



ACCCRN

Asian Cities Climate Change Resilience Network

Responding to the Urban Climate Challenge





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Contributing Authors



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Asian Cities Climate Change Resilience Network (ACCCRN)

THE URBAN CLIMATE RESILIENCE CHALLENGE

Human-induced climate change, in conjunction with environmental degradation, will have unavoidable effects on cities. UN-Habitat estimates that 70% of the world's population will live in urban areas by 2050, and approximately 60% of the growth is expected to take place in Asia. Climate change will lead to warmer temperatures, greater

CLIMATE CHANGE AND CITIES

Sudden onset natural hazards such as floods, extreme rainfall events, and urban heat waves often receive the attention of city leaders and planners. Climate change is likely to increase the frequency, intensity, and duration of such extreme events in unpredictable ways and will require cities to develop adaptation strategies that enable them to manage this variability and uncertainty. Equally important but less visible are slow-onset, creeping events associated with climate change. Slow-onset events happen over weeks, months, and years and may be difficult to perceive and are typically easier to ignore. They include gradually rising temperatures that lead to lower productivity of city food suppliers, sea level rise that erodes low-lying cities, or gradually disappearing glaciers and snowfields that have in the past sustained city water supplies. ■

variability in local conditions, and changes in the frequency, intensity, and location of precipitation and storms. Medium-sized cities are growing particularly rapidly and lack the resources of larger, more established cities to address the compounding challenges of climate change, urbanization, poverty, and environmental degradation. How will these cities manage the stresses and respond to the inevitable shocks and surprises of climate change while assuring the wellbeing of their growing populations?

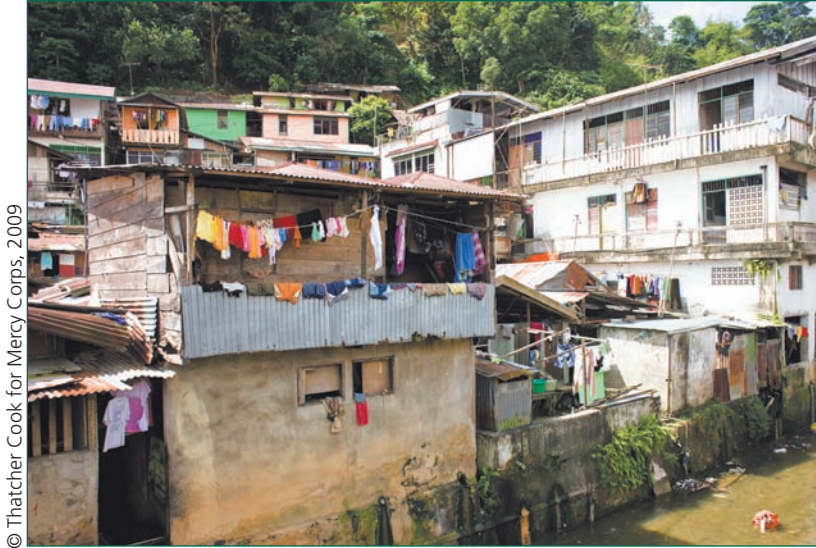
How ACCCRN is Responding to the Challenge

Although it is not possible to predict with absolute certainty the exact nature of climate impacts and resulting challenges each city will face, the Asian Cities Climate Change Resilience Network (ACCCRN) helps cities and their citizens build flexible and dynamic systems and institutions that identify and respond to the challenges climate change poses to urban areas. ACCCRN is a cutting edge research and urban climate resilience action program being piloted in 10 cities in Asia.

Through collaboration between outside experts, national partners, local governments, and other organizations, ACCCRN enables each partner city to confront the complexities of climate change and develop the local capacity to address their specific challenges. The current phase of the ACCCRN program is assisting partner cities to develop resilience strategies and associated implementation proposals.

Cities engaged in the ACCCRN process will be able to anticipate how their vulnerabilities will be exacerbated and altered by climate change, identify urban populations most affected by changing conditions, and develop climate resilience strategies and actions to

meet the most serious climate impacts. Poor and vulnerable populations within each city are already challenged by urbanization and environmental degradation and have the potential to be further marginalized by centralized planning processes. Therefore, ACCCRN is engaging multiple community-based organizations and vulnerable stakeholder groups, as well as local governments, from the outset of the urban resilience planning process. ACCCRN is comprised of key stakeholders in each city, national partners in each country who are familiar with the climate change and disaster risk reduction policies of their countries, and international experts. ACCCRN partners are committed to building urban climate resilience as a continual process, realizing that as the climate changes, and urban areas grow, responses will need to constantly evolve. ACCCRN is building local capacity and ownership to ensure that resilience plans, strategies, and actions are sustainable and can advance even after the formal program ends.



Batu Merah District, Ambon City, Indonesia

— ACCCRN is already helping the cities to: —

- ✓ Identify their current climate vulnerabilities across sectors and populations.
- ✓ Enable them to think about how climate change will exacerbate current vulnerabilities and create new opportunities and challenges.
- ✓ Engage vulnerable populations and community organizations as stakeholders in urban climate resilience planning.
- ✓ Build capacity to analyze the direct and indirect impacts of climate change.
- ✓ Develop locally appropriate resilience strategies.
- ✓ Test and refine methods and tools for engaging stakeholders and planning climate resilience action.
- ✓ Pilot interventions to build resilience.

The ACCCRN process will:

- Enable cities to develop resilient strategies and implement interventions to increase resilience
- Build a replicable base of lessons for engaging stakeholders.
- Introduce actions that mainstream climate resilience into city planning and operations.
- Point to strategies that support the most vulnerable groups within the cities to respond effectively to climate change risks.
- Support the transfer and sharing of lessons to other cities not involved in the program.
- Engage other funders, practitioners, and policy-makers to support urban climate resilience for poor and vulnerable people.

ACCCRN CITIES:

Vietnam:

Can Tho
Quy Nhon
Da Nang

India:

Gorakhpur
Surat
Indore

Indonesia:

Semarang
Bandar Lampung

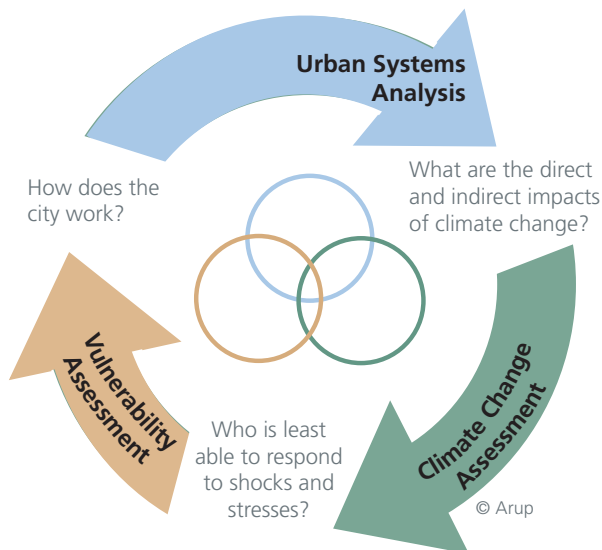
Thailand:

Chiang Rai
Hat Yai

Core Themes of ACCCRN

ACCCRN partners use a few core themes as the starting point for building adaptation and learning frameworks. ACCCRN examines the intersection of climate change, urban systems, and vulnerability to test resilience strategies by considering both *direct* and *indirect* impacts of climate change.

ONE APPROACH TO DEALING WITH THE URBAN CLIMATE CHALLENGE



The questions ACCCRN partners are investigating in each city in order to identify resilience strategies, actions and plans.

DIRECT AND INDIRECT IMPACTS OF CLIMATE CHANGE

The impacts of climate change on urban systems are not always direct and may cause secondary impacts. For instance, a drop in power due to heat waves and increased energy demand for air conditioning could halt sewage and drinking water treatment. Conversely, lack of water, whether due to drought or water lines being destroyed in a flood or storm, could disrupt power delivery because water is necessary for cooling power grid systems. In many developing cities, these types of formal infrastructure and services simply do not exist, particularly in informal settlements. Yet these communities may rely on other core urban systems, such as transportation and communication, in order to acquire basic services, including sanitation and fresh water, indirectly. ■

CLIMATE CHANGE

Part of building urban resilience to climate change is to understand what climate projections and historical information can *and* cannot say about the future, and therefore be able to develop adaptive solutions that do not presume a single climate future. Climate change projections are uncertain for many reasons – not the least of which being that we do not know what kind of energy and lifestyle choices will be made in the future. While climate projections cannot give exact estimates of how much precipitation will fall in one of the ACCCRN cities by 2050, for example, the projections provide very useful information on the changes in trends and ranges of climate conditions. Uncertainty in climate change projections for ACCCRN cities is challenging them to explore innovative actions and strategies that are capable of being resilient against a wide range of climate conditions, rather than relying on traditional approaches to planning and engineering that assume the future climate, including extreme events, are simply predictable reflections of historical trends. ACCCRN works with city partners to identify the broad trends and ranges of climate projections for their regions and to develop resilience strategies around multiple *what-if* climate scenarios that do not depend on precise knowledge of the future.

URBAN SYSTEMS AND VULNERABILITY

A city is comprised of high population densities within defined political and administrative units where the capacity of local ecosystems to provide the basic food and water requirements of the city are exceeded. The urban systems therefore depend on sources of food, energy, and raw materials from elsewhere, accessed through regional, national, and global networks and markets. Cities' socio-economic systems tend to be quite resilient because of the innovative, interlinked, and flexible systems on which they

are founded. Yet cities are intricate systems whose components interact in complex and often unpredictable ways. Urban physical, socio-economic, institutional, and ecological

systems can fail, and when they do, the results can be catastrophic for large populations directly and indirectly affected. The impacts of climate change:

- * Will directly affect ecosystems that produce the food and water on which cities depend;
- * Will have disproportionate impacts on poor and vulnerable urban populations; and
- * May overwhelm the infrastructure that ensures movement of people, goods, and services; provides security and health to city residents, and assures livelihood opportunities and economic benefits to increasing numbers of urban migrants.

RESILIENT CITIES

Given the current hazards cities face and the likely impacts of climate change on climate variability and baseline conditions, what can cities do to be resilient against a variety of shocks and slow-onset changes? Resilient cities create, enable, and sustain the services and institutions required for basic ongoing survival and are characterized by their ability to generate new opportunities for their residents. They avoid relying on solutions that depend on anticipating specific hazards, and instead take a broader, integrated approach. A resilient city is able to withstand a variety of challenges because the following elements are incorporated into urban systems and the ways in which people construct and maintain those systems:

Redundancy: Several urban systems can serve similar functions and provide substitutable services when another system is disrupted. If redundancy is eliminated, urban vulnerability increases. An example of infrastructure redundancy may be the use of multiple energy sources with a variety of pathways distributing power to all parts of the city. Redundancy can also build social capacity. For example, training individuals in dispersed neighborhoods in basic health and emergency response so that when an extreme event occurs, fragmented neighborhoods can provide immediate triage and basic medical services until transportation and communication systems are restored.

Flexibility: Resilient cities have the ability to absorb shocks and slow-onset challenges in ways that avoid catastrophic failure if thresholds are exceeded. In the event that a system or institution fails, it does so with minimal impact to other systems. Flexibility can include such things as a diversified economic base not exclusively dependent upon agriculture or a single industry, or actions like coastal ecosystem restoration to serve as a buffer against flooding, rather than relying on levees.



GEAG, 2009

Urban flooding in Gorakhpur, India

ELEMENTS OF URBAN RESILIENCE



Adapted from the Resilience Alliance.

Capacity to Reorganize: The ability to change and evolve in response to changing conditions includes the ability to reverse processes of degradation. It also means recognizing when it is not possible to return to previous methods, with a focus on the continual effort to find new solutions and strategies to evolving challenges. This can include, for example, the capacity to introduce new structures, organizations, and land use measures in response to increased risk of bush fires around the fringes of cities during hot, dry weather.

Capacity to Learn: The ability to internalize past experience, respond to it, and avoid repeating mistakes ensures that future decisions are made with appropriate caution and forethought. This could include, for example, explicit efforts to document and integrate lessons from previous disaster management efforts into future planning or by monitoring watershed conditions to ensure adequate wetland and floodplain areas are maintained to buffer floods.

