



## CHAPTER 1

# INTRODUCTION

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|--|----|
| CATALYZING URBAN CLIMATE RESILIENCE          | 8  |
| COUNTRY BY COUNTRY                           | 12 |
| THE PARTNERS                                 | 18 |
| URBAN CLIMATE RESILIENCE                     | 20 |
| STRUCTURE OF THIS PUBLICATION                | 23 |
| URBAN CLIMATE RESILIENCE PLANNING IN CONTEXT | 26 |
| NEXT STEPS                                   | 27 |

## CATALYZING URBAN CLIMATE RESILIENCE

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In a dynamic and rapidly changing world, we can be so preoccupied with immediate problems that we lose sight of the long-term trends. This publication introduces new concepts and practices to address the intersection of two critical and widely recognized trends that will have a major influence on the daily lives of most of the planet's population in this century: climate change and urbanization. The evolution of human societies in the remainder of this century is fraught with uncertainty — technology changes, economic transformations, political shifts, civil insurrection, or military interventions may dramatically affect the course of events in any given location. But at a global level, there are few trends in which we have as much confidence as climate change and urbanization. It is somewhat surprising then that practitioners have devoted so little effort to understanding the interaction of these two issues. This publication reports results from the second phase of the Asian Cities Climate Change Resilience Network (ACCCRN), an innovative initiative supported by the Rockefeller Foundation to assess and respond to the interaction between urbanization and climate change in a selection of medium-sized cities in India, Indonesia, Thailand, and Vietnam.

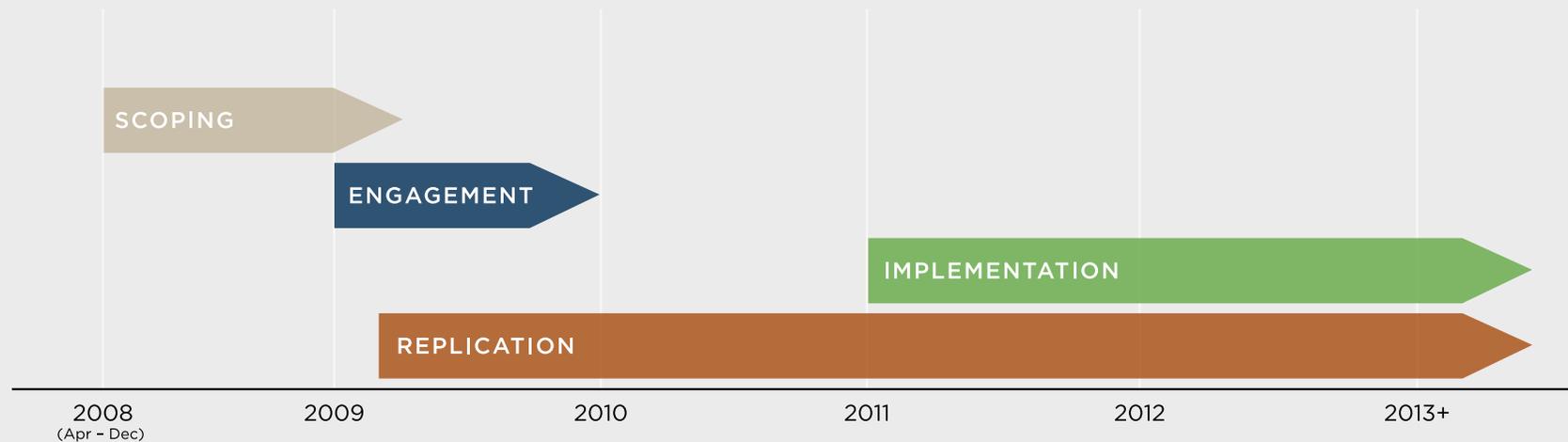
The evidence for climate change is now overwhelming. Repeated international scientific assessments have demonstrated that human activities at a global scale, including fossil fuel use, deforestation, and

agricultural practices, are changing the composition of the planet's atmosphere and modifying climate on an unprecedented scale (IPCC 2007b). Despite acknowledgement of the situation, there has been only very limited response by national governments under the rubric of the United Nations Framework Convention on Climate Change (UNFCCC). Meaningful action on emissions reduction has generally eluded international agreement, and global emissions continue to rise

*Half of the world's total urban population is now in Asia, 75% of urban residents live in developing countries, and the most rapidly urbanizing countries in the world are also its poorest.*

rapidly (International Energy Agency 2011). This means that we can expect unavoidable changes in climate through the remainder of this century. It also points to the need for strategic plans and long-lived infrastructure investments in order to reduce anticipated impacts and take advantage of emerging opportunities.

FIGURE 1.1 | Program Timing



Meanwhile, for the first time in human history, most of us live in cities. Slightly over half of the world's population is now urban, and that proportion is expected to steadily grow, reaching 60 percent in less than 20 years. Half of the world's total urban population is now in Asia, 75 percent of urban residents live in developing countries, and the most rapidly urbanizing countries in the world are also its poorest (UN-HABITAT 2011). While urban life may offer city residents employment, education, and services, many urban residents in developing countries still live in poverty. Many rapidly growing cities cannot meet existing demands for basic urban services and infrastructure. For example, across all cities in Indonesia, only 37 percent of households have connections to treated water supply, and in India, only 54 percent of urban households have access to sanitation infrastructure. The proportions are much lower in Africa (2008 data: UN-HABITAT 2011). In the coming decades, climate change may further strain the lives of poor urban residents and the already frayed infrastructure and administrative systems of these

cities (Satterthwaite, Huq et al. 2007; Wilbanks, Lankao et al. 2007; Balk, Montgomery et al. 2009; UN-HABITAT 2011).

