specific resilience strategies must also be facilitated in order to ensure context-specific actionable plans for specific urban centers in the state. The state-level policy must make a case for cities to conduct risk and vulnerability analyses to understand their specific requirements for resilience building and develop city-specific strategies for adaptation and mitigation.
- **Data and climate projections:** Resilience planning would entail drawing up extensively from specific datasets, such as socio-economic data, climate trends, and sector-specific datasets to enable formulation of strategies. The state policy, therefore, will have to define an action plan for conducting the climate projections and trend analysis and development of database management systems. Most cities in India lack the proper information systems required for addressing the various aspects of climate change impacts, such as, data on weather anomalies, frequency, and extent of urban floods. Integrating resilience planning in the urban planning process requires very specific data sets on various local and regional climate parameters. Hence, maintaining a repository of city and region specific data using management information systems (MIS) would be an essential step, which could be used to develop time-series and spatial data bases in this regard.

  TERI has prepared a database management system (DBMS) for the city of Panaji under its project on Climate Resilient Infrastructure Services program supported by the USAID. The DBMS system entails the infrastructure inventory of the entire city of Panaji and is prepared to be instituted in the Corporation of the City of Panaji (CCP). This DBMS system has a potential of upgradation and replication in other parts of the state and can add immense value to the state's efforts towards sustainability.
- **Institutionalization plan:** To facilitate the above mentioned objectives and action points, a strong regulatory and institutional backing is required which also draws out financing mechanisms to support the cause. An important point of consideration is the fact that resilience requires multi and cross-sectoral interventions and may not fit into the present divisions of institutional responsibilities. Therefore, while the policy can guide the overall mechanisms to support resilience mainstreaming into urban development discourse, it should also identify various entry points within existing institutional mechanisms and regulatory framework (TERI 2014a).

  The policy should call for exploring inter-linkages with the existing disaster management set-up and facilitate response mechanisms and preparations for any unforeseen events, such as floods and extreme rainfall. The institutionalization could be achieved through engagement at various levels while also integrating these concerns into development regulations and project planning and financing activities. Similarly, various other sectors, such as water, infrastructure, transport, etc., would have a bearing on the planning, implementation, and monitoring of the policy. Hence, these relevant sectors have to be integrated within the policy action points and mechanisms for interdepartmental coordination along with formulation of joint adaptation action plans.

  The suggestive institutional architecture for implementation of the policy could start with establishing a state-level climate resilience cell in the ambit of the urban development department of the state. The cell coordinates with the entire urban development machinery which would include Directorate of Municipal Administration, Goa State Urban Development Authority, North and South Goa Planning and Development Authority, Town and Country Planning Organization, Goa State Industrial Development Corporation, to name a few, and becomes an interface with a state-level

high powered steering committee chaired by the Chief Secretary of the state and the head of the Departments from other sectors, parastatals, and public sector undertakings (PSUs). The steering committee would have a key role wherein projects and actions on climate resilience will be developed and implementation and financing of the same will be sought. The steering committee would also facilitate interface between external aid agencies and technical agencies, such as research and academic institutes that brings in knowledge and technical capacities for building resilience. If needed, formal approvals and notifications process could be devised for smooth functioning of such an interface between various departments. The flowchart in Figure 2 presents the suggested framework for institutionalization of the policy. There is merit in establishing a nodal body at the city level; e.g., the Municipal Corporation, that would have the statutory authority to coordinate and direct the resilience planning and implementation efforts with relevant officials, semi-officials, and non-governmental agencies operating there. Capturing local communities' interest and involvement could be one of the responsibilities of the nodal body.

