INTRODUCTION TO ACCCRN

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Content

1. Introduction

1.1 Overview

The Asian Cities Climate Change Resilience Network (ACCCRN) is a network of ten cities in India, Indonesia, Thailand and Vietnam, currently experimenting with a range of activities that collectively will improve the ability of the cities to withstand, to prepare for, and to recover from the projected impacts of climate change and climate variability. The approaches taken are determined by the local needs and priorities of each city.

Through engagement in the ACCCRN cities, and with various partners throughout the region, the Rockefeller Foundation seeks to support a promising collection of urban climate change resilience interventions that will address a range of climate impacts and vulnerability contexts, scales, and geographies.

The ultimate objective of ACCCRN is to provide poor and vulnerable people the ability to respond in an appropriate way to existing and future climate risks. As a result:

- People are able to problem solve and are willing to invest time, energy and resources and be entrepreneurial
- People will have more choices – they will feel more secure and less vulnerable
- Lives are improved because people feel more secure and less vulnerable in the face of disasters

In order to achieve this, the program partners have developed a diverse range of effective approaches, processes, and practices to build urban climate change resilience that incorporates the priorities of poor and vulnerable communities in ACCCRN cities. Through ACCCRN, dissemination and sharing of models and best practices will generate further action by a greater number of institutions and communities within the ACCCRN cities and within new geographies.

The Rockefeller Foundation seeks to assemble a portfolio that includes individual or linked interventions that:

- Span, preferably, all four ACCCRN countries and are located in several cities
- Grow out of and are initiated by different types of institutions, including government entities, non-governmental organizations, private sector firms, and community based organizations
- Employ a diversity of approaches such as capacity building, policy development, infrastructure developments and financial interventions
- Garner a spectrum of types of support from Rockefeller Foundation, including costs for pre-feasibility or feasibility studies, direct funding, co-finance, resource brokering, and assistance in the marketing of proposals
- Demonstrate diversity in size and scope, financially and in timelines for implementation
- Maintain relevance across a range of sectors impacted by climate change
- Target a variety of climate risks, including direct and indirect impacts as well as impacts that relate to current and future risks
- Address a range of vulnerabilities and vulnerable groups
- Affect different urban scales, from community level, to sector level, to city-wide
- Use evidenced based interventions based on deep understanding of urban climate poverty vulnerabilities
- Show clear multi-stakeholder and multi-sector support
- Prove from the outset that they are cost effective, technically, legally and financially viable

An additional objective of ACCCRN is to expand and deepen the base of urban climate change resilience work to achieve greater scale. The focus for this expansion is both within the ten ACCCRN cities and to new geographies through additional financial and technical support, and through policies that enable urban climate change resilience.

1.2 Resilience: Coping with the Impacts of Past Behavior

To date, most attention to climate change has focused on mitigation, i.e. reducing greenhouse gases. Irrespective of any international agreements or local actions taken to reduce emissions going forward, the IPCC (Intergovernmental Panel on Climate Change) predicts decades of global warming as our past emissions continue to heat up the earth's atmosphere. Potential climate change impacts include: rising sea levels, more frequent, stronger storms, coastal erosion, diminishing biodiversity, continuing loss of glaciers and arctic ice, salinity in freshwater aquifers and an increase in vector-borne diseases like malaria and dengue fever. It is recognized that the impacts of climate change will be felt most acutely by poor and vulnerable populations – those typically least equipped to cope with shocks and stresses.

These impacts present one of the greatest challenges of our time, and pose a variety of threats and opportunities for urban communities, governments and private sector actors around the world. It is precisely this challenge that ACCCRN seeks to address.

Communities around the world need better weapons – new tools, techniques, and strategies – if they hope to tame the three-headed hydra of climate risk, poverty, and precipitous urbanization. Given that it may be too late to halt the climate change that is already occurring, communities must develop coping mechanisms and build robust resilience strategies to survive the impacts. Considerably less attention has been devoted to adaptation and resilience, i.e. what measures need to be taken to help people and

environments respond to the changes that have already occurred, and with those that are coming.

Addressing these issues can, at first, appear overwhelming. As the Rockefeller Foundation commenced the work of building ACCCRN, we found that the most effective approach is to connect the pressures of today – poor urban drainage, public health concerns, and inadequate infrastructure services – with the challenges of the future. Using current challenges as an entry point helps communities, civil society, governments and business leaders to frame potential priorities to pursue in the development of urban resilience climate change strategies.

1.3 ACCCRN: Building Urban Climate Change Resilience in Asian Cities

ACCCRN was launched in January 2009 and is funded by the Rockefeller Foundation as part of its US$70 million, five-year *Building Climate Change Resilience Program*. This initiative aims to catalyze attention, funding, and action in three primary areas:

1) experimenting with and testing local approaches to building climate change resilience for institutions and systems serving poor and vulnerable communities;
2) promoting, demonstrating, and disseminating knowledge about these and other viable approaches; and
3) increasing awareness among funders, practitioners, policy makers and business on the need to invest in building climate resilience.

The Network is both regional and global in its outlook and outreach. One of the key objectives is to share ACCCRN's success stories and encourage cities around the world to replicate effective activities, for example in how land-use and infrastructure planning in a town can incorporate climate data in order to ensure that investments will stay safe well into the future. In order to do this, ACCCRN has a broad mandate to engage actors across a variety of sectors, including national and municipal government decision makers, civil society leaders, international donor agencies and multi-nationals and local small to medium sized enterprises interested in both social investment and the business opportunities which building climate change resilience presents.

ACCCRN is divided into four Phases of development and implementation:

- Phase 1 – City scoping and selection
- Phase 2 – City level engagement and capacity building
- Phase 3 – Implementation of urban resilience strategies
- Phase 4 – Replication

As of late 2010, ACCCRN is at a critical juncture, moving into Phase 3.[1]

1.4 The ACCCRN Cities

50% of the global population currently lives in cities and this is expected to increase to 70% (or 6.4 billion people) by 2050. Asian cities are expected to account for more than 60% of this increase and 46% of all urban population growth will occur in cities with fewer than 500,000 inhabitants. Such rapid urbanization is expected to exacerbate the fundamental problem of high density populations living in informal housing, without access to basic social

[1] See Section 2, *ACCCRN Phases & Methodologies* for a full description of the four Phases.

and physical infrastructure, and a concentration of poor people living in areas susceptible to natural hazards.

The ACCCRN cities are typically second tier, and their geographic scale and populations vary dramatically. For example, the cities of India are home to several million – Surat and Gorakhpur are at the 4.7 and 3.7 million mark, respectively; while the populations of the Thai cities are much smaller – Chiang Rai, for example, has a population of approximately 69,000. In many cases, the population can only be approximated given that many migrants or the residents of particular poor neighborhoods and slums tend to be largely under documented. Regardless of size and number of inhabitants, the ACCCRN cities are growing both in geographic spread and total population.

After extensive investigation and consultation, these were the cities selected for participation:

India – Each of the ACCCRN cities in India are experiencing rapid population growth and industrial expansion, with increasing demands on water and energy resources, expansion of informal settlements and challenges for urban planners. Water scarcity is the main threat to the city of **Indore**, with the level of water demand far outstripping supply, leaving a large section of the population un-served. Although the problem of water scarcity is not new, increasing incidence and severity of drought and floods are adding more stress on the city's population and city managers. **Gorakhpur** is located in the middle of northern India's Gangetic Plain. Prolonged water logging together with poor waste management has caused an increase in the incidence of vector borne diseases and related health problems, as well as contamination of ground water. Flooding, coastal storms and cyclones, sea level rise and inundation are major threats to the port city of **Surat.** The city has experienced major flooding every few years in the last two decades, with some events covering as much as 75 percent of the city. Low lying settlements and settlements close to the river, often home to the poorest and most vulnerable populations, have been worst affected by floods, necessitating relocation.

Indonesia – The combination of high population density, together with a staggering 80,000 kilometers of coastline and 17,500 islands, makes Indonesia one of the most vulnerable countries to the impacts of climate change. Almost all districts in **Semarang** are affected by flooding. Rising sea levels and coastal erosion have led to continuous inundation in some low-lying areas. Simultaneously, drought has become a serious problem due to longer dry seasons, causing failed harvests, degradation of vegetation, and a decrease in drinking water availability. **Bandar Lampung** is also extremely vulnerable to the impacts of droughts and erosion. Furthermore, flooding is a major problem for the city due to deforestation, increasing construction, sea level rise, and insufficient drainage capacity.

Thailand – While **Chiang Rai** is a small town with strong rural links, it has a relatively high profile for its size due to the tourism economy that exists in that region of Thailand. It is also likely that the city will experience rapid growth as the trade corridors to Myanmar and China are expanded. Increased frequency of storms is a key climate vulnerability in Chiang Rai and has resulted in damage to residential and agricultural areas. Deforestation and the city's poor drainage system have exacerbated the floods. Local government is particularly active and has already show strong interest in dealing with the city's major air quality problems which are exacerbated by climate change effects. ***Hat Yai*** is a larger, more urbanized city that is a major center in the south of Thailand. The city serves as the gateway to the troubled southern region, and is of significant political interest because of its ethnic composition. It has a strong tourism economy; while surrounding contiguous suburbs have a relatively high number of vulnerable and poor people. Hat Yai experienced severe floods in 2000 and again in 2008.

Vietnam – In **Da Nang,** storms have caused severe damage to vulnerable coastal areas, leading to the resettlement of many poor households. Flooding is a recurring problem, both in poorly drained central areas as well as in peri-urban districts undergoing rapid land conversion. Rapid tourism development on exposed beach areas may become vulnerable in future. In **Quy Nhon,** heavy rains generally leads to extensive flooding in low lying peri-urban estuarine areas; while more remote coastal fishing communities are exposed to increasing erosion by storms and higher tides. The same areas often suffer from water shortages and saline intrusion in the dry season as droughts become more frequent. The threats in **Can Tho** are somewhat different from the other two cities because this region is accustomed to large-scale flooding of the Mekong River, even without local rainfall. Flooding causes temporary water logging, which can damage crops and reduce household incomes. Sea level rise and upstream climate and land use changes exacerbate this threat, resulting in saline intrusion and water shortages.

1.5 It Takes a Network

A core objective of ACCCRN is to support interventions that can be replicated in other locations to achieve benefits that reach beyond the 10 core ACCCRN cities. While the strong regional links will provide extensive opportunities for these cities to share information and experiences, it is anticipated that the global benefits of a network of this scale and diversity will be significant.

