INSIGHTS FROM THE ASIAN CITIES CLIMATE CHANGE RESILIENCE NETWORK

Urban Climate Change Resilience in Action: Lessons from Projects in 10 ACCCRN Cities

ACCCRN
Asian Cities Climate Change Resilience Network

THE ROCKEFELLER FOUNDATION

1 Key messages and background

- Identifying and advancing effective and appropriate urban climate change resilience (UCCR) interventions is generally contingent on conducting a city-wide resilience assessment and strategy, coordinated across multiple sectors and scales, especially given the complex and interdependent nature of key urban systems.

- Good UCCR interventions can help a city address immediate challenges, as well as build its capacity to tackle future problems, in more innovative and sustainable ways.

- Projects that focus on 'softer measures', like institutional coordination, capacity development, or information systems, can make other capital-intensive investments more effective.

This paper presents key insights emerging from an analysis of the 36 intervention projects, totaling approximately $15.5 million, which have been funded and are being implemented under the Rockefeller Foundation Asian Cities Climate Change Resilience Network (ACCCRN) in ten initial cities[1]. As a pioneering effort to advance on-the-ground actions aimed at building urban climate change resilience (UCCR), this portfolio of projects[2] provides a 'first generation' view of how a set of cities have interpreted UCCR challenges and translated their understanding into targeted priorities and actions. One of the intentions of the ACCCRN initiative was to advance the still young field of UCCR with practical actions that substantiate the growing number of theoretical frameworks.

The first set of ACCCRN city projects started in 2011, and although in most cases it is too soon to draw conclusions on their ultimate impacts, there are multiple insights from the work and positive outcomes for city residents thus far that might help inform similar work.

EARLY IMPACTS – THE IMPORTANCE OF BUILDING RESILIENCE TODAY!

When Typhoon Nari hit Vietnam's Da Nang city in October 2013, all 244 of the houses that had been upgraded through a credit and technical design scheme funded by the Rockefeller Foundation survived with no major damages. As well as providing safe shelter for poor households (often female headed), the intervention safeguarded them against catastrophic costs that would have drained their savings or put them in debt.

In 2006, 75 percent of India's Surat city flooded after an emergency release of the Ukai dam, affecting 3 million people. Through an ACCCRN project, Surat has now built a new coordination mechanism involving 13 departments across city, state and national jurisdictions, with a new reservoir management protocol in place that helped the city avert severe flooding in 2013, despite equally heavy rainfall.

2 What is resilience in a city context?

The Rockefeller Foundation defines urban resilience as the capacity of cities (individuals, communities, institutions, businesses and systems) to survive, adapt, and thrive in the face of stress and shocks, and even transform when conditions require it.

Cities are complex, interconnected systems with extensive and unpredictable feedback processes that operate at multiple scales and time frames. Cities are vulnerable to all kinds of stresses and shocks. In short, they are dynamic places where resilience is critical to avoiding prolonged or irrecoverable outcomes when bad things happen. Through our practice and research across multiple contexts in the developed and developing world, we see that there are a number of generalizable characteristics observable in resilient cities. These relate to the behaviors and capacities of multiple sets of actors within cities who can shape resilience outcomes - from different parts of city government, to the business sector, civil society, and communities themselves. They are:

AWARE

Awareness means knowing what your strengths and assets are, what liabilities and vulnerabilities you have, and what threats and risks you face. Being aware is not a static condition; it's the ability to constantly assess, take in new information, reassess and adjust your understanding of the most critical and relevant strengths and weaknesses and other factors on the fly. This requires methods of sensing and information-gathering, including robust feedback loops, such as community meetings or monitoring systems for a global telecommunications network.

