ACCCRN City Projects

Asian Cities Climate Change Resilience Network

August 2012

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Rockefeller Foundation
Innovation for the Next 100 Years

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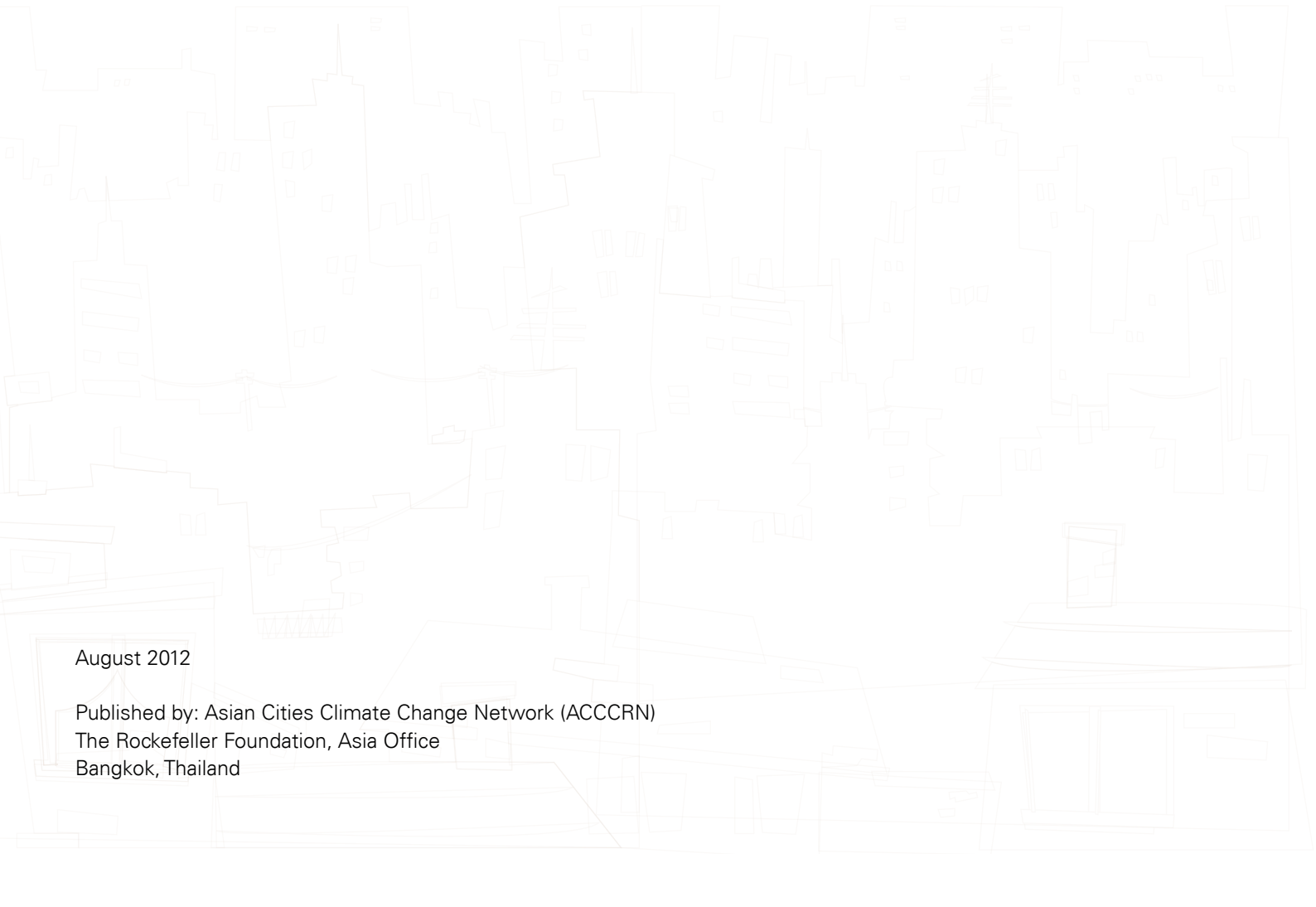

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Acknowledgements

This publication draws on the intensive work of a number of ACCCRN partners who have provided vision, dedication and technical support that has led to the generation of diverse city projects. The content of this catalogue draw significantly from key city project documents prepared by in-country partners who work closely with partners in each of the 10 ACCCRN cities to design and implement intervention projects. These partners include the Institute for Social and Environmental Transition (ISET), Challenge to Change, the Natinal Institute for Science and Technology Policy and Strategy Studies (NISTPASS), TARU Leading Edge, Gorakhpur Environmental Action Group (GEAG), Mercy Corps, and Thailand Environment Institute (TEI). These partners and their roles are discussed in more detail on the following project sheets.

The analyses of climate change risks and resilience characteristics associated with the city projects are based largely on contributions by the International Development team of Arup. The Urban Resilience Framework, which guides the resilience planning approach utilized in ACCCRN and has been refined through demonstrations in ACCCRN, has been jointly developed by Arup and ISET. The contributions of these organizations and individuals are gratefully acknowledged.

OVERVIEW

RESPONDING TO CLIMATE CHANGE IN AN URBAN CONTEXT

Cities around the world are facing challenges brought about by rapid increases in population and geographic spread which places greater pressure on infrastructure and services. More than 50% of the world's population currently lives in cities. By 2050, this figure is expected to increase to 70%, or 6.4 billion people. Asian cities are likely to account for more than 60% of this increase.

Climate change impacts, including rising sea level, more frequent and severe storms, coastal erosion and declining freshwater sources will likely exacerbate urban issues, in particular in poor and vulnerable communities that lack adequate infrastructure and services.

The Asian Cities Climate Change Resilience Network (ACCCRN) works at the intersection of climate change, urban systems and vulnerability to consider both direct and indirect impacts of climate change in urban areas.

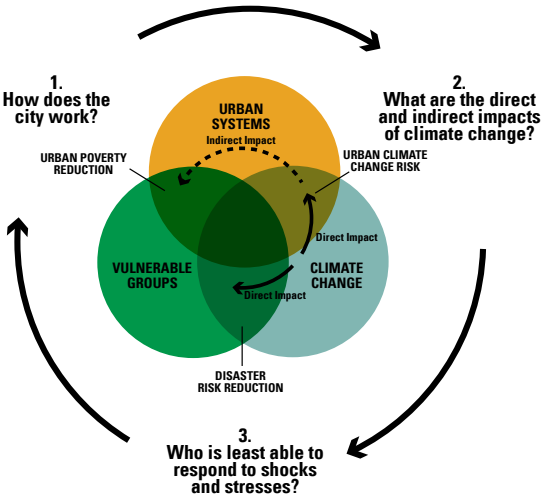


Figure 1 Climate impacts: a compound effect combining direct impacts, indirect impacts, and pre-existing vulnerabilities[1]

ABOUT ACCCRN

ACCCRN is a 7-year initiative (2008-2014) supported by the Rockefeller Foundation. It aims to catalyze attention, funding and action to strengthen cities' resilience to climate change impacts. ACCCRN has been working in 10 cities in 4 Asian countries (India, Indonesia, Thailand and Vietnam) to develop and demonstrate effective processes and practices for addressing urban climate vulnerabilities using multi-stakeholder planning as well as implementing targeted intervention projects.