Regional Technical Assistance
The Rockefeller Foundation has assembled an experienced and committed network of regional program and country implementation partners to facilitate various aspects of the initiative. By selecting program partners with core expertise in climate science, urban development, process facilitation, project development and execution, donor engagement, public policy, knowledge management and information capture, and monitoring and evaluation, Rockefeller Foundation has ensured that city level implementation of resilience strategies will be well supported and well monitored.[2]

Local Ownership
ACCCRN and its city-level activities stem from a recognition that a successful intervention depends in large part upon the degree to which city stakeholders own and support it. Local ownership is a critical factor that will enable implementation, but will also help determine whether the intervention is sustainable. One of the core ways in which Rockefeller Foundation will assess local ownership is how the proposed interventions under Phase 3 link to the initial engagement process. How did the project arise out of the city-level stakeholder engagement processes, and who led the process to define the project? Local government actors are critical to the implementation process.

Civil Society
ACCCRN has many distinguishing features, not least of which is the critical participation of civil society actors in city level activities and assessments. Ranging from environmental non-governmental organizations, to women's associations, to community based organizations, to universities and technical institutions; each ACCCRN city has cultivated engagement across a spectrum of civil society actors. Private sector actors, including chambers of commerce, have in a number of cities demonstrated strong commitments to urban climate change resilience building activities.

[2] See Appendix 1: *ACCCRN Program Architecture and Partners*

A number of local projects have already emerged from active civil society groups. For example, the Rockefeller Foundation recently announced support for the Women's Union in Da Nang to undertake a feasibility study that will lead to a full proposal for storm resistant housing and livelihood development for female-headed households. This intervention will seek to develop and sustain the adaptive capacity of vulnerable women by providing mechanisms and support for them to become competent entrepreneurs and contractors or skilled worker in the construction industry. The proposed support will be in the form of a credit scheme for selected households to repair, reinforce and rebuild houses and sites that are vulnerable to storms and floods to increase their resistance to high winds, heavy rain, regular flooding, and other extreme conditions.

Cross-sector Collaboration

ACCCRN enjoys strong government support, with many city level and municipal leaders directly engaged in the planning of phase 3 interventions. At the city level, many different municipal departments have been active stakeholders in ACCCRN activities, from Departments of Public Works to Departments of Housing and Construction to Departments of Irrigation. However, the challenge of building urban climate change resilience is not for governments alone. There are several key drivers for private sector involvement in this area. Effective responses to climate change impacts require action from multiple sectors and stakeholders:

- Financial services and insurance companies need to develop and distribute products that insure against new combinations and permutations of risk
- Agriculture, water, tourism, and energy businesses, to name a few, will need to understand the risks and impacts of climate change on business sustainability, and be prepared to react accordingly – including capitalizing on new business opportunities
- Infrastructure will need to accommodate new standards and incorporate a new flexibility that can respond to climate change uncertainty
- Health systems will need to build local response capacity for widespread events such as heat waves, while simultaneously extending the reach of efforts to mitigate climate-related diseases such as malaria and dengue fever
- Disaster relief organizations will need to plan for new types of disasters on a larger scale.

1.6 Knowledge Management & Innovation

From the outset, ACCCRN has been framed around developing and testing approaches to build urban climate change resilience using locally generated empirical approaches. This has required efforts at the city level to build capacity and engagement, in order to research and understand the relationship between local climate change impacts and the prevailing socio-economic and geopolitical conditions. Much of the analyses and assessments have been undertaken by local stakeholders using local institutions, most often in local languages. ACCCRN cities are developing their own knowledge systems and resilience strategies.

One of the critical result areas for ACCCRN is the generation of new knowledge that can be shared amongst a wide cross-section of users. Through the ACCCRN partners and their associated activities, considerable attention is weighted on ensuring that the lessons learned from experimentation, practice, and processes help to build the field of urban climate change resilience. In this sense, ACCCRN functions to both share information 'horizontally', i.e. across the Network partners and cities themselves, as well as 'vertically', meaning that knowledge generated within the Network can feed upwards into forums which will shape the development of adaptation and resilience models for urban climate change at a global level.

Climate change and its impacts on cities – and particularly poor and vulnerable populations – demands new thinking and approaches to resolve complicated and deep-rooted social, technical, physical, and financial challenges. Urban resilience building demands flexibility and an ability to operation in a context of uncertainty and surprises. The Rockefeller Foundation specifically seeks projects and interventions that are innovative and include new technologies, financial models, processes, and approaches designed to help reduce urban vulnerability and increase resilience. The Rockefeller Foundation anticipates that the private sector may play an important role in spurring innovation and views positively new models and approaches for private sector engagement, including public-private partnerships and risk sharing enterprises.

1.7 Outcomes: What does Success Look Like?

Rockefeller Foundation, with strong support from strategic partners, has defined the key outcomes for ACCCRN:

- ***Outcome 1 - Capacity (Capacity)***
  There is improved capacity to plan, finance, coordinate, and implement climate change resilience strategies within ACCCRN cities.

- ***Outcome 2 – Network for knowledge, learning and engagement (Knowledge, Engagement)***
  Shared practical knowledge to build urban climate change resilience deepens the quality of awareness, engagement, demand and application by ACCCRN cities and other stakeholders.

- ***Outcome 3 – Expansion, deepening of experience, scaling up (Money, Leverage)***
  UCCR is expanded with ACCCRN and new cities taking action through existing and additional support (finance, policy, technical) generated by a range of actors.

1.8 From Big Picture to Action

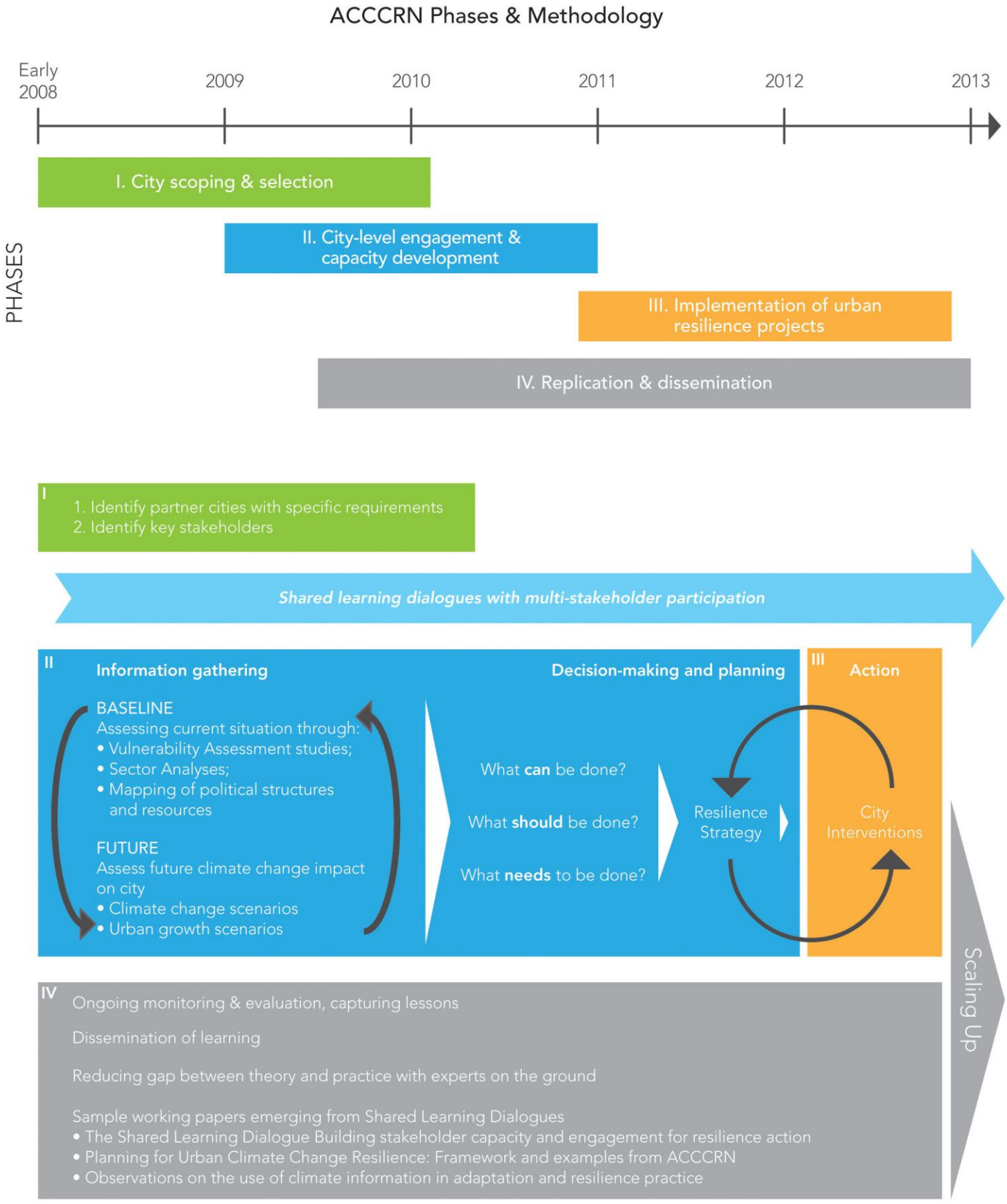
ACCCRN represents a unique initiative to develop, test and demonstrate practical strategies for responding to the impacts of climate change on urban areas. While attention and funding for climate change resilience and adaptation is increasing, globally there is a dearth of practical strategies that can achieve clear and demonstrated results. This presents a challenge in terms of ensuring that adaptation funding is allocated to achieve efficient, cost effective and equitable outcomes. As has happened with strategies for sustainable development, terms such as "climate change adaptation" or "urban resilience" could become little more than rhetoric, accepted as broad principles but lacking the tangibility to serve as guiding principles for major global investment to respond to real needs.

ACCCRN was envisioned to help reduce this gap in practice. The approaches developed under ACCCRN assist cities in diagnosing the likely impacts they will face as a consequence of climate change, and to develop a solid, strategic foundation for responding to these impacts across sectors, communities, scales and time. This strategic foundation, in turn, is being used to identify and strategically locate specific measures or projects that will provide that very practical and tangible evidence regarding "what can be done", enabling the participating cities to move beyond rhetoric to practical courses of action. Furthermore, it does this in a way that actively engages the multiple groups that must ultimately own both the strategy and the more specific resilience plans and interventions. This level of

engagement and the ‘bottom-up’ process of resilience strategy development are key distinguishing elements of ACCCRN.

Concern over climate change has emerged as a consequence of scientific work at the global level. As a result, most approaches to diagnose problems and identify solutions are top down. The history of international development suggests, however, that the sustainability of any initiative depends on active ownership and involvement in the design of strategies, plans and activities. Through ACCCRN, cities and their partners are developing tangible examples of urban climate change resilience measures along with a replicable process for resilience strategy development. Importantly, the approaches taken are rooting the building of resilience to climate change in the contexts and communities which are most likely to be affected.

2. ACCCRN Phases & Methodologies



Shared Learning Dialogues

Challenge:
Developing a common understanding and generating appropriate and technically sound responses to climate change impacts that incorporate emerging scientific knowledge with local priorities and realities on the ground.