DIVERSE

Diversity implies that a person or system has a surplus of capacity such that it can successfully operate under a diverse set of circumstances, beyond what is needed for every-day functioning or relying on only one element for a given purpose. Diversity includes the notion of redundancy, alternatives, and back-ups, so it can call up reserves during a disruption or switch over to an alternative functioning mode. Being diverse also means that the system possesses or can draw upon a range of capabilities, information sources, technical elements, people or groups. Many developing country cities evolve inefficient diversities to compensate for weak core infrastructure provision. Nonetheless, the existence of multiple pathways to access water (city supply, water tankers, wells and tanks etc.) or the prevalence to back-up energy sources for cooking and boiling water can be extremely valuable in the face of a shock. However, truly resilient cities need to build diversity in a prioritized, intentional and cost-effective manner at a city-wide scale.

SELF-REGULATING

This means elements within a system behave and interact in such a way as to continue functioning to the system's purpose, which means it can deal with anomalous situations and interferences without extreme malfunction, catastrophic collapse, or cascading disruptions. This is sometimes called "islanding" or "de-networking" – a kind of 'safe failure' that ensures failure is discrete and contained. A self-regulating system is more

likely to withstand a disruption, less likely to exacerbate the effects of a crisis if it fails, and is more likely to return to function (or be replaced) more quickly once the crisis has passed. Overreliance on a single piece of protective infrastructure (e.g. a flood barrier) can expose the underlying lack of resilience of the city and its people, should that system falter in the face of increasingly unpredictable shocks and stresses.

INTEGRATED

Being integrated means that individuals, groups, organizations and other entities have the ability to bring together disparate thoughts and elements into cohesive solutions and actions. Integration involves the sharing of information across entities, the collaborative development of ideas and solutions, and transparent communication with people and entities that are involved or affected. It also refers to the coordination of people groups and activities. Again, this requires the presence of feedback loops.

ADAPTIVE

The final defining characteristic of resilience is being adaptive: the capacity to adjust to changing circumstances during a disruption by developing new plans, taking new actions, or modifying behaviors so that you are better able to withstand and recover from a disruption, particularly when it is not possible or wise to go back to the way things were before. Adaptability also suggests flexibility, the ability to apply existing resources to new purposes or for one thing to take on multiple roles. It also implies that people and institutions (government, businesses and civil society) in the city systematically learn from experience, with an adaptive planning mindset that is accepting of unpredictable outcomes. Adaptive cities and systems are also prepared to respond quickly to extreme events, including modifying organizations, procedures or structures as needed. This

In an urban context, especially in the developing world, these five characteristics needs to be underpinned by the notion of **inclusion** – i.e. that all people and places are included in the economic, social, political and cultural life of the city, and that they are equally able to access (physically, financially and socially) the resources, services and decision-making processes that influence their lives. An inclusive city implies the existence of a high level of social capital that enables broad consultation and engagement of communities, including the most vulnerable groups. Addressing the shocks or stresses faced by one sector, location, or community in isolation of others will be anathema to the notion of resilience.

Cities are dynamic places where resilience is critical to avoiding prolonged or irrecoverable outcomes when bad things happen.

3 How did the ACCCRN city projects emerge?

The ACCCRN city projects emerged from an intensive planning process[3] that brought together stakeholders from multiple sectors to analyze a range of risks and vulnerabilities associated with climate change and rapid urbanization. These are incorporated into a City Resilience Strategy (CRS) which outline a range of prioritized actions for building resilience in the short, medium and longer terms. The CRS serves as a framework for cities to identify and prioritize an appropriate set of actions for building resilience through an integrated systems approach. The process of engaging a cross-section of city stakeholders resulted in a high degree of traction and ownership among local actors in different sectors. Most of the projects emerged from these CRS's, though several emerged as the application of the initial activities revealed areas or issues not originally included but subsequently considered important. For instance, a city project in Semarang, Indonesia targeted the health sector and strengthening its disease monitoring and response system, taking into account climate change scenarios. The project was developed after the first edition of CRS was completed, when the health department joined the multi-stakeholder dialogue and planning process. The CRS was then revised to include the health component.

The city projects were approved for funding by the Rockefeller Foundation in annual cycles between 2010 and 2013. Proposed projects were assessed against criteria that touch on many dimensions (Table 1), with priority given to projects designed to improve resilience by tackling the intersecting risks and hazards of climate change, urban systems and vulnerabilities and projects that demonstrate potential benefits to the urban populations struggling with poverty or other vulnerabilities because they likely are the least able to respond to shocks and stresses.