But urbanization also offers opportunity. Rural-urban migration, whether seasonal, temporary, or permanent, reflects the perception of greater opportunity and choice in the more productive and diverse environment of a city. For poor rural residents, especially those in vulnerable coastal areas or in marginally productive rain-fed agricultural zones, climate change will pose a challenge to their survival. Higher variability in rainfall, longer droughts, more severe floods, more intense storms and high tidal surges will all make rural livelihoods even riskier. Rather than face impoverishment in the countryside, many are likely to respond to greater climate risks by moving to the city.

In the face of climate change then, are cities in the developing world likely to become refuges of opportunity, security, and productivity, where migrants can avoid the worst impacts of climate change and seek



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diverse alternative livelihoods with access to improved infrastructure and services? Or are cities likely to become centers of concentrated vulnerability to increasingly unpredictable climate hazards, with densely populated slums exposing tens of thousands of poor people to storms, flooding, sea level rise, or loss of basic services due to climate impacts? The outcome depends largely on whether local organizations at the city level can anticipate the risks and act accordingly to reduce them. This publication is an initial attempt to explore what is needed — in concept and practice — to ensure that climate resilience grows along with medium-sized cities in Asia.

Recognizing this challenge, the Rockefeller Foundation committed in 2008 to supporting a group of medium-sized Asian cities in building their capacity to plan and implement adaptation measures for climate

change. In its first phase, the ACCCRN initiative reviewed potential candidate cities, selecting four countries and ten cities to include in the program. This publication reports on the results of Phase 2 of ACCCRN, the engagement and planning phase, which ISET coordinated. Phase 2 lasted from early 2009 to early 2011, although different cities moved through the phase at different rates and over different time periods. ACCCRN is unusual because it focuses on *practice* rather than primarily on concepts. With ISET's coordination, Phase 2 utilized shared learning approaches to bring together emerging global knowledge on climate change with local knowledge and local groups of stakeholders, with the goal of producing city level resilience strategies.

ACCCRN is now in its third phase, in which local governments, non-government actors, or other local level partners identify and

## **ACCCRN Conception**

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The ACCCRN initiative was conceived by the Rockefeller Foundation with the intention of generating replicable models and interventions for climate adaptation in medium-sized Asian cities. The initiative takes an action research approach that has catalyzed city level actors to assess key climate stresses and potential vulnerabilities and to propose measures to respond to them, rather than commissioning external experts or national agencies to prepare such plans independently. More information on ACCCRN can be found at: **[www.acccrn.org](http://www.acccrn.org)**.

implement activities for building resilience based on the results of the strategic planning conducted during the second phase. The cities participating in the second and third phases of ACCCRN are Gorakhpur, Surat, and Indore (India), Da Nang, Can Tho, and Quy Nhon (Vietnam), Bandar Lampung and Semarang (Indonesia), and Chiang Rai and Hat Yai (Thailand). These cities are described in the table below and their locations indicated on the accompanying map. They represent the large number of mid-sized cities across Asia that are growing rapidly, for which government planning capabilities are often strained, and in which large portions of the population are poor or socially marginalized. While the largest cities have greater prominence on national and international investment agendas, most of the urban population in Asia actually resides in these mid-size cities, and it is they that will face some of the most severe challenges in planning and responding to climate change.

VIETNAM



INDIA



INDONESIA



THAILAND



## COUNTRY BY COUNTRY

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The following pages introduce the “Country by Country” sections, which appear in chapters 3 through 7. The sections describe each country’s on-the-ground experiences with the concepts and background that the chapters present.

Here, the Country by Country section provides background information about the ten ACCCRN cities.