Solution:
Shared Learning Dialogues are iterative, transparent discussions with local actors in communities, government agencies, civil society organizations, research centers and other technical agencies designed to facilitate mutual learning and joint problem-solving. In the context of ACCCRN, SLDs have focused on bringing together available information – from technical sources as well as local knowledge – on urban growth and development, climate change, and vulnerability of peoples and sectors, and prioritizing amongst this group which measures to undertake to strengthen urban climate change resilience.

SLDs have the following attributes:
1) Multi-directional information sharing;
2) Open dialogue amongst broad group of stakeholders;
3) Methodology crosses scale, community, organizational and disciplinary boundaries;
4) Iterative process to share, generate, and understand new knowledge;
5) Flexibility to adjust to reality on the ground.

Result:
The flexibility of the SLD process allows local organizations to address climate impacts as framed by their own particular social, cultural, and political boundaries and interests. The shared learning processes also bridges the divides across sectors and scales, and promotes inclusiveness by engaging marginalized groups and poor communities.

ACCCRN experience:
Overall, the broad stakeholder groups involved in the SLDs have always included political and technical agency decision makers within government, to increase the possibility that tangible action will be taken after the engagement. For example, in Thailand, Thailand Environment Institute (TEI) held Climate Workshops in each city. These events were attended by a wider group of city stakeholders than just those concerned with the more technical aspects of climate change. During the first SLD, scenarios were employed to help participants envision future climate and development pathways, as one of the central identified challenges was the ability of partners to absorb, understand, and act on climate concepts and ideas especially given the uncertainty and ranges being presented to them. Following the session facilitated by TEI, city stakeholders then arranged additional meetings on their own initiative, indicating that the group members have developed a positive working relationship among them, as they have identified a sufficient degree of mutual interest and incentive to drive the process forward. The SLDs have provided a forum in each city for the results of various studies, vulnerability assessments, sector studies, and climate impact assessments, to be brought back to the group of stakeholders in order to help advance leanings, analyses, and to provide direction in terms of priorities and next steps.

Vulnerability Assessments (VAs)

Challenge:

How to identify and understand the current location and dynamics of vulnerable urban populations in each city and to anticipate how these, and new communities, will be affected by climate change impacts. To also identify and develop climate resilience strategies and actions to address the most serious climate impacts.

Solution:

Through climate vulnerability assessments, the cities are assessing exposure to risks as well as what existing capacities can strengthen their ability to adapt and be more resilient to climate change and its impacts on urban systems. The assessments results in vital information that feeds into the iterative SLD and resilience planning processes.

Result:

The vulnerability assessments help to ensure that resilience strategies and interventions are based on an analysis of how the most vulnerable urban communities will be affected by climate change. This problem analysis, which focuses in part on poor and vulnerable populations, helps city teams identify opportunities to address exposure to risks and hazards, but also to build upon existing capacities within the city.

ACCCRN Experience:

As the SLDs and VAs progressed, it became clear that there was a huge gap in terms of access, understanding, and utilizing climate change information amongst partners. In some cities, the availability of basic disaggregated data access (e.g. rainfall, temperature, storm incidences) proved a significant barrier. In general, there was a limitation in both historical climate information and a lack of standardization and consistency in terms of climate projections. Therefore the focus of the VAs shifted to place a greater emphasis on researching the current vulnerabilities and how they might be exacerbated by climate change, in addition to projecting how ongoing climate change and climate variability might create new situations and/or vulnerabilities. This shift proved tactically critical in many cities as it helped anchor the understanding of climate change in today's context rather than focusing on an intangible future date. This is especially important since city decision makers as well as poor populations tend to be pressed with the challenges of meeting the demands of their *current* lives, livelihoods, and political pressures.

Sector Studies and Engagement Projects

Challenge:
How to keep stakeholders engaged, and build local research and analysis capacity, during the process of assessing climate risk and vulnerability and to understand the specific issues associated with particular sectors of importance to the city.

Solution:
Cities have conducted in-depth and detailed sector-studies for a deeper analysis on priority issues facing the city, and started testing small projects as a means of building collaboration and engagement among stakeholders. These local engagement projects provide immediate and tangible changes and outcomes, but are not treated as early stage or pilot efforts for potential scaling-up.

Result:
These sector studies and engagement projects built experience and intensified collaboration between partners, and additionally built the capabilities of local research and technical institutions. They also deepened the understanding of climate change and urban growth impacts on particular priority sectors. These activities also helped position climate change resilience more visibly onto the city agenda.

ACCCRN Experience:
The engagement with local research institutions for conducting sector studies, while not always optimal in terms of required expertise, played a critical role in strengthening local capacities and building links between researchers and local government departments. The ability of local actors to treat knowledge generated as locally derived, and to engage with the researchers, has been a valuable ingredient for building ownership over results and findings. Furthermore, in all cases the primary objective of the engagement projects was achieved, which was to deepen buy-in and build trust between the city stakeholders.

Resilience Planning and Strategy

Challenge:

How to collate and synthesize the range of analyses that have been identified through SLDs, vulnerability assessments, sector studies, and engagement projects to identify a framework and prioritized set of options for the cities to better prepare for the challenges of the current and future climate variability

Solution:

An integrated multi-sector city-level strategy document prepared by local government and other local institutions. This document aims to provide the context, evidence and analysis justifying the actions to strengthen urban resilience to climate change. The strategy should also identify the most high priority resilience actions that can be linked to and coordinated with other local initiatives, and funded through local and external resources.

Result:

To build local capacity and ownership to ensure that resilience plans, strategies and actions are sustainable and can advance even after the formal ACCCRN program ends. The resilience plan will also identify and prioritize specific interventions to build resilient characteristics of the urban systems and capacities of city stakeholders and institutions. Furthermore, local engagement in the development of these plans gave a much greater understanding of the climate change issues and resilience processes among local and national partners.

ACCCRN Experience:

The process of resilience planning has demonstrated how local organizations have used new climate and urbanization information to identify vulnerabilities and capacities to develop integrated resilience plans. These resilience strategies have generated a series of inter-linked measures that if pursued stand to build the cities' resilience across a range of sectors, stakeholders, and geographies of the city. Most of the cities have explicitly prioritized the value of this new information in helping them to assess risks and to select interventions that could have a strong positive impact on increasing urban resilience to climate change.

3. A Tale of Two Cities: Building Urban Climate Resilience Strategies

3.1 Case Study Overview

In the context of ACCCRN, a city climate resilience strategy is a broad guidance document prepared by local government or by a specialized public or private organization in consultation with other stakeholders. The strategy is structured around three sections: (1) understanding current and future climate impacts and vulnerabilities; (2) presenting potential actions for building the resilience of urban systems and linkages to other city plans and priorities; and (3) establishing priority areas for city intervention and seeking external support.

Developing a city climate resilience strategy provides context, evidence and analysis for justifying and identifying actions to strengthen to the cities' resilience to climate change. The strategy aims to align with existing development policies, procedures and plans (recognizing that in many cases these are not internally consistent), and recognizes that it should have direct links to the budgets and work plans of existing agencies so that it can be readily applied.

In each ACCCRN city, partners have undertaken a resilience planning process. This process utilized inputs from climate projections, impact assessments, vulnerability assessments, shared learning dialogues, technical sector studies and other stakeholder engagement processes. Throughout this process, there has been a strong focus on local engagement and creating ownership across a broad group of stakeholders and partners, including government, community members, civil society, research institutes, industry representatives and other local technical experts. In addition, ACCCRN continuously monitors and evaluates these processes and outcomes with different partners to ensure ongoing learning and information dissemination. Furthermore, a knowledge management system is being established to generate lessons across the initiative and among all the concerned partners. Ultimately, ACCCRN aims to develop easily transferable tools and lessons on urban climate change resilience planning that can be widely adopted by users within the Network itself and shared at a global level.

In this section, two short case studies are presented on the ACCCRN cities of Surat, India and Da Nang, Vietnam.. Brief overviews of each city and its respective challenges are provided, followed by some description of the different tools and methodologies used to develop the city strategies. Finally, each case study highlights some preliminary outcomes and planned interventions, as ACCCRN moves into Phase 3.

3.2 Surat Case Study

3.2.1 The City and its Challenges

The city of Surat is located along the tidally influenced Tapi River, in western India. Surat, the ninth largest city in India, is a major trade center and port of the State of Gujarat and is approximately 250 km north of Mumbai. The diamond industry (polishing, cutting, and export) and textiles (fabric/fiber production and export) are the primary economic drivers. In addition, there are chemical, petrochemical, and natural gas-based industries in Hazira, a major port located near the city of Surat at the mouth of Tapi and under its jurisdiction. Surat is located strategically along the Ahmedabad-Mumbai corridor and also has direct links with the industrial urban centers of Vadodara, Ankleshwar, and Vapi.

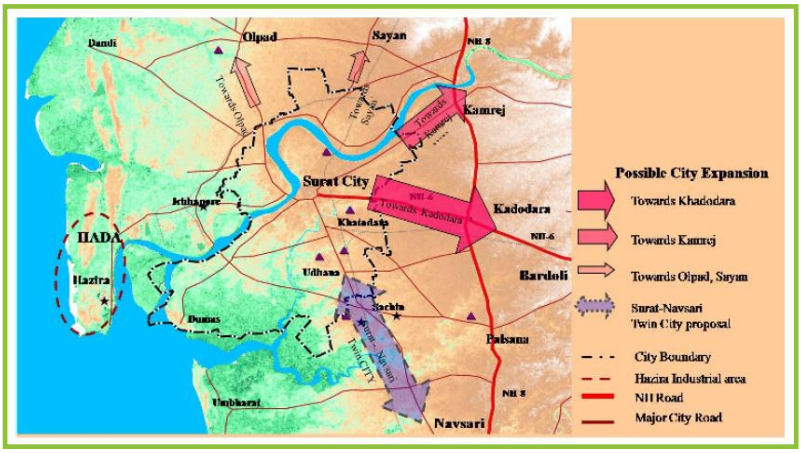


Figure [1]: Surat and its projected urban expansion (Source: TARU)

The city has seen unprecedented growth in the last four decades, recording one of the highest growth rates in the country and a ten-fold population rise during this period. The estimated population of the city in 2009 was 4.5 million, although the actual population may already exceed this number. Coupled with this, the spillover of the population into Surat's periphery has also been observed especially towards the coast and Hazira in the west, and towards the National highway in the East. The city area has expanded over time and presently covers 327 square kilometers.

Surat is a dynamic city with a vibrant economy and high level of home ownership. Residents have access to basic utility services such as water and electricity, and strong employment growth continues to attract new migrants. Despite its relative wealth in the India context, Surat was selected to join ACCCRN for several reasons. Importantly the city is highly exposed to the effects of climate change and variability. The city is also rapidly urbanizing, which both contributes to its economic wealth and places pressure upon existing infrastructure. Within local government there was strong interest to engage with ACCCRN for building climate change resistance, and an existing commitment to deploying forward-looking investments in infrastructure.