The ACCCRN Process

ACCCRN supports urban climate resilience in four different countries, with four different languages and systems of political organization. A common framework across

the program has been adapted and implemented locally to reflect national and city contexts and expertise. While ACCCRN supports leading-edge climate resilience analysis, engaging local experts and key city stakeholders in their own language is a critical part of the process. Throughout the various phases of the program, key city stakeholders network across the participating cities and with national and international climate science, adaptation, and disaster risk reduction experts. There are four phases to the ACCCRN process. (See ACCCRN Process Timeline on page 7)



Challenge to Change, 2009

Focus group from community vulnerability assessment, Can Tho, Vietnam

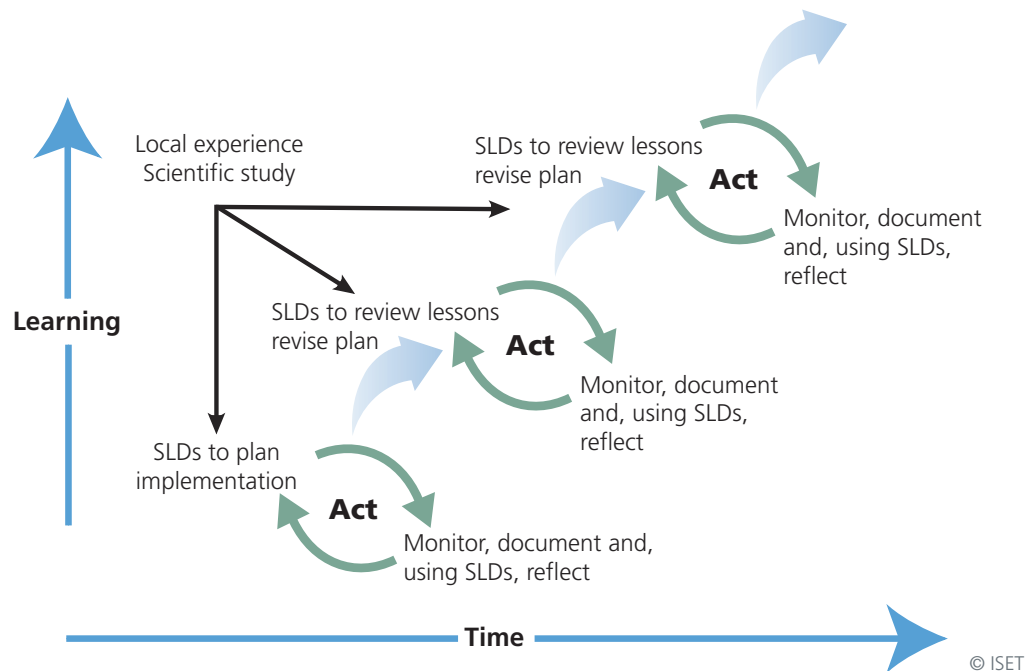
ACCCRN PROCESS TIMELINE

PHASE	TIMELINE	ACTIVITIES
1) City scoping and selection	April 2008 – Late 2009	<p>Identify partner cities that are:</p> <ul style="list-style-type: none"> • Experiencing rapid urbanization • Vulnerable to the impacts of climate change • Have the capacity to engage with ACCCRN <p>Identify key stakeholders and local partners, especially from vulnerable groups</p>
2) City-level engagement and capacity development	2009 – 2010	<p>Shared Learning Dialogues with key stakeholders and vulnerability analyses to:</p> <ul style="list-style-type: none"> • Understand city-level vulnerability and particularly vulnerable groups • Identify potential climate change impacts • Create an urban climate resilience strategy and action plan
3) Implementation of urban resilience projects	2010 – 2012	<p>Work with local and international partners to implement replicable interventions identified in the urban climate change resilience strategy and action plan</p>
4) Replication	Mid 2009 - onwards	<p>The ACCCRN program will scale-up through:</p> <ul style="list-style-type: none"> • Networking and shared learning within and between cities, countries and sectors • Monitoring and evaluation of emerging results to capture lessons • Disseminating learning and adaptation frameworks, methods, and tools • Leveraging additional funding sources for urban resilience efforts

All aspects of the program – from developing tools and methodologies used to assess current and future urban climate vulnerability, to testing and piloting resilience strategies and actions – are iterative. The Shared Learning Dialogue (SLD) process builds partners' capacities to:

- * Deal with the uncertainty of climate projections
- * Understand and work with complex, adaptive urban systems
- * Generate new information and utilize multiple sources of existing information and expertise in new ways
- * Engage vulnerable groups and involve them in resilience planning
- * Cross disciplinary and organizational boundaries and scales of governance
- * Test and adapt tools to local conditions and capacities
- * Develop new planning and learning processes suited to different city contexts and actors
- * Share lessons between cities and beyond

The Shared Learning Dialogue Process



Adapted from Lewin 1946: "Action research and minority problems"

ACCCRN METHODS AND TOOLS

ACCCRN partners are currently engaged in Phase 2, in which the cities are exploring their current and future vulnerabilities, identifying their most vulnerable populations, and beginning to develop an urban resilience strategy and action plan. These processes are iterative. ACCCRN partners use a combination of methods and tools, centered on Shared Learning Dialogues and climate vulnerability analyses that they have adapted to their specific city contexts.

ACCCRN partners are using Shared Learning Dialogues, piloted by ISET, to construct these city-level processes. SLDs are iterative, transparent group discussions with local actors in communities, government agencies, and specific organizations designed to bring together available information on climate change with local knowledge and perceptions. Development of a common understanding of climate change and urban resilience takes time; it requires a process in which insights from multiple sources within communities and across scales and jurisdictional boundaries can be brought together. The SLD process is designed to ensure that vulnerable populations in each city have the opportunity to build their adaptive capacity and participate in the urban climate resilience process. The ultimate outcome of SLD processes is not just shared understanding but includes actions for responding to climate change risks. The SLD process guides all ACCCRN stakeholders in identifying the constraints and opportunities in adapting to climate change, understanding the complex systems within each of the partner cities, and working with the poor and vulnerable populations to build urban resilience. Each ACCCRN city is undertaking climate vulnerability assessments to provide a basis

for better understanding how individuals, communities, and urban systems specific to their city may be affected by future climate impacts – both directly and indirectly. Through the climate vulnerability assessments, the cities are exploring what existing capacities can enhance their ability to adapt and be more resilient to climate change. The assessments result in vital information that feeds into the iterative SLD and resilience planning processes. They help ensure that resilience strategies, actions, and interventions will target the most vulnerable populations, address vulnerabilities of urban sectors and systems, and build on existing capacities. During the assessment phase of the ACCCRN program, there is equal emphasis on identifying local and regional capacities as on vulnerabilities. ACCCRN partners adapt existing tools and methodologies for conducting vulnerability assessments to their specific contexts, but each climate vulnerability assessment entails:

- * An understanding of **projected climate scenarios and potential impacts** and the limitations of the projections
- * Identification of who/what are the **most vulnerable groups, areas, sectors, and urban systems** and how they may be affected
- * Identification of the **range of factors that systematically combine to make them vulnerable**, including both direct (e.g. exposure to hazards) and indirect (e.g. regional or international food security) factors
- * Assessment of **existing capacities to adapt**

NEXT STEPS: PILOT PROJECTS TO IMPLEMENTATION

The ACCCRN cities are using SLDs and climate vulnerability assessments to begin thinking about resilience strategies and action plans. In the short term, cities are conducting in-depth “sector studies” for deeper analysis on priority issues facing the city and testing small pilot activities to explore specific vulnerability needs or small areas in which they can begin making changes and monitoring the outcomes. Armed with knowledge of key vulnerabilities and existing adaptive capacities, and drawing on both international and local experience, the cities are developing climate resilience strategies and action plans that will enable them to better prepare for the challenges of current and future climate variability. This includes a process of identifying, assessing, and prioritizing actions that will effectively build climate resilience of the city’s systems and resilience of its poorest and most vulnerable populations. These resilience strategies and action plans will be integrated with city planning processes, but may also require additional financial and technical support from government departments, donors, private sector, and other sources. Over the next few years, cities will implement and learn from these strategies and interventions as well as monitor how effective these efforts are in strengthening resilience. Through networking and shared learning within and between cities, countries, and sectors, ACCCRN hopes to scale-up and replicate successful strategies both within and beyond the ACCCRN network.

ACCCRN Case Studies

This publication is intended for other cities and decision-makers looking for practical processes and examples of how to build urban climate resilience. Each of the ACCCRN

city and country partners have contributed information to this guidebook documenting the steps they are taking to identify city-specific climate vulnerability, their vulnerable populations, and the points of entry in exploring resilience strategies and action plans. The cities in India and Vietnam have just finished conducting their vulnerability analyses with the help of national partners and outside experts and are analyzing their points of vulnerability. The Indonesian partner cities are currently assessing their vulnerabilities. The cities in Thailand have just joined ACCCRN and are at the beginning stages the program. The case studies present where each city is in the ACCCRN process and how they are evaluating the urban climate resilience challenge. In 2010, ACCCRN cities will focus on resilience planning, actions and strategies, and design interventions to test these activities.

PILOT: MANGROVE PLANTING



Planting mangrove forest in Thi Nai Lagoon, Quy Nhon, Vietnam. Mangrove forests help to reduce disaster risks and pollution, support aquaculture, help develop tourism as a livelihood option, and protect community assets, buildings and infrastructure when floods, storms, or sea level rise occur.



Huynh Xuan Loi, Management Board of Con Chim ecosystem, Binh Dinh Province, Vietnam.



ACCCRN City Cases: Vietnam



Vietnam is the easternmost country on the Indochina Peninsula in Southeast Asia, and has a population of over 86 million. Historically, Vietnam has been an agricultural civilization based on rice cultivation. Since 1986, with the introduction of significant economic reforms, GDP growth has rapidly increased; annual GDP growth was about 7% from 2000 to 2005. Manufacturing, information technology, and high-tech industries form a large and fast-growing part of the national economy. Nonetheless, the economy remains anchored in agriculture and fisheries. Rice and aquatic products are two of Vietnam's largest exports and underpin the economy, culture, and policies of the country.

Climate Governance and Capacity in Vietnam

Vietnam is projected to be one of the top-five countries most affected by climate change, in part because it is a low-elevation, coastal country. In response to this threat, Vietnam has formulated two national level initiatives:

- * The National Target Program to Respond to Climate Change, which calls for each Vietnamese city, province, and national ministry to devise an action plan to respond to climate change, including both mitigation and adaptation.
- * The National Strategy for Natural Disaster Prevention, Response, and Mitigation to 2020, whose aim is minimize loss of life and property, damage to cultural heritage, and environmental degradation through pro-active planning and response to natural disasters.

The Vietnamese people have historically been highly resilient, adapting over the centuries to difficult circumstances. This capacity has been supported by the value placed on strong 'social capital' (supportive social networks) and strong government and mass organizations that are able to reach out to the grassroots level. Recent storm and typhoon responses illustrate the government's increasing capacity to plan for and recover from disasters. Nonetheless, Vietnam's ability to reduce its vulnerability to climate change impacts, including extreme events, is currently limited. Developing climate change resilience requires, in part, development of new ways of thinking about how to address

vulnerability and climate risk. However, in much of Vietnam, centralized, target-driven planning still hinders this development.

The ACCCRN Process in Vietnam

The goal of the ACCCRN project in Vietnam is to develop collaborative action plans for adaptation to climate change to benefit poor and vulnerable residents in three cities: Da Nang, Can Tho, and Quy Nhon. In each city, project leadership rests with the People's Committee, who approve the project and its management structure. A Vice Chairman of the People's Committee leads the Project Steering Committee, which is comprised of relevant technical departments and civil society organizations, with the participation of Challenge to Change (CtC) and ISET. Climate Working Groups in each city provide technical support.

In Vietnam, the political boundaries of cities encompass built-up, high-density areas, suburban areas, and rural areas. Consequently, addressing “urban” climate change in Vietnam includes addressing impacts to rural settings, communities, and peoples.

The most vulnerable populations in the three Vietnamese ACCCRN cities include:

- * Recent migrants who lack residential registration: This group is particularly vulnerable as they live in hazardous locations and are not entitled to compensation if flooded.
- * At-risk communities in coastal or floodplain sites that are resettled to new locations: Often the resettlement process reduces the ability of these populations to earn a livelihood, and new sites may still be vulnerable. The current approach to planning and management of resettlement needs to be reconsidered to ensure that the process does not further impoverish and imperil the most vulnerable groups.
- * Women, children and parents: These groups are especially affected by flood and storm related hazards, including contaminated drinking water. Poor sanitation services and lack of piped water supply contribute to the problems. Longer duration seasonal floods (e.g. in Can Tho) can mean loss of schooling for children trapped at home and loss of income for parents who have to stay with them. Lack of swimming skills is also a significant risk for children in areas with frequent and lengthy flooding.
- * Poor: Those in poverty often have high exposure to climate hazards because they have limited livelihood options. The fisheries sector is particularly vulnerable to hazards. Vulnerability would be reduced through diversification of livelihood options.

NATIONAL ACCCRN PARTNERS IN VIETNAM

Challenge to Change works with communities in Vietnam's ACCCRN cities to conduct community-based climate change vulnerability assessments and develop community-based initiatives to build resilience to climate change. It is a nonprofit organization supporting poor communities in Asia to build more resilient livelihoods and to adapt to the impact of climate change. www.challengetochange.org

National Institute for Science and Technology Policy and Strategy Studies (NISTPASS) is leading national level policy engagement in support of implementing city climate resilience plans in Vietnam, including Quy Nhon, Da Nang, and Can Tho. NISTPASS is a research organization under the Vietnamese Ministry of Science and Technology (MOST) that executes policy-relevant research on issues of organizational and management matters of science and technology. www.nistpass.gov.vn

PROJECT TIMELINE IN VIETNAM

TIMEFRAME	PROCESS	GOALS/OUTCOMES	PARTICIPANTS
March 2008 - July 2008	Vietnamese City Scoping and Selection		
February 2009	1st SLDs (Individual)	Develop understanding of ACCCRN process at local level	National partners, key government, technical experts, and citizen groups
March 2009	1st Methodology Workshop	Review vulnerability assessment methods and climate information; Define goals and tentative timelines	National partners, city representatives from each city, outside technical experts
April 2009 - July 2009	HCVA	Conduct analysis of most vulnerable populations	CtC, city partners, vulnerable communities, local technical experts
June 2009 - August 2009	City-level Vulnerability Assessment	Conduct urban systems and institutional vulnerability analysis	CtC, city partners, vulnerable communities, local technical experts
August 2009	2nd SLD	Develop understanding of results from vulnerability assessments; Begin building resilience	National partners, key government, technical experts, and citizen groups
November 2009 - ongoing	Awareness Raising	Awareness raising of youth and private sector; Training in community-based disaster risk management	
March 2010	Sector Studies	Completion of sector studies designed to gain more in-depth knowledge about specific areas of interest	
April 2010	Implementation Projects	Development and prioritization of implementation project proposals	
June 2010	City Resilience Strategies	Complete versions of city resilience strategies	

Key Challenges and Opportunities

The existing national policies and initiatives around climate change have catalyzed awareness and interest across the country. Consequently, cities and communities have been open to learning about climate change and its potential impacts. Existing mechanisms in place for annual city and disaster planning can be used to address climate change adaptation, and the ACCCRN process in Vietnam to date has produced significant interest and ownership on the part of key city stakeholders. Despite early interest, there remain significant challenges, which include:

- * Limited awareness on the part of local governments and communities regarding climate change and its potential impacts.
- * Weak coordination mechanisms between different local departments and organizations, and between the public and private sector.
- * Lack of information sharing and management across sectors.
- * Lack of tools and methodology to support the decision making and adaptation planning process (e.g. lack of integration of climate change issues into local development plans).