FIGURE 1.2 | Country by Country: ACCRN Ten Cities Map

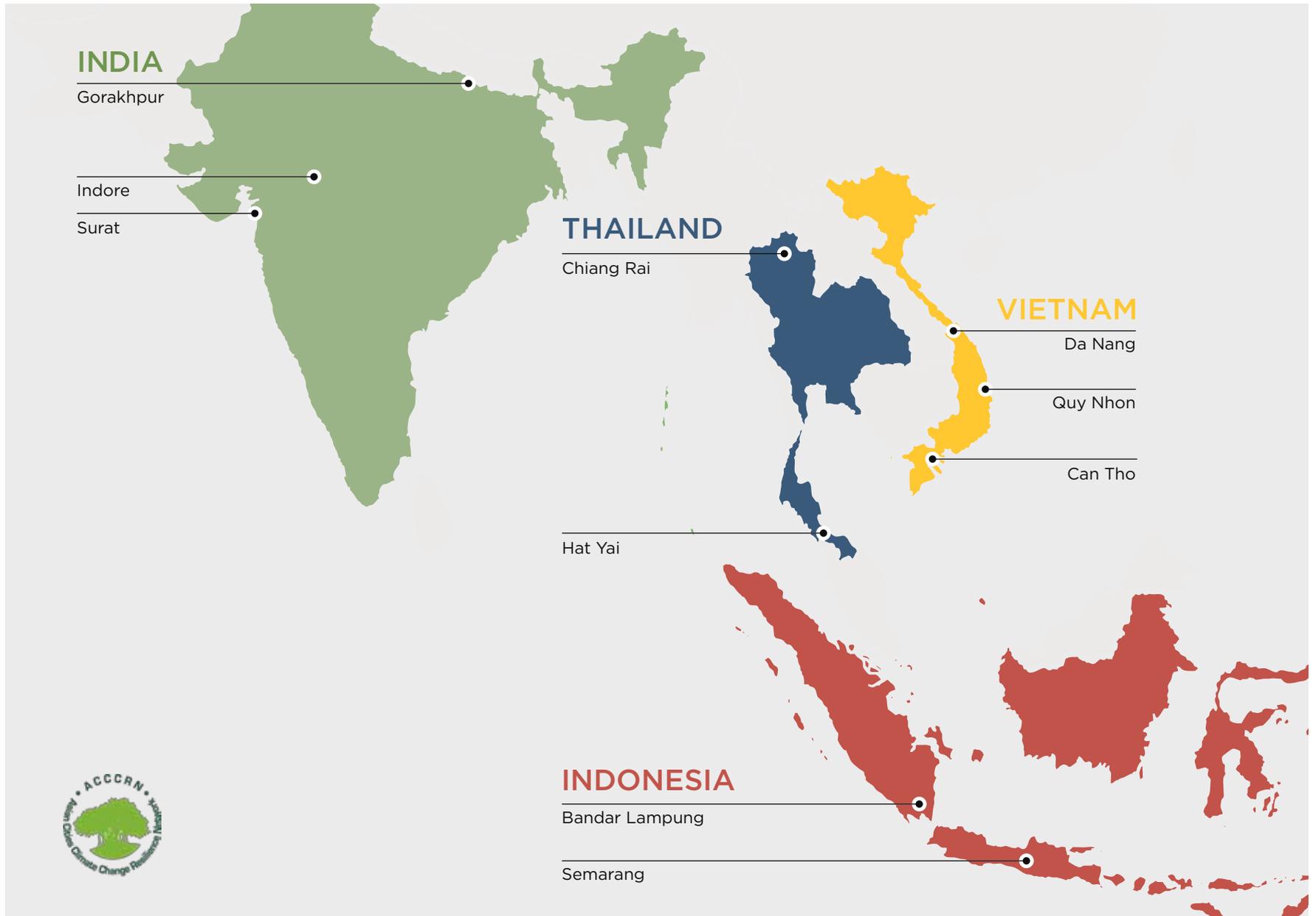


TABLE 1.1 | Country by Country: ACCCRN Ten Cities Data

| India City Data     |                        |  |  |  |   |  |
|---------------------|------------------------|--|--|--|---|--|
| CITY                | POPULATION             | DENSITY<br>(people per km <sup>2</sup> ) | GEOGRAPHY  | TEMPERATURE RANGES   | AVERAGE ANNUAL<br>PRECIPITATION   | MAIN ECONOMIC ACTIVITY   |
| GORAKPHUR           | 622,701<br>(2001)      | 4559                                     | 136.85 km <sup>2</sup><br><br>On the river Rohin,<br>eastern part of Middle-<br>Ganga plain; 75-85m<br>above sea level                                   | <b>Average:</b> 25.68°C<br><br><b>Summer average:</b><br>31.95°C   | 1,192 mm<br><br><b>Rainy season:</b><br>June-Sept                                 | Largest commercial center of the<br>Trans Suryu plain: tertiary and<br>home based self-employment<br>important, also government<br>employment; agriculture |
| INDORE              | 1.52 million<br>(2001) | 12,598                                   | 134 km <sup>2</sup><br><br>Southern edge of the<br>Malwa plateau; on Khan<br>River; links Central India<br>with the coast; 550<br>meters above sea level | <b>Summer average:</b><br>42-44°C<br><b>Winter average:</b> 4-15°C | 914 mm<br><br><b>Rainy season:</b><br>June-Sept                                   | Commercial and industrial center   |
| SURAT               | 2.81 million<br>(2001) | 8,812                                    | 326.515 km <sup>2</sup><br><br>Coastal city, on the Gulf of<br>Cambay and the river Tapi   | <b>Summer highs:</b><br>37.8°C-44.4°C<br><b>Winter low:</b> 15.5°C | 950-1,200 mm<br><br><b>Rainy season:</b><br>June-Sept<br>932 mm                   | Industry (diamond cutting, textiles)   |
| Indonesia City Data |                        |  |  |  |   |  |
| BANDAR<br>LAMPUNG   | 879,651<br>(2010)      | 4,460                                    | 197.22 km <sup>2</sup><br>(Southern end of<br>Sumatra island)  | <b>Annual average:</b><br>30-32°C                                  | 2,000 mm<br><br>Rainy year around<br><br><b>Primary rainy<br/>season:</b> Nov-May | Trade; important port city   |
| SEMARANG            | 1.5 million            | 6,662                                    | 225.17 km <sup>2</sup><br>(Northern coast<br>of Java)  | <b>Average Max:</b> 31.1°C<br><br><b>Average Min:</b> 25°C         | 1,500mm<br><br><b>Rainy season:</b><br>Nov-May                                    | Main shipping port for<br>central Java, industry   |