Major climate change threats in Surat stem from flooding, coastal storms and cyclones, sea level rise, and associated inundation. During the last two decades, floods affected Surat in 1994, 1998, 2002 and 2006, with some events covering as much as 75 percent of the city, as was the case in 2006. The floods of 1998 are still remembered as some of the worst. Approximately 90 percent of Surat's geographical area is affected by some type of climate hazard and climate change will exacerbate these hazards. Being located in the Gulf of Cambay, maximum tidal range varies between five and six meters with the monthly high tide reaching the western part of the city. It is the low-lying settlements and those close to the river, often home to the poorest and most vulnerable populations, which have received the brunt of the inundations.

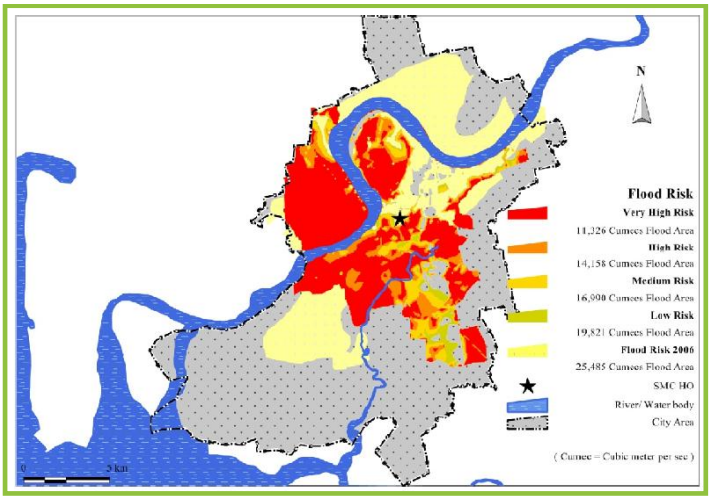


Figure [2]: Tapi river flood risk zones (Source: TARU)

Surat faces several major challenges in building urban climate change resistance. First, the city's rapid urban growth strains infrastructure investments and access to basic resources, such as water and energy. As the urban population grows, the availability of land that is not exposed to climate hazards will continue to diminish. Other major challenges in Surat that ACCCRN aims to tackle include:

- management of the upstream Ukai multipurpose dam which controls the level of Surat's Tapi River, despite conflicting objectives under extreme event dominated precipitation patterns; and
- monitoring and management of epidemics and community health issues.

Projected sea level rise and increased inundation pose serious threats to industry, a significant economic driver, which has catalyzed a high degree of participation in ACCCRN activities. Additionally, the effective leadership of the Surat Municipal Corporation and Southern Gujarat Chamber of Commerce, as well as cost sharing by the key agencies involved in ACCCRN assessments, has propelled the process forward and is likely to maintain momentum into future project phases. In particular, previous disaster events, such as the 1994 floods followed by plague and the 2006 floods, triggered cooperative action across a diverse range of city actors.

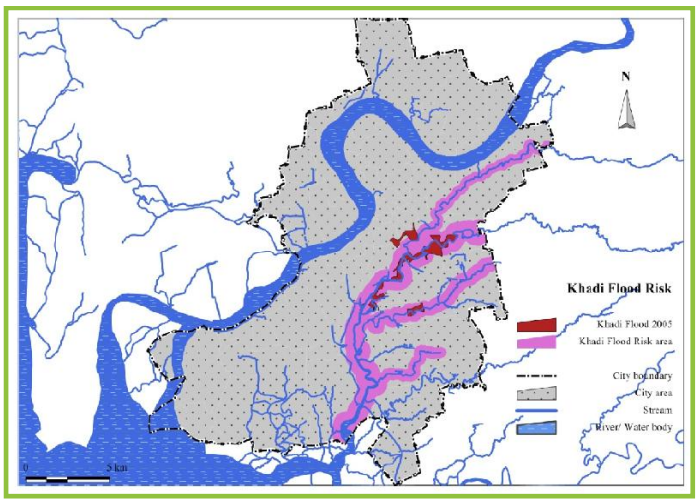


Figure [3]: Khadi flood risk zones (Source: TARU)

Surat, as with all the ACCCRN cities, also has the challenging task of communicating links between the impacts of climate change and climate variability, local risks and hazards, and creating awareness within a population with diverse knowledge and skill levels, especially amongst new immigrants.

3.2.2 ACCCRN in Surat

Surat has a strong business community which has engaged with the issue of urban climate change resilience since Surat launched its involvement with ACCCRN. The city established a City Advisory Committee (CAC) with participation from key stakeholders, including the Surat Municipal Corporation and Southern Gujarat Chamber of Commerce and Industries (SGCCI). The CAC helped provide direction and guidance for the city's participation in a range of assessments and analyses undertaken during Phase 2 of ACCCRN.

A key outcome from the two year engagement with ACCCRN to date is the City Resilience Strategy (CRS) that Surat city stakeholders have prepared with support from TARU Leading Edge. In Surat, Phase 2 ACCCRN activities were led by TARU Leading Edge with additional support from ISET.[3] In addition to involvement of local technical institutions and a range of local experts (e.g. in health, architecture and design), Surat has benefitted from a highly engaged and proactive business community and Municipal Commissioner. Both have helped generate both momentum and direction for the CAC and its activities.

In the next phase (Phase 3) in which a main focus will be on implementation of urban climate change resilience measures, TARU Leading Edge will act as the ACCCRN country coordinator for India. The Rockefeller Foundation will provide funding for the implementation of a set of prioritized initial interventions aimed at increasing urban climate change resilience. These will be executed by a range of relevant stakeholders in coordination with the CAC, with the intention that the initial investments will leverage in other resources to enable the entire resilience strategy to be implemented over time.

Processes and Methodologies for Determining Resilience Strategy

Surat's resilience strategy outlines short and medium term interventions across various categories: natural disasters, public health, water resources, population, environment, economy, social equity, and technology[4]. Most importantly, this strategy was guided by the knowledge gained from various local assessment activities, including a vulnerability assessment, sector studies and interactions with multiple stakeholders, and are looked at in further detail below.

The city resilience strategy suggests developing synergy with several ongoing and planned programs in order to leverage funds and to better position climate change resilience in current and forthcoming national programs. For example, Surat's resilience strategy has taken into account the National Action Plan on Climate Change launched by the Government of India. The National Action Plan on Climate Change outlines existing and proposes the development of future, policies and programs to address climate mitigation and adaptation, covering sectors that include urban health, urban water bodies, urban governance and infrastructure, and housing and services for the poor.[5]

Shared Learning Dialogues

The city of Surat has completed three rounds of stakeholder consultations, or shared learning dialogues (SLDs). From the outset, SLDs were aimed at accomplishing the

[3] Please see page 11-13 for a complete list and description of the ACCCRN grantees and partners.
[4] See complete list at Appendix 3.
[5] See complete list at Appendix 4.

following objectives:

- Develop a common understanding about the impacts of climate change and the potential mechanisms for responding to them;
- Inform the decision making processes to prioritize the areas and sectors requiring detailed vulnerability analysis;
- Raise awareness about local formal and informal institutions and support systems, especially during and after disasters;
- Promote detailed understanding of the factors perceived by local groups as responsible for damages, including early warning and post disaster recovery support; and
- Address other issues, such as community coping mechanisms, informal credit arrangements and migration.

A set of analyses were undertaken to better understand vulnerable populations and sectors in the city of Surat. The findings from these studies were shared through the SLDs. In Surat, a vulnerability assessment (VA) and five sector studies were completed. Surat has also initiated three engagement projects, and Surat's CAC continues to drive and support efforts towards broader resilience planning.

Future climate change risks and vulnerabilities

A climate resilience strategy requires technically credible information, not only with respect to climate information, but also about urban systems – projected population growth, land use, service and infrastructure demands and coverage and availability of natural resources, like water. TARU, with technical assistance from ISET, began seeking climate change related information relevant to the city in April 2009. After the initial round of rapid appraisal of vulnerability issues in slums, TARU employed Geographic Information System (GIS) methods to enable sampling and aggregation, which identified homogeneous socio-economic categories (SECs) through visual observation of satellite imagery. This was verified by rapid, on the ground surveys. TARU also collected historical, daily precipitation and temperature data from the Indian Meteorological Department and Anand Agricultural University.

Projected climate change impacts for Surat point to increased precipitation, rising sea levels, and increased temperatures. The city lies towards the northern most part of the western coastal humid zone, and the arid zone is only a few hundred kilometers to the north. The slightest deviation in climate either way is likely to impact Surat which already falls within a flood risk prone zone. The core urban systems affected by these risks include water supply, sanitation and housing, while secondary and tertiary systems include health and industry, respectively. Transport and communication, as cross-cutting systems, will also be affected, the nature and extent of which will depend on the intensity of risk. In particular, slums, many of which are located in low-lying areas, are areas identified as at high-risk from flooding of the Tapi River and *Khadi* (the Gujarati name for minor streams or tidal creeks rivers) as well rises in sea level. Surat is subject to three main types of flooding:

- **Tapi Floods** - The Tapi River is controlled upstream by the Ukai dam. The river divides Surat into northern and southern sections. Tapi flood hazards primarily affect the western portion of the city due to overflow from the Ukai dam during and following heavy rainfall in the catchments between Kakrapar and Surat.

- **Khadi Floods** - Khadi floods, generated by local rains combined with high tides, often inundate the south/southwest portions of the city, and also affect the southeast portion of the city.

- **Sea Level Rise** - Sea level rise is a flooding concern for areas below the high tide zone

in the western part of the city. As the sea rises, new areas of the western part of the city will also be impacted. Sea level rise will also likely impact groundwater as saline waters encroach upon aquifers. Surat lies in a flat terrain at an altitude about 10 meters above the mean sea level. Sea level rise of even a couple of meters will shift the tidal zone towards the city which can worsen the flood situation.

The assessment indicated that about three fourths of the area that falls under the jurisdiction of the Surat Municipal Corporation is at risk of flooding. All socio-economic classes and community groups within these flood risk areas are vulnerable.

In addition, the Flood Vulnerability Index classified slums – low income settlements which are located close to the river and middle-upper socio-economic groups residing on the periphery – as more vulnerable. GIS based analysis indicated 71,000 households are prone to *Khadi* flood risks, and about 450,000 households are at risk due to sudden releases from the Ukai dam. Though the frequency and intensity of cyclones has been low, any cyclone occurrence could potentially present a high intensity risk to the city.