Challenge to Change, 2009



Can Tho, Vietnam.

CAN THO

Can Tho City is the largest city in the Mekong River Delta, encompassing an area of 1,401 km². Located on the southwestern bank of the Hau River, which is the larger branch of the Mekong River, Can Tho is 75 km from the East Sea and 169 km northeast of Ho Chi Minh City. Can Tho is connected to the rest of the country by National Road 1A, Cai Cui Port, and Can Tho Airport. The city has a dense system of rivers and canals serving agriculture, aquaculture, navigation, and water supply for the city and region.

Can Tho is the political, cultural, scientific, and economical center of the Mekong Delta region, with significant, stable infrastructure, including a large freshwater port and two industrial parks. However, 45% of the city inhabitants live in rural areas. In these areas, rice farming and aquaculture form the backbone of the economy. Administratively, Can Tho City constitutes an independent municipality at the same level as provinces of Vietnam.

City Characteristics

Population: 1,159,000

Primary Economic Activity: Aquaculture, agriculture (particularly rice) and Ninh Kieu port

GDP Growth Rate: 13.5% (2001-2005)

Climate: Tropical monsoon climate with two seasons: rainy from May to November and dry from December to April

City Location: Southwestern bank of the Hau River (the larger branch of the Mekong River) within the Mekong River Delta.

ACCCRN City-level Coordinators:

- ▶ Department of Natural Resources and the Environment (DONRE)
- ▶ The Center for Natural Resource and Environment Monitoring (CENREM)

Can Tho has a tropical, monsoon climate with two separate seasons: rainy from May to November and dry from December to April. Average annual rainfall is 1,500 to 1,800 mm per year, 90% of which falls during the monsoon. Average annual temperature is 27°C. Hau River flows are highest between September and October when flow is on the order of 15,000 to 16,000 m³/s; at these levels, bank erosion tends to be high. Dry seasons flow can be 10 times smaller, on the order of 1,600 to 1,700 m³/s.

City Climate Change Vulnerability Context

Projected climate change impacts for Can Tho include sea level rise, increased temperatures year round (particularly in winter and at night) potential increases in monsoon rainfall, and increased drought in summer.

Temperature Rise Coupled with Dry Season Drought

Increased dry season (January to May) temperatures coupled with drought could significantly impact annual crops. Drought currently leads to low discharge from upstream, which in turn exacerbates soil acidity and salinity problems. A combination of increased plant stress and water demand resulting from temperature increases could significantly reduce or eliminate crop yield depending on type and timing.

Sea Level Rise, Rice Farming, and Aquaculture

Without intervention, the city estimates that a 30 cm sea level rise could impact all of the current aquaculture and rice growing areas in the city during peak monsoon season. Options to address this include, for rice, shifting to a 2-crop per year, rather than a 3-crop per year, system, growing flood-tolerant crops, or shifting to seasonal aquaculture. For aquaculture, options include increasing the height of the dykes around aquaculture ponds. Thoughtfully addressing these issues will likely require working with the agricultural extension offices and integrating climate change and sea level rise impacts into the



Can Tho, Vietnam

C. Rumbaitis del Rio, 2008.

city Master Plan and Annual Plans, as well as integrating these plans with the Mekong Delta Plan. However, higher rural-urban migration should also be expected as farming becomes too risky or unprofitable.

Climate Change Impacts to Built-Infrastructure

With the exception of sea level rise, which could lead to inundation of some of the un-diked portions of the city, built-infrastructure vulnerability to climate change is currently assessed as low. However, temperature rise coupled with drought could lead to water supply issues.

Areas Requiring Further Study

Areas that have not yet been addressed in the vulnerability analyses but that have been noted as critical include: salinity intrusion under projected sea level rise; reduction of food security; increasing social problems resulting from livelihood reduction of rural farmers and urban poor and the impacts of migration from rural to urban areas; and increases in vector-borne disease due to weather changes and degraded water quality.

Challenge to Change, 2009



Can Tho, Vietnam

DA NANG

Located on the central coast of Vietnam, and encompassing an area of 1,256 km², Da Nang is the largest city in central Vietnam and one of the country's most important ports. Ringed by mountains on one side and the East Sea on the other, the city is geographically constrained. Da Nang is connected to the rest of the country by National Highways 1 and 14B, Tien Sa Port, Da Nang International Airport, and by the Unification Train System.

Da Nang has a tropical, monsoonal climate driven by the Northeast Monsoon. The monsoon rainfall is at its peak from September to December; Da Nang is driest in March and April. The primary rain-producing systems within the monsoon period are tropical depressions and typhoons. Average annual rainfall is from 2,000 to 2,700 mm per year, 40 to 60% of which falls during the monsoon. Average annual temperature is 25 to 26°C.

Da Nang is impacted by both river and tidal/sea level issues. The Song Han River, which flows through central Da Nang, is unregulated. Peak flows occur during the rainy season, and comprise 70 to 80% of the annual flow. Da Nang is also affected by irregular diurnal tides with amplitudes of 1.2 to 1.5 m. During the rainy season if rains coincide with peak tide, water levels 0.4 to 1.0 m higher than regular maximum sea water level can result.

City Characteristics

Population: 887,100 (2009)

Primary Economic Activity:

Tourism, fishing, light industry, Tien Sa port

GDP Growth Rate: 11.35% (2007)

Climate: Tropical, monsoon climate with two seasons, typhoon and non-typhoon; peak rainfall September - December, associated with typhoons and tropical depressions.

City Location: Coastal city lying on the central-eastern seaboard at the mouth of the Song Han River, ringed by mountains.

ACCCRN City-level

Coordinator:

► Department of Foreign Affairs (DOFA)

City Climate Change Vulnerability Context

The primary climate change hazards for Da Nang are typhoons, typhoon- and rain-induced flooding, drought, sea level rise, and storm surge.

On average, Da Nang is struck by one typhoon a year. Major storms, such as in 2006, can result in significant damage. Typhoon impacts include rain, strong wind, flooding, flash floods, and riverbank and coastal erosion. Heavy, multi-day rainstorms are also problematic. Storms can deposit 500 to 1000 mm or more of rain over a few days, resulting in flash floods, inundation, landslides, and high erosion. In urban areas, large rains often cause inundation, seriously affecting the environment and livelihoods. With climate change, typhoon intensity and frequency and other intense precipitation events are all projected to increase.

During the dry months, Da Nang can experience prolonged drought that significantly impacts agriculture production and city water supply. In recent years, shifts in timing and duration of dry spells have been severe enough that farmers are beginning to shift rice-cropping patterns. Saline intrusion is often observed at the same time as drought — the more severe the drought, the more serious the saline intrusion, especially during the most arid months. Prolonged saline intrusion will seriously affect agricultural cultivation and domestic and industrial supply in some sections of the city.



Challenge to Change, 2009

Shared Learning Dialogue in Da Nang

Tourism

Tourism plays a large and growing role in the economy of Da Nang. Without adequate planning, increases in the intensity and frequency of storms and floods could result in significant losses in this sector.

- * Restaurants, hotels, and resorts have developed primarily in the coastal areas and mountains, the areas most vulnerable to natural disasters.
- * Environmental pollution resulting from indiscriminate discharge of waste, particularly from restaurants along the coastal tourist areas, has been and will continue to be a significant problem until addressed. In the context of climate change, sea level rise, coupled with existing pollution and the current poor drainage system, has the potential to create a significant health hazard.
- * Tourism development does not currently address coral reef conservation. Pollution, compounded by increased temperatures under climate change, could severely impact the reefs, reducing their efficacy for coastal protection.

QUY NHON

Quy Nhon is the capital city of Binh Dinh province located just south of the Ha Thanh River. The city is comprised primarily of low-lying coastal land with mountains running alongside the entire western edge of the city, constraining its expansion. The city experiences considerable diurnal tidal variation. Quy Nhon's climate is tropical, with an average monthly maximum temperature of 32.5°C from March to September. Approximately 80% of annual rainfall is during the months of September to January, associated with the Northeast Monsoon. The primary rain producing systems within this monsoon period are tropical depressions and typhoons.

Given its current status as a Class 2 city in Vietnam, most administrative authority, planning decision-making, and project management rest with Binh Dinh province. However, Quy Nhon is expanding its boundaries within the next 3 to 5 years and will attain Class 1 city status, which will grant the city administrative authority separate from the province. The city will soon have much more ability to actively incorporate climate resilience activities and strategies into planning, development, and urban operations.

City Characteristics

Population Estimates: 264,800 (2006)

Primary Economic Activity: Ocean fishing, aquaculture, agriculture, wharf / industrial activity, service sectors, tourism

GDP Growth Rates: 12% (2006)

Climate: Tropical, monsoonal climate with two seasons, typhoon and non-typhoon; peak rainfall September to December, associated with typhoons and tropical depressions

City Location: Low-lying coastal land, south of the Ha Thanh River, bordered by mountains to the west

ACCCRN City-level

Coordinator:

- DONRE (Department of Natural Resources and the Environment) of Binh Dinh Province

City Climate Change Vulnerability Context

All areas in Quy Nhon city are currently affected by flooding, particularly peninsula and coastal areas and along the banks of Thi Nai lagoon. Flash floods and river flooding, both originating in the mountains on the western side of the city, are frequent during the rainy season. During storm-related flooding, the city often also experiences storm surges and sea flooding along the coastline, leading to inundation of portions of the city from two sides. Sea level rise and a projected increase in the frequency and intensity of storms will exacerbate flooding hazards in the city. Sea level rise will also intensify saline intrusion and erosion issues.

During the dry season, various urban sectors and populations are disproportionately affected by heat waves and drought conditions. Projected



S. Opitz-Stapleton, 2009

Quy Nhon, Vietnam

increases in drought and prolonged high temperatures will impact agriculture, will increase forest fire risk in forested areas, and may impact city water supply.

One or more of the above natural disasters will affect most areas in the city.

The most affected areas include:

- * The Thi Nai lagoon area, which is affected by inundation, drought, saline intrusion, and flood-tide.
- * Coastal wards and communes, which are affected by coastal erosion, saline intrusion, and inundation by flood-tide.
- * Wards and communes, which are affected by forest fire because of long drought and high temperature.

Built-Infrastructure

City planners in Quy Nhon have conducted assessments of areas in the city that may experience deep inundation or that play critical roles in the city's drainage network, delineating these as unfavorable for development. Construction which negatively impacts the size of water bodies or their water storage and control capacity is not allowed, nor is construction within 30 m of the edge of water bodies. In areas where construction is pursued, planned elevations must be higher than the common severe flood levels. Though currently these planning regulations do not address the potential changes to flood frequency or inundation depth under climate change, the province is conducting experimental land-use planning with integration of climate change in two districts.



Quy Nhon, Vietnam

S. Opitz-Stapleton, 2009

Electrical System

Quy Nhon's electricity is currently supplied by the Vihn Son Hydropower Plant. The city's electricity development strategy through 2020 forecasts a demand of 1500 kWh/person-year in the inner-city by year 2020. However, temperature increases, and, in particular an increase in the frequency and duration of hot, sunny weather, would increase electricity demand. This, in turn, would impact the load capacity of lines and substations and require additional supply.

Water Supply

Quy Nhon municipal water supply is obtained from groundwater, with current pumping rates of 58,500 m³/day, with an additional 12,000 m³/day planned. The renewable groundwater yield in Quy

Nhon has been assessed at 51,000 m³/day. Therefore, current underground water exploitation is likely exceeding renewable supply, and demand is anticipated to increase when Quy Nhon becomes a Class 1 city. Declining water tables, coupled with increased drought and sea level rise projected under climate change will increase saline intrusion risk. Plans for a sustainable water supply are needed.



ACCCRN City Cases: India



INDIA All three ACCCRN cities in India are experiencing rapid population growth and industrial development. With increasing demands on resources such as water and energy, expansion of informal settlements is posing enormous challenge to urban planners. Gorakhpur, Surat, and Indore were chosen for the ACCCRN process in India based on their willingness to engage during the scoping process. Each city has a different set of vulnerabilities, governance structures, and climate hazards, bringing diversity and varied experiences to the ACCCRN program.