| Thailand City Data |                   |  |  |  |   |  |
|--------------------|-------------------|--|--|--|---|--|
| CITY               | POPULATION        | DENSITY<br>(people per km <sup>2</sup> ) | GEOGRAPHY  | TEMPERATURE RANGES   | AVERAGE ANNUAL<br>PRECIPITATION   | MAIN ECONOMIC ACTIVITY   |
| CHIANG<br>RAI      | 226,555<br>(2009) | 186                                      | 1,284.4 km <sup>2</sup><br>Kok river basin; 410–580<br>meters above sea level  | <b>Summer Average:</b> 24.4°C<br><br><b>Winter Average:</b> 21.4°C   | 1,664 mm<br><br><b>Rainy season:</b> Jul-Sep  | Agriculture, wholesale and<br>retail trading, services, and<br>real estate; in the “Golden<br>Triangle” of Myanmar,<br>Laos, China, and Thailand |
| HAT YAI            | 370,919<br>(2009) | 435                                      | 852.796 km <sup>2</sup><br>Surrounded by mountain<br>ranges; near Songkhla Lake  | <b>Summer average:</b> 28.6°C<br><br><b>Average max:</b> 34.2°C<br><br><b>Rainy season<br/>average:</b> 27.5°C<br><br><b>Average min:</b> 23.0°C | 1,916 mm<br><br><b>Rainy season:</b> Nov  | Commercial and business<br>center; education and<br>tourism also important   |
| Vietnam City Data  |                   |  |  |  |   |  |
| CAN THO            | 1,200,200         | 857                                      | 1,400 km <sup>2</sup><br>On the Cuu Long Delta<br>in the down-stream<br>area of Mekong Delta<br><br>Majority of city is 0.8-1<br>meters above sea<br>level; higher elevations<br>1-1.5meters above sea level | <b>Annual average:</b> 27°C<br><br>Highest daily max in April<br>and lowest daily min in Jan   | 1,600–2,000 mm<br><br><b>Rainy season:</b> May–Nov                                      | Services 44.9%<br><br>Industry 38.4%<br><br>Agriculture 16.7% (2008)   |
| DA NANG            | 822,339<br>(2009) | 599                                      | 1,256 km <sup>2</sup><br>92 km coastline; on two<br>main river systems, the<br>Cu De and the Han   | <b>Average max:</b> 36°C<br>(May–July)<br><br><b>Average min:</b> 23°C (Jan)   | <b>2,044 mm (from World<br/>Meteorological Org)</b><br><br><b>Rainy season:</b> Aug–Jan | Important port and<br>industrial center; exporter<br>of agricultural products;<br>center of tourism  |
| QUY NHON           | 280,300<br>(2009) | 949                                      | 285.5 km <sup>2</sup><br>42 km coastline   | <b>Average:</b> 27.1°C<br><br>Little variation between<br>rainy and dry seasons  | 1,950 mm<br><br><b>Rainy season:</b> Sept–Dec<br><br><b>Dry season:</b> Jan–Aug         | Industry, trade, seaport<br>services, aquaculture,<br>and tourism (increas-<br>ingly service-based)  |

FIGURE 1.3 | ACCCRN TIMELINE

| JAN '09 | FEB  | MAR | APR       | MAY  | JUN | JUL | AUG         | SEPT | OCT | NOV | DEC | JAN '10 | FEB   | MAR   | APR  |
|---------|------|-----|-----------|------|-----|-----|-------------|------|-----|-----|-----|---------|-------|-------|------|
|         | SLD1 |     | HCVA      |      | VA  |     | SS*<br>SLD2 |      |     |     |     |         |       |       |      |
| INDORE  |      |     | SLDs      |      |     |     | SLDs<br>VAs | SS*  |     |     |     |         |       |       | RtR  |
| GORAK.  |      |     | SLD<br>VA |      | SLD |     |             |      |     |     |     |         |       |       | SLD  |
| SURAT   |      | CAC |           | SLDs |     |     | SS*         | VA   |     |     |     |         |       |       | RtR  |
|         |      |     |           |      | CNF |     | SLD1        | VA   |     | PP  |     |         |       | SLD 2 | SLD3 |
|         |      |     |           |      |     |     |             |      |     |     |     | CW      | SLD 1 |       |      |

VIETNAM

- 2009**
- 02 SLD 1
  - 04-07 HCVA
  - 06-08 City-level VAs
  - 08 SLD2
  - 08 City working groups formed
  - 08 Initial results of SS available
- 2010**
- 05 SLD 3
  - 05 IC developed
  - 06-10 Initial results of PP available
  - 08 RS finalized
  - 08 First full IPs developed

INDIA

- 2009** *INDORE*
- 04 SLDs and consultations, set 1; CAC formed
  - 04-09 VA
  - 08 SLD - CAC
  - 09 SLD - VA with local officials
  - 08-03/'10 Initial results of SS available
- 2010**
- 04-05 RtR workshops
  - 05 IC developed
  - 05-01/'11 Initial results of PP available
  - 08 RS finalized and first full IPs developed
- 2009** *GORAKHPUR*
- 04-05 SLDs and consultations, set 1; CSC formed
  - 04-09 VAs and community-level SLDs
  - 07 CSC SLD
  - 08-03/'10 Initial results of PP available
  - 08-09/'10 Initial results of SS available
- 2010**
- 03-04 RP-SLD workshops
  - 05 IC developed
  - 08 First full IP proposals developed
  - 10 RS finalized
- 2011**
- 01 RS published
- 2009** *SURAT*
- 03 CAC formed
  - 06-07 SLDs with CAC
  - 08-12 Initial results of SS available
  - 09 VA
  - 09-08/'10 Consultation with CAC
- 2010**
- 04-05 RtR workshop
  - 05-01/'11 PP
  - 05 First IC developed
  - 08 RS finalized and first full IPs developed