FUNDING PRINCIPLES AND CRITERIA	
PRINCIPLES	
Ecologically sustainable development	Contributes to urban climate change resilience without negatively straining or degrading ecological systems or resulting in unsustainable practices
Do not harm	Contributes to urban climate change resilience without generating negative consequences that would yield determined impacts on poor and vulnerable populations.
CRITERIA	
Credibility	1. Contribution to building urban climate change resilience 2. Impact on lives of impoverished and vulnerable populations 3. Potential to integrate with other resilience-building measures 4. Scale of impact
Viability and sustainability	1. Technically and operationally viable 2. Financially viable and sustainable 3. Prospects for timely implementation 4. Local ownership
Leverage capacity	1. Ability to leverage other resources (financial, human technical)
Replicable and scalable	1. Prospects for replication in other places 2. Ability to achieve scale 3. Ability to contribute new urban climate change resilience knowledge and practice
Innovation	1. Innovative
Portfolio balance	1. Contribution to a diverse and balanced set of projects and interventions ACCCRN-wide

Table 1: Funding principles and criteria

Left: Nic Dunlop | The Rockefeller Foundation

[3] For further discussion on planning processes see the other ACCCRN Insight paper, "*Ten Cities, Four Countries, Five Years: Lessons on the Process of Building Urban Climate Change Resilience*"

4 Ten UCCR action areas, three dominant themes

City projects in the ACCCRN portfolio are diverse in terms of sectors, approaches and implementing partners (see Figure 2). Furthermore, they generally fall into one of ten critical UCCR action areas[4] across a range of urban systems. Looking at overall project distribution, we find that 70% of the projects address 5 of the 10 action areas: land use & urban planning, drainage, flood & solid waste management, emergency management & early warning systems, water demand & conservation systems, and responsive health systems.

Many cities are already experiencing chronic stresses affecting their water supply.

FLOOD CONCERNS A DOMINANT AGENDA FOR MANY

When designing the project review process and criteria, we did not have pre-determined notions of the sectors or thematic areas the projects would address. However, we were not surprised when several projects related to flood response and management emerged given this was frequently cited as a priority in many of the engagement processes. It presents an obvious entry point for resilience building, especially because most climate projections point to shifting rainfall patterns and increasingly severe and frequent weather events that will exacerbate flood risks. It also encourages cities to incorporate a future horizon when seeking solutions for a very tangible current problem, potentially leading to solutions that will be more relevant in the long-run.

The flood-related projects in the portfolio include interventions that aim to strengthen emergency management and early warning systems (11 percent) as well as projects that focus on increasing drainage and flood retention capacity and a few that aim to improve city's broader flood management plan (17 percent). There are 12 projects in total that include land use and urban planning issue as part of their objective (four projects primarily target land use and urban planning), which also relate to addressing flood risks. These projects are taking place in cities with very different characteristics, and are tackling flood problems at different scales. They include Da Nang and Quy Nhon (Vietnam) and Hat Yai (Thailand), which focus on city-wide hydrological modeling and land use planning, while in Gorakhpur (India) we see projects focusing on micro drainage systems at the ward level as well as a project that works at larger scale by promoting agriculture of peri-urban green space as flood retention.

WATER SCARCITY LOOMS LARGE

We anticipated a number of projects focusing on water demand and conservation systems, and indeed a sizable part of the portfolio falls in this category (six projects, at 17 percent). Many cities are already experiencing chronic stresses affecting their water supply (such as Indore, India), while others anticipate a steep rise in water demand over the next few decades due to increasing population and economic expansion, among other factors (such as Chiang Rai, Thailand and Da Nang, Vietnam). Stakeholders readily recognized the potential impacts of climate change, including how the increasing frequency and severity of drought can exacerbate existing and anticipated water shortage. Of the six projects focusing on water supply, the majority are taking a community-based approach and/or are demonstrating local, decentralized solutions (see more at Lesson 6).