Beyond major risks of flooding, other key points of the assessment are summarized below:

- Low education is one of the major constraints to creating awareness and developing effective resilience strategies and implementing resilience-building measures.
- About one third of households have poor income stability, indicating a need for improved education and skills development. Among the middle class, nearly half rely on unorganized trade. These people are highly vulnerable to changes in the city's economy, disasters or external shocks.
- Drainage and sewerage networks serve as lifeline infrastructure in cities like Surat, given the high population.
- Among poor SECs, loans are difficult to obtain and insurance coverage is limited, making this group particularly susceptible to the effects of flooding and other climate related disasters, and their ability to rebuild and recover from such disasters more difficult.

Sector Studies and Engagement Projects

Sector study reports outline the range of interventions and adaptation options necessary for strengthening the city's resilience to address climate risks, development issues and growth challenges. These studies provide a deeper analysis of priority issues facing the city, as well as the engagement activities to explore specific vulnerabilities or small areas in which the city stakeholders can begin making changes and monitoring outcomes. Specifically, these engagement projects are intended to build experience and collaboration between partners, as well as to introduce new local organizational approaches.

Further, the sector studies were conducted to capture the systemic vulnerabilities for specific priority sectors, and to highlight cross-sectoral linkages in the city. Under ACCCRN, five sector studies were undertaken in relation to environment, flood risk and management, health, energy security, and water security to guide the development of the 2010 Surat CRS.

The key findings from the sector studies, which reveal a strong contrast in the risks and vulnerabilities of different communities throughout the city, are set out below. It is important to consider the findings within the context of Surat's economic development and growth. The current economy of Surat is dominated by diamond cutting, textiles, gold thread, dyeing and printing which cater to both domestic and export markets. Recent events, such as the establishment of the Special Economic Zone and the development of industries in nearby regions, have further driven the economic development of the city and attracted a heavy flow of immigration.

- **House types**: Almost 95 percent of the houses are owned by the resident households across the surveyed settlements, out of which a sizeable proportion (84 percent) are single house units.

- **Dependency Ratio**: Dependency ratio is an important measure of vulnerability, especially among poor households with unsteady and/or seasonal incomes. It shows the ratio of non-earning persons to earning members within the households. Dependency ratio across the settlements in Surat is medium with reportedly 70 percent of the households falling within the range of 201-500 (~1 to 2 earning members per household of five to seven members).

- **Literacy**: Even though the sample is biased towards low income groups, the study shows low illiteracy (for the age group above 14) across the settlements. This indicates that most of the working population has basic education.

- **Livelihoods**: Only 17 percent of the total employed people are engaged in professional (white collar) work. Skilled workers form the major category, constituting 47 percent of the total work force. This category includes mill workers, masons, carpenters, drivers etc.

- **Water Supply**: In Surat, it was observed that community access to services like water and electricity is much better than many other cities as indicated by more than 95 percent coverage. Almost 100 percent of the households across the various settlements in Surat reported access to municipal water supply.

- **Electricity**: Electricity supply is not a major concern in Surat settlements. Power cuts are rare in most cities of Gujarat. Unlike many Indian cities, almost all slums also have metered electricity access.

- **Hazard Risks-Floods**: The 2006 floods are still fresh in the memory of most people, with many respondents sharing information about the history of floods in Surat from 1968 followed by 1994, 1998, 2002, 2004 and 2006. However, these instances have been reported mostly from older settlements across the city. The greatest response was in relation to the 2006 floods, which was recollected by 43 percent of the respondents across sample settlements. A majority of the respondents (32 percent) reported to have never faced floods. These communities include those located on higher grounds.

- **Water scarcity**: Surat has sufficient water supply due to its location along the Tapi River and investments in water supply. Water scarcity is currently not a primary concern. About 37 percent of households reported no water shortages. About 63 percent of households reported some form of water scarcity during the summer months. Water quality is, however, reportedly a concern in the western peripheral parts of the city. Water scarcity is mostly reported in new parts of the city, since the Surat Municipal Corporation expanded its area in 2006.

- **Access to Credit**: The survey indicates that formal community support systems across settlements in Surat are not strong. However, this is only part of the picture. The communities are organized with strong kinship groups based on caste and/or place of origin, especially in the case of informal settlements. Further, most of these immigrants send money to their families living in their native places and loans are often taken from their villages.

Based on the consultations and analyses undertaken in ACCCRN Phase 2, Surat is implementing three engagement projects:

1) A National Level Architecture Competition for Flood Resistant Buildings for Slum Households and Town Planning, based on a "living with floods" concept which yielded a spatial area plan for low lying area with high flood risk in October 2010
2) Development of a Spatial Database of Vulnerable People Requiring Special Care during Emergencies
3) A Volunteer-based Basic Services (water, sewerage, solid waste disposal) Monitoring System

Resilience strategy development and outcomes

The resilience strategy in Surat aims to "provide an overarching framework with a clear vision and direction for improved delivery of services by the stakeholders and action to be undertaken by the communities, thereby promoting economic development." Foremost in the analysis for Surat are urban trends, such as growing population and migration patterns, resource scarcity, weaknesses in public sector management and economic trends. Such urban growth scenarios function as a central framework in the strategies for understanding vulnerability and translating this into actions.

The Surat CRS includes a risk assessment section which describes hazards facing the city and vulnerabilities, based on a set of quantitative social and service access indices produced from surveys undertaken as part of the VA. The strategy summarizes results of various sector studies undertaken under ACCCRN and describes the climate risks identified in the studies. Next, urban growth scenarios depicting key alternative future trends – produced through CAC consultation – are described in detail. The scenarios themselves do not explicitly evaluate climate change issues.

The strategy provides a framework for the types of actions deemed strategically useful for building resilience in Surat. Due to the presence of a more effective municipal corporation that already recognizes climate problems, the Surat CRS relies more heavily on actions driven by the local government structures, and less on advancing public awareness, with the aim of achieving the following objectives:

- Build on current and planned initiatives
- Demonstrate resilience building projects to leverage further action at the local level
- Generate multi-sectoral information and develop a portfolio of potential projects (i.e. identification of diverse potential actions that could be supported by donors or state or national governments)
- Build synergies with state and national level urban initiatives that are already underway.

First cycle of city-level resilience interventions

During Phase 3 of ACCCRN, which was initiated in the last quarter of 2010, Surat and other ACCCRN cities will focus on developing and implementing a range of urban climate change resilience building measures. These interventions will build from the CRS and the analyses and priorities on which the strategy is based. In Surat, the studies conducted to date indicate that hydro-meteorological risks, coastal risks, high population growth, physical expansion of the city, health risks, and the links among these factor are the most critical issues facing Surat.

Further, climate variability and change exacerbate these existing risks. These factors are likely to influence the safety as well as quality of life of the citizens. The poor are differentially impacted due to higher exposure and inherent vulnerability, marked by less capacity to cope with shocks and stresses. Based on the knowledge gained from sector studies and interactions with multiple stakeholders, the 2010 Surat CRS outlines short-term (three-five years) and medium term (five-twenty years) interventions across various categories: natural disasters, urban health, water resources, population, environment,

economy, social equity, and technology.[6]

One proposed intervention under consideration by the Rockefeller Foundation would aim to reduce the intensity of floods and resultant flood damage to Surat. This proposed intervention would focus on improving reservoir operations to minimize peak floods and it would also help to improve the preparations and coordination of key institutions and the public to better respond to flood emergencies. One of the desired outcomes would be to increase the number of days of advanced warning to five days as a means to help people better prepare and thus reduce losses. This intervention will be carried out over a two to three year period.

3.2.3 What's Next?

The city of Surat, in collaboration with TARU Leading Edge, prepared the first proposal for an urban climate change resilience project and submitted it to the Rockefeller Foundation in the last quarter of 2010. Under the ACCCRN framework, Surat will continue to develop proposals for urban climate change resilience interventions through at least 2012, which will be submitted to the Rockefeller Foundation and other donors for funding consideration.

The Rockefeller Foundation is also coordinating with TARU and city stakeholders in Surat and in the other ACCCRN countries and cities to help leverage the city knowledge and experience to generate additional funds from other sources in order to increase resilience investments at the local level. There is already strong evidence of this happening in Vietnam, where a number of other government and donor funded activities overlap with Rockefeller Foundation funded activities in the three Vietnamese ACCCRN cities. The cities themselves are coordinating and facilitating these activities actively.

In addition to the highest priority interventions proposed to the Rockefeller Foundation for funding, each city is also engaged in ongoing work related to climate resilience and supported either with its own budget or by national government programs and other donors. Surat, for example, already has a variety of urban infrastructure, livelihood diversification and capacity building, and public health programs that are directly linked to the vulnerabilities identified in climate change studies. In this sense, the city of Surat has a strong foundation to build upon in relation to the development and implementation of its resilience strategy.

3.3 Da Nang Case Study

3.3.1 The City and its Challenges

Da Nang plays an important role in the Greater Mekong Sub-region. With a coastline of 92 kilometers, Da Nang is the biggest city in the central region and the midpoint between Hanoi and Ho Chi Minh City. The city provides a gateway to the East Sea of the East-West Economic Corridor linking Myanmar, Thailand, Laos and Vietnam. Da Nang consists of plains and mountain areas, 70 percent of the total area being mountainous. The high mountain area is sloping and mainly lies on the west and northwest of the city. This area is primarily forested and a high value is placed on biodiversity, natural resources, ecosystems and environmental protection.

The annual economic growth rate (GDP) of the city reached 9.98% in 2000 and 11.2% in 2009. It is projected to reach 11.6% in 2010 and as high as 12-13% in 2020. Da Nang's GDP currently accounts for approximately 1.6% of the country's GDP and is projected to account for 2.8% by 2020. GDP per capita (current prices) in 2010 is 33.2 million

[6] See complete list at Appendix 3.

Vietnamese dong, which reflects an increase of over 400% from 6.9 million dong per capita in 2000. It is expected that in 2010, the city would create 32,000 new jobs for laborers. .

The population of Da Nang City in 2009 was 822,000, which is a 1.9% increase from the previous year. Women account for 51.1% of the population and the birth rate has decreased to 3.2 per thousand. As with many Vietnamese cities, a large proportion of the population lives in areas that have rural characteristics. In Da Nang, the rural population that lives within the city boundaries is 108,000. According to a survey conducted by the Department of Labor, Invalids and Social Affairs, at the beginning of 2009, the city had 32,796 poor households out of a total of 170,268 households. This accounted for 19.3% of the total population.

Da Nang was selected to participate in ACCCRN due to its exposure to environmental risks and hazards, its rapid rate of economic urban growth, and clear evidence of local demand to engage with the initiatives. In addition to ACCCRN, Da Nang City is also a member of CITYNET[7], and has been supported by Japan International Cooperation Agency (JICA), the German development agency (GTZ) and the Asian Development Bank (ADB) for a number of for climate-related initiatives. As a result, Da Nang has many opportunities for cooperation, sharing of experiences, and potential for joint funding of climate change adaptation actions.