| MAY        | JUN | JUL      | AUG       | SEP   | OCT | NOV   | DEC | JAN '11 | FEB | MAR | APR | MAY | JUN | JUL | AUG |
|------------|-----|----------|-----------|-------|-----|-------|-----|---------|-----|-----|-----|-----|-----|-----|-----|
| SLD3<br>IC | PP* |          | IP<br>RSF |       |     |       |     |         |     |     |     |     |     |     |     |
| IC<br>PP*  |     |          | RSF       |       |     |       |     |         |     |     |     |     |     |     |     |
| IC         |     |          | RSF       |       |     |       |     |         |     |     |     |     |     |     |     |
| PP<br>IC   |     |          | RSF       |       |     |       |     |         |     |     |     |     |     |     |     |
| SLD 4      |     |          | IP        |       |     | SLD 5 |     |         | RSF |     |     |     |     |     |     |
|            |     | VA<br>SS | SLD 2     | SLD 3 |     |       |     |         | IP  |     |     | RSF |     |     | PP* |

| THAILAND  | INDONESIA   |
|---|---|
| <p><b>2010</b></p> <p>01 Climate workshop</p> <p>02 SLD 1</p> <p>07 VA completed</p> <p>07 SS completed<br/>(Chiang Rai only)</p> <p>08 SLD 2</p> <p>9-10 SLD 3</p> <p>12 City partner info<br/>for RS goes to TEI</p> <p><b>2011</b></p> <p>02 First IP developed</p> <p>05 RS finalized</p> <p>08 Initial results of PP available</p> | <p><b>2009</b></p> <p>06 City network formed</p> <p>08 SLD 1</p> <p>09-02/'11 VAs</p> <p>11 PPs selected and launched</p> <p><b>2010</b></p> <p>02 SLD 2; CWG formed</p> <p>04-05 SLD3</p> <p>05-06 SLD 4</p> <p>06 ICs developed</p> <p>07 Initial results of PP available</p> <p>08 Initial results of SS available</p> <p>10-11 Meetings with LPA on<br/>midterm development plan</p> <p>11-12 SLD 5</p> <p><b>2011</b></p> <p>02 RS finalized</p> <p>08 First full IP developed</p> |

| ACRONYMS  |
|---|
| <b>CNF</b> Climate Network Formed                         |
| <b>CW</b> Climate Workshop                                |
| <b>CWG</b> City Working Group                             |
| <b>HCVA</b> Hazard, Capacity and Vulnerability Assessment |
| <b>IC</b> Intervention Concepts                           |
| <b>IP</b> Intervention Proposal                           |
| <b>LPA</b> Local Planning Authority                       |
| <b>PP</b> Pilot Project                                   |
| <b>PP*</b> Pilot Project results available                |
| <b>RSF</b> Resilience Strategy Finalized                  |
| <b>RtR</b> Risk to Resilience                             |
| <b>RP</b> Resilience Planning                             |
| <b>SS</b> Sector Studies                                  |
| <b>SS*</b> Sector Study results available                 |
| <b>VA</b> Vulnerability Assessment                        |
| <b>VC</b> Vulnerable Community                            |

## THE PARTNERS

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This publication draws on an enormous volume of work undertaken by organizations and individuals in all ten of the Asian Cities Climate Change Resilience Network (ACCCRN) over the period of February 2009 to February 2011. Although ISET has prepared this report and assumes responsibility for its content, we could not have done so without the efforts of skilled and enthusiastic partners: In India, TARU Leading Edge, a Delhi-based consulting firm with offices in Surat and Indore, and the NGO Gorakhpur Environmental Action Group (GEAG), based in and solely operating in Gorakhpur; Mercy Corps, Centre for Climate Risk and Opportunity Management (CCROM), and Urban and Regional Development Institute (URDI) in Indonesia; the Thailand Environment Institute; and in Vietnam, the National Institute of Science and Technology Policy and Strategy Studies (NISTPASS — an agency within the Ministry of Science and Technology) and Challenge to Change (CtC — an independent international NGO based in the UK). In addition, the active engagement of city level participants, from local government and other organizations, shaped key contributions and provided guidance for resilience planning. These local participants did the heavy lifting for this phase of the ACCCRN project: puzzling through new concepts, searching for data, interpreting and helping

ISET to communicate new and often highly abstract concepts, and then applying new ideas and tools in their own work. This publication would have been impossible to produce without their diligent efforts, data contributions, explanation, review, and support.

Each of these partners have contributed to or produced detailed reports, resilience strategies, and other documents on their own. Where we have utilized material from these reports or from interviews with these partners their inputs are gratefully acknowledged. However, the opinions expressed and the conclusions drawn are the responsibility of ISET and of the chapter authors.

THE  
**ROCKEFELLER**  
FOUNDATION



**ARUP**



## URBAN CLIMATE RESILIENCE

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Climate change will impose a wide array of stresses on urban areas. Some of these are likely to involve the direct and easily understood impacts of storms, sea level rise, temperature change, and extreme climatic events, but others will involve indirect impacts that reverberate through the systems — energy, transport, communications, etc. — that urban areas depend on. The dynamics of climate change are complex and the specific changes that will occur at the local level are often highly uncertain. Furthermore, cities depend on a wide variety of tightly coupled complex systems that reach well beyond their boundaries. When such systems fail, they often fail in unpredictable ways (Little 2002). As a result, avenues for identifying vulnerabilities and building resilience to less easily projected changes or to the consequences of multiple stresses on different systems require approaches capable of dealing with uncertainty and complexity.