[4] The ten UCCR action areas are outlined in Brown et al., 'From Practice to Theory: Emerging Lessons from Asia for Building Urban Climate Change Resilience', *E&U*, vol. 24(2): 531–556.

Top: Lisa Murray | Robin Wyatt Vision and The Rockefeller Foundation

DISTRIBUTION OF PROJECTS ACROSS 10 UCCR ACTION AREAS – KEY SECTOR

NO. OF PROJECTS
% OF PORTFOLIO

- Land use & urban planning
- Drainage, flood & solid waste management
- Water demand & conservation systems
- Emergency management & early warning systems
- Responsive health systems
- Resilient housing & transport systems
- Ecosystems service strengthening
- Diversification & protection of climate affected livelihoods
- Education & capacity building of citizens
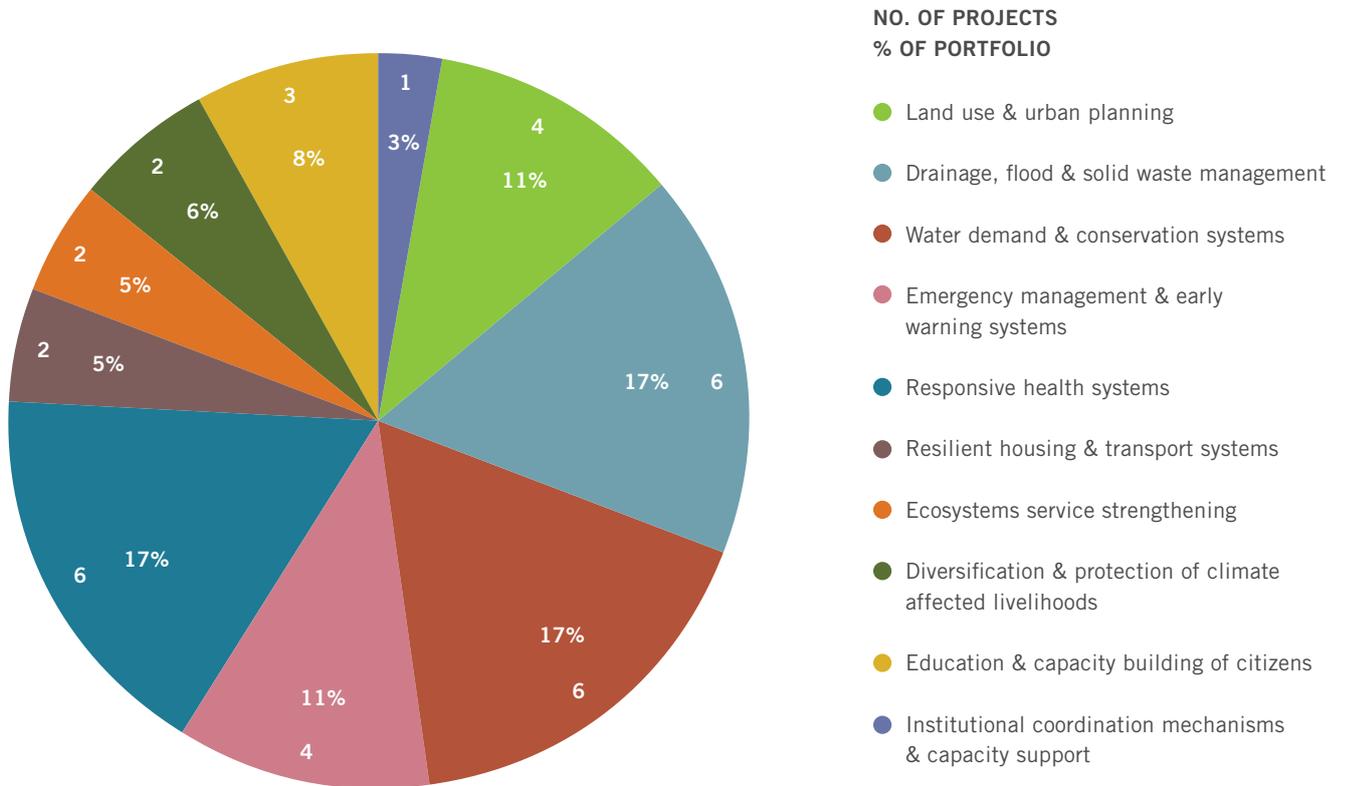- Institutional coordination mechanisms & capacity support