CLIMATE CHANGE AND DISASTER MANAGEMENT POLICIES:

- National Water Policy
- Disaster Management Act 2005
- Energy Act 2003 and National Electricity Policy 2005
- Energy Conservation Act 2001
- Coastal regulations policies
- Jawaharlal Nehru National Urban Renewal Mission
- Nehru Rozgar Yojana
- National Housing Policy
- National Task Force on Urban Perspectives and Policy (three technical groups: Urban Perspectives and Policy, Urban Infrastructure, and Urban Planning): to feed into National Urban Policy (planned)
- National Action Plan on Climate Change to outline National Missions on key sectors: solar energy, enhanced energy efficiency, sustainable habitat, water, etc.

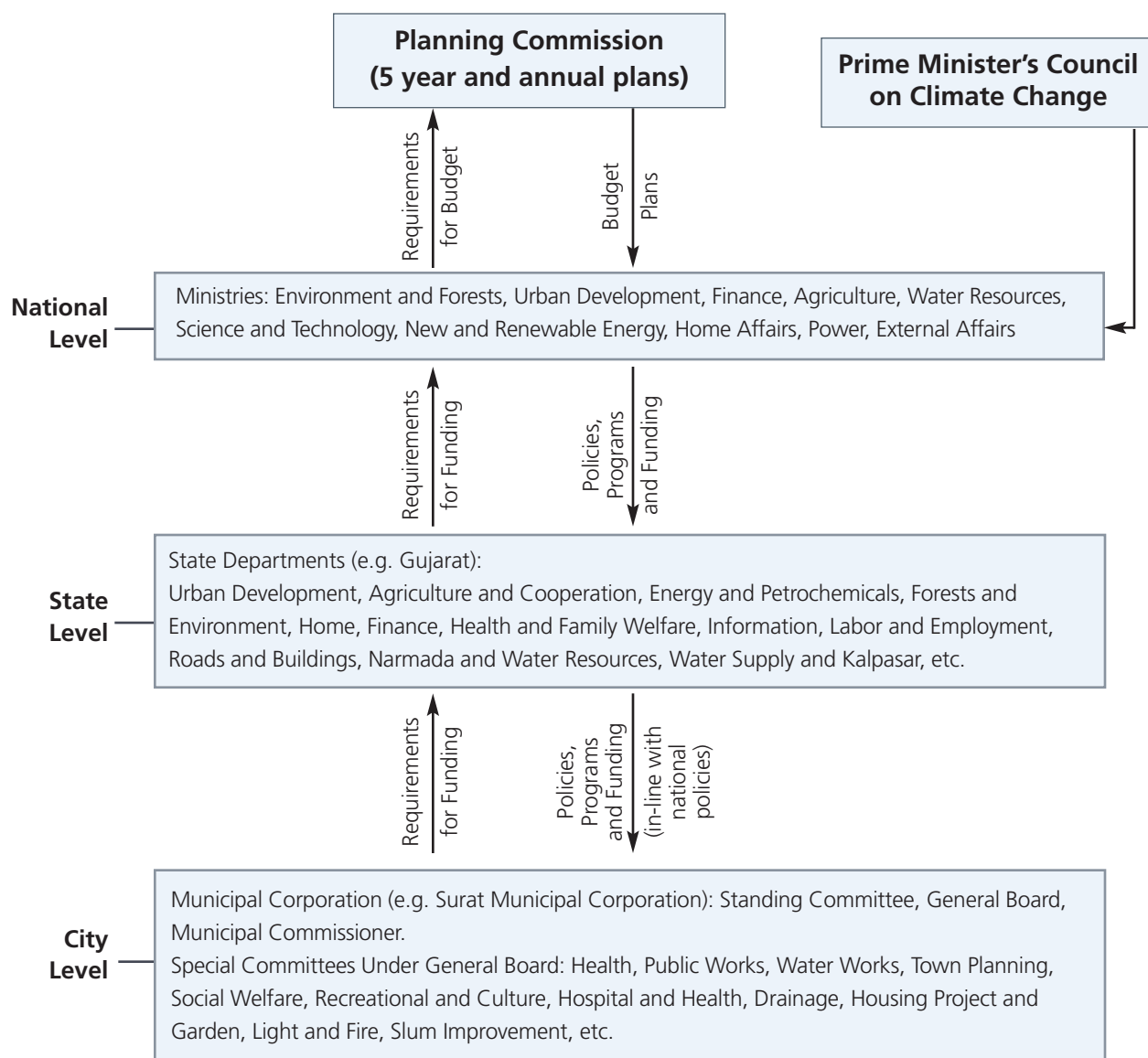
Climate Governance and Policy Landscape

The national government's Ministry of Environment and Forests (MoEF) deals with climate change issues within the country, as well as related international negotiations. In June 2007, a high-level advisory committee called the 'Prime Minister's Council on Climate Change' was established to coordinate national action for assessment, adaptation, and mitigation. The committee's mandate is to develop a coordinated response on climate change at the national level, formulating action plans and monitoring key policy decisions. The Indian government launched the National Action Plan on Climate Change on June 30, 2008. The plan provides a directional shift toward the development of a low-carbon economy through multi-pronged, long-term, and integrated strategies.

ACCCRN Process in India

Each city is collaborating closely with the Indian national partners: TARU, in Indore and Surat, and the Gorakhpur Environmental Action Group (GEAG) in Gorakhpur. The ACCCRN processes in

INDIA'S CLIMATE CHANGE POLICY AND PROCESSES, USING SURAT AS AN EXAMPLE



the three cities have been very different, tailored to the varying physical, socio-economic, and hazard contexts each city faces. The process in each city is described in greater detail within the city-specific sections. Due to the national election in 2009, it was not possible to hold large multi-stakeholder SLDs in each city. Instead, a number of one-on-one consultations and small group meetings were held at the city and state levels. There are plans to partner with key government and non-government agencies at the national level to facilitate linkages of ACCCRN with relevant policies and programs through SLDs.”

The city-level vulnerability assessments in India included community and household questionnaires, an assessment of each city’s aggregated and disaggregated vulnerability



TARU, 2009

Aerial view of Surat, India

capacity index (VCI), and an evaluation of institutional and service delivery mechanisms for basic services such as water supply and sanitation, drainage, and sewerage. In Surat and Indore, GIS-enabled vulnerability analysis was utilized to provide information on the spatial distribution of risks and vulnerability to explore targeted options for adaptation. This approach coupled spatially explicit data with a variety of indirect indicators to better understand local socioeconomic and vulnerability parameters: location (core, periphery, distance from markets/industries etc), road access, building size, and roof types that can be easily discerned from remote imagery/maps.

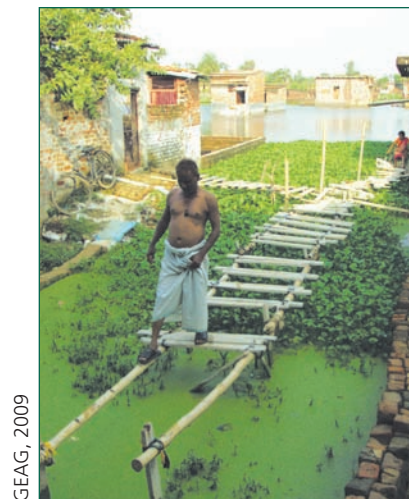
PROJECT TIMELINE: INDIA

TIMEFRAME	PROCESS	GOALS/OUTCOMES	PARTICIPANTS
April 2008 - July 2008	City Scoping	Select city partners; Develop understanding of the climate risks and vulnerability context	TARU, ARUP
December 2008 - April 2009	One-on-one consultations and small group meetings	Identify stakeholders; Develop understanding of city and vulnerability context; Finalize tools for vulnerability surveys; Facilitate formation of City Advisory Committee (CAC)	Municipal Corporation (MC), local NGOs, development authority, private sector, academia, community representatives
April 2009 - July 2009	Vulnerability Assessment	Assess vulnerability of populations, systems, and areas for 50% of sample size	Local NGOs with support from GEAG and TARU
August 2009	Consultations	Conduct mid-term review of vulnerability assessment results	CAC and GEAG/TARU
September 2009 - October 2009	Vulnerability Assessment	Assess vulnerability of populations, systems, and areas for remaining 50% of sample size	Local NGOs and GEAG/TARU
September 2009 - December 2009	Sectoral Studies	Introduce systemic understanding of vulnerability	Individuals, organizations, institutions with sectoral expertise
January 2010 - March 2010	SLD	Develop urban resilience planning and strategy	National, state, and city level stakeholders

Key Opportunities and Challenges

The initial ACCCRN engagement process was constrained by procedural requirements due to the national elections. Additionally, the continuity of leadership has been hard to maintain due to transfer of key government officials:

- * Identifying key actors to anchor the process at city level. This has been problematic in some cities, particularly in Indore.
- * Bringing divergent interest groups to the same city level platform.
- * Lack of adequate and appropriate data/information.
- * Lack of capacity for urban vulnerability surveys.
- * Relating climate change phenomenon to on-the-ground realities.
- * Retaining interest of stakeholders from one consultation to another.



GEAG, 2009

Community adaptation: bamboo bridges in waterlogged area

There are, however, a number of important opportunities that are reflected in the positive early engagement by the mayor of Surat in the first city-partner ACCCRN, as well as the innovative pilot projects being proposed in Surat and other locations.

GORAKHPUR

Gorakhpur is located in the middle of northern India's Gangetic Plain, an almost featureless plain whose primary topographic variation is due to shifting of river channels. The city encompasses an area of 3383 km², 77% of which is agricultural land and 2% of which is forest. Eighty percent of the population lives in rural areas where agriculture is the economic base, with the remaining 20% of the population residing in urban areas. Two rivers flow through Gorakhpur, the Rapti and Rohini, both of which originate in the Himalayas. (For additional information, visit: <http://gorakhpur.nic.in/city1.htm>)

Divided by two rivers and bordered by a lake, Gorakhpur is subject to chronic flooding and soil saturation (also known as waterlogging). Drainage challenges compound existing problems with the sewer system, which is old, in need of renovation, and covers only 22% of the city. Frequent clogging of the system, where it exists, results in raw sewage discharge to local water bodies and ultimately, the Rapti River. Together the waterlogging, poor drainage, and sewer issues result in a high incidence of vector borne diseases and related health problems and contamination of groundwater. Climate change and its consequences — for example, increased incidence and severity of flood, drought, and hot or cold waves — will exacerbate these problems.

City Characteristics

Population: Estimated at 0.6 million

Growth Rate: 23.61% (1991-2001)

Poor Population: 33% slum population

Primary Economic Activity: Agriculture

Climate: Dominated by the monsoon with an average annual rainfall of ~100 mm

City Context: Inland, bounded on the northeast by the Himalayas, by a river to the west, and a lake to the south with an elevation of ~ 80 m above mean sea level

NATIONAL PARTNERS

TARU is a leading South Asian research consulting firm specializing in development planning and implementation of multi-sector public policy and development initiatives focused on building safe and sustainable cities. TARU is leading the vulnerability analysis work in the city of Indore and Surat. www.taru.org.

Gorakhpur Environmental Action Group (GEAG) is leading the vulnerability analysis work in the city of Gorakhpur. GEAG is a leading resource institution on sustainable agriculture, participatory approaches methodologies, and gender in north India. www.geagindia.org. ■

KEY CITY PARTNERS

Gorakhpur Environmental Action Group (GEAG)
Gorakhpur Municipal Corporation (GMC)
Gorakhpur Development Authority (GDA)
Gorakhpur Industrial Development Authority (GIDA)
Public Works Department
Town and Country Planning Department
Gorakhpur Jalkal
Uttar Pradesh Jal Nigam
Mayor, Gorakhpur City and Corporators from different wards
NGOs (Indo Nepal Friendship Society, Sikh Association, Purvanchal Gramin Vikas Shansthan, Daud Memorial)
Pharmaceutical Association
Academic institutions
D.D.U Gorakhpur University,
BRD Medical College, Gorakhpur
Mahatma Gandhi P.G. College, Gorakhpur

The ACCCRN Process in Gorakhpur

The ACCCRN process in Gorakhpur is led by Gorakhpur Environmental Action Group (GEAG), an NGO based in the city. During Phase 1 of the ACCCRN process, GEAG engaged key city stakeholders including Gorakhpur Municipal Corporation (GMC) through individual meetings and focus group discussions. The objective of these meetings and discussions was to identify primary climate risks and hazards in the city and to prioritize them in terms of severity, coverage, and population affected. The major issues arising during these discussions were degradation of water bodies, increased severity and duration of waterlogging, groundwater contamination, solid waste disposal, and health.

Even before the constitution of a formal project advisory committee in Gorakhpur, key actors were identified and engaged with the project process. A series of meetings, as part of the shared learning dialogue process, were conducted to assess the current levels of climate vulnerability, both spatially and socio-economically, within Gorakhpur. The meetings were also used to identify the causal loops for various risks and the responsible parties for planning, implementation, and maintenance of the urban services.

The meetings were followed by a vulnerability assessment, where the approach was to first categorize the city into specific and homogenous socio-economic units, primarily based upon housing types identified through GIS-based maps, as high, middle, and low income groups. Information and ideas discussed during the shared learning process fed into and informed the vulnerability analysis. This method of creating typologies in the city helped in distinguishing the different factors contributing to vulnerability for each group. The socio-economic classification maps were then superimposed on risk maps and the resulting information was used to determine the spatial distribution of differential patterns of vulnerability. Instead of a detailed and intensive questionnaire survey, GEAG used a number of other methods, supplemented with a small sample of household level surveys. The final assessment, now underway, will present the vulnerabilities in both quantitative and qualitative aspects, including seasonality of waterlogging and health impacts, measuring satisfaction with urban services, and trend analysis.