ACCCRN aims to achieve three outcomes:

1. Capacity building

Improved capacity to plan, finance, coordinate and implement climate change resilience strategies within ACCCRN cities;

2. Developing a network for knowledge and learning

Shared practical knowledge to build urban climate change resilience deepens the quality of awareness, engagement, demand and application by ACCCRN cities and other stakeholders; and

3. Expansion and scaling up

Urban climate change resilience (UCCR) is expanded, with ACCCRN and new cities taking action through existing and additional support (finance, policy, technical) generated by a range of actors.

Each ACCCRN city has developed a City Resilience Strategy (CRS), which is informed by multiple analyses. The CRS provides a basis for action plans and urban resilience intervention projects that address the city's climate change vulnerabilities. This catalogue provides an overview of each funded project.

ACCCRN cities employ multiple analyses :

VULNERABILITY ASSESSMENTS

CLIMATE CHANGE RISK ASSESSMENTS

CLIMATE CHANGE SCENARIOS

URBAN GROWTH SCENARIOS

SECTOR STUDIES

1 da Silva, J., Kernaghan, S, & Luque, A (2012). A systems approach to meeting the challenges of urban climate change. International Journal of Urban Sustainable Development. November 2012.

CITY PROJECTS

As of August 2012, the Rockefeller Foundation has approved and funded 23 city projects that build urban climate change resilience (UCCR). These interventions have been initiated in the 10 core ACCCRN cities and have amounted to US $9.4 million, with some additional contributions from local governments and other local partners. Through ACCCRN, new projects in the 10 core cities will continue to be initiated until 2014, further expanding the base of practice. The city projects include both "hard" and "soft" measures, span multiple thematic sectors – flood/ drainage, disaster risk reduction, water resources, housing and health—with most projects addressing more than one sector in a single intervention. They also employ a range of approaches e.g. planning, further analysis, direct action, and coordination mechanisms.

This catalogue provides a brief overview of ACCCRN city projects across 10 cities. The following project sheets provide basic information about the city project, intended impacts and key beneficiaries. They also highlight the climate change vulnerabilities and urban issues that each project aims to address, as well as how projects contribute to improved urban climate resilience of the city's systems. These aspects are further explained below and are highlighted in each project sheet.

RESILIENCE

With a growing understanding of climate change impacts, and the lessons learned by the collapse of urban systems in places like New Orleans in the aftermath of Hurricane Katrina, resilience has increasingly been seen as a useful concept to approach risk, unpredictable change and the efforts to return to normalcy. Practitioners and academics in the fields of climate change science, disaster risk reduction and infrastructure security tend to consider resilience as an attribute of the urban system that reflects the ability of its infrastructure, institutional and knowledge networks to return to or maintain a stable state.[2] In ACCCRN, the concept of resilience has drawn heavily from literature on ecosystems and socio-ecological systems, which typically define resilience as "the ability to absorb disturbances, to be changed and then to re-organize and still have the same identity (retain the same basic structure and ways of functioning)".[3]

Urban resilience to climate change demands that key actors develop and demonstrate a set of core capacities and that city systems exhibit a number of essential characteristics.[4] See Box 1. These characteristics of resilience can be used to group and conceptualize a set of systemic behaviors that avoid catastrophic outcomes or system breakdown, and enable recovery and stability after dramatic and unexpected events or gradual impacts that force change over time. Each of the characteristics is applicable to the infrastructure, institutional and knowledge networks that comprise the urban system.[5]

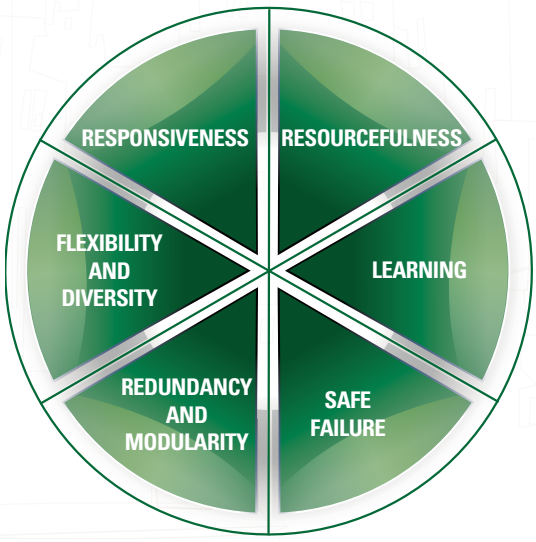


Figure 2 Resilience Characteristics

2 ibid.
3 Resilience Alliance webpage, "Key Concepts", accessed 30 April 2012 at http://www.resalliance.org/index.php/key_concepts.
4 Moench, M., S. Tyler, eds. 2011. Catalyzing Urban Climate Resilience. Applying Resilience Concepts to Planning Practice in the ACCCRN Program (2009-2011). Boulder, the Institute for Social and Environmental Transition.
5 da Silva, Kernaghan & Luque, op.cit.

BOX 1: RESILIENCE CHARACTERISTICS[6]

[1] Flexibility:

The ability to change, evolve and adopt alternative strategies (in either the short or longer term) in response to changing conditions. Flexibility implies recognizing when it is not possible to return to the previous way things worked and finding new solutions and strategies (evolution). This favors 'soft' rather than 'hard' solutions.

[2] Redundancy:

Spare capacity to accommodate increasing demand or extreme pressures. Redundancy is about diversity and the ability to adopt alternative strategies through the provision of multiple pathways and a variety of options. Some components of the urban system serve similar functions and can provide substitute services when another component is disrupted.

[3] Resourcefulness:

The capacity to visualize and act, to identify problems, to establish priorities and mobilize resources when conditions exist that threaten to disrupt an element of the system. This capacity is related to the ability to mobilize assets (financial, physical, social, environmental, technology, information) and human resources to meet established priorities and achieve goals.

[4] Safe failure:

Resilient network infrastructure is designed for safe failure. This is related to its ability to absorb shocks and the cumulative effects of slow-onset challenges in ways that avoid catastrophic failure if thresholds are exceeded. When a part of the system fails it does so progressively rather than suddenly, with minimal impact to other systems. Failure itself is accepted.

[5] Responsiveness:

The ability to re-organize, to re-establish function and sense of order following a failure. Rapidity is a key part of responsiveness in order to contain losses and avoid further disruption. However, such rapidity of response should not impair the capacity to learn, and therefore a balance between learning and rapidity should be achieved.

[6] Learn:

Direct experience and failure plays a key role in triggering learning processes. Individuals and institutions should have the ability to internalize past experience and failures, and use such experience to avoid repeating past mistakes and exercise caution in future decisions.