- **Multi-level engagement-** Resilience planning is successful and apt when an integrated approach to various urban sectoral needs is followed through continuous stakeholder consultations, inter-departmental and institutional coordination, and community participation. The policy should establish a mechanism to institutionalize the process of this multi-stakeholder engagement; for instance, the national government could incorporate climate resilience in the reforms agenda and resource planning under national schemes and introduce incentive mechanisms for states and cities. The state government should support the national government's interventions towards the goal of resilient urban systems by integrating climate resilience into state-level laws and regulations, budgeting for climate resilience, and initiating and implementing capacity building programs at the state and city levels. Cities would need to assess and understand their vulnerability and develop responses to climate-proof urban systems.
- **Financing urban resilience:** Reinforcing and climate proofing existing infrastructure would

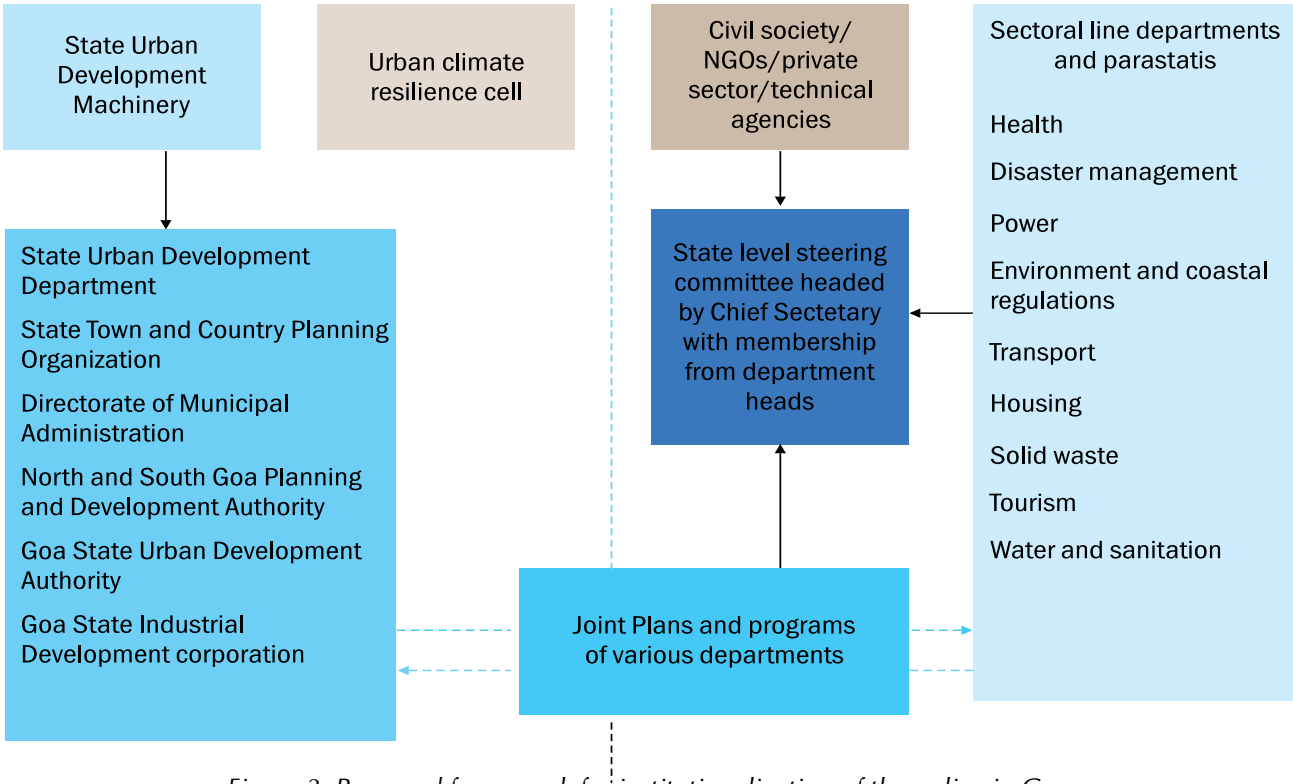


Figure 2: Proposed framework for institutionalization of the policy in Goa

require additional funds. Therefore, financial allocation for resilience building and adaptation projects would also be an integral part of the proposed policy. Establishing national- and state-level climate funds and resource planning under various national schemes, such as Smart Cities and AMRUT can go a long way in this direction.