City Climate Change Vulnerability Context

A 2009 report by ISET and ISET-Nepal indicates that the projected climate impacts for Gorakhpur include increased precipitation during the monsoon season, resulting in increased intensity and frequency of floods, particularly small scale flooding. Climate change will also exacerbate waterlogging and result in increased mean temperatures. Combined, these conditions will worsen the already frequent incidences of water borne diseases that are common after floods, such as jaundice, malaria, and Japanese encephalitis (JE).

Hazard: Flooding

The Rapti River, with a catchment of over 23,000 km², flows along the western edge of the city. Devastating floods are common at least once in a decade. During high rainfall and a concurrent rise in the water level of the river, drainage pumping becomes inadequate and parts of the city remain under knee deep water for a considerable period of time.

Direct and Indirect Impacts

Waterlogging

Most parts of the city are below the riverbed level, resulting in water saturation of lands and periodic flooding. The bulk of the waterlogging, affecting about 40% of the city, is to the south and west. However, the drainage system for the entire city is challenged. Waterlogging has been getting worse in recent years, in part due to changes in rainfall, but also to increased sedimentation of local bodies of water. Rainfall has not increased overall, but the average intensity of rainfall in the summer months has increased. Waterlogging issues now impact some areas of the city for 3 to 4 months of the year.

Sewage

Only a small part of the city (22%) is served by the underground municipal sewerage system. The total drain length is approximately 55 km and the sewerage disposal is mainly through open drains and sewer lines. The low lying areas, low slope gradient, open drains, and lack of proper solid waste management systems increase the city's vulnerability. The sewer lines are also linked to the freshwater bodies existing in the city, causing eutrophication and degradation of the water reservoirs. Malaria and dysentery have historically been a problem; recent years have seen a rise in diarrhoeal diseases and the introduction of Japanese encephalitis.

Solid Waste

The solid waste generation in the city amounts to approximately 300 tons per day and will increase as population grows and access to consumer goods increases. There is no organized solid waste management in place and the accumulation and disposal of solid



GEAG, 2009

Flooding in Gorakhpur, India

waste is a major concern. The increasing usage of polythene (plastic) shopping bags and other items, as well as the disposal of waste into open drains, has increased drainage congestion, exacerbating the incidence of waterlogging. The city lacks an incinerator to dispose of bio-medical wastes.

Drinking Water

The ground water table is high in the region and as a result, the majority of the population depends upon personal electrified borewell pumps and hand pumps for drinking water. The municipal water supply only covers 65% of the city area. One of the secondary impacts of the waterlogging and poor drainage is groundwater contamination. With easy accessibility to groundwater and low levels of literacy and awareness, people tend to depend on shallow hand pumps that provide contaminated water. Water extracted from these shallow hand pumps generates health problems and induces bacteriological and gastro-intestinal disorders in a large percentage of the population.

Energy Issues

The state of Uttar Pradesh, and particularly the eastern districts, is electricity deficient, with supply significantly below the demand level. Gorakhpur city has almost 10 to 12 hours of power outages per day. As a result, diesel generators are common alternative sources of energy. During monsoon months, approximately 50 electricity-powered pumps are deployed to drain the waterlogged areas, which further contributes to an energy drain in the city. The duration of waterlogging in various areas amounts to 2 to 3 days a month.

Key Opportunities and Challenges

The residents of Gorakhpur have a high degree of awareness of the environmental issues facing the city, the result of a large, citywide campaign to conserve lakes and other bodies of water. Although this public awareness can be positively leveraged for the ACCCRN project, currently city officials are insufficiently sensitized to the scope of issues needed to effectively address climate adaption and may lack the political will to implement the necessary plans and efforts. Other challenges include:

- * Inter-departmental convergence: All departments work in specific sectors with very little scope for coordination across departments.
- * Energy: Gorakhpur faces chronic energy shortages. Developing urban resilience provides an opportunity to address this issue.
- * Mainstreaming climate change in the Master Plan: A Master Plan was prepared prior to climate change becoming an important concern for the city, and the political-economic conditions make integrating climate-related initiatives a challenge.
- * Sensitizing policy planners: The success of an urban resilience program will depend heavily on the impact it has on shaping appropriate policies and programs that are climate-resilient.
- * Lack of data: One of the core needs for proper resilience planning is adequate, accurate, and reliable data.

SURAT

The city of Surat is located along the tidally influenced Tapi River, in western India. Surat is a major trade center and port of the State of Gujarat. 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 and under its jurisdiction. Surat is a pivotal center on the Ahmedabad-Mumbai regional corridor and also has direct linkages with the industrial urban centers of Vadodara, Ankleshwar, and Vapi. Flooding, coastal storms and cyclones, sea level rise, and associated inundation are the major climate threats to Surat. The city has experienced major flooding every few years in the last two decades, with some events covering as much as 75% of the city. Approximately 90% of Surat's geographical area is affected by some type of climate hazard. Climate change will exacerbate these hazards. It is the low-lying settlements and those close to the river, often home to the poorest and vulnerable populations, that have received the brunt of the inundations.



TARU, 2009

Jalaram Nagar, Surat

The ACCCRN Process in Surat

The Surat Municipal Corporation (SMC) and the Southern Gujarat Chamber of Commerce and Industries (SGCCI) are the key city partners in the ACCCRN process. The SMC is primarily responsible for overall governance and delivery of the basic services, as well as disaster management. In Surat, a City Advisory Committee (CAC), with SMC and SGCCI as pivotal organizations, was formed and is taking on the leadership role in the

City Characteristics

Population: 3.8 million

Growth Rate: 62% decadal growth

Poor Population: 133,000 households

Primary Economic Activity: Diamonds, textiles, petrochemicals (Hazira)

Climate: Dominated by the monsoon and milder than other parts of India due to its proximity to the coast, with April and May being the hottest months.

City Layout: The Tapi river divides Surat into northern and southern portions, with the Gulf of Khambhat to the west.

KEY CITY PARTNERS

Surat Municipal Corporation
Gujarat State Disaster Management Authority
The Southern Gujarat Chamber of Commerce and Industry
Industrial Representatives-Hazira Industrial Area
Veer Narmad South Gujarat University
Centre for Social Studies
Sarvajanic College of Engineering and Technology
TIFAC-CORE in Environmental Engineering
Urban and Social Health Advocacy and Alliance (NIWCD, Surat)
Government Medical College, Surat
Surat Citizens Council Trust
Surat NGOs and concerned individuals

ACCCRN process. The process has been most effective with high levels of participation by key and diverse actors. The ACCCRN SLD process to date has involved one-to-one meetings, small group meetings, and CAC meetings. The sectoral studies have been undertaken by sub-groups, with each sub-group led by a CAC member.

City Climate Change Vulnerability Context

Projected climate change impacts for Surat include the possibility of increased precipitation, sea level rise, and increased temperatures. 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, are also impacted, the nature and extent depending on intensity of risk. The majority of slums are located in low-lying areas facing high flood risks due to Tapi and Khadi river floods and sea level rise.

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 Preparedness Measures

The SMC has some measures for flood preparedness including a disaster management plan (DMP) and ongoing maintenance of drainage (i.e. dredging and cleaning of creeks, clearing of storm drains, temporary trenching before each monsoon). The DMP was initially supported by the United Nations Development Program (UNDP), but it requires revision to incorporate climate risks in sectors such as water, energy, health, housing and infrastructure. Local coping strategies include the construction of houses on raised plinths or stilts, and provision of lofts in low-income group houses. SMC's long-term plans include raising and straightening of the Tapi River embankment, increasing the coverage of storm drainage systems, and relocating of informal housing to less flood-prone areas.

Key Opportunities and Challenges

The ACCCRN project in Surat benefits from a high level of enthusiasm and participation from key and diverse interest groups. Projected sea level rise and increased inundation pose serious threats to industries, which are a significant economic driver, and has catalyzed a high degree of participation. Additionally, the effective leadership of SMC and SGCCI, as well as cost sharing by the key agencies involved in assessments, has propelled the process forward and is likely to maintain momentum into future project phases. Previous signature disaster events, the 1994 floods followed by plague and the 2006 floods, in particular, triggered cooperative action by diverse city actors. One of the principal challenges remains communicating linkages of the climate change phenomenon to local risks and hazards.

INDORE

Indore is the most populated city in the central Indian state of Madhya Pradesh, located near the drainage divide between the Chambal and Narmada Rivers. Indore is primarily a trading center, serving as a hub for trade and commerce to all of western India.

Though the city is prosperous, 50% of the population has access to only informal housing in the form of squatter settlements. According to a 2006 study by the National Institute of Public Finance and Policy, more than 15% of the population lives in unauthorized communities with inadequate facilities. The city also suffers from the lack of physical infrastructure. Only 54% of the city has access to water, with an average supply of 80 liters per capita per day. The local water table is 150 m below the surface, and the wells that have not gone dry are generally low yield. Drainage for the city is inadequate and in many cases non-existent. (For more information, visit: http://jnurm.nic.in/nurmudweb/cdp_apprep_pdf/CDP_Appraisals_Nipfp/CDP-Indore.pdf.)

All of these factors, including the city's location on the banks of two rivers, high density in core areas, and high slum population, make the city vulnerable to climate change and its consequences. Water scarcity is a primary threat with water demand far outstripping supply and leaving a large section of the population without a formal water supply system. Demand for clean water is increasing rapidly with population growth and extensive industrial development. Although the problem of water scarcity is not new, increasing incidence and severity of drought and floods are adding new demands and increasing stress on the city's population.

City Characteristics

Population: 2.4 million

Growth Rate: 4% annually

Poor Population: 260,000 reside in slums

Primary Economic Activity:

Textile units, food processing, pharmaceuticals, iron, steel, leather, industrial chemicals, and automobile components.

Climate: Temperatures range seasonally from 40°C to 2°C with precipitation dominated by the monsoon from June to September

City Context: Located in the Khan River basin on flat terrain at an altitude of approximately 550 m above mean sea level

The ACCCRN Process in Indore

In Indore, there is strong interest from the Indore Municipal Corporation (IMC) and Indore Development Authority (IDA) in the ACCCRN process. These organizations hosted the initial ACCCRN meetings, and they subsequently have become key members of the City Advisory Committee.

CITY PARTNERS

Indore Municipal Corporation (IMC)
Indore Development Authority (IDA)
Madhya Pradesh Urban Services for Poor
School of Energy and Environment Studies
Institute of Engineering Science,
Indore Public School
Mehta & Mehta Associates
Sandeep Shikha & Associates
Industry leaders
Concerned citizens and civil society
organizations

The ACCCRN process in Indore has had three rounds of consultations at different levels, consisting of one-on-one discussions and small group meetings with various city actors. Information exchange focused on city problems and issues, the project objectives, and activities. The main risks and concerns identified during these consultations were water scarcity, sanitation, and solid waste management in the city. The second round of consultations/interactions were conducted with specific stakeholder groups – city NGOs, communities (slums and residents welfare associations), industry groups, institutions, and urban local bodies (Indore Municipal Corporation and Indore Development Authority). This round of consultations used the preliminary city specific findings and focused on learning more about the causes, context, and spatial and social dimensions of these issues. The third round of consultations was conducted with a smaller group of key members of the City Advisory Committee. These discussions focused on specific steps and action items related to vulnerability studies in the city. The main outputs from the third round were identification of sectoral studies to be undertaken in the cities and the formation of sub-groups for various sectors/themes.



TARU, 2009

Stakeholder consultation, Indore

City Climate Change Vulnerability Context

Projected climate change impacts for Indore include increases in precipitation on the order of 200 to 400 mm/year with increased variability of timing and intensity, and increases in summer temperatures by about 1.5°C to 2.0°C. The impacts of these changes will fall most heavily on the slum population.

Water Scarcity/Droughts

Water for Indore is being pumped from a distant source while the groundwater level in the city is decreasing rapidly. Large surface reservoirs remain empty most of the year. Two rivers, the Saraswati and Khan, which used to be city lifelines and were almost perennial, remain dry for most of the year. Water scarcity will be exacerbated by projected increases in precipitation variability. The core urban systems impacted will include water supply and sanitation. Industries will also be exposed to risks due to water scarcity and drought.

Flooding

Indore has experienced flood events due to sudden and heavy downpour more frequently in the recent years (2005, 2007, and 2009). Flood risk is exacerbated by the almost complete absence of storm water drains and poor solid waste disposal system. Flooding impacts water supply and sanitation, as well as housing, industry, transportation, and communication sectors.

Health

Indore has witnessed increased incidence of vector borne diseases, e.g. chickengunia, malaria, and dengue, particularly after flooding events. The projected increase in variability in precipitation and temperature will exacerbate the health risks.

Energy

Owing to distant water sources being tapped for municipal supply coupled with increasing number of deep bore wells requiring enormous energy for lift and conveyance, the city's energy demand has increased significantly in recent years. With projected increase in temperatures, the demand for cooling and refrigeration will pose additional challenges to energy security. Risks in the energy sector will also impact tertiary systems (industry) and core urban systems (water supply).