Due to its geographical location, Da Nang is one of the cities in Vietnam most exposed to natural hazards – typhoons, floods, drought, erosion, saline intrusion – and extreme weather (e.g. extremely hot spells and heavy rain). Each year, the city is hit by an average of one-two typhoons and experiences two-three floods of level 3 or higher.[8]

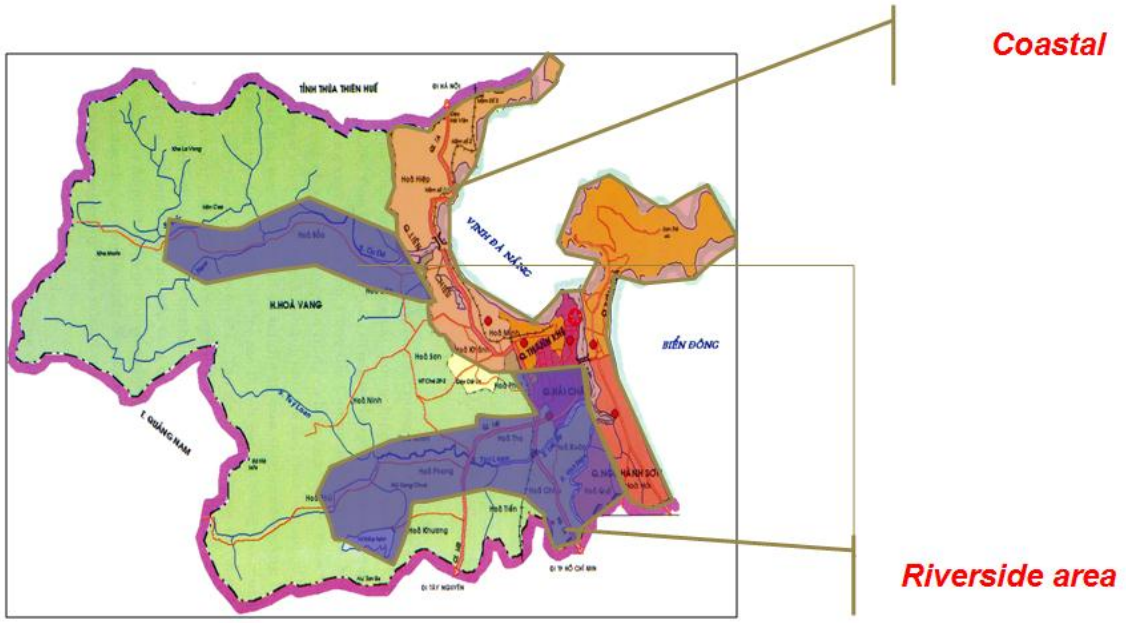


Figure [1]: Da Nang (Source: Da Nang City)

Major climate change challenges for Da Nang are manifested in temperature and precipitation changes, as well as the increasing frequency and intensity of climate related

[7] CITYNET is a network committed to helping local authorities improve the lives of its citizens and create the urban sustainability across Asia-Pacific and beyond. See http://www.citynet-ap.org.

[8] There are four flood levels at which the government issues an alarm, including level 1, level 2, level 3 and above level 3. Flood level reaches alarm level 3 when all low-lying areas are submerged (including urban low-lying areas); river protection dams are at risk; and damage to infrastructure begins to occur.

events such as typhoon, flood, drought, erosion and saline intrusion. Efforts to combat climate change also present numerous challenges, including:

- **Institutions and policies**: Vietnam launched the National Target Programme (NTP) to Respond to Climate Change, which presents an important framework to strengthen resilience to climate change. To date, there have not been detailed policies or guidelines on the approaches and methods that should be employed for resilience planning and incorporating climate change into development plans, programs, or projects at the city level. At the same time, Da Nang currently lacks a mechanism or organizational structure that can address the cross-sectoral dimensions of climate change adaptation.

- **Capacity**: Climate change presents a new set of challenges to decision makers around how to plan for and make decisions in the context of uncertainty. Climate models have improved, but they still lack a high degree of resolution and it is not possible to predict or to know for certain which impacts will play out, at what point in time, and how multiple impacts might interact with one another. It's in this context – with uncertain conditions in terms of the scope, intensity and frequency of events (typhoons, flooding and drought) – that local authorities have to make choices on development and investment plans. Thus, new capacities for more dynamic planning systems are required, in which local planners can provide a framework for making decisions across a range of potential outcomes and scenarios.

- **Budget**: Climate change is a long-term and uncertain trend that is complicating other more visible and urgent issues facing the city (e.g. rapid urban growth, shortage of safe housing, increasing demand for clean water and energy resources). Financial resources are limited in city budgets, and so the incorporation of climate change into longer-term planning perspectives requires additional financial and technical support from the central government, national resource agencies, and foreign funders in order to stimulate new action in this area.

3.3.2 ACCCRN in Da Nang

In 2009, Da Nang became one of three Vietnamese cities to join ACCCRN, along with Quy Nhon and Can Tho. ISET and NISTPASS have provided technical assistance and guidance to Da Nang and the other Vietnam ACCCRN cities. Challenge to Change has also provided strong support, in particular, leading activities focused on community based vulnerability assessments.[9] Other key partners included the Institute for Meteorology, Hydrology and Environment (IMHEN), a technical division of the Ministry of Natural Resources and Environment in Hanoi which is responsible for generating national climate scenarios.

Processes and Methodologies for Determining Resilience Strategies[10]

During Phase 2 of ACCCRN, which focused on engagement and capacity building in the cities, Da Nang completed three multi-stakeholder meetings. These SLDs provided a forum for a range of information, including climate change impacts, urban growth and development, and city priorities to be shared and understood across a diverse group of actors. Key analyses undertaken included: a Climate Change Impacts and Vulnerabilities Assessment; a Hazard Capacity and Vulnerability Assessment (HVCA); sector studies; and

[9] Please see page 10-13 for a complete list and description of the ACCCRN grantees and partners.
[10] In Vietnam, ACCCRN cities use the term resilience "action plans" rather than city resilience strategies. The concept of strategic planning is not widely understood or practiced in public sector planning in Vietnam, and local partners generally agreed that the Vietnamese term for "strategy" did not sufficiently capture the intended meaning as it typically denotes national or regional level policy. However, to save confusion all ACCCRN city resilience strategies will be referred to as such.

two training sessions on climate adaptation and resilience planning. Da Nang also initiated two engagement projects. These assessments and activities provided important contributions to the development of the Da Nang City Resilience Strategy.

Shared Learning Dialogues

Shared learning is an approach to participatory planning and problem solving in complex situations for which mutual learning is a defining feature in determining a positive outcome of the engagement. It is useful for addressing climate adaptation and environmental or resource management issues in which no single source of knowledge is complete or sufficient as the basis for making strategic decisions. In these cases, processes are required that generate 'hybrid knowledge'.

Da Nang's first two SLDs identified the most serious climate change hazards, vulnerabilities, impacts, and those districts of the city most exposed and vulnerable to climate change and climate variability. The first SLD took place in September 2009 and guided the city's vulnerability assessment process. A Climate Change Impacts and Vulnerability Assessment utilizing climate change scenarios, sea level rise scenarios and hydrological modeling, evaluated potential effects of changing temperatures, precipitation, evaporation, sea level rise, and typhoons.

One of the city assessments characterized natural hazard and disaster threats according to impacts on the most vulnerable groups, livelihoods, infrastructure and locations within the city. In addition to examining exposure, assessments were made in relation to the city's capacity to prepare for and respond to disasters. The HCVA utilized information on historical climate vulnerability (e.g. based on climate events like typhoons, floods, and drought) as a way to evaluate impacts on communities and individuals in certain districts. The HCVA also examined the relationship between climate change impacts and social factors such as gender, age, and socioeconomic class. The HCVA and other community-level work in Da Nang was led by Challenge to Change, in close collaboration with local government and community leaders.

Future climate change risks and vulnerabilities

The main climate-related vulnerabilities in Da Nang that affect socio-economic systems are loss of human life and impacts on public health; loss of land; reduction in crops and livestock productivity; water shortages; destruction of road and irrigation works; destruction of houses, schools, factories and hospitals; environmental pollution; damage to fishing boats and livelihoods of local people; and disruption of manufacturing, business, cultural and social activities [11] The magnitude, scale and scope of impacts was also considered in the evaluation. The analysis drew upon historical data that captured damages caused by climate related events.

The assessment of future socio-economic and environmental vulnerability takes into consideration the effects of five main climate-related impacts: typhoon, flood, drought, river bank and coastal erosion, and saline intrusion.[12] Key criteria used for the evaluation included the magnitude, scale and scope of impacts.

According to the report conducted by IMHEN, which was based on calculations using national greenhouse gas emission scenarios, by 2050 the sea level in Da Nang is likely to rise by between 30.1cm and 33.4cm. Using these same scenarios, the analysis projected that the total flood area for Da Nang would increase between 3 and 23.2 square kilometers.

[11] See complete list at Appendix 5.

[12] See complete list at Appendix 6.

Flooded areas caused by sea level rise will possibly include Hai Chau, Son Tra and Ngu Hanh Son districts.

Flood, droughts and typhoons, in particular, are likely to occur more frequently, with higher intensity, but with less predictability. These events, coupled with rising sea level, present risks for many sections of Da Nang, but especially populations and sectors living and operating in sensitive parts of the city, such as riverbanks and coastal and low-lying areas.

The most vulnerable are poor populations in urban areas, including migrants (from rural areas and other provinces), freelance laborers, populations under resettlement programs, and unmarried women. The HCVA considered gender-sensitive vulnerabilities and included women-headed households in the study. These include: (i) women with children without a husband; (ii) divorced women; and (iii) widows or women with sick husbands.

While certain segments of the population will likely face higher levels of vulnerability, the analyses undertaken in Da Nang also focused on those sectors which are especially vulnerable. Tourism and services industries, including the infrastructure systems that service them, are essential economic sectors for the city. These sectors are expected to be affected significantly by climate change, given their location in high risk areas (e.g. Cam Le, Son Tra and Ngu Hanh Son districts). In addition, under the combined impacts of increased drought and saline intrusion (due to sea level rise), water supplies are likely to be severely affected which will have a major impact on various economic and social sectors across Da Nang.

Sector studies
Ideas for sector studies and engagement projects in Vietnam were solicited and discussed during the second SLD, following presentations and discussion of the vulnerability assessment findings. In Da Nang, sector studies included a focused study on vulnerability in parts of Cam Le district subject to flooding and rapid urbanization.