- **Capacity building:** Climate resilience is a new concept in India, requiring specific technical know-how and data for cities to draw up their resilience plans. It also needs awareness generation to be built in civil society to foster interest and support (TERI 2014a). Therefore, an important milestone in this discourse is to provide for need-based, area-specific training for officials at all levels to enable planning for climate resilience and preparedness for dealing with any climate-induced emergency situation. Designing specific training programs to suit local variations and availability of adequate resources for the training programs would be a prerequisite. In addition to building capacity of relevant stakeholders, the policy should call for raising awareness of citizens about the need to include climate resilience in the urban development planning process. The broad objectives of the capacity building would be as follows:
  - Generate awareness about climate change impacts on urban areas
  - Acquaint stakeholders with the principles of resilience planning and its benefits for the cities' sustainability and development
  - Develop techniques, methods, and tools for assessment of climate risks and vulnerability to climate change in cities. Customized material, such as toolkits, guidelines, and case studies can be developed for use in resilience planning.
  - Strengthen the role of institutions and governance in fostering climate-resilient development

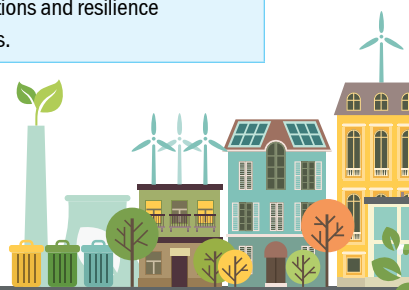
Integrating urban resilience in the existing policies and regulations

Considering that the resilience options are not independent of the regular sustainability goals and planning needs of the city, it is pertinent to dovetail climate resilience to the urban development framework. This means integrating:

- Climate-related issues and addressing them through the state-level acts and regulations. E.g., the State Town Planning Acts could have clauses that integrate climate parameters into master planning processes
- Resilience interventions could be included into the development regulations of the cities, e.g., building byelaws, development controls, and zoning regulations
- Integrating measures to bring in climate resilience into national and sub-national schemes and plans such as the town planning schemes and city development plans.

To this end, a detailed review of the present policy environment was conducted by TERI for the state of Goa. This involved a cross-sectoral assessment of acts, rules, and policies that govern urban development processes in the state, namely urban planning, urban infrastructure, water supply and sanitation, housing, public health, tourism, disaster management, power supply sectors, and coastal zone regulations. Table 1 below summarizes these recommendations for each sector under consideration for this study.

Urban Planning and Housing	
Regulations	**Entry Points/Recommendations/Action Points**
Goa Town & Country Planning Act, 1974 (last amended in 2011)	■ The Act stipulates the preparation of the Regional Plan for the state of Goa. A chapter on urban climate change resilience, which includes present vulnerabilities of all the key urban centers of the state, may be incorporated in the Plan. This will also include a climate vulnerability assessment to identify the vulnerable hotspots, communities and assets. The outcomes of the vulnerability assessment must be taken into consideration while formulating and evaluating land use plans prepared as part of the Regional Plan. ■ The Act provides for the procedure to be followed for the preparation and approval of the Plan. Under this provision the state government should make climate change considerations and resilience integration mandatory in the preparation and approval process of the Master Plans.