TARU, 2009

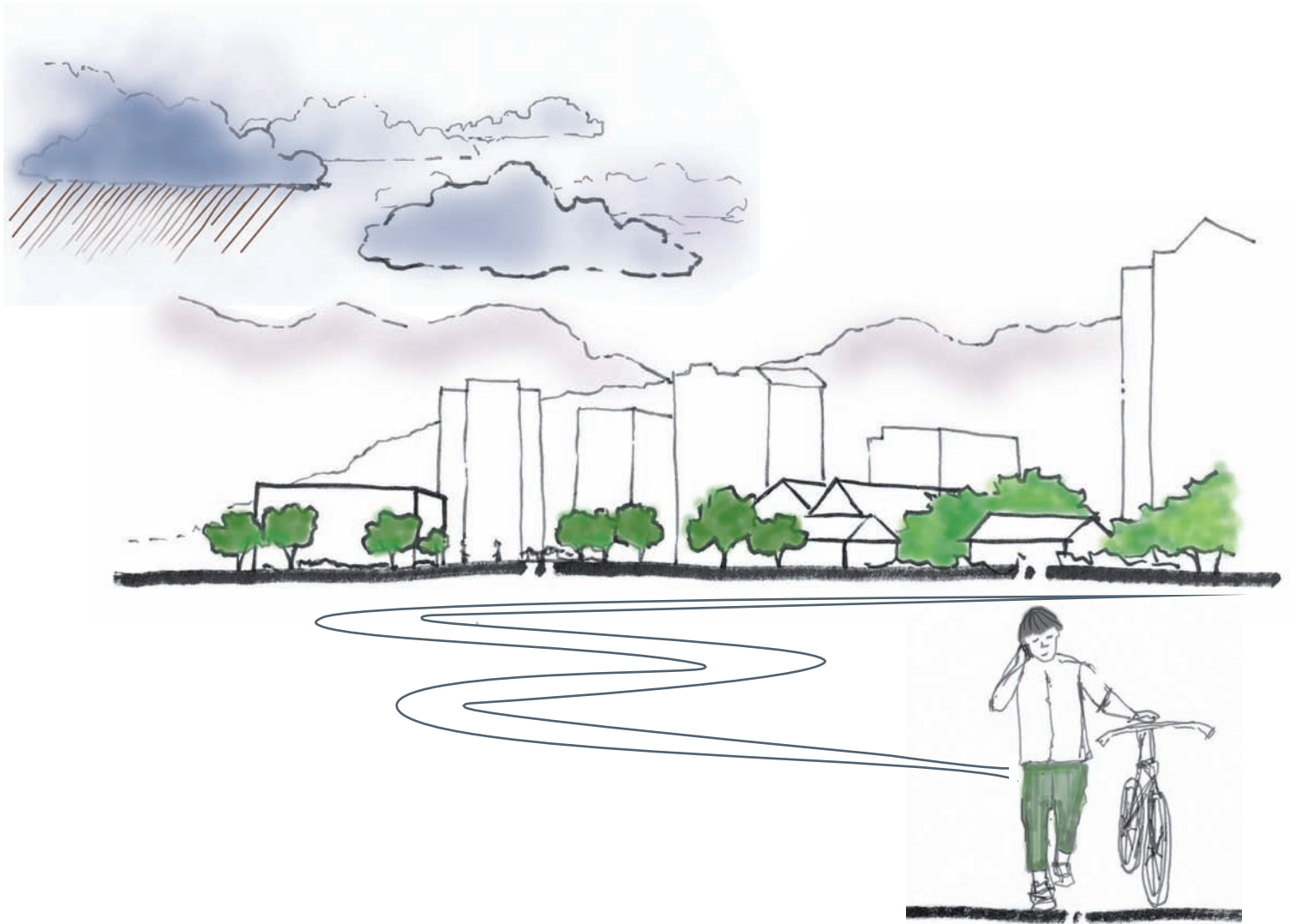
Women lining up to purchase water, Indore

Key Opportunity and Challenges

With the conclusion of the national elections, the ACCCRN process in Indore can now begin to engage a broader range of community members through larger, structured workshops and meetings. Furthermore, the head of Indore Municipal Corporation (highest urban body in a city) was transferred and the process of influencing city stakeholders to engage in the ACCCRN process has had to be restarted. Indore's divergent and conflicting interest groups pose challenges to effective multi-stakeholder deliberations and adds additional complexity in the capacity building process. Other challenges include:

- * Communicating linkages between climate change consequences and local risks such as water scarcity. It is difficult to relate the global climate change phenomenon with specific consequences on the ground.
- * Lack of adequate and appropriate data/information.
- * Lack of capacity for urban vulnerability surveys. Most of the local organizations are not familiar with climate change issues. Hence, it requires orientation and building capacity, which takes time, for conducting citywide vulnerability surveys.

While the ACCCRN project is largely a capacity building initiative with minimal funding for direct implementation, there are large ongoing donor aided projects such as ADB, DfID and WaterAid aimed at improving delivery of urban services to poor, which have a strong interest from the city stakeholders. There is a need to develop synergies with these large projects to gain interest from city officials and stakeholders.



ACCCRN City Cases: Indonesia



NATIONAL PARTNERS

Mercy Corps implements programs in Indonesia that strive to address the root causes of poverty, thereby improving the quality of life for disaster- and conflict-affected, urban, and coastal communities. The Urban Program currently works in areas of disaster risk reduction, pro-poor provision of water supply, sanitation, flood risk reduction, solid waste management, sustainable energy, small business development, urban value chain development, and health and nutrition. www.mercycorps.org

Urban and Regional Development Institute (URDI) was established in 1995 an independent not-for-profit organization aimed at promoting sustainable urban and regional development in Indonesia. URDI has worked with many local governments across the country, providing assistance and policy advocacy, as well as community level assistance and empowerment programs. www.urdi.org ■

INDONESIA Climate change is compounding a range of urban environmental and social pressures in Indonesia to pose a serious threat to the country's socio-economic development and environment. Indonesia's urban growth is one of the fastest in the world, with a rate of 3.3% per year as compared to the countrywide growth rate of 1.1% per year. Currently, no less than 114 million people live in urban areas, making up approximately 50% of its total population.

Indonesia is already experiencing prolonged droughts, increases in temperature, and increased frequency of extreme weather events and heavy rainfall, all of which are expected to intensify with climate change. As an archipelago, the country is exceptionally vulnerable to sea level rise and the inundation of coastal areas. Rapid urbanization presents an additional challenge for cities seeking to adopt climate change resilience strategies, as increasing migration places stress on existing, inadequate urban service provision.

Climate Governance and Policy Landscape

The President of Indonesia recently established a National Climate Change Council responsible for national coordination and international cooperation on mitigation and adaptation. A National Action Plan on Mitigation and Adaptation to Climate Change (RAN-MAPI) aims to chart out short, medium, and long-term actions to strengthen resilience. Under the leadership of the National

Development Planning Board, BAPPENAS, the Indonesian government is preparing a Road Map to prioritize climate change issues in national development planning. The Road Map will feed into the National Medium-Term Development Plan (RPJMN) for 2010 to 2030, with an emphasis on forestry, energy, industry, transport, agriculture,

coastal areas, water, waste, and health sectors. In order to facilitate effective resource allocation, BAPPENAS and the Ministry of Finance recently established the Indonesian Climate Change Trust Fund (ICCTF) to both coordinate funding and to catalyze investment for adaptation and mitigation activities across the country.

Given the vulnerability of Indonesia's urban areas—particularly, but not exclusively, in the country's coastal cities—and the importance of urban systems in the country's development, there is increasing focus on low-carbon growth and adaptation in cities. Such efforts are relatively new, and lessons from the experience of ACCCRN cities may help inform the development of national adaptation strategies for strengthening urban resilience.

The ACCCRN Process in Indonesia

The lead ACCCRN partners in Indonesia are Mercy Corps, which oversees project management and coordination, and the Urban and Regional Development Institute (URDI), which provides national policy and city stakeholder mapping and financial opportunity analysis. Following a 3-month city scoping process, Mercy Corps and URDI are partnering with Bandar Lampung (Province of Lampung in Sumatra) and Semarang (Province of Central Java). The scoping phase generated considerable enthusiasm from a number of cities and provinces interested in pursuing local resilience planning processes. A third city, Blitar (Province of East Java), will participate in some of the ACCCRN events to learn from the process and replicate aspects of it in their own planning efforts.

During the scoping process, city stakeholder engagement and mobilization processes helped to assemble formal city networks that are now leading the ACCCRN initiatives. The networks consist of government departments, NGOs working on urban poverty and environment, climate and urban planning researchers, and representatives of the private sector.

Both of the cities held their first SLDs in August 2009. These dialogues presented opportunities for many diverse actors and organizations to add their voices to the process, providing a strong, comprehensive basis for the vulnerability and impact assessments. Another key partner, the Center for Climate Risk and Opportunity Management

KEY NATIONAL STAKEHOLDERS

- BAPPENAS (National Development Planning Board)
- DNPI (National Council on Climate Change)
- Ministry of Environment
- Ministry of Finance
- Meteorology, Climatology, and Geophysics Agency (BMKG)
- Other national ministries, e.g. Ministry of Public Works, Ministry of Health



© Bunga Siraat for Mercy Corps, 2007

Coping with floods in Kapuk District, Jakarta City

PROJECT TIMELINE: INDONESIA

TIMEFRAME	PROCESS	GOALS/OUTCOMES	PARTICIPANTS
May 2009 - July 2009	City Scoping	Establish criteria; Develop city profiles and short list; Conduct city visits; Engage city-level interest	National partners, cities, national government, international agencies
July 2009	City Network Mobilization Workshops	Engage cities; Facilitate formation of city networks; Build capacity for first SLD	City government, civil society, communities, other relevant stakeholders
August 2009	1st SLD	Build consensus on climate change issues; Provide basis through discussions for vulnerability assessments	National and local climate and adaption experts, senior local government officials, NGOs, university staff, private sector, Mercy Corps, URDI, ISET
September 2009 - January 2010	Impact and Vulnerability Assessments	Assess vulnerable populations, areas and systems to current and future climate risks	Center for Climate Risk and Opportunity Management (CCROM), city networks, Mercy Corps, URDI
November 2009	Pilot Project Selection	Pilot resilience activities in city	City networks, Mercy Corps, ISET, Rockefeller Foundation
January 2010	2nd SLD	Discuss results of vulnerability assessments, formulate sector studies	City network, Mercy Corps, URDI, CCROM, ISET, resource persons
February 2010 - onwards	Pilot Projects, Sector Studies, Resilience Planning, Economic Opportunities, Analysis, Proposal Development		City network, national and international partners

(CCROM), based at the Bogor Agricultural University (IPB), is leading the vulnerability assessments, together with city partners, Mercy Corps and URDI. The results of these studies will inform further SLDs, sector studies, and city resilience planning in 2010.

In-country Lead Partners:

- ▶ Mercy Corps
- ▶ The Urban Resource Development Institute (URDI)

Key Opportunities and Challenges in Indonesia

Although the ACCCRN process is currently focused primarily on the two partner cities, many of the concerns flagged in Semarang and Bandar Lampung reflect challenges faced by urban areas in Indonesia more generally. SLDs showed that both cities are confronting existing environment and development issues, such as poverty, water scarcity, land-use change, and natural hazards like flooding. Upcoming vulnerability assessments will reveal the ways in

which climate change compounds current problems and raises new and unexpected challenges.

Along with identifying vulnerabilities present in their cities, stakeholders have begun to highlight important opportunities to build capacity and increase resilience. They have emphasized the need to:

- * Integrate climate change resilience into development policy and planning at all levels.
- * Strengthen institutional arrangements to translate policy into action.
- * Coordinate planning within cities and across levels of government, particularly across municipal boundaries.
- * Facilitate knowledge transfer and dissemination of information on climate change resilience.
- * Build inclusive partnerships and dialogue among national and city government to support climate change resilience.
- * Access resources such as finance, technology, technical expertise, and information.



Penjaringan District, Jakarta City, Indonesia

Among the key steps needed to realize these goals is strengthening the capacity of multiple city stakeholders to understand and use climate information in the development of informed and coordinated strategies and actions for enhancing urban resilience. ACCCRN in Indonesia has made significant strides within a very limited timeframe. However, the process is still in initial stages, and with multi-dimensional goals, diverse stakeholders, and complex urban contexts, it will require an iterative approach, time, and flexibility.

SEMARANG

The city of Semarang is the capital of the Province of Central Java in Indonesia. A major port city, Semarang's northern boundary is coastal and composed of lowlands, turning into upland slopes in the south leading to the Ungaran Mountain. Urbanized areas constitute only one-third of Semarang municipality's total area, with the remainder comprised of a range of other land-uses, including agricultural, conservation, production forests, and coastal fishponds. The city plays an important role in regional development, serving both as a transit point between Indonesia's two main urban centers, Jakarta and Surabaya, and as a connector between three development corridors in Central Java.

In Semarang, a city network of urban stakeholders is in the process of formally establishing itself and will take on the leadership role for

City Characteristics

Population: 1,455,000

Annual Growth Rate: 1.41%

Poor Population: 80,000

Primary Economic Activity:

Restaurant and hotel sectors together make up 30.38% of the economic activities, with processing industries accounting for 27.37%.

Economic Growth Rate: 4.6%, from 2001-2006.

Climate: Tropical, with a rainy season from December to May.

the ACCCRN process. The network includes government departments, NGO actors, climate science and urban planning researchers, and members of the private sector.

Semarang itself is under the authority of the Semarang municipality, which is headed by a mayor.