The example of Hurricane Katrina in New Orleans in August 2005 is instructive. Severe hurricanes happen with historic regularity in this region, yet the string of linked failures of dikes, power systems, hospitals, and emergency evacuation procedures were largely unexpected. If failures of this kind can happen in one of the wealthiest countries in the world, the challenges in developing countries are likely to be even greater.

Climatic uncertainties and dynamic urbanization trends present cities in the developing world with new and unfamiliar planning challenges. Developing countries need to invest in urban infrastructure at a more rapid pace to meet the needs of an exploding urban poor population so as to enable private investment that will create economic opportunities for an expanding national labor force. Investments in urban development and infrastructure are extremely costly and largely irreversible. With costs mounting and social, economic, and climate uncertainties, city decision makers face a dilemma: how to guide investment to meet the diverse needs of residents and the urban economy, even under unforeseen climate conditions and unexpected indirect impacts.

In facing these challenges of novelty, uncertainty, and complexity, ISET has followed two basic strategies. First, we have worked with Arup International Development, a key partner in the ACCCRN initiative, to develop a synthetic conceptual and planning framework for urban climate resilience. Second, we have utilized processes for shared learning to bring together the multiple sources of information, techniques, perspectives, and activities required to identify practical courses of action in response to climate change that are likely to be effective despite the uncertainties involved.

The Urban Climate Resilience Planning Framework (UCRPF), developed by ISET and Arup, focuses on resilience as a goal that is not merely responsive to predicted climate impacts, but that also fosters proactive and systemic approaches to preparing for unexpected and indirect effects of global change (see chapter 2). The understanding of urban climate resilience — what it means for an urban area to be “resilient” to climate change along with the more specific factors that contribute to such resilience — have been raised in various international discussions but remain in a formative stage. A recent review of multiple streams of resilience literature, for example, highlights common characteristics that are thought to contribute to resilience generally. These include “...diversity, flexibility, adaptive governance, and capacity for learning and innovation” (Leichenko 2011, p. 165).

Resilience, rather than adaptation, is the focus of the UCRPF in order to direct more explicit analytical attention to interacting urban systems, where direct climate impacts are linked through spatial, physical, and economic connections to effects on urban populations. The UCRPF also focuses on the differential impacts of climate change on marginalized populations (such as the poor, women, and cultural minorities) who often lack secure access to critical systems or depend on systems that are fragile and particularly susceptible to failure when exposed to climate related stress. Beyond impacts, the framework encourages attention to the autonomous actions of social agents, both individuals and organizations, who are able to prepare and respond to climate effects independently. Finally it emphasizes the role institutions play in mediating the relationships among different types of agents and between agents and systems. Within the framework, resilience is defined as high where system characteristics (diversification, flexibility, redundancy, modularity, and safe failure), agent capacities (ability to visualize, act, organize and reorganize, and learn), and enabling institutions combine in ways that enable all groups to access systems and ensure that those systems continue to function as climate conditions evolve. Taken together, the



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*The UCRPF focuses on the differential impacts of climate change on marginalized populations (such as the poor, women, and cultural minorities) who often lack secure access to critical systems or depend on systems that are fragile and particularly susceptible to failure when exposed to climate related stress.*

UCRPF provides insights into *who* (which agent or set of agents), might draw on *what source of authority* (institution), to address *which climate impacts*, and on *what system* or *what group of people*. These factors are explored in more detail in chapter 2, and then find expression through the rest of this volume in the actual practices implemented through the ACCCRN initiative.

Beyond the UCRPF, addressing climate change requires communication, knowledge sharing, and open decision making among stakeholders at multiple scales. Rather than a standard set of actions or interventions, it requires a process of shared learning in which global knowledge and understanding can be brought together with local knowledge to identify courses of action that respond to local contexts. While the need for shared learning processes was intuitively self-evident at the start of the ACCCRN initiative, the components of such a process (the specific mechanisms for such exchange among city actors in relation to climate change) had never been piloted in urban contexts. Prior to ACCCRN, ISET had developed shared learning dialogue (SLD) processes in rural and a few urban settings in other research projects, to bridge the gap between local and global knowledge (Moench and Dixit 2007; Moench, Ahmed et al. 2008). ISET also used SLDs to understand complicated issues regarding natural resources such as water. It had not, however, attempted to apply SLD processes in wider urban contexts, with diverse actors, and at multiple levels of coordination, from local NGOs to national government counterparts. Nor had it attempted to transfer this approach to local partners to adapt and implement as an ongoing tool. As a result, ISET recognized from the beginning that the shared learning approach would need to evolve and be refined over the course of Phase 2 of the ACCCRN initiative.

The development of the UCRPF has paralleled, rather than preceded, the shared learning process and various implementation activities at the city level in ACCCRN. While early conceptualizations of the

framework provided the groundwork for guiding local engagement and introduction to climate change and vulnerability assessment, and the shared learning dialogues (described in chapter 4) represent a consistent methodology transferred early on from prior ISET experience, details of the UCRPF were refined through its application in partnership with city and country level actors in ACCCRN. The order of presentation in this publication should be seen by readers, therefore, as logical rather than chronological, and we expect this foundational work to continue to evolve as it is informed by practice.