Figure 2: Distribution of projects across 10 UCCR action areas

AN UNEXPECTED FOCUS ON HEALTH SYSTEMS

Six ACCCRN city projects (17 percent of the portfolio) focus on addressing health-related impacts of climate change. The emergence of such a substantial cohort of health system-related projects was unexpected, because public health or medical personnel have not engaged as heavily in climate change dialogues, and it was assumed that the links between climate change and health impacts may not be obvious to city actors. The focus on health and the health system is an indication that cities are indeed concerned with slower-onset and incremental climate impacts, in addition to sudden extreme events.

The health-related projects include building public health system's ability to respond to new risks associated with changing disease patterns, development of a real-time salinity monitoring system to detect small but increasingly frequent fluctuations in the salinity level, which will affect potable water quality, and the impact of temperature increases on the health and productivity of urban workers. Four of the six health-related projects focus on the risk of waterborne and vector-borne diseases, particularly dengue fever, which is a major problem that cities already battle. Health workers and the general public have already observed marked shifts and volatility in disease patterns, providing an impetus for further scientific studies to be carried out, and improved health information systems to obtain better epidemiological data. With the global discourse increasingly paying attention to the links between climate variability and health, the cohort of projects that have emerged through ACCCRN could over time provide a valuable set of lessons for others.

In the overall mix, we have observed several other critical action areas emerge that might not have been originally anticipated. For example, several cities have initiated *education projects*, indicating the importance of long-term shifts in mindsets of urban residents. Indeed, although only three projects in the portfolio have education as a core focus, around 40 percent of the projects include a component on education or building the capacity of citizens. A number of projects with a focus on *protecting or restoring natural ecosystems* have emerged, indicating a growing awareness of the importance of looking at build infrastructure in tandem with natural infrastructure when thinking about urban resilience. And for several cities, a key driver for change was the introduction of new *institutional arrangements* to *coordinate and advance resilience actions*, indicating the importance of 'soft' measures when considering what projects are needed in a particular context.

We expect that as awareness in the city grows, other action areas will surface. For instance, energy systems have not yet come up in the city project portfolio, nor were there any proposals from cities for energy-related projects.

ENHANCING DISEASE MONITORING AND RESPONSE SYSTEMS

One of the major health risks resulting from climate change is altered disease patterns, particularly waterborne and vector-borne diseases, which have increased the risk of disease outbreaks in urban areas. In several ACCCRN cities, for instance, there is no longer a 'dengue fever season'. A growing number of cases are appearing throughout the year due to increased rainfall, higher temperatures and poor drainage in which water stagnation allows vectors to remain active for longer periods. With this trend, four ACCCRN cities in three countries (Indore and Surat in India, Can Tho in Vietnam and Semarang in Indonesia) are implementing projects focused on strengthening disease surveillance and the response system in the context of climate change. A component across all projects is data system improvement to enable the more timely detection of potential outbreaks and the ability to trigger timely control and response measures. Technological solutions that have emerged range from phone- and SMS-based data collection aimed at streamlining bottom-up reporting to more advance ICT and GPS-based platforms that can quickly reach scale. There is also impetus to increase flow of information in multiple directions. In all cases, affordability is a key consideration.

TECHNICAL INSIGHTS FROM THE HEALTH-RELATED PROJECT IN SURAT

The trend of rising temperature is also having a direct impact on human health and is becoming an important concern. The United Nations Intergovernmental Panel on Climate Change Fifth Assessment Report predicts with 90 percent certainty that heat waves will be more frequent and longer lasting in many parts of the work and particularly in Asia. A project in Da Nang, Vietnam analyzed the effects of increased temperatures on health and safety and productivity of low-income workers in the urban area and produced recommendations on workplace policy to be considered by the government and private sector employers. In India's Indore and Surat, new building designs for passive ventilation and cooling techniques are being tested. The project is testing 15 cooling methods in 40 sites (approximately 100 households). Preliminary findings show that a simple whitewash can achieve 2o–5oC reduction in indoor temperature. Low-cost methods, such as reflective paint, also have been found to be highly effective.