KEY ACCCRN CITY STAKEHOLDERS IN SEMARANG

- BAPPEDA (City Development Planning Board)
- City Environmental Board
- Other city government agencies
- Diponegoro University
- Bintari (NGO)
- LEPASS (NGO)

Semarang is already facing significant environmental and climate pressures, including storms, coastal erosion, and drought, with resulting problems of flooding, coastal inundation, and depleted water supplies. Land subsidence and inadequate drainage exacerbate these impacts by disrupting the local economy, endangering livelihoods, and increasing health problems. A number of existing city programs and local initiatives are aiming to address these issues through disaster mitigation planning, mangrove reforestation,

coastal infrastructure, drainage improvement, greening, and tree planting, among others. Although these initiatives illustrate strong awareness of environmental challenges and suggest the political will to meet them, the city also recognizes that they currently lack an integrated adaptive strategy sufficient to manage the likely increased magnitude, intensity, and frequency of climate events and uncertainties. City stakeholders have identified limitations in managing the scale of hazards and lack of coordination across sectors. The mayor and city network hope that ACCCRN can help inform city adaptation planning to target needs of the poor and most vulnerable people in the city.

The ACCCRN Process in Semarang

In August 2009, Semarang's city stakeholders completed a rigorous 3-month ACCCRN city selection process. As a result of the process, a formal city network was formed, which is now awaiting ratification by Semarang's mayor. The main initial challenge of the ACCCRN process in Semarang has been building understanding among city stakeholders about climate change impacts. In later phases, Mercy Corps, URDI, and the Semarang city network will look towards integrating climate change frameworks into government development plans and programs.

The ACCCRN process is only in initial stages in Semarang, and its first SLD was held in August 2009. Local stakeholders and national resource managers shared knowledge about existing and potential future climate impacts in Semarang. The city network, with the support of Mercy Corps, URDI, ISET and CCROM, subsequently engaged in a series of constructive discussions about existing vulnerabilities, recent climate events, and city and local strategies to address them. Understanding the current vulnerabilities and adaptation strategies of Semarang provides a strong initial basis to inform future climate vulnerabilities, as many current problems are likely to become exacerbated by climate trends. The city's vulnerability assessments, now underway, seek to explore new and/or intensifying vulnerabilities, assess which populations and urban systems may be most vulnerable to future climate variation, and identify existing adaptation capacities.

City Vulnerability Context

Recent climate observations indicate that the dry season in Semarang is becoming longer, with more intense rainfall events occurring during the rainy season. This changing rainfall pattern contributes to existing problems with flooding and drought. Flooding in Semarang may originate upstream from heavy rainfall or along the coast from tidal flooding. Currently almost all of Semarang's districts experience severe disruption of transport systems, economies, and livelihoods from flooding. Fisheries and residences on the coast are particularly at risk from sea-level rise, coastal erosion and land subsidence (currently at rates of 9 cm/year). There is concern that this might stimulate migration from coastal areas to other parts of the city, creating additional social and demographic pressures.

CURRENT VULNERABILITIES AS IDENTIFIED AT SEMARANG'S FIRST SLD

Climate Hazard	Primary, secondary, and tertiary systems affected	Most vulnerable groups	Key issues that worsen impacts
Tidal Flooding	<ul style="list-style-type: none"> • Fisheries and fishery port • Small industries • Transportation • Housing • Tourism • Agriculture • Public service • Unemployment • City revenue • Sanitation • Economic loss 	<ul style="list-style-type: none"> • Slum settlements • People dependent on fisheries • Drivers • Women • Entrepreneurs • Farmers 	<ul style="list-style-type: none"> • Poor waste management • Inadequate drainage • Unemployment • Insecure tenure • Destructive fishing practices • Salinization • Lack of clean water supply • Lack of early warning system
Coastal Erosion	<ul style="list-style-type: none"> • Fisheries • Energy deliver infrastructure (electricity tower) • Tourism • Ecosystems (ie. mangroves) • Coastal residences • Tourism • Migration from coastal areas • Economic loss 	<ul style="list-style-type: none"> • Fishermen and others dependent on fisheries • People dependent on tourism 	
Drought	<ul style="list-style-type: none"> • Agriculture • Health • Industry • Forestry • Housing • Economic loss 	<ul style="list-style-type: none"> • Poor • Entrepreneurs • Farmers 	
Landslides	<ul style="list-style-type: none"> • Housing • Transportation 	<ul style="list-style-type: none"> • Poor 	

The city also experiences severe water scarcity related to drought, urban development of catchment areas, over-extraction of groundwater, and inadequate water utility infrastructure to meet increasing demand. Longer dry seasons and droughts have led recently to failed harvests and death of vegetation. In addition, over-extraction of groundwater contributes to saline intrusion, and overflow of seawater onto shores.

Other major concerns in Semarang include the inadequacy of sanitation and solid waste disposal; the pollution of the Tapak River and drinking wells from liquid industrial waste; difficulty meeting energy demands due to the city's rapid development; river erosion; and, concerns that heavy rain will trigger landslides. Slum settlements in Semarang lacking basic services and infrastructure are among the most vulnerable groups to these hazards and secondary and impacts. They are particularly susceptible to water-related health challenges and threats to livelihoods. Due to Semarang's role as a major port, there is concern that impacts may reverberate far beyond the city's boundaries.



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Inadequate waste management is a serious challenge in both Bandar Lampung and Semarang, with solid waste blocking drainage systems and exacerbating flood and health hazards.

Key Opportunities and Challenges

City stakeholders have expressed the need to augment existing city efforts to manage these issues and to better mainstream climate change into city planning efforts. ACCCRN will help facilitate city actors to develop strategies and actions that will strengthen urban resilience in the short and medium-term and that will target those most vulnerable and poor populations.



Kangkung District, Bandar Lampung

BANDAR LAMPUNG

Bandar Lampung is the capital city of Lampung Province and is the major trade point linking the islands of Java and Sumatra. It is a coastal city with a diverse landscape, made up of plains, hills, and mountains that reach up to 700 m above sea level. A mayor, who had jurisdiction over a number of technical boards, municipal divisions, agencies, and districts, governs Bandar Lampung municipality. In Bandar Lampung, ACCCRN is represented by a city network of stakeholders, which includes NGOs, researchers, private sector representatives, and government agencies.

The ACCCRN Process in Bandar Lampung

Bandar Lampung became an ACCCRN partner city following a 3-month city scoping process involving five Indonesian cities. A city network of stakeholders forms the leadership of Bandar Lampung's ACCCRN process, with strong support from the city mayor.

The city network, with technical support from national and international partners, held its first SLD in August 2009. The group's initial discussions addressed the most vulnerable sectors, populations, and districts, and the existing coping methods, resources, and means of integrating climate change considerations into the planning processes. The SLD also yielded a series of preliminary ideas for

City Characteristics

Population: 812,000

Annual Growth Rate: 1.55%

Poor Population: 60,000

Primary Economic Activity:

Important sectors are financial services, rental and service companies, industries, trade, hotels, and restaurant sectors. The main industries are food and tobacco.

Economic Growth Rate: Regional growth of 6.45% from 2004-2008

Climate: Hot and humid equatorial tropical climate with a rainy season between November and May and a dry season from June to October.

KEY CITY PARTNERS

- BAPPEDA (City Development Planning Board)
- Public Works Agency
- Public Health Agency
- Spatial Planning Agency
- University of Lampung
- Mitra Bentala (NGO)
- Walhi Lampung (NGO)

promoting resilience in Bandar Lampung, including greater law enforcement, capacity building, environmental education, use of local wisdom in community-level early warning systems, protection of catchment areas, and the pursuit of alternative funding sources. These initial discussions have informed the ongoing vulnerability assessments which will be finalized in early 2010.

City Vulnerability Context**CURRENT VULNERABILITIES AS IDENTIFIED AT BANDAR LAMPUNG'S FIRST SLD**

Climate Hazard	Primary, secondary, and tertiary systems affected	Most vulnerable populations	Key issues that exacerbate impacts
Floods	<ul style="list-style-type: none"> • Fisheries and coastal livelihoods • Housing • Soil fertility • Water- and vector-borne diseases • Agriculture • Infrastructure (transportation, communication) • Small industries 	<ul style="list-style-type: none"> • Poor, particularly in slum areas • Children • Elderly • Traders • Fishermen • Drivers 	<ul style="list-style-type: none"> • Lack of information from the local government • Poverty • Insufficient drainage and waste management • Lack of disaster mitigation infrastructure • Limited funds and human resources • Insecure land tenure, particularly of poor • Lack of coordination between city stakeholders • Lack of public participation in disaster management planning • Increasing pressure on groundwater • Land-use changes
Storms	<ul style="list-style-type: none"> • Housing • Public facilities • Infrastructure • Economic loss 	<ul style="list-style-type: none"> • Children • Elderly • Disabled • Women • Poor 	
Landslides	<ul style="list-style-type: none"> • Infrastructure • Economic loss • Transportation 	<ul style="list-style-type: none"> • Children • Elderly • Disabled • Women • Traders 	
Droughts	<ul style="list-style-type: none"> • Clean water supply • Agriculture • Salinization • Hydroelectric output • Energy shortages 	<ul style="list-style-type: none"> • Farmers • Entrepreneurs • Poor 	
Coastal Erosion	<ul style="list-style-type: none"> • Fisheries • Tourism • Migration 	<ul style="list-style-type: none"> • Fishermen and people dependent on fisheries • People dependent on tourism 	

A number of Bandar Lampung's current challenges and vulnerabilities are similar to those experienced by Semarang. Changing rainfall patterns have recently led to longer dry seasons, drought, and water shortage, coupled with extreme rainfall events during the rainy season. Droughts have adversely affected water availability, rice production, and hydroelectricity. Only 32% of city residents are currently able to access water from the public water supplier, with the remaining 68% depending on declining ground water sources from deep household or community wells or on private water tankers. Moreover, Bandar Lampung is already experiencing extreme energy shortages due to inadequate power supply from rainfall-sensitive hydroelectric sources.

© Awanda, Mercy Corps Indonesia, 2009



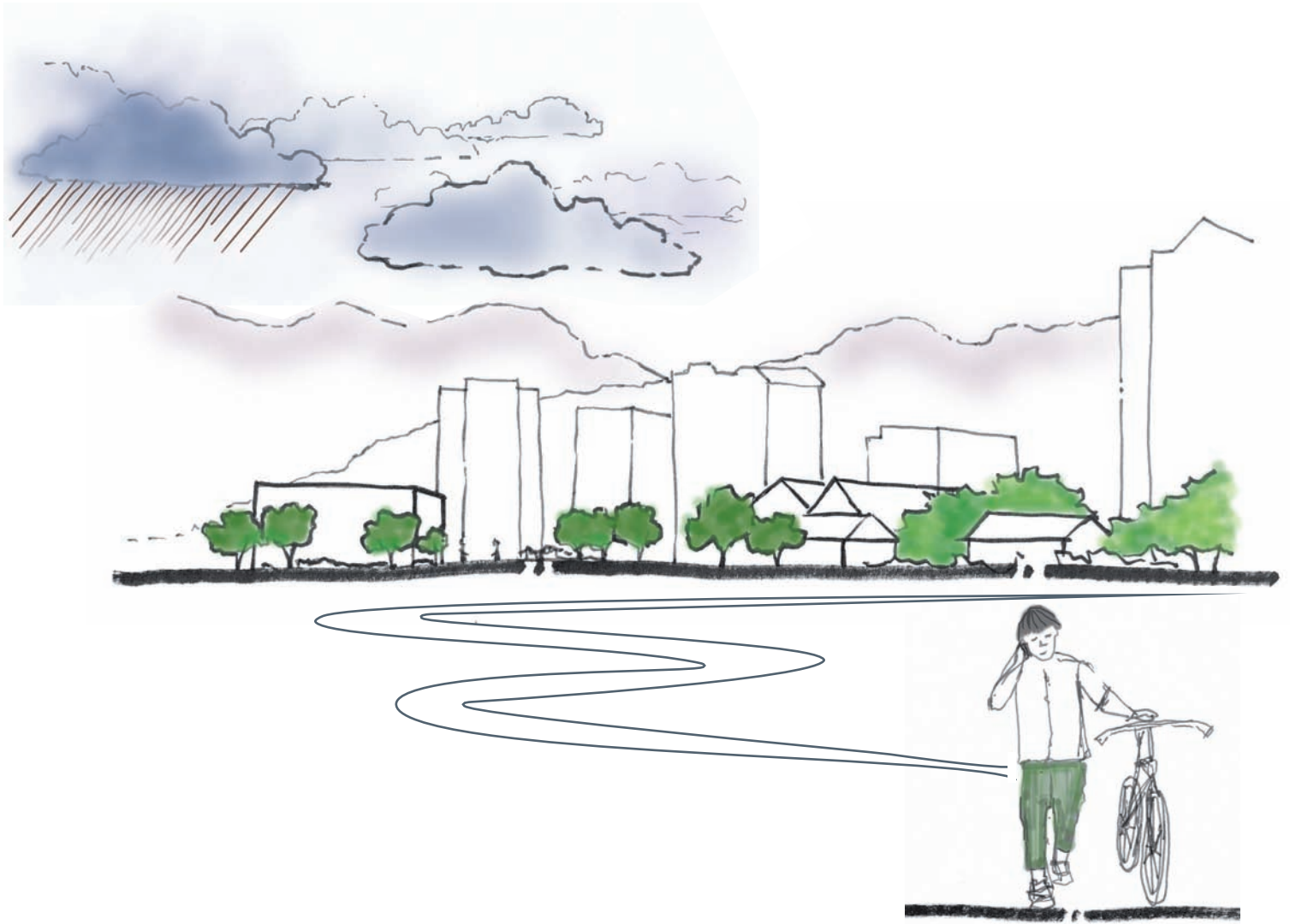
Penjaringan District, Bandar Lampung

A substantial portion of Bandar Lampung's area is prone to flooding, a problem linked to urban development, deforestation and mangrove destruction, and inadequate drainage systems. The amount of waste produced in Bandar Lampung far exceeds its daily landfill capacity, with the remaining waste either being burnt or buried by residents, thus blocking drainage and contributing to flood hazard. During floods, untreated runoff flows into and pollutes Lampung Bay. Vector-borne diseases such as dengue, that proliferate with stagnant pools of water, as well as gastrointestinal diseases, emerged as particular concerns for city stakeholders in the SLD. Coastal erosion and sea-water intrusion threatens both the eastern and western coasts of the city, leading to problems of salinization and thereby threatening water supply sources for consumption, agriculture, and industry.