There is no silver bullet action that will make a city resilient. Rather, resilience will only be achieved through a collection of interventions and actions over time, and the ability of individuals and institutions to internalize learning and experience to inform future behavior.[7] While each project profiled in this catalogue individually strengthens the resilience of the city, multiple interventions that span different action areas are required in each city to develop the needed resilience capacities and characteristics.

6 Moench, M., S. Tyler, eds., op.cit.

7 da Silva, J., Kernaghan, S, & Luque, A (2012)

CLIMATE CHANGE RISKS

City projects supported under ACCCRN respond to a range of current and future urban climate change impacts faced by the city. Key climate change risks considered here include:

Direct impacts- **temperature increases, rainfall variability and more intense or more frequent storms** and

Indirect impacts - **sea level rise, saline intrusion, flooding, drought and increased risk of water- or vector-borne diseases.**

These impacts present some of the greatest challenges of our time and present a variety of threats and opportunities for urban communities, governments and businesses around the world.

10 UCCR ACTION AREAS:

URBAN CLIMATE CHANGE RESILIENCE (UCCR) ACTION AREAS

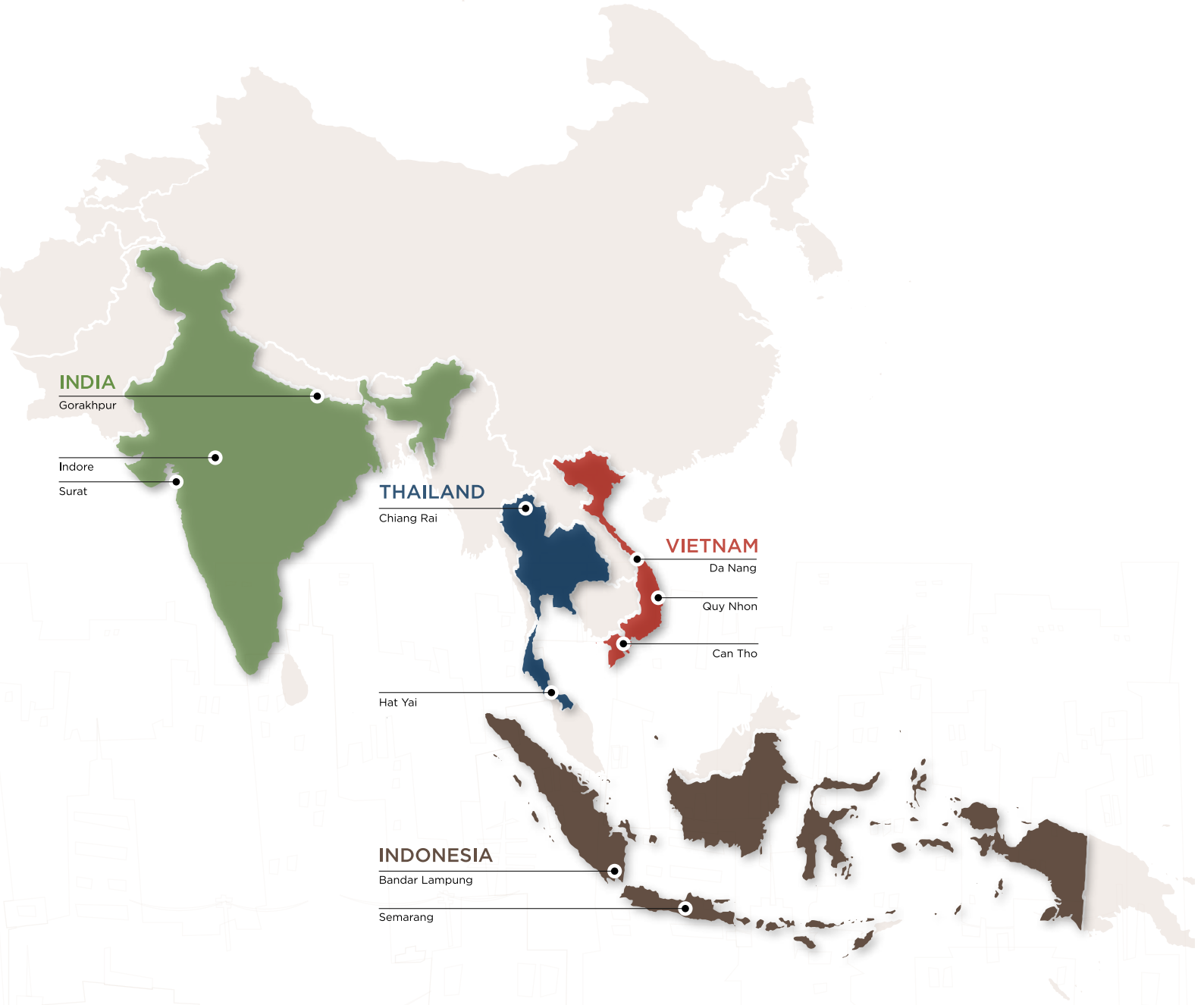
Through the range of city projects that have been proposed, funded and implemented so far under ACCCRN, 10 major Urban Climate Change Resilience (UCCR) action areas have emerged. These represent categories of action that cities must consider to strengthen their ability to anticipate, prepare for and respond to climate change impacts.[8]

In each of the city project sheets, we identify the UCCR action areas that the project addresses.

8 Brown, Dayal, Rumbaitis del Rio: *Environment and Urbanization*, Vol. 24, No.2, October 2012.

CITY PROJECTS

ACCCRN Cities



City Projects

INDIA

Gorakhpur: Implementing and Promoting Ward-level Micro Resilience Planning

Gorakhpur: Implementing and Promoting Adaptive Peri-urban Agriculture

Indore: Testing and Promoting Decentralized Systems for Differential Water Sources and Uses

Indore: Strengthening Vector-borne Disease Surveillance and Response Systems

Surat: End-to-end Early Warning System

Surat: Urban Health and Climate Resilience Center

INDONESIA

Bandar Lampung: Integrated Solid Waste Management Master Plan

Bandar Lampung: Ground Water Conservation (Biopores)

Bandar Lampung: Building Teachers and Students Climate Change Resilience Capacity

Semarang: Pre-feasibility Study for Expanding Rainwater Harvesting Systems

Semarang: Flood Forecasting and Warning System

THAILAND

Chiang Rai: Restoration of Kok River for Urban Flood Management

Hat Yai: Community-based Flood Preparedness and Institutional Coordination Systems

VIETNAM

Can Tho, Da Nang, Quy Nhon: Climate Change Resilience Coordination Offices (CCCOs)

Can Tho, Da Nang, Quy Nhon: Vietnam Youth Urban Resilience Competition

Can Tho: Strengthening Dengue Fever Surveillance and Response System

Can Tho: Developing and Implementing Real-time Salinity Monitoring, Dissemination and Response Mechanisms

Da Nang: Hydrology, Hydraulic and Urban Development Simulation Model

Da Nang: Storm and Flood Resistant Credit and Housing Scheme

Da Nang: Developing, Testing and Promoting New Education Modules to Increase Youth Awareness on UCCR