Top: Gitika Saksena | Robin Wyatt Vision and The Rockefeller Foundation
Bottom and right: Nic Dunlop | The Rockefeller Foundation

5 Critical lessons and insights

INCORPORATING FUTURE SCENARIOS INSPIRE QUALITATIVELY DIFFERENT PROJECTS

In the initial engagement and planning phase in each city, there was a natural tendency to focus on acute shocks, with disaster risk reduction and emergency response interventions prioritized. However, with the introduction of analyses of a broader range of slow onset climate impacts and stresses on urban systems, a more holistic understanding of UCCR developed, and with it greater diversity in the type of projects being prioritized. For example, in many cities taking action on slow onset crises and chronic stresses, such as health-related projects, did not arise early on but surfaced in later rounds of proposal development through the iterative learning within the UCCR framework[5]. This is what motivated the team in Surat, India to establish an Urban Health and Climate Resilience Center for strengthening the disease surveillance system and operational protocols to respond to future public health emergencies.

Addressing current problems while considering future scenarios has also led to projects that garner strong acceptance, and become increasingly relevant over time. For instance, the project to promote cool roof and passive ventilation for indoor temperature control in Indore and Surat (India) addresses severe heat stress already being faced by low income households. However, the project emerged higher up the list of priorities by taking into account average temperature increase projections for 2045–2060, with severe anticipated urban heat island effects and longer dry periods. Similarly, given that existing water scarcity is likely to be further aggravated by rainfall variability and temperature increase, Indore, prioritized a project to test decentralized systems for multiple water sources and usage that will increase access today, while refining a model that could be an essential solution in the future.

Time has proved an important factor that allowed for city stakeholders to develop a broad base of understanding of climate change impacts on the city. Without sustained engagement and a process to help different actors in the city to reach new levels of awareness most projects would have likely remained focused on addressing more obvious challenges.

PROJECTS TRIGGER A VIRTUOUS CYCLE OF ACTION, ENGAGEMENT, & CAPACITY BUILDING

The opportunity to translate plans into action motivate people and deepens their interest in the urban climate change resilience agenda. It creates new opportunities for city stakeholders to advance knowledge, deepen cross-sector and multi-stakeholder engagement, and in turn creates feedback loops that help refine a shared analysis of the priorities for further action. The very first project in Bandar Lampung, Indonesia, was for developing a new integrated solid waste management master plan. A departure from the previous plan, the new master plan was developed through collaboration of six local government agencies, a local academic institution and an NGO, with support from an international engineering firm. Although this raised concerns about the level of co-ordination needed, ultimately having so many institutions and departments collaborate was hugely positive and led to broader ownership of the plan.

Engaging people in delivering projects with tangible results also helps mitigate the risk of a decline in interest after the initial engagement which centered on analysis and planning. Shifts in priorities that can arise with changes in leadership, for example, are mitigated when there is a base of practical action being advanced. The existence

> Addressing current problems while considering future scenarios has also led to projects that garner strong acceptance, and become increasingly relevant over time.

of these projects enables UCCR champions within city administrations to be visible, helping solidify ownership of the UCCR agenda despite changes in city leaders. At the same time, it has also proven important in several ACCCRN cities to have projects that are led by non-state actors such as local universities, NGOs and business associations. This helped ensure that there are nodes of leadership and pressure from outside government, who can use projects to continue driving the UCCR agenda if the political leadership lacks sustained commitment.

Projects also help to build the technical capacity of local actors, especially given that UCCR is a relatively new field with relatively few tested solutions, and certainly no blueprints for action. For instance, the Da Nang Women's Union had implemented housing and sanitation projects before, but had no prior experience with storm and flood resistant housing upgrades. The project required them to collaborate with and an international design firm that provided technical assistance, and Vietnamese architects who could build the capacity of local artisans. This has built a new awareness and capability that could have enormous scale potential across the city, and potentially beyond.