The Goa (Regulation of Land Development and Building Construction) Act, 2008	Prior to planning and siting of land use and development schemes, climate vulnerability assessment to identify the vulnerable hotspots, communities, and assets may be undertaken.
The Goa, Daman and Diu Housing Board Act, 1968 and Rules, 1969 (last amended in 2001)	Prior to planning and siting of housing schemes, vulnerability assessment for risks including floods, water logging, and impacts of sea level rise should be undertaken. Currently, building bylaws do not specifically cover flood risk management or heat stress issues though rainwater recharging has been addressed to a certain extent. These aspects need to be addressed in the planning process for housing development and the building bylaws for urban areas. The Rules and bylaws under the Act should enable promotion and development of green and energy efficient buildings based on Energy Conservation Building Code (ECBC) and GRIHA (Green Rating for Integrated Habitat Assessment), India's indigenous green rating system for built environment.
Goa Housing and Habitat Policy, 2010	The policy primarily outlines the procedure to be followed for the preparation, approval and financing of housing schemes. Under this provision integration of climate change considerations and resilience building measures may be made mandatory in the preparation and approval process. Also, the policy should incentivize and enable financing mechanisms for development of resilient housing.
Water Supply and Sewerage	
The Goa Provision of Water Supply Act, 2003 The Goa Ground Water Regulation Act, 2002 and Rules, 2003	The Act should ensure departmental coordination and sharing of information with the concerned departments developing and managing urban water supply. For example, the Ground Water cell should assist the Public Works Department (PWD) and city municipalities in quality monitoring and assessment at locations of bulk withdrawal.
The Goa Sewerage System and Sanitation Services Management Act, 2008 & Rules, 2010	■ The process of planning and siting of sewerage systems should take the vulnerability assessment and low-lying zones into consideration to minimize risks to public health. ■ The design features of new drains to appropriately build in resilience features into the system, for instance, slopes, building materials, etc., to manage damage and corrosion risks as a result of floods, water logging and sea-level rise and ingress. ■ Use of DEWATS and other suitable decentralized sewage management systems.
Solid Waste, Sanitation, and Public Health Management	
The Municipal Solid Waste (Management & Handling) Rules, 2016	■ Schedule I- Specifications for Landfill Sites in the Rules, specify the criteria for site selection. While they mention that selection of landfill sites shall take into consideration the relevant environmental issue, there is a need to define these issues and elaborate their implications in the respective state plans. For instance, for coastal cities the municipal authorities might need to assess vulnerable areas with respect to impact of sea-level rise and storm surges and consider the results while siting for landfill sites; compost stations; sorting centres and other disposal/processing stations. ■ The impacts of sea-level rise and high precipitation on disposal/landfill activities should be thoroughly studied and the existing guidelines should be constantly updated to include knowledge about these impacts. ■ The municipal authorities must bring in capacity building for all waste management stakeholders to create awareness on the potential impacts of climate change that could influence their service delivery responsibilities and contractual commitments. It is recommended that awareness activities for site operators are conducted for increasing their preparedness to weather related impacts on the waste management sector.
The Goa Municipalities Act, 1968 (last amended 2010)	■ Key functions of municipalities being sanitation, solid waste and drainage management, and building permissions and approvals, integration of resilience building measures like siting of buildings and infrastructure assets as per vulnerability assessment, standard operational procedures for efficient management of services, such as drainage and solid waste and enforcement of amended building bylaws for resilience building should be put in place.

	▪ As of present, the 74th Constitutional Amendment Act has not been fully implemented in the state as a result of which the municipalities are not currently carrying out all the functions listed under Schedule XII. With the dissolution of urban planning and management functions to the municipalities, local climate resilience efforts may be better implemented.
Goa Health Services Development Act, 2008 (Goa Act 13 of 2009)	Health sector is critical for climate change action, as climate change not only induces extreme events and casualities but also induces epidemics and other health issues. For example, outbreaks of post-flood epidemics. Augmenting health facilities and making them accessible to urban poor, in particular along with standard operational procedures, for public health management during emergency and non-emergency situations would be some of the important steps.
Tourism	
The Goa Tourist Places (Protection and Maintenance) Act, 2001	Vulnerable built heritage/precincts, ethnic communities or natural assets, such as beaches, Khazans or salt pans, which are also of tourist importance, may be brought within the purview of the Act for protection and conservation.
The Goa, Daman and Diu Registration of Tourist Trade Act, 1982 and Rules, 1985 (last amended in 2011)	▪ Siting and location of tourist activities, for instance, avoiding vulnerable hotspots ▪ Regulation of water and energy consumption and use of efficient and renewable services ▪ Enforcement of building byelaws to ensure resilient building construction in terms of setbacks, plinth levels, use of basements and building materials in view of the flood and seas level rise vulnerability in coastal areas.
Beach Shack Policy (as amended in 2012–13) under the Goa Registration of Tourist Trade Act, 1982	▪ The policy provides guidelines on locations and materials for building shacks. These should be strictly enforced for building resilient structures. ▪ It is recommended that an inventory of registered and approved shack owners is maintained and updated regularly to regulate the construction and use of beaches.
Energy	
The Electricity Act, 2003	▪ The Act facilitates development of renewable energy options, hence enforcement of the same ▪ Provision for enabling development of decentralized smart grids, based on renewable energy at neighborhood/ community level ▪ Climate proofing power transmission and distribution infrastructure by using the appropriate construction techniques and materials to minimize the impacts of climate change which include: » Elevating or relocating important electrical equipment along the coasts, to protect it from flooding » Underground transmission and distribution lines where feasible » Reinforcing overhead poles with sturdier materials, to reduce damage during storms
Road Transport	
The Goa, Daman and Diu Highways Act, 1974	▪ Climate and disaster vulnerability mapping of road infrastructure should be conducted such that the road infrastructure map includes all the critical infrastructures. This assessment will also help in making a plan for maintenance of existing roads alignment and design of new roads and highways. ▪ Formulating standard operational procedures for routine maintenance and emergency maintenance. Routine maintenance would include provisions for cleaning of drains, culverts and soil erosion control to prevent the choking of drains and flooding for building climate resilience of highways. On the other hand, emergency maintenance and special repairs will take care of reconstruction of damaged highways due to floods, sea water ingress, etc.
Environment , Climate Change, and Disaster Management	
The Indian Forest (Goa Amendment) Act, 1988 and The Goa State Forest Policy, 2009	Regulation of land use and development of built structures and infrastructure in areas that provide natural buffers for management of floods and storms, for instance, mangroves.