Da Nang: Pathways to Water Resilience: A Comprehensive Assessment

Quy Nhon: Hydrology and Urban Development Modeling for Flood-related Land-use Planning

Quy Nhon: Urban Mangrove Restoration for Storm Surge Protection and Resilient Land-use Practice

Gorakhpur: Implementing and Promoting Ward-level Micro Resilience Planning

Proponents

Project Holder: Gorakhpur Environmental Action Group (GEAG)
Project Implementer: GEAG
Project Period: December 2010 – December 2013 (37 months)
Budget: $479,150

Other Partners: Gorakhpur Municipal Corporation; Gorakhpur Development Authority; District Disaster Management Authority; Agriculture and Horticulture Dept, Government of Uttar Pradesh; Poorvanchal Grameen Bank; Radio Mantra; Mahanagr Paryavaran Manch; ARUP, ISET and SEEDS India
Contact: GEAG (geagindia@gmail.com)

Population **670,000**

Project Rationale

- ***Climate change risks:*** the city is prone to frequent ***flooding*** and water logging, caused by extreme precipitation, topography, improper development, and poor solid waste management. This is likely to be exacerbated as climate change brings greater rainfall variability. The city's poor population typically occupies the most marginalized areas, which are often water logged.
- ***Demand for micro resilience planning:*** In recent years, Gorakhpur citizens have come together on common platforms, demanding lasting solutions to the perennial problems. The approach fulfils a bottom-up approach towards development planning.

Project Overview

The project is establishing micro planning mechanisms in the Mahewa Ward within the city that address multiple sectors including agriculture and livelihoods, solid waste and drainage management, water and sanitation, drainage, housing, health, and education. This new micro planning model will be shared among other wards in the city. The project will also advocate the integration of climate resilience in the overall development planning process to the local government.

The project targets its activities at three levels:

- Household level: education on issues related to household level integrated farming, waste management and flood resilient construction is carried out with families.
- Neighborhood level: community groups are mobilized around issues of common interest such as health, sanitation, drainage, drinking water, upgraded housing and micro-credit, and support provided to find technical solutions and climate resilient agricultural planning.
- Ward level: the project engages with the ward level committee on issues such as provision and maintenance of municipal services and conservation of natural water bodies. These ward level committees ensure an on-going involvement in planning.

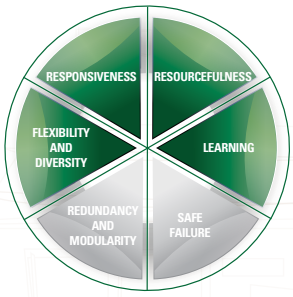
Urban Climate Change Resilience Action Areas

Expected Impact

There will be direct impact at the household level (approximately 12,000 people), but the major impact will be at the ward level where local climate change resilience is built. Ward level capacity is strengthened through the sharing of common basic services. The learning and experiences are proposed to be linked to Gorakhpur government's city-wide planning processes and the micro-resilience model to be recognized by state government and national stakeholders for wider adoption.

This project contributes to building 4 resilience characteristics in Gorakhpur ***'Flexibility and diversity'***- the diversity and function of community assets, such as, storm water drainage system, hand pumps, toilets and school, is improved. ***'Resourcefulness'***- participatory planning processes increase the capacity of the community to visualize problems and act on them such as through the community weather station. ***'Responsiveness'***- The project focuses on capacity building of neighborhood and ward-level institutions to plan in the aftermath and advance of flooding including improved management of the sewer and storm-water drainage systems, community level management and monitoring of solid waste management. ***'Learning'***- internal experiences of the project can be transferred into wider city-level departments and organizations by exposure visits from other organizations/city wards, thematic platforms to share learning, and publication of project findings.

Resilience Characteristics



Key Beneficiaries

The project's micro resilience planning will benefit a wide range of people. Forty farmers will be trained in climate resilient agriculture and will become trainers. The decentralized drainage system will benefit 5,900 people. 400 households will benefit from solid waste management; 100 households from raising of 5 India Mark Hand Pumps; 600 women and girls from community health activities; and 6 neighborhoods from Quality Drinking Water Surveillance at ward level. Moreover, city and state government officers will benefit from workshops which share project results with them.

Gorakhpur: Implementing and Promoting Adaptive Peri-urban Agriculture

Proponents

Project Holder: Gorakhpur Environmental Action Group (GEAG)
Project Implementer: GEAG
Project Period: December 2011 – May 2015 (42 months)
Budget: $631,240

Other Partners: Agriculture Dept, Horticulture Dept, Livestock and Fisheries Dept, State Government of Uttar Pradesh; Narendra Dev University of Agriculture and Technology, Faizabad; Purvanchal Grameen Bank; Gorakhpur Development Authority; Gorakhpur University; Indian Meteorology Dept; ARUP; and ISET
Contact: GEAG (geagindia@gmail.com)

Population **670,000**

Project Rationale

- ***The need for peri-urban agriculture:*** Urbanization is straining natural resources and absorbing existing agricultural land on the city's periphery. This leads to reduced green spaces, interrupted food supply chains, disrupted livelihood patterns, and reduced natural drainage of excess storm water. Most farmers follow traditional agricultural practices that are ineffective in the face of flooding, which tends to increase as climate change progresses. Farmers are vulnerable due to the lack of alternative sources of income. This has triggered interest in strengthening peri-urban agriculture since it improves livelihoods and provides vital ecosystems services for urban populations.
- ***Climate change risks***: Increasing ***rainfall variability*** and ***more intense/frequent storms*** are expected to exacerbate ***flooding*** and further degrade agriculture yield. Households that rely on traditional livelihoods, which are exposed to climate, are the most severely affected group of populations. Illegal housing construction on flood plains renders those living in these areas even more vulnerable to water logging.

Project Overview

The project scope includes 8 villages, all prone to recurring floods and water logging, with livelihoods dependent on input intensive agriculture, or casual labor during the floods. The project aims to demonstrate the importance of ecosystem services of peri-urban agriculture such as flood buffering for broader area of the city.

Project methodologies:

- Developing models of low input climate-resilient integrated agriculture-horticulture-aquaculture-livestock systems on small-marginal landholdings in the peri-urban villages. Diversifying the income and food security of the targeted farmer population. Introducing innovative agricultural techniques, taking into account the local agro-climatic conditions. For example, resilient farm models can withstand floods and water logging.
- Ensuring the sustainability of peri-urban agricultural lands through diverse mechanisms including advocacy for effective enforcement of planning laws. Keeping areas vulnerable to flooding free from development.
- Institutionalizing sustainable management of agricultural ecosystems.

Expected Impact

The primary impact will be on farmers in the 8 target villages who will improve their productivity and household income. The livelihood security of vulnerable groups in peri-urban areas and food security of urban poor will be enhanced. The wider city population will also benefit from flood protection.