Engagement projects
Results from the vulnerability assessments and sector studies guided the development of Da Nang's two engagement projects. The engagement projects were intended to help continue to build interest in and support for urban climate change resilience, while also testing out ideas that have the potential to strengthen resilience in the city. Highlights of the two engagement projects are set out below:

- Installation of a boat winch system to haul small fishing boats into protected areas ahead of major storms. This project was particularly novel in that the winch system was based on a rather simple, traditional technology which was melded with modern innovation.

- Community-based disaster risk reduction project involving tree planting, distribution of radios providing storm warnings to fishermen, as well as administering training on disaster management and climate change.

Resilience strategy development and outcomes
The Da Nang City climate change resilience action plan outlines the core objectives to pursue:

- Increase awareness of climate change and its impacts, and build capacity for resilience planning for authorities at all levels, departments and agencies, social organizations and communities in the city;
- Identify and provide support for vulnerable target groups and sectors under climate change and disaster conditions;
- Incorporate climate change into development plans and projects of the city, including urban development projects and (long-term) tourism development plans;

- Incorporate the issues of climate change into resettlement, particularly those relating to the provision of social services and livelihood support;
- Create a new Da Nang City climate change coordination office and establish operating mechanisms for the office;
- Improve the quality of disaster warnings and forecasts under climate change conditions;
- Build a database on climate change to facilitate incorporating climate change into the development plans and programs of the city.

ACCCRN has benefitted from considerable support in Da Nang. The Central Government has executed supporting policies for climate change resilience activities in a number of localities, and has provided a framework, the National Target Program, for Vietnam's cities to take action.. Da Nang City leaders have demonstrated commitment by providing direction and support for city departments and agencies to undertake climate change resilience planning. A range of parties, sectors and community groups have taken an active interest in resilience planning, including a focus on climate change response and disaster mitigation.

In Da Nang City, with a large population living on exposed coastline, the active and proactive participation of community members in mitigating disaster consequences presents an opportunity to strengthen the role of those affected by climate events in disaster prevention and climate change adaptation. In response to the five main types of climate-related impacts identified above – typhoon, flood, drought, river bank and coastal erosion, and saline intrusion – stakeholders in Da Nang are now analyzing and developing adaptation actions to strengthen the resilience of the city, with particular consideration for vulnerable groups.

Proposed adaptation measures are required to accomplish the following:

- Meet the criteria of redundancy and flexibility, enable reorganization in the event of shocks and stressors and demonstrate the capacity for learning;
- Benefit vulnerable groups;
- Complement and be linked to one another;
- Connect to policies, programs and development plans of the city.

First cycle of city-level resilience interventions

The cities in Vietnam have categorized their proposed actions in different ways. Da Nang and Quy Nhon undertook their analyses of climate impacts and vulnerability by examining climate hazards. The priority actions in Da Nang involve awareness and training, and capacity building at all levels, which in both cases includes community disaster preparedness. In Da Nang, city stakeholders have framed the intervention planning process to take into consideration the lifestyle and customs of local people. These screens are critical to determine whether the proposed actions would be suitable for the local people.

Building from the Da Nang resilience strategy, the Rockefeller Foundation has just recently granted approval to support two interventions, which will be coordinated by ISET

Establishment of a City Climate Change Coordination Office (CCCO) – The overall objective of this intervention is to create and implement a sustainable and effective mechanism for local government planning, decision-making and policy implementation for climate change resilience and adaptation in Da Nang, Quy Nhon and Can Tho, consistent with the requirements of the Vietnam National Target Program for Climate Change. This intervention involves institutional capacity building and has potential for replication nationally. The CCCO would also serve as an institution within the city to help ensure coordination across different municipal departments, with national ministries, and with other donors. . (Period: two years)

Pre-feasibility study of storm resistant housing designs and creation of a credit scheme – this intervention aims to define feasibility, scope for replication, and institutional support mechanisms to develop a detailed project proposal for "Storm resistant housing and livelihood development for female-headed households." This project aims to support participating poor female-headed households, identified by the HCVA as the group most vulnerable to climate change in Da Nang City, to develop and sustain their adaptive capacity by becoming competent entrepreneurs and contractors or skilled worker in the construction industry. The support will be in the form of a credit scheme for selected households to repair, reinforce and rebuild houses that are vulnerable to storms and floods to increase their resistance to high winds, heavy rain, regular flooding, and other extreme conditions. The credit scheme will serve as a platform for training and transfer of relevant livelihood skills, technologies and building techniques to those households, and assist them to enter into the Da Nang labor force. It will also disseminate information on climate adaptation, storm resistant housing, and disaster risk mitigation practices to other vulnerable communities and to relevant public and private sector actors. The Da Nang Women's Union and Challenge to Change will be key implementing partners. (Period: 4 months – feasibility phase only)

A third proposal is currently under consideration for funding by the Rockefeller Foundation – *Flood Modeling for Urban Development Planning*. This intervention to generate and run a Hydrology and Urban Development Simulation Model would construct a linked hydrologic---hydraulic model (H---H model) and supporting database for Da Nang that take into consideration potential impacts of climate change and urban development, to simulate urban planning and development options under future climate conditions (change in river flow and currents, intensified river flooding exacerbated by sea level rise, change in water quality caused by saline intrusion, accumulation of pollutants…) for urban development planning purposes. (Period:18 months)

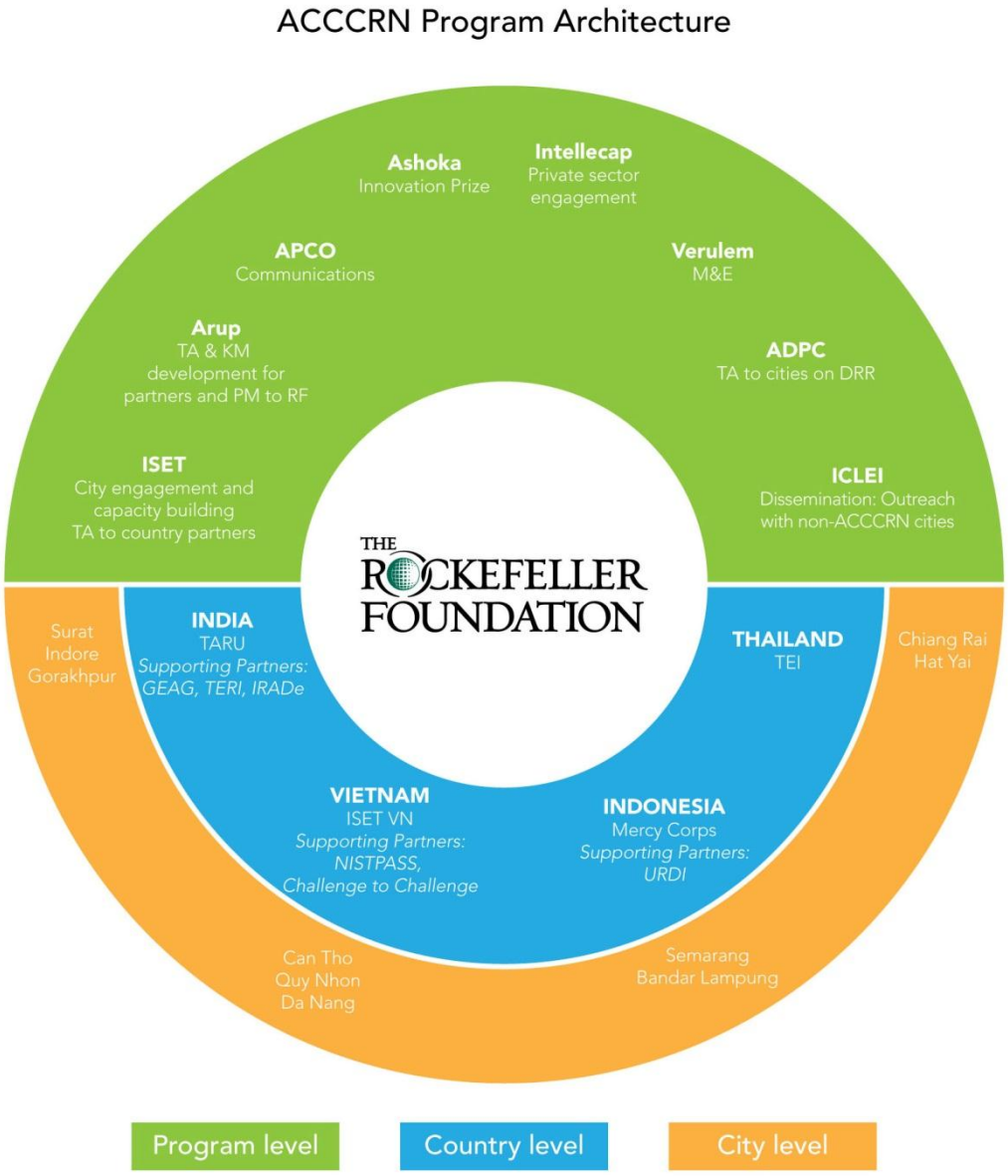
3.3.3 What's next?

One of the issues that have been approached from different perspectives across the ACCCRN cities is how resilience planning becomes institutionalized in local decision-making. In Vietnam, where local governments are highly organized and still dominate strategic economic and social decision making, and where national policy already has created a requirement for local climate action planning, city teams saw a logical step to establish a mechanism to help integrate climate resilience into decision making and to coordinate across different government departments and a range of donors. The city climate change coordination offices, which will receive partial support from the hosting municipal governments, present a starting point from which future urban climate change resilience measures at the city scale can be implemented and linked to other new emerging activities.

The Da Nang team like the other Vietnam ACCCRN cities will continue to develop new proposals to strengthen urban climate change resilience while also implementing on the proposals that have already been approved for funding. RF will review city proposals on a rolling basis through the duration of ACCCRN as a program, and will seek cooperation with other donors in order to scale up the resilience building effort in the city.