District Disaster Management Plan for North Goa and District Disaster Management Plan for South Goa	■ The Plan should enable detailing out and preparation of city/ micro-level emergency management and resilience plans, including strategies for community sensitization, SOPs, identification evacuation routes and gathering points, etc. ■ Integration of disaster management as a key component of resilience planning, especially for risk reduction in the case of climate change-induced extreme events.
Coastal Regulation Zone Notification	Strict enforcement and implementation of the coastal regulation zones.

Conclusion

This policy brief draws out possible entry points for integrating resilience measures into the state urban planning framework in Goa. At the same time, the overarching lessons from the program hold true for many cities in India, especially in the context of coastal states. The brief, therefore, is intended as a reference point for development of similar state-level policy frameworks in other parts of the country. One of the challenges in operationalizing the proposed road map would be in terms of the time taken to formulate and institutionalize the new policy, given its cross-sectoral purview and the kind of inter-departmental coordination that would be required. TERI realizes that such a change in the governance systems is a complex and time-consuming process. It may also not be possible to bring about all the changes in one go and it is expected that the policy would have a relatively longer gestation period of the outcomes. To this end, an incremental approach is required by identifying priority action points in a time-bound and phased manner in terms of short-, mid, and long-term objectives and activities to be undertaken.

Besides, as this study reveals, there is no dearth of guidelines that cities could use to plan the systems effectively, however, there is definitely a lack of technical capacity and manpower that needs to be taken into account. This will include capacity building of not only the planners and decisionmakers but also the local communities. Moreover, involvement of local stakeholders, including the affected community, will be an integral part of policy formulation and implementation for urban climate resilience in the state of Goa. This will require effective enforcement of public participation mechanisms, such as the community participation law (CPL), brought in as part of JNNURM reforms. Moreover, inclusion of the poor and marginalized groups in decision making, monitoring, and evaluation will be a key step in reducing the climate vulnerability of the local communities.

References

- ACCCRN, 2013. "Background Paper—National Conference on Emerging Mechanisms and Responses of Cities to Climate Change". New Delhi
- TERI. 2014a. Climate Proofing Indian Cities: A Policy Perspective. Available at <http://www.teriin.org/policybrief/index.php?a=11>.
- TERI. 2014b. Planning Climate Resilient Coastal Cities: Learnings from Panaji and Visakhapatnam, India. New Delhi: TERI.
- TERI. 2015a. Towards a Policy for Climate Resilient Infrastructure and Services in Coastal Cities. Available at <http://www.teriin.org/policybrief/index.php?a=21>.
- TERI. 2015b. Directions, Innovation and Strategies for Sustainable Development in Goa. New Delhi: TERI.

For more information contact:

Raina Singh

The Energy and Resources Institute (TERI)
Darbari Seth Block,
IHC Complex, Lodhi Road,
New Delhi- 110003

Tel: 24682100 or 41504900
Fax: 24682144 or 24682145
Web: www.teriin.org
E-mail: raina.singh@teri.res.in

The Energy and Resources Institute

The ROCKEFELLER FOUNDATION