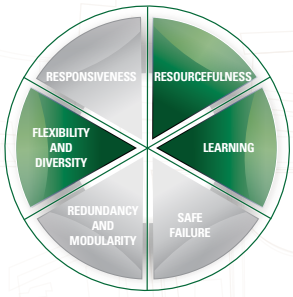
This project contributes to building 3 resilience characteristics in Gorakhpur. ***'Flexibility and diversity'***- low input climate-resilient models will provide ways to secure diversified livelihoods under varying climatic conditions. ***'Resourcefulness'***-the uptake of new models by farmers will demonstrate the capacity to identify problems and take action to mitigate these. ***'Learning'***-the use of the lessons learned from the project by local authorities regarding land use and planning laws will show an ability to internalize past experiences and avoid making the same mistakes.

Key Beneficiaries

The project will directly benefit a population of 18,000 marginal farmers over 450 hectares of peri-urban agricultural land. Indirect beneficiaries include a population of 80,000 covering 7,000 hectares of peri-urban agricultural land around Gorakhpur City who will benefit through advocacy, dissemination and lessons sharing. Urban planners, Gorakhpur Municipal Corporation, and Gorakhpur Development Authority will benefit through the availability of a demonstrable model of climate resilient peri-urban agriculture. Policy makers and practitioners at state and national level will also benefit from cross learning.

Urban Climate Change Resilience Action Areas

Resilience Characteristics



Indore: Testing and Promoting Decentralized Systems for Differential Water Sources and Uses

Proponents

Project Holder: TARU Leading Edge
Project Implementer: TARU Leading Edge
Project Period: December 2010 – June 2013 (31 months)
Budget: $239,850

Other Partners: Sewa Surbi, Aim for Awareness of Society and other NGOs; local engineering and technical institutions; Indore Municipal Council
Contact: TARU Leading Edge (info@taru.org)

Population **2,400,000**

Project Rationale

- ***The need for differential water sources and uses:*** the city's water supply is currently unsustainable due to factors including rapid population growth and urbanization. This has led to heavy reliance on water from the distant Narmada River which is costly and energy-intensive. Service deficiencies faced by Indore residents are disproportionately borne by the lower-income sections of society.
- ***Climate change risks*****:** ***Rainfall variability and temperature increase*** are forecasted, with ***more intense/frequent storms***, leading to ***increased vector and water-borne diseases*** which are common during the rainy season, due to water logging.

Project Overview

Despite the challenges, there is significant scope for improvement to both the water supply and related public health status, in order to build resilience. The project's main objective is to demonstrate alternative viable and sustainable models for cost-effective, reliable urban water management through community involvement, which can be mainstreamed into the municipal system. The project comprises 3 key phases:

- Community context analysis to understand the city's water scarcity situation and provide the context for developing integrated water management options and community-level intervention processes.
- Development of tools and methods for the assessment of the present water resource situation and future projections and technology options.
- Community-level interventions such as developing tools for community mobilization, and piloting user-managed integrated water systems.

Urban Climate Change Resilience Action Areas

Water demand & conservation systems

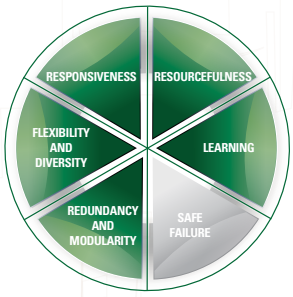
Resilient housing & transport systems

Expected Impact

The project will initially benefit the four communities selected for participation. However, the models developed will be of benefit at city level. The intervention provides cheaper, higher quality, and more diverse local water supply options which will build resilience against unreliable supplies and help accommodate increasing or surge demand. This will provide water security for the poor who get differentially lower levels of services and pay relatively higher rates due to the hidden costs of poor water supply. It will reduce the poor's disease burden and domestic burden of water collection, much of which falls on women and children.

The project contributes to the following resilience characteristics: ***'Flexibility and Diversity'***- diversity of water sources means vital assets and functions are distributed so they are not all affected by a given event at any one time. ***'Redundancy and Modularity'***- the project promotes the ability to accommodate increasing or surge demand through multiple pathways options. ***'Resourcefulness'***- the activities will increase the city's capacity to identify problems with water resources, establish priorities and mobilize resources to tackle the risk. ***'Responsiveness'***- the ability to organize/reorganize the water system both in advance of and following a stress through capacity building measures. ***'Learning'***- capacity building measure will enhance the city's ability to internalize past experiences and failures and make improvements to the water system.

Resilience Characteristics



Key Beneficiaries

The project will directly benefit around 1,000 poor households and Indore Municipal Corporation as a result of better managed water supply and redundancy options. It will reduce waterborne health risks through improved knowledge about the water quality of different sources.

Indore: Strengthening Vector-borne Disease Surveillance and Response Systems

Proponents

Project Holder: TARU Leading Edge
Project Implementer: District Health Department
Project Period: December 2011 – October 2014 (35 months)
Budget: $183,080

Other Partners: District Health Society; Indore Municipal Corporation; Urban Health Resource Centre; and community-based organization Sahayata
Contact: TARU Leading Edge (info@taru.org)

Population **2,400,000**

Project Rationale

- ***Climate change risks:*** Some areas, especially slums, built along the natural drainage channels, remain perpetually water-logged due to lack of sewerage. This is exacerbated by the ***more intense and frequent storms*** that the city has been facing. Stagnating water causes ***increased vectorborne/ waterborne diseases***, worsened by urbanization, and climate change induced temperature increase.
- ***The need for disease surveillance system:*** The existing system of monitoring vector/water-borne diseases is already overstretched and subject to errors. The current system does not promote participation of private health facilities, nor does it have a structured response mechanism in case of any major outbreak of disease. The project is innovative because, aside from Surat, no other city in India has deployed a technology based on real-time surveillance system.

Project Overview

The overall objective of the project is to reduce the incidence of vector and waterborne disease outbreaks in Indore. This will be achieved through the establishment of an integrated, citywide disease surveillance and response system. Disease-related data will be collected by the city health department from clinics, hospitals, private medical practitioners and pathological labs across the city on a daily basis. Such a mechanism will help identify areas which are prone to a particular type of disease outbreak, as well as aid the health department in ensuring timely action for preventive interventions. The knowledge will also help the Indore Municipal Corporation and the city health department to effectively prioritize sanitation and contingency plans. Moreover, the activities will encompass building community's coping capacity, raising awareness and capacity building of the city health department, to address health-related emergencies.

Expected Impact

An effective disease surveillance and response system will promote city resilience by capacitating city stakeholders through technology-based tools to mitigate the impacts of climate change on health faced by the poor and to create a city-wide network for protecting public health. Timely preventive action will mean fewer people affected by these diseases, less treatment cost on the poor and reduced burden on health facilities.