## STRUCTURE OF THIS PUBLICATION

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The Urban Climate Resilience Planning Framework presented in this report summarizes the results of work by ISET, Arup, and other partners during Phase 2 of the ACCCRN initiative to develop an integrated approach for understanding urban resilience that can be used to guide planning efforts at the local level. The framework brings together the characteristics of resilience that have emerged from our own and our partners' work and from extensive reviews of the literature. It focuses on the critical roles of *systems*, *agents*, and *institutions* and the manner in which they are directly or indirectly *exposed* to climate change. It also incorporates the concept of shared learning as part of an iterative process in which analysis feeds into planning, planning into action, action into learning, learning into further cycles of analysis, and so on. This iterative, shared action-learning cycle fosters building and maintaining resilience over time, in the face of rapidly evolving contexts and high levels of uncertainty.

Chapter 2, on the UCRPF, serves several purposes. It anchors in a diverse interdisciplinary literature what is otherwise mainly a report of actual practices in the field, thus providing a reference point for the origins of these practices. It summarizes a synthetic and integrated framework for urban climate resilience planning that is both novel and grounded in practice. It provides a rationale for the innovative methods and tools

applied through this phase of engagement and strategic planning at the city level. The UCRPF also highlights the resilience factors that should form the basis of local monitoring in subsequent phases of ACCCRN. Finally, the framework serves as a sort of roadmap to the various subsequent chapters in this volume, which describe the experience of ACCCRN partners as they undertook the various component elements of the framework. In this way, readers can use the UCRPF as outlined in chapter 2 as a guide to the remainder of this volume. The following five chapters describe the experience of ACCCRN partners in putting key portions of the planning framework into practice. Each chapter discusses the participating actors and processes in each country and relates the practices and pitfalls of urban climate resilience planning from the perspective of the main participants.

The resilience planning process can have many entry points. But in order to engage with local ACCCRN partners around climate change issues, partners first needed a better understanding of what those issues might be. So, while the ACCCRN program focused on the intersection of urbanization, climate impacts, and local vulnerability, engagement in all ten cities began by exploring the local implications of emerging scientific evidence on climate change. Right away, the program bumped into some major challenges, as documented in chapter 3. Climate projections are



*The shared learning dialogue was the key tool for engaging local stakeholders in the resilience planning process and integrating knowledge of climate change from outside experts with local knowledge of development issues and planning priorities. The use of ongoing, iterative SLDs provided a backbone to support and guide the diagnosis and planning steps.*

poorly understood by non-scientists and poorly represented by the climate science community, and the relevant data proved surprisingly difficult to retrieve in a format that was useful to local planners. Chapter 3 explains some of the implications for resilience planning and offer examples from ACCCRN practice.

The shared learning dialogue (SLD) was the key tool for engaging local stakeholders in the resilience planning process and integrating knowledge of climate change from outside experts with local knowledge of development issues and planning priorities. The use of ongoing, iterative SLDs provided a backbone to support and guide the diagnosis and planning steps. Chapter 4 describes the SLD tool and the process through which it was applied in different cities. In ACCCRN, shared learning dialogues engaged scientific experts, local government officials, civil society, private sector, and community representatives in deliberation on the available climate data and future scenarios, local implications, and potential responses. They provided a novel platform for building shared knowledge and commitment to action that met multiple interests. This platform also linked all the inputs to the resilience planning process: diagnostic studies, vulnerability assessments, local knowledge, community feedback, technical agency inputs, and development and prioritization of proposed actions.

The UCRPF describes the two key steps to building urban climate resilience as understanding vulnerability and building resilience. Iterative SLDs that engage multiple stakeholders at several scales drive both of these steps. The first of these processes may be conceived as the diagnostic phase, involving key agents in the assessment of vulnerability of urban systems and of agents to climate change. The diagnosis involves both an assessment of climate impacts, but also a matching assessment of the characteristics of system elements and linkages that might render them more or less vulnerable to direct and linked indirect impacts. In ACCCRN partner cities, this diagnostic phase took the form of

vulnerability assessments, often complemented by more detailed sector studies that focused on specific vulnerability issues to provide more detailed analysis. Early pilot projects further engaged stakeholders and provided preliminary operational lessons; these projects offered small scale funding to experimental local actions addressing high-profile climate vulnerabilities that were identified early on in the diagnostic phase. Chapter 5 describes each city's experience with these elements.

The next step in the UCRPF is building resilience through the development of interventions that respond to the vulnerabilities identified in the diagnostic phase. Resilience building starts with the preparation of a strategy that includes prioritized interventions. In ACCCRN, each of the ten cities prepared a City Resilience Strategy. The inputs for these strategies included the discussions of the SLDs, the results of vulnerability assessments and sector studies, and other research and local plans that may already have existed. The resilience strategies were the main products of Phase 2, and included prioritized proposals for interventions to be funded and implemented in the next phase of the program. The process of developing these strategies, including the links to various inputs and the roles of key participants in their development, is described in detail in chapter 6. The chapter also outlines key lessons for replication of resilience planning in other contexts.

Chapter 7 describes the contents of the resilience strategy documents prepared by the cities and compares their key features. High priority interventions are listed with reference to the key elements of the UCRPF to show how cities' priority proposals compare to the categories of the conceptual framework. These preliminary resilience strategies will be used to guide initial implementation of those proposals selected for funding.