Poverty has been identified as an important factor rendering impacts more serious, as poor city residents often have less access to city services (water, sanitation, health); live in slum or squatter settlements in hazardous areas; have minimal economic resources to manage losses; and, receive less climate or disaster information from the government. Many of Bandar Lampung's poor depend on fisheries for their livelihoods. Other vulnerable groups include urban or peri-urban farmers facing soil salinization and drought and workers in industries based on vulnerable resources (i.e. fish processing and coffee production).

Key Opportunitites and Challenges

In Bandar Lampung, NGOs and other actors are addressing some of these challenges through watershed management initiatives that enhance clean water supply, coastal zone management to strengthen coastal protection, stronger land use planning and zoning, and improvements to drainage infrastructure. The city is also trying to learn from previous experiences in disaster management to inform future planning efforts. However, stakeholders recognize that these efforts are not sufficient to address both current and future climate impacts, particularly among the poor and most vulnerable groups. ACC-CRN will help the city network to better understand how climate change may exacerbate existing challenges, render new vulnerabilities, and develop strategies and actions that will best strengthen resilience to current and future climate impacts.



ACCCRN City Cases: Thailand



THAILAND The ACCCRN process is gathering momentum in its newest partner country, Thailand. Thai national partners, the Thai Environmental Institute (TEI) and the Asian Disaster Preparedness Center (ADPC), have recently completed their city scoping phase, selecting Chiang Rai and Hat Yai as ACCCRN member cities. Three other cities, Udon Thani, Samut Sakorn, and Phuket will act as observers to replicate the resilience building process in their own local contexts.



City of Samut Sakorn

TEI Team, 2009

Thailand is composed of four regions: a mountainous north, a central plain, the northeast, and the south. Due to its large variation in altitude, a wide range of crops are cultivated, from tropical to temperate agriculture. Thirty-three percent of Thailand's population of nearly 66 million currently reside in urban areas, with an annual urbanization growth rate of 1.7%.

Climate Governance and Policy Landscape

The government of Thailand has initiated a National Strategy on Climate Change, which will guide national adaptation and mitigation planning until 2012. Spanning both mitigation and adaptation, the strategy is divided into six sub-strategies:

- * Capacity building for adaptation and vulnerability reduction
- * Support for greenhouse gas emission reduction and carbon sink development
- * Support for research and development
- * Efforts to raise awareness and promote public participation
- * Capacity building and coordination of relevant personnel and institutions
- * Support for international cooperation on sustainable development

The ACCCRN Process in Thailand

ACCCRN's two lead in-country partners bring a range of expertise and experience to the process. TEI has taken the lead role in engaging with local governments and assessing their levels of readiness for an urban-resilience initiative. ADPC provided support and expertise on technical and physical assessments of disasters and climate related issues during Phase 1.

Chiang Rai and Hat Yai were chosen as ACCCRN city partners following a city scoping process that was conducted over several months. In selecting the Thai partner cities, the national partners considered three main criteria: city competency and capacity to engage in the resilience project; city governance and political stability; and climate risks and trends.

PROJECT TIMELINE IN THAILAND

TIMEFRAME	PROCESS	GOALS/OUTCOMES	PARTICIPANTS
May 2009 - October 2009	City Scoping	Identify and engage stakeholders; Assess levels of readiness; Conduct physical assessments of disasters and climate related issues	TEI, ADPC, city stakeholders, national, and international partners
December 2009- January 2010	City Stakeholder Engagement	Further engage city and national partners; Facilitate formation of City Networks; Develop understanding of climate risks and resilience; Build capacity for SLD	TEI, ADPC, city stakeholders, national partners
January 2010	SLD 1	Develop consensus on current climate risks; Identify preliminary vulnerable groups and areas	City network, TEI, ISET
January 2010 - March 2010	Climate and Vulnerability Assessments	Document city-level climate change impact projections, vulnerable groups, systems, and areas; Generate potential resilience ideas	City network, technical partners
March 2010	SLD 2	Communicate results of vulnerability assessments to city network and working groups; Identify sector studies; Generate ideas and guidelines for pilot projects	City network, TEI, other relevant partners
March 2010 - May 2010	Sector Studies Implementation	Map linkages across sectors; Conduct in-depth analysis of specific climate impacts	City network, city working groups, TEI, technical partners, other relevant stakeholders and partners
March 2010 - April 2010	Pilot Project Design, Development, and Selection	Pilot project design, development, selection	

The ACCCRN process in Thailand will benefit from the experiences and resources of the more advanced ACCCRN processes in Vietnam, India, and Indonesia. Moving into

Phase 2, the main goal of ACCCRN in Thailand is to engage multiple community-based organizations and vulnerable stakeholder groups, as well as local government, national partners, and internal climate, urban adaptation, and disaster risk reduction experts. During Phase 2, the ACCCRN Thai partners will identify and assess city-level current and future climate risks and vulnerabilities in Hat Yai and Chiang Rai; identify and develop pilot projects and city-level climate resilience strategies; and, engage and collaborate with other ACCCRN partner cities and national agencies to highlight urban resilience strategies and actions.

The city scoping process revealed that the five short-listed cities (Chiang Rai, Hat Yai, Udon Thani, Samut Sakorn, and Phuket) share many similar challenges, for instance: environmental and social issues such as flooding, water shortage, poor waste management, pollution, and problematic land-use, with information gaps on poverty, poor communities, illegal immigrants, past disasters, and city-level climate profiles. However, there are also many significant differences between the five short-listed cities. This was particularly significant with regard to the awareness, preparedness, and capacity of city governments and stakeholders. At the end of the scoping process, Chiang Rai and Hat Yai were engaged as ACCCRN partners, with the other three cities expressing interest in ACCCRN and continuing to act as observers.

NATIONAL ACCCRN PARTNERS IN THAILAND

Thailand Environment

Institute (TEI) is an NGO focusing on environmental issues and the conservation of natural resources in Thailand and at wider regional and global levels.
www.tei.or.th

Asian Disaster Preparedness

Center (ADPC) is a non-profit organization supporting the advancement of safer communities and sustainable development through implementing programs and projects that reduce the impact of disasters upon countries and communities in Asia and the Pacific.
www.adpc.net ■

City Vulnerability Context

Climate change is likely to exacerbate many existing vulnerabilities in Thailand while creating new pressures on groups and systems. A limited number of climate models have suggested that in Thailand, dry seasons may become drier, with the amount of rainfall during the monsoon increasing. Likewise, the hot season may become longer and the cool season shorter. For more information, see IPCC 2007: <http://www.ipcc.ch/>. Sea level rise is also a concern for Thailand, with a significant proportion of the country living in low elevation coastal zones.

SLDs and vulnerability assessments have not yet been undertaken in Chiang Rai or Hat Yai. Once initiated, these will provide valuable insights into current and future vulnerabilities.

CHIANG RAI

A small town located in north Thailand in the Lower Mekong Delta, Chiang Rai is considered the gateway to Myanmar, Lao PDR, China, and Vietnam. The city has strong rural linkages and enjoys a relatively high profile for its size due to its tourism economy. As the trade corridors to Burma and China expand, Chiang Rai will experience rapid growth. The city suffers from serious water pollution, increasing air pollution, and has experienced severe landslides.



TEI Team, 2009

Chiang Rai's government has expressed enthusiasm for the ACCCRN process and is actively engaged with the project.

City Characteristics

Population: 36,400

Primary Economic Activity: Tourism

Climate: Tropical hot and humid climate all year round, with the hot season lasting from March to May and rainy season lasting from June to October.

HAT YAI

Hat Yai is an urbanized, major center in the south of Thailand. It has a strong tourism economy for mostly sub-regional tourists, a diverse ethnic composition, and serves as the country's gateway to Singapore and Malaysia.

The surrounding suburbs have a relatively high number of vulnerable, poor people. Water pollution affects the Utaphao River, which runs with limited drainage through the city in concrete channels. Floods have been the city's most significant hazard in recent years, with experiences of severe flooding in 2000. While much has already been done to address this hazard, the experience may provide a good platform of engaged institutions for broadening the work on climate resilience.



TEI Team, 2009

City Characteristics

Population: 157,700

Primary Economic Activity: Commerce and tourism

Climate: Hot and humid tropical climate year round, receiving much of its annual rainfall during the rainy season lasting approximately from August to December.

NATIONAL PARTNERS MAY INCLUDE:

- National Municipal League of Thailand (NMLT)
- Department of Public Works and Town and Country Planning (DPWTCP)
- Thailand Greenhouse Gas Management Organisation (TGO)
- Department of Disaster Preparedness and Mitigation (DDPM)
- Department of Local Administration (DLA)
- Office of Natural Resources and Environmental Policy and Planning (ONEP)
- The Southeast Asia director of Systems for Analysis Research and Training.



City of Udon Thani, Thailand

TEI Team, 2009

POTENTIAL CITY STAKEHOLDERS IN EACH CITY:

- City mayor or deputy mayor
- City clerk or deputy
- Chair of the Provincial Municipal League
- Provincial Department of Disaster Prevention and Mitigation
- Community leaders in affected areas
- Representatives of community-based networks in affected areas
- Existing local government networks
- Provincial Administrative Organisations (PAO)
- Tambon Administrative Organisations (TAO)
- University, technical college, research institutions
- Business / private sector
- Civil society organizations

Key Lessons and Challenges

Though still in its early stages, the ACCCRN process in Thailand has already identified a series of common challenges facing Thai cities. These insights suggest that cities will require:

- * **Greater local government transparency** to provide a clear vision, mission, strategic planning, and action plans.
- * **Technology and knowledge sharing and transfer** on climate-related issues. This will require participatory management on the part of local governments and community stakeholders, especially the most poor and vulnerable groups, to strengthen relationships and linkages between municipalities, NGOs, academics, and with other cities.
- * **Transboundary agreements and collaboration**, especially to address issues that originate outside of the municipality or even outside the country (i.e. smoke and air pollution from open burning of crops and forests in Lao PDR or countries sharing the Mekong River watershed).

ACCCRN: National and International Partners

LEAD ORGANIZATION:

The Rockefeller Foundation: Founded in 1913, the Rockefeller Foundation supports work around the world to expand opportunities for poor or vulnerable people and to help ensure that globalization's benefits are more widely shared. The Foundation's efforts are overseen by an independent board of trustees and managed by its president through a staff drawn from scholarly, scientific, and professional disciplines. An Advisory Group of international experts provides guidance on what project success might look like and how best to achieve it. <http://www.rockfound.org>

PARTNER ORGANIZATIONS:

Institute for Social Environmental Transition (ISET): ISET is the lead facilitation partner working with country level partners to support project cities through a Shared Learning Dialogue (SLD) process that will identify resilience-building activities; facilitate the development of replicable processes, methodologies, and strategies for adapting to climate change in urban settings; and support cities in developing proposals and disseminating results from their analyses in ways that inform climate adaptation at local, national, and global levels. <http://www.i-s-e-t.org>

Arup International Development: Arup is a global consultancy with over 10,000 consultants including planners, scientists, economists, and engineers working in 37 countries. Arup is providing technical assistance to project partners. <http://www.arup.com/international-development>

ProVention Consortium: ProVention provides leadership in identifying, connecting, and aligning with potential funding sources at country, regional, and global levels; leveraging opportunities for donor funding of ACCCRN projects; and building linkages between ACCCRN, practitioners, and donors on resilience priorities to support the objectives of the initiative. <http://www.proventionconsortium.org>

ICLEI, Local Governments for Sustainability:

ICLEI is an international association of more than 1000 local, national, and regional government organizations that have made a commitment to sustainable development. They provide leadership in bringing city-level work to the national and global levels by helping cities build a business case for the local governments and are assisting the country partners in Indonesia in city-level engagement processes.

<http://www.iclei.org>

COUNTRY PARTNERS:

Country partners coordinate with national level entities and assist in the identification of local partners and coordinate city-level processes. For more information about how these partners are participating in the ACCCRN project, please visit the relevant country chapters.

Vietnam

Challenge to Change

<http://www.challengetochange.org>

National Institute for Science and Technology Policy and Strategy Studies (NISTPASS)

<http://www.nistpass.gov.vn>

India

TARU Leading Edge

<http://www.taru.org>

Gorakhpur Environmental Action Group (GEAG)

<http://www.geagindia.org>

Indonesia

Mercy Corps

<http://www.mercycorps.org>

Urban and Regional Development Institute (URDI)

<http://www.urdi.org>

Thailand

Thailand Environment Institute (TEI)

<http://www.tei.or.th>

Asian Disaster Preparedness Center (ADPC)

<http://www.adpc.net>





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