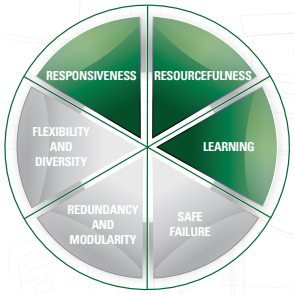
The project contributes to building 3 resilience characteristics in Indore. ***'Responsiveness'***-the reorganization of the surveillance system to accommodate private health facilities and on a more structured basis recognizes the threat of increased disease outbreaks as a result of climatic variability. ***'Resourcefulness'***-demonstrated by the public and private health services seeking to build surveillance capabilities, both systemic and in terms of human resources. ***'Learning'***-the lax existing system will be addressed through the innovative surveillance system and knowledge generated will feed into the health department's contingency plans.

Key Beneficiaries

The main beneficiaries of this project are the Indore city residents, especially the poor who are more vulnerable to vector/waterborne diseases. The project will directly benefit the poorer areas, reaching nearly 800,000 people living in slums and resettlement colonies. Benefits will also accrue to other segments of the population including the low-middle, middle and higher middle class communities living in the vicinity of these areas. The city health department will greatly benefit from reduced loads on medical facilities. The collection of information over time will also be used by academic institutions in understanding the linkages between the climate, environment and specific vector borne diseases prevalent in Indore.

Urban Climate Change Resilience Action Areas

Resilience Characteristics



Surat: End-to-end Early Warning System

Proponents

Project Holder: TARU Leading Edge
Project Implementer: Surat Municipal Corporation
Narmada Water
Project Period: December 2010 – March 2013 (28 months)
Budget: $509,900

Other Partners: Resources and Water Supply Department; Gujarat State Disaster Management Authority; Surat Urban Development Authority; Sardar Vallabhbhai National Institute of Technology; Central Water Commission; Irrigation Department; South Gujarat Chamber of Commerce and Industries
Contact: TARU Leading Edge (info@taru.org)

Population **4,500,000**

Project Rationale

- ***The need to address Surat's flood:*** Surat is the most flood-prone city in the state of Gujarat, with high vulnerability amongst the poor population and industries. The floods of 2006, resulting from an emergency release from the Ukai dam, inundated 75% area of the city costing several hundred billion Rupees.
- ***Climate change risks:*** Since the dam's construction in 1971, the increasing building of embankments and new infrastructure along both sides has reduced the safe discharge of the river between the banks and narrowed down the mouth of Tapi, which will likely be exacerbated by ***sea level rise***. Climate change scenarios for Surat indicate ***rainfall variability***, leading to more emergency dam releases and ***flooding***.

Project Overview

This project has developed an integrated meteorological, hydrological and reservoir modeling system in order to improve reservoir operations for flood mitigation. An end-to-end early warning system is also set up to inform the city administration to take action in case of extreme precipitation events. The project is also building community disaster response capacity. This project addresses the issue of flooding in a multi-scalar and multi-institutional manner, looking at upstream causes of flooding beyond the administrative boundary of the city. Key activities include:

- Establishment of Surat Climate Change Trust: multi-stakeholders to facilitate the design of the flood management system, direct agencies to set up a data collection system and suggest studies to reduce vulnerability.
- Climate change informed modeling: existing hydrological models will be integrated with rainfall predictions, real time rainfall, stream gauge, and reservoir data collection systems. Simulation of changes induced by climate change will also be carried out to assess future scenarios and generate flood risk maps.
- Early warning and disaster management system: based on near-real time modeling results and communicated through various channels to the communities at risk.
- Support to the poor: feasibility studies will look at setting up a database of vulnerable people and a community-managed asset bank, whilst building by-laws will be influenced in favor of the poor.

Expected Impact

The enhanced met-hydro reservoir models will provide at least four days respite time before flood enters the city. This gives sufficient time for controlled release of dam water, thereby minimizing flood-related damages and the vulnerability of the poor, whose houses are located in more flood-prone areas. The climate informed flood information will also help residents build safer homes.

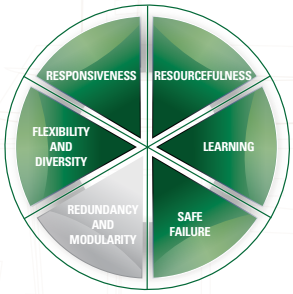
The project contributes to building multiple resilience characteristics in Surat. ***'Flexibility and Diversity'***- improved management of the Ukai dam allows normal functionality of the dam within a wider range of rainfall patterns as well as creates ***'Safe Failure'*** through controlled release of water if its capacity is exceeded. ***'Resourcefulness'***-the flood modeling database and vulnerable people's database enable appropriate planning mechanisms to identify and prioritize problems and mobilize resources. ***'Responsiveness'***-The establishment of a multi-stakeholder of Surat Climate Change Trust increases their capacity to manage systems against potential threats. ***'Learning'***-The development of a shared flood modeling database and the establishment of the of Surat Climate Change Trust enable internal agents to understand flood risk and climate change impacts on their city and incorporate learning into appropriate urban management strategies.

Key Beneficiaries

End-to-end warning system directly benefits roughly 75% of the city population. The losses to businesses and the Surat Municipal Council will be reduced. Over 20% of the city's poor households along creeks and rivers, and nearly 50% of the total households will benefit from reduced risks due to more controlled releases and sufficient respite time to shift to safer locations. Almost all the households and industries will be prevented from livelihood and business disruptions.

Urban Climate Change Resilience Action Areas

Resilience Characteristics



Surat: Urban Health and Climate Resilience Center

Proponents

Project Holder: TARU Leading Edge
Project Implementer: Surat Municipal Corporation's Health Department
Project Period: August 2012 – December 2015 (40 months)
Budget: $521,795

Other Partners: Surat Municipal Institute of Medical Education and Research
Contact: TARU Leading Edge (info@taru.org)

Population **4,500,000**

Project Rationale

- ***Climate change risks:*** Surat is already prone to ***vector-borne diseases, rainfall variability, flooding*** and potentially more prolonged water logging.
- ***The need for Surat Urban Health and Climate Resilience Center:*** The city has one of the best public health care services and delivery infrastructure in the country which is considered as a model. It integrates vector breeding control measures, provision of safe water supply, collection of solid and biomedical wastes, and wastewater management. However, the system needs to be strengthened in order to meet the demands of rapid urbanization and climate change. Based on the health sector study carried out in 2010 under ACCCRN, the team recommended establishing an Urban Health and Climate Resilience Center to build on the knowledge and operating procedures established in Surat, in order to provide support to the state and central-level urban health support systems that incorporate climate change resilience issues.

Project Overview

The project involves establishing an Urban Health and Climate Resilience Center with the main goal of improving urban health management through evidence-based research, strengthening surveillance, and developing operating procedures for lifeline services departments in the city. The Center will be established within an existing institution, the Surat Municipal Corporation's Health Department, and will be the first of its kind in the country to address public health and climate change adaptation issues.

Key activities include:

- Formation of a public health working group to steer the Centre's establishment and to advise on possible climate change scenarios in the city and their impacts on existing public health systems.
- Development of climate-informed disease surveillance system which will involve the analysis of various parameters, such as the impact of climate risks on the population, and the success of adaptation measures towards the improvement of health and the environment.
- Inter-disciplinary research which will prioritize a set of research areas integrating urban health, environmental services and climate change. It will also focus on policy pathways for equitable health care for poor/ vulnerable citizens.
- The centre will establish an outreach program to promote these preventive health practices in other cities through published materials, training packages and professional networks.