These resilience strategies represent the first efforts of most ACCCRN partners to develop formal responses to climate change. The UCRPF

illustrates how these initial planning and intervention efforts should be monitored to form the basis for further learning, revised strategies, and new intervention proposals in the future. The concluding chapter summarizes the key lessons from this initial round of ACCCRN resilience planning so far and points to the next steps in applying the planning framework. This volume provides a record of the ACCCRN experience, a demonstration of the application of the UCRPF, and a set of lessons to help refine resilience planning and replicate it in other cities.

## URBAN CLIMATE RESILIENCE PLANNING IN CONTEXT

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The notion of urban climate resilience was an abstract one at the outset of Phase 2 of ACCCRN in 2009, and the tools needed to define and achieve it were in a nascent form. But the activities of the program have generated a broad range of experience with these emerging concepts and have helped to refine the tools through practice. Climate resilience strategies created by local partners over this short period are now being used in Phase 3 to select and guide a broad spectrum of actual implementation activities. In total, in all ten cities this work represents a significant and unique contribution — mostly achieved by the cities themselves and their supporting national partners — to the rapidly evolving body of practical experience in responding to climate change. Globally most attention to climate change has focused on mitigation — that is, the reduction of greenhouse gas emissions. Adaptation, though increasingly recognized as essential, has received far less attention. As a result, the body of analysis and of practice is quite limited. The second phase of the ACCCRN program can serve as one of the first examples of what can be achieved with relatively modest levels of investment across a diverse array of cities and governance contexts.

ACCCRN's urban focus also underlines the significance of the resilience planning experience reported in this volume. Work on climate vulnerability and adaptation has focused on rural areas because they are

perceived to have lower adaptive capacity and because climate change is likely to have immediate impacts on ecosystems that directly affect agriculture and water resources. In an increasingly urban and interconnected world, however, vulnerability can be a function of a set of complex and geographically distributed systems that are not easily comprehended or managed. And even direct ecosystem-related impacts on rural areas are likely to increase urban vulnerabilities due to migration. While poverty and social marginalization are good indicators of vulnerability, they do not capture the wider sources of risk or the wider opportunities for response present in urban areas. By looking at these broader sources of risk and opportunities for building resilience from the perspective of the evolving urban resilience planning framework presented here, ACCCRN can offer meaningful innovations in both conceptual synthesis and informed practice at a global level.

## NEXT STEPS

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The next step for the ACCCRN program is implementing resilience interventions, which will take place between 2011 and 2013. The resilience strategies described in this report will guide initial priorities, but the ongoing monitoring and learning from the implementation process — along with better climate data and better linkages to other ongoing local planning processes — should help each city revise its vulnerability assessment and resilience strategy. In this way, the cities will complete and iterate both of the cycles described in the UCRPF.

ISET will work with ACCCRN partners to develop indicators of resilience based on the conceptual elements in the UCRPF, but generated to match local conditions. The indicators will help local climate resilience planners to determine whether their interventions are improving the city's overall resilience and to highlight areas that might need additional attention. Once they have been refined through practice, these indicators should provide useful guidance for other cities that wish to apply the UCRPF.

The processes and tools reported in this volume will evolve further through ongoing practice, feedback, and adaptation by city level partners in ACCCRN during Phase 3. Other cities beyond the ACCCRN program will be able to replicate the resilience planning processes described in this report. Overall, these experiences will make an important contribution to an evolving body of practice that will help cities reduce climate impacts on their most vulnerable populations.

## For more information on Catalyzing Urban Climate Resilience, please visit: [www.i-s-e-t.org](http://www.i-s-e-t.org) and [www.acccrn.org](http://www.acccrn.org)

Climate change and dynamic urbanization processes present new and unfamiliar planning challenges for cities globally. Nowhere is this more apparent than in the developing world, where the challenges of urbanization and climate are compounded by poverty and social marginalization. Since most attention to climate change has focused on reductions in greenhouse gas emissions, far less has addressed the equally essential question of adaptation. As a result, the body of analysis and practice regarding adaptation is limited. “Catalyzing Urban Climate Resilience: Applying Resilience Concepts to Planning Practice in the ACCCRN Program (2009-2011)” reports on the results of an innovative initiative supported by the Rockefeller Foundation—the Asian Cities Climate Change Resilience Network (ACCCRN) program—to assess and respond to the interaction between urbanization and climate change and the impacts on particularly vulnerable communities in ten medium-sized cities in India, Indonesia, Thailand, and Vietnam.

“Catalyzing Urban Climate Resilience” describes the experiences of ACCCRN cities with assessing climate vulnerability and applying emerging concepts of urban climate resilience. It presents an innovative resilience-planning framework that offers multiple entry points for local resilience-building interventions. The framework introduces an iterative shared learning process

to engage diverse forms of knowledge and build joint understanding and commitment to adaptation actions among diverse stakeholders. The framework looks at broad sources of risk and opportunities for building resilience and helps to identify specifically who might do what to build climate resilience. It also helps to identify specific vulnerabilities and practical interventions for the urban poor and other socially marginalized communities.

While the framework is firmly grounded in emerging scientific knowledge, it is at the same time a practical base for planning and action at the local level and for building the knowledge and capacity necessary to respond effectively as climatic conditions evolve. The climate resilience strategies that cities have developed as part of the second phase of ACCCRN serve as early examples of what can be achieved with relatively modest levels of investment across a diverse array of urban conditions and governance contexts. The ACCCRN experience described in this publication offers meaningful innovations in both conceptual synthesis and informed practice at local to global levels. It provides the key tools for shared learning, vulnerability assessment, and intervention analysis for replication in other cities around the globe.