BREAKING DOWN SILOS AND ADDRESSING MULTIPLE OBJECTIVES
Although at a first glance ACCCRN projects may appear to fall into a single sector, a closer review reveals that they in fact tend to contribute to positive outcomes across multiple domains (see Table 2).

The emphasis in UCCR planning processes on understanding the interdependencies across different city systems through an iterative, multi stakeholder dialogue increases the potential for the design and execution of projects that break down traditional silos. For example, an ACCCRN-supported mangrove restoration project in Quy Nhon, Vietnam, was initially conceived to provide protection to 60,000 residents living alongside the lagoon at risk from floods and coastal erosion. As the thinking developed, it became clear that part of the resilience challenge for these households was in terms of assured livelihoods, and so and alternative livelihoods option was developed through the introduction of community-based co-management of the forest. However, what makes the project especially unique is that in the process of developing the project, a wider dialogue on the need to reconsider development plans in an adjacent zone was triggered. Because the same stakeholders had also been engaged in city-wide hydrology and flood modeling work, it soon became apparent that although the mangrove project would help protect communities from storm surge, a potentially far greater vulnerability to urban flooding for these and other communities lay ahead. As a result, what began as a targeted mangrove intervention project came to be linked with a wider land use and zoning conversation. This resulted in a subsequent decision to revise the city master plan in order to redirect urban development and expansion to a less flood-prone zone.

The city of Gorakhpur in India is expanding agriculture in its peri-urban area to increase the flood retention capacity outside the city, and reduce chronic water-logging within the urban core. At the same time, increased supply of fresh produce from local sources will reduce vulnerability to food supply chain disruptions.

In Surat, India, the cities' ability to manage flood risks depends on collaboration with other state and national level government agencies. These agencies now participate in a new reservoir management protocol that enables safer dam releases, critical for the city as climate variability increases.

Top: Lisa Murray | Robin Wyatt Vision and The Rockefeller Foundation
Bottom: Gitika Saksena | Robin Wyatt Vision and The Rockefeller Foundation

ACCCRN CITY PROJECTS	Land use & urban planning	Drainage, flood & solid waste management	Water demand & conservation systems	Emergency management & early warning systems	Responsive health systems	Resilient housing & transport systems	Ecosystems service strengthening	Diversification & protection of climate affected livelihoods	Education & capacity building of citizens	Institutional coordination mechanisms
GORAKHPUR: Implementing and promoting adaptive peri-urban agriculture	●	●					●	●		
INDORE: Peri-urban lake restoration to create emergency water management options	●		●	●			●		●	
BANDAR LAMPUNG: Ground water conservation (Biopores)	●	●	●							
CHIANG RAI: Developing climate-resilient urban and economic development plans	●		●				●			
CAN THO: Developing and implementing real-time salinity monitoring, dissemination and response mechanisms					●			●	●	
QUY NHON: Urban mangrove restoration for storm surge protection and resilient land-use practice	●	●		●			●	●		

Table 2: A Sample of projects with objectives that contribute to multiple UCCR action areas

THE IMPORTANCE OF BRIDGING SCALES AND JURISDICTIONS

Often, the systems upon which a city depends (such as water, power, food, and flood protection) intersect with and are affected by those outside the city's administrative or geographic remit. Indeed, to address many of the urban climate change resilience challenges inside cities, and to avoid transferring risks to other areas, stakeholders need to consider scales and jurisdictions beyond their own. The inherent emphasis of resilience thinking on the inter-dependencies between systems encourages UCCR projects that do this.