Expected Impact

- Institutionalization of water/vector-borne disease surveillance system enables improved prediction of epidemics and prevents incidents leading to epidemics; as well as, provides preventive measures in a coordinated manner with other stakeholders and agencies.
- The project will provide support to Surat Municipal Corporation departments to implement strategies to minimize the impacts of climate change on human well-being.
- Evidenced-based understanding of climate – health linkages will be developed.

The impact will be at the city-wide level, although the center will generate information that will be useful across the state, as well as a model that can be replicated across the country. The project contributes to building 3 resilience characteristics. ***'Responsiveness'***- the health centre represents a new form of organization that is emerging in response to urbanization and climate change. Surveillance system will allow health workers to organize a response in advance of a threat. ***'Resourcefulness'***- the improvement of the health information management and incorporation of climate change data into health analysis will improve actors' ability to identify problems and provide evidence as a basis for resource requests. ***'Learning'***-ability to internalize past experiences and failure within the health system as a result of the improved health information management system.

Key beneficiaries

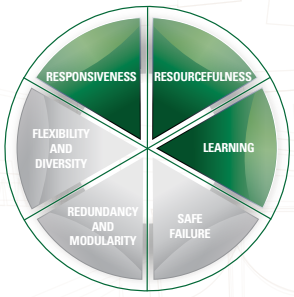
The whole city population will benefit especially poor and vulnerable groups prone to infectious diseases and vector-borne diseases. A reduced disease burden will mean steadier incomes and reduced costs of medical support.

Urban Climate Change Resilience Action Areas

Responsive health systems

Institutional coordinatiion mechanisms & capacity support

Resilience Characteristics



Bandar Lampung: Integrated Solid Waste Management Master Plan

Proponents

Project Holder: Mercy Corps
Project Implementer: Bappeda (Local Development Planning Board)
Project Period: November 2010 – December 2011 (14 months)-Project completed
Budget: $233,530

Other Partners: Lampung University; Kementerian Lingkungan Hidup (representative of national government); URDI; Cleanliness and Parks Agency (Disbertam); Public Works Agency; Mitra Bentala (an NGO); ARUP
Contact: Omar Saracho (osaracho@id.mercycorps.org)

Population **810,000**

Project Rationale

- ***The need for integrated solid waste management:*** the city's existing solid waste management system is unable to cope with demands brought about by rapid urbanization and the city lacks an integrated plan. The majority of all city's waste goes uncollected due to lack of institutional capacity, or is improperly disposed of. Much of the waste amasses in rivers and drains, which reduces drainage and increases flood risk along the riverbank where many of the urban poor live. There is low community participation in solid waste management due to low awareness of the issues.
- ***Climate change risks:*** the city's Vulnerability Assessment (2010) projects rapid ***rainfall variability***, which will increase the number and severity of ***flooding***. Together with ***Temperature increase*** and improper solid waste disposal, this will lead to greater health risks for vulnerable populations, since piles of uncollected waste and standing water provide a breeding ground for ***vector-borne disease***.

Project Overview

An Integrated Solid Waste Master Plan (ISWMP) has been produced based on an assessment of a number of options for integrated waste management that are technically, institutionally, and economically viable.

Key activities:

- A literature review focused on waste management needs and projected climate change impacts.
- Policy analysis that includes lessons learned from other cities with initiatives focused on solid waste management and climate change, and related experience in policy formulation.
- Value chain assessment focused on community-based, informal solid waste systems
- Best practice identification in municipal solid waste management by comparing Bandar Lampung's management with other cities.
- Techno-economic assessment to prepare options for integrated waste management based on economic feasibility.
- Developing the master plan to synchronize results with city land use planning and incorporate it into Bandar Lampung city resilience strategy and city planning.

Expected Impact

The ISWMP increases urban climate resilience by incorporating climate change projections and health-related vulnerabilities into solid waste management. The process has built awareness of the relationship between solid waste management, drainage, the health sector and climate change, as well as building capacity of the city to manage these in an integrated manner. The ISWMP will help reduce flood damage to assets while a healthier environment will reduce the poor's health expenditure and provide an opportunity to increase savings. The assessments carried out in the project including master plan scenarios and the project's recommendations provide the basis for integrated waste management plan in Bandar Lampung through 2025.

The project contributes to the resilience characteristics: ***'Resourcefulness'***- research into solid waste management, policy analysis and best practice identification shared through multi-stakeholder forums increases internal agents' capacity to identify problems, prioritize actions and mobilize resources. ***'Responsiveness'***- multi-sectoral working increases the capacity to organize effective management urban systems. ***'Learning'***- research to establish baselines, evaluation of pilots and formation of working groups supports learning and establishment of new strategies that relate to the agency of different actors.

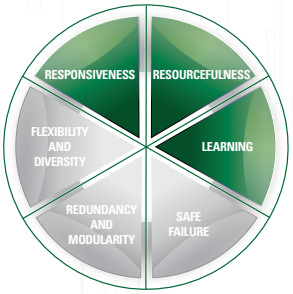
Key Beneficiaries

Disbertam and Bappeda receive direct benefit through the production of the solid waste master plan. Communities will benefit from improved quality of life through better services and a healthier environment.

Urban Climate Change Resilience Action Areas

Drainage, flood & solid waste management

Resilience Characteristics



Bandar Lampung: Groundwater Conservation (Biopores)

Proponents

Project Holder: Mercy Corps
Project Implementer: BAPPEDA (Local Development Planning Board)
Project Period: January 2012 – April 2014 (28 months)
Budget: $495,860

Other Partners: A multi-stakeholder Task Force Team with representatives from: Local Development Planning Board; Local Public Water Company Way Rilau; City Planning Agency; Agriculture, Animal Husbandry, and Forestry Agency; Local Environmental Control and Management Board; Public Park and City Hygiene Agency; University of Lampung; Private Sector; Community Groups; ARUP
Contact: Omar Saracho (osaracho@id.mercycorps.org)

Population **810,000**

Project Rationale

- ***The need for groundwater conservation:*** the severity of water scarcity increases during extreme climate events, such as ***droughts*** and ***floods***. The city has groundwater reserves but the quantity and quality are deteriorating due to high water demand and limited service coverage of the regional water provider leading to groundwater extraction, and an expanding area of impermeable surface which leads to a rapid runoff rate. Groundwater recharge is a critical matter for the provision of safe water in the city. Due to its coastal position and poor infrastructure, Bandar Lampung is a disaster-prone area. The affected areas are mostly inhabited by poor households, who are more vulnerable to the impacts since they have a relatively low adaptive capacity.

- ***Climate change risks:*** ***sea level rise, more intense/frequent storms***, deforestation, urban development activities and inadequate drainage are increasing the frequency and severity of ***flooding***. Improper solid waste disposal into canals has exacerbated this.