4. Appendices

Appendix 1: ACCCRN Program Architecture and Partners



ACCCRN Program Partners

The Rockefeller Foundation supports work that expands opportunity and strengthens resilience to social, economic, health and environmental challenges, affirming its pioneering philanthropic mission since 1913 to promote the well-being of humanity. www.rockfound.org

ADPC (The Asian Disaster Preparedness Center) provides technical review of city-level intervention proposals dealing with disaster risk reduction, and technical assistance to country and city level partners in the implementation of DRR-related interventions. http://www.adpc.net

APCO Worldwide provides support to ACCCRN partners in communications, identifying opportunities for engagement with key stakeholders including media, the donor community and general public, to raise awareness and understanding about ACCCRN objectives, processes and outcomes. www.apcoworldwide.com

Arup, a global consultancy of planners, engineers and economists, provides technical assistance to country and city partners on urban climate change resilience intervention development and implementation. Arup also provides strategic partnership to the Rockefeller Foundation. www.arup.com/internationaldevelopment

Ashoka supports social entrepreneurs and their innovations throughout the world, creating a new generation of change makers to create positive social change. Ashoka manages an ACCCRN innovation prize, which seeks to identify and provide leadership development support to a small number of emerging entrepreneurs who are actively advancing urban climate change resilience in their own communities. www.ashoka.org

ICLEI (International Council for Local Environmental Initiatives) is an international association of local governments as well as national and regional local government organizations. ICLEI is developing a toolkit to enable broader dissemination of urban climate change resilience planning to new cities, beginning in India. www.iclei.org

Intellecap is a research and advisory firm that focuses on identifying and promoting enterprise solutions for poverty and development challenges. Intellecap was commissioned by the Rockefeller Foundation to examine the opportunities for private sector engagement in building urban climate change resilience in ACCCRN cities. www.intellecap.com

ISET (Institute for Social Environmental Transition) has developed the core methodologies that country and city partners have used to understand climate impacts, vulnerability, and to undertake resilience planning. ISET also provides technical assistance, including access to global climate science. www.i-s-e-t.org

Verulam Associates is the monitoring and evaluation partner of ACCCRN, whose key role is to capture and share lessons learned about the relevance, effectiveness, efficiency, influence, impact and sustainability of ACCCRN activities, and to foster learning, accountability and performance improvements across the Network. www.verulamassociates.org

ACCCRN Country Partners

In Phase 3, Country Coordinators are working with city partners to develop and implement a pipeline of urban climate change resilience interventions at the local level. Country Coordinators will focus on scaling urban resilience activities and lessons learned by engaging with national and state level policy makers, identifying funding opportunities, and building a base for increased resource allocation for urban climate change resilience measures.

India

Country Coordinator: **TARU Leading Edge Consulting**, a multi-disciplinary consulting firm with strong technical expertise in urban contexts, climate change, and disaster mitigation, is active throughout India and works with local, state and national governments, multi-lateral organizations and civil society groups to address development challenges in India. www.taru.org

Supporting Partner: **GEAG** (Gorakhpur Environmental Action Group) is an NGO that undertakes development initiatives to impact positively the lives of the poor, deprived and marginalized through a people-centered approach focusing on their participation, awareness and empowerment for sustainable development. www.geagindia.org

Supporting Partner: **TERI** (The Energy and Resources Institute) is working to **r**ealize the potential for national and international leadership as a knowledge based agent of change in the fields of energy, environment, other natural resources and sustainable development. www.teriin.org

Supporting Partner: **IRADe** (Integrated Research and Action for Development). is set up as a fully autonomous advanced research institute, which aims to do research and policy analysis in the areas of poverty, degraded environment, poor terms of trade, inadequate infrastructure and the weak bargaining power of the poor. www.irade.org

Indonesia

*Country Coordinator***: Mercy Corps** is an international NGO, helping people around the world to turn the crises of natural disaster, poverty and conflict into opportunities for progress. The program in Indonesia addresses the root causes of poverty, thereby improving the quality of life for disaster and conflict affected urban and coastal communities. www.mercycorps.org

Supporting Partner: **URDI** (Urban and Regional Development Institute) is an Indonesia-based think tank, providing policy analysis and technical support on issues relating to urban and regional development. www.urdi.org

Thailand

Country Coordinator: **TEI** (Thailand Environment Institute) is a non-profit, non-governmental organization focusing on environmental issues and the conservation of natural resources in Thailand. TEI works with stakeholders across sectors to help formulate environmental directives and link policy with action to encourage meaningful environmental progress in Thailand. www.tei.or.th

Vietnam

Country Coordinator: **ISET**, in addition to its regional role, is the country coordinator for Vietnam. Based in Hanoi, ISET Vietnam is providing technical assistance and support to the

ACCCRN cities in Vietnam as they implement the interventions at a local level under the respective city resilience strategies. www.i-s-e-t.org

Supporting Partner: **NISTPASS** (the National Institute of Science and Technology Forecast and Strategy Studies) is the research organization of the Ministry of Science and Technology and Environment. It focuses on analysis and development of Science and Technology Policy and Strategy towards innovation and sustainable development. www.nistpass.gov.vn/english

Supporting Partner: **CtC** (Challenge to Change) is an international NGO with a base in Vietnam, focusing on climate change issues, and supporting poor communities to adapt their livelihoods to the local impacts of changing climate in Vietnam. www.challengetochange.org

Appendix 2: Issues and impacts in Surat

(Source: Surat City Resilience Strategy (2010), TARU)

	Current Status	Future Trends (business as usual without climate change)	Climate Change Issues
Population	High demographic growth	Trend potentially continues, unless economic growth slows down	Push migration periods from impacts on rural areas, dominance of low skilled population
Natural Disasters	Floods, High tides frequent, the increase in flood levels for similar discharges due to embankments and land filling. Cyclones rare.	Trend likely to continue, Impacts due to city expansion and other anthropogenic changes likely to worsen the flood intensity, Disease profiles may change	More intense floods, water scarcity periods, local floods, Tides, Cyclones frequency may change, and the storm surge may impact more areas due to sea level rise.
Health	Malaria, Filariasis and Dengue common, strong seasonality, Heat strokes unknown	Trend likely to continue	Seasonality of the vector-borne diseases likely to change, expansion of disease transmission period likely to increase due to increased temperature and changes in humid seasons
Resources (Water, land, energy)	Sufficient, for meeting current demands	Water scarcity issues likely to crop up with high population growth, reuse options can reduce impacts	Water scarcity issues can become more acute with increase in variability, Loss of land from sea level rise, especially along coast and tidal creeks. increased energy demand due to temperature increase and humidity level
Environ-ment	Very dense core, Vehicular pollution, lack of open spaces	Traffic issues, pollution may increase, but with stringent norms expected	Higher impacts of pollution due to higher temperatures
Economy	High growth	Medium to high growth expected with increase in efficiencies, can be affected by external shocks.	Minor change in energy consumption for processes, but significant impact on energy demands for space cooling, vector borne diseases may impact the labor productivity.
Technology	Fast up gradate on to overcome labor scarcity	Shift to better technologies, focus on energy conservation	Surat becoming a centre for CC technologies, resilience cc approaches possible
Social/ equity	Iniquitous growth being addressed by housing, Rare conflicts	Migration can change world views, social cohesion, would need interventions	Push migration can lead to more cc diversity in worldviews, Higher inequity due to skill constraints of new in-migrants, pressures on resources

Appendix 3: Resilience strategies have been listed for consideration in Surat

(Source: Surat City Resilience Strategy (2010), TARU)

Sectors	Resilience Options/Interventions
Natural Disasters	Climate Watch Group End-to-End Early Warning System Multi-Hazard Emergency Response Plan Hazard Risk Zonation and Zoning Ordinance Flood reduction infrastructure
Urban Health	Disease surveillance and epidemiological research Health Geographic Information System Improved Vector control system Literacy development on Climate Change and Health Risks
Water Resources	Water resources and supply management plan informed by Climate Variability and Climate Change. This includes: • Water supply monitoring system • Climate Variability and Climate Change informed resource assessment • Technology options (including reuse and desalination) • Demand side management • Water conservation options • Hardening and design of resilient infrastructure to withstand sea • level rise, floods • Emergency supply management • Reduction of leaks programme • Awareness Programme - Skill building Programme - Certification Programme - Monitoring programme on migration, Need Assessment
Population	
Environment	Integrated Public Transport System Traffic Management Plan
Economy	Loss Minimization Studies Business Continuity Plan Development of health support systems for industrial workers Managed retreat of industries and high value infrastructure (from high risk to low risk zones) Disaster resilient and energy efficient housing for poor Awareness generation and social action Preventive action (to reduce conflicts)
Social/equity	
Technology	Energy efficiency improvement programmes Clean and sunrise industry/service sector

Appendix 4: Ongoing and planned government interventions relevant to climate change resilience

(Source: Surat City Resilience Strategy (2010), TARU)

Ministry/Department	Sectors	National Level Programmes
Health and Family Welfare	Urban health	Integrated Child Development Services (ICDS)
		Urban Malaria Scheme , National vector Borne Disease Control Programme (NVBDCP)
		National Urban heath Mission(proposed)
		Integrated Disease Surveillance Project
		Upgradation of Quality of Street Food, (Ministry of Food Processing Industries)
Environment and Forests	Urban water bodies	National lake Conservation plan
	Rivers	National River conservation plan
Ministry of New & Renewable Energy (MNRE)	Energy	Development of Solar Cities
Urban development	Urban governance & Infrastructure	Jawaharlal Nehru National Urban Renewal Mission (JNNURM) I:Urban Infrastructure and Governance:
Rural Development	Push Migration	National Rural Employment Guarantee Scheme
Women and Child Development	Livelihoods	Support to Training & Employment Programme for Women (STEP)
Housing &urban poverty Alleviation	Housing & Services for poor	Jawaharlal Nehru National Urban Renewal Mission (JNNURM) II: Basic Services for Urban poor
		Rajiv Awas Yojana (Housing for Urban Poor)
	Employment and livelihoods	Swarna Jayanti Shahari Rozgar Yojana (SJSRY)
Human Resources	Education	Education Guarantee Scheme and Alternative & Innovative Education
	Training and Skills Development	Schemes undertaken by Department of Vocational education, employment and training.

Appendix 5: Da Nang climate vulnerability assessment in the past and in the present

(Source: Da Nang City Climate Change Resilience Action Plan, 2010)

Climate change impact	Level of vulnerability						
	Loss of land	Deterioration of livelihood and social issues	Shortage of water	Destruction of traffic/ irrigation works	Destruction of houses and public works	Loss of human life and health	Environmental pollution
Typhoon	++	++	+	+++	+++	++++	+
Flood	++	++	+	+++	+++	++	++
Drought	+	+++	++++	+	+	+	++
River bank and coastal erosion	+++	++	-	++	+++	+	+
Saline intrusion	+	+	+++	+	-	+	+

Notes:

++++ *extremely high level of vulnerability*
+++ *high level of vulnerability*
++ *medium level of vulnerability;*
+ *low level of vulnerability;*
: *invulnerable*

Appendix 6: Da Nang climate vulnerability assessment in the future

(Source: Da Nang City Climate Change Resilience Action Plan, 2010)

Climate change impact	Level of vulnerability							
	Loss of land	Deterioration of livelihood and social issues	Reduction in crops and livestock productivity	Shortage of water	Destruction of traffic/ irrigation works	Destruction of houses and public works	Loss of human life and health	Environmental pollution
Typhoon	+++	++	+++	+++	+++	+++	++++	+
Flood	+++	++	+++	+++	++	++	++	+
Drought	+	++	+++	++++	-	-	++	++
River bank and coastal erosion	++++	+	+++	-	++	++	+	+
Saline intrusion	-	+	++	+++	-	-	+	-

Notes:

++++ extremely high level of vulnerability
+++ high level of vulnerability
++ medium level of vulnerability
+ low level of vulnerability
- invulnerable