SOFT INTERVENTIONS AS BUILDING BLOCKS FOR OPTIMIZING INVESTMENTS

City projects implemented under ACCCRN has clearly demonstrated that a range of carefully considered 'soft' interventions are an essential accompaniment to the harder capital intensive or infrastructure-scale measures cities might want to take. The AC-CCRN initiative has introduced a diversity of such interventions, with several projects

focused on action research, training, citizen education and improved coordination. The creation of new institutional coordination mechanisms stands out as an area that has been especially important. These have brought in new capacity to enable disparate actors and functions to be re-organized so that they can effectively respond to changes and shocks. Notably, the Climate Change Coordination Offices (CCCO) in the three ACCCRN Vietnam cities[6] led to improved connectivity between city government departments, enabling more collaboration to emerge, and more effective engagement with other investments. Such robust collaboration critically informs some of the larger infrastructure projects, such as the ADB-funded comprehensive water supply assessment project in Da Nang, Vietnam, which has a formal agreement with the CCCO to use the studies and assessments conducted under ACCCRN.

PROJECT TITLE	COMMUNITY BASED	MODULAR
GORAKHPUR, INDIA: Ward-level resilience planning	●	
INDORE, INDIA: Decentralized systems for differential water sources and uses		●
INDORE AND SURAT, INDIA: Cool roof and passive ventilation for indoor temperature comfort		●
GORAKHPUR, INDIA: Decentralized water sanitation for peri-urban farmers (DEWATS)	●	●
BANDAR LAMPUNG, INDONESIA: Ground water conservation (biopores)		●
SEMARANG, INDONESIA: Rainwater harvesting systems		●
SEMARANG, INDONESIA: Community-based mangrove restoration	●	
CAN THO, VIETNAM: Community-based canal and riverbank strengthening	●	
DA NANG, VIETNAM: Storm and flood resistant credit and housing scheme		●
DA NANG, VIETNAM: Heat stress impact on workers' health and safety		●

Table 3: Community-based and modular solutions: examples from ACCCRN

THE CENTRALITY OF DECENTRALIZED, COMMUNITY-BASED & MODULAR SOLUTIONS

Many projects in the ACCCRN portfolio enable solutions to be implemented at a household or community scale, which tends to build greater flexibility, modularity and redundancy into systems - key characteristics of resilience. They also tend to surface local solutions or technologies, which make them more affordable, particularly among poorer communities that are not served by core infrastructure. And although they are relatively small-scale individually, they lend themselves to replication on a broad scale without necessarily depending upon a centralized mandate or decision by government.

These projects have demonstrated that modular solutions can be used to address a variety of critical UCCR action areas, including building more resilient housing, addressing water demand, strengthening urban ecosystems, and mitigating growing flood risks. And they can aggregate to have a city-wide impact. For example, the involvement of communities in the restoration of 15 urban lakes in Indore, India, will provide 1.2 million cubic meters of additional water storage available for emergency purposes (equivalent to approximately 3 days of demand for the city).

In general, addressing the interdependencies across urban systems is a key differentiating factor for UCCR projects. For example, 'climate proofing' measures tend to focus on making specific adjustments to infrastructure to make them more durable to projected climate shifts. However, they will rarely consider the interface with other systems or pieces of infrastructure and may even lead to an erosion of resilience by transferring risk to other parts of city. For instance, after extensive flooding in Quy Nhon, Vietnam in 2009, higher-level roads were built in parts of the city and, while this newer infrastructure can endure higher water levels, it inhibits the surrounding natural drainage and increases flood risk in adjacent low-lying areas[7]. A number of projects proposed by ACCCRN cities, especially in the first and second cycles, were not advanced because they lacked any analysis of how different systems would interact or be affected by the project.

[7] Adapted from Urban Climate Change Resilience Partnership briefing note, by Arup for the Asian Development Bank.

Above: Nic Dunlop | The Rockefeller Foundation

6 Looking ahead

There have been notable lessons resulting from the design and implementation of the first 36 UCCR projects, in terms of results and impacts the work is having, and how the awareness and behavior of city stakeholders is changing. Today, in the 10 initial ACCCRN cities, there is a much greater level of confidence in applying UCCR concepts in practice because of the opportunity to design, test, refine and implement such a diverse range of specific interventions. That said, these are still early days and it is essential that we continue to learn from the expanding number of projects being planned at different scales, by multiple actors.

JANUARY 2015