Project Overview

The project aims to reduce flood potential, increase groundwater quantity, and accelerate soil infiltration capacity, by implementing an artificial groundwater recharge method in the form of biopore infiltration holes. This project involves:

- Pilot project: A preliminary assessment will determine the most appropriate location and method to install biopores and will include a review of successes/failures of biopore application at local and national scale. An inception workshop and site visit will develop a general understanding of the biopore method, gather lessons learned and ensure stakeholder commitment. Data will be collected and analyzed on soil composition, groundwater quality, solid waste, weather and hydrological characteristics. Local facilitators will be appointed in the two sub-districts of the pilot, to act as community-level coordinators for biopore implementation and maintenance. Approximately 20,000 biopores will be installed during this phase.
- Extended implementation: This phase will involve the implementation of the biopore project on a wider scale in Bandar Lampung municipality - city-wide, if possible – based on the pilot project's findings. During this particular implementation stage, 80,000 biopores will be installed.

Expected Impact

The project is expected to positively impact the wider ecosystem by increasing the groundwater reserve which will help the community to overcome drought during the dry season by increasing groundwater. It will also reduce flood potential by enhancing the soil's re-absorption capacity. Since a biopore system relies on organic waste to stimulate the activities of soil organisms that play a major part in increasing soil porosity, the project will also provide a secondary benefit by alleviating solid waste.

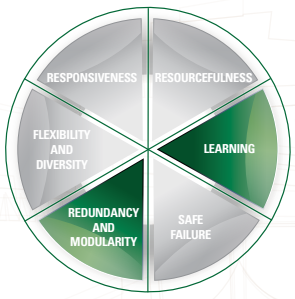
The project contributes to the following resilience characteristics: ***'Redundancy and Modularity'***- the biopores will provide additional soil infiltration capacity to help reduce inundation and support the existing drainage system. ***'Learning'***- the project design will benefit from a review of past experiences locally and nationally, to ensure best practices are applied. The implementation of a pilot project will also offer the opportunity for project stakeholders to learn from this before the intervention is rolled out at a larger scale.

Key Beneficiaries

The project will directly benefit communities of around 300,000 people living in the target area by reducing inundation caused by high surface runoff.

Urban Climate Change Resilience Action Areas

Resilience Characteristics



Bandar Lampung: Building Teachers' and Students' Climate Change Resilience Capacity

Proponents

Project Holder: Mercy Corps
Project Period: January 2012 – December 2014 (36 months
Budget: $450,000

Project Implementer: Project Management Unit comprising representatives from: Ministry of Environment; Curriculum Center of the National Education Department; Hanns Seidel Foundation; Indonesian Municipality Association; University of Satyawacana; Indonesian NGO Network in Environmental Education; Education Agency of Bandar Lampung; University of Lampung; Local Development Planning Board of Bandar Lampung; Education Council of Bandar Lampung; WATALA; Mitra Bentala
Contact: Omar Saracho (osaracho@id.mercycorps.org)

Population **810,000**

Project Rationale

- ***Climate change risks:*** climate change will increase the impact of climate-related hazards already faced by the city including tidal waves, storm surges, coastal erosion and ***sea level rise***. It will also likely exacerbate ***flooding*** and ***drought***. Children are particularly vulnerable according to the vulnerability assessment conducted in 2010.
- ***The need for improved climate change resilience capacity:*** education and knowledge will build city residents' resilience and mainstream climate change adaptation. There is need to develop hands-on educational materials on climate change adaptation, to integrate them into the schools' curriculum and to train teachers and school students so that the knowledge will then be shared within their local community.

Project Overview

This project aims to increase climate change adaptive capacity of teachers and students through education with an ultimate goal to integrate climate change into national curriculum. It will also encourage activities within the wider city to increase resilience.

- A review will be conducted with key stakeholders in the education sector to identify existing modules on the natural environment, climate change, and disaster reduction in Indonesia.
- An urban climate change resilience module will be developed for elementary and junior high schools in collaboration with city stakeholders. An initial trial training workshop for teachers will test the draft module for its suitability.
- A pilot project will be conducted to test the effectiveness of the module and to measure its impacts on teachers' and children's knowledge and climate-risk preparedness behavior.
- The finalized UCCR module will be disseminated at city and national level. Advocacy, including seeking a Mayoral Decree, will be used to promote institutionalization of the curriculum.

Urban Climate Change Resilience Action Areas

Emergency management & early warning systems

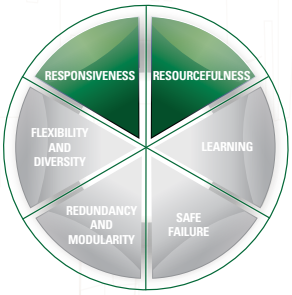
Education & capacity building of citizens

Expected Impact

The key impact will be increased adaptive and response capacity of students in dealing with climate change effects. As a result, the capacity of their communities will also increase. Teachers' understanding of and skills in climate-related knowledge will be strengthened. Not only is it expected that the module will be officially adopted by the Education Agency and Mayor of Bandar Lampung, and so disseminated city-wide, but also it is hoped that the project will be able to disseminate its best practices nationally.

The project contributes to these resilience characteristics: ***'Responsiveness'***- the increase in adaptive capacity will enhance individuals' and households' ability to organize themselves and act in a timely manner prior to and after a disaster. ***'Resourcefulness'***- being equipped with increased knowledge regarding climatic threats and adaptation methods, communities will be better able to take appropriate decisions and actions to mitigate the worst impacts, which may include mobilization of community or local authority resources.

Resilience Characteristics



Key Beneficiaries

Direct beneficiaries are students and teachers in the 4 pilot schools. Once the new curriculum is implemented in all schools in Bandar Lampung, the anticipated number of direct beneficiaries is around 314 elementary and 142 junior high schools.

Semarang: Pre-feasibility Study for Expanding Rainwater Harvesting Systems

Proponents

Project Holder: Mercy Corps
Project Implementer: Project Management Unit led by Semarang Development Planning Board
Project Period: December 2010 – November 2011 (12 months)- Project completed
Budget: $189,520

Other Partners: Semarang University; City team comprising BLH Semarang, BINTARI Foundation, BMKG Semarang, PSDA Semarang, P5 UNDIP, LMB UNIKA, LEPAAS Semarang, and PERDIKAN Association Semarang; ARUP
Contact: Omar Saracho (osaracho@id.mercycorps.org)

Population **1,460,000**

Project Rationale

- ***The need for water security:*** based on the city's current water supply strategies and its population growth, it is projected that by 2025 Semarang's water demand will exceed its supply. PDAM's (Local Government Water Enterprises) water distribution is concentrated in the city centre, leaving those living outside to fulfill their needs by building pumped wells, purchasing from water trucks and collecting from distant water springs.
- ***Climate change risks:*** Climate change will exacerbate water shortages by broadening the ***drought*** impact area, increasing ***flooding*** and water contamination. Increased flooding, drought and clean water shortages will potentially exacerbate ***vector-borne disease*** incidences, presenting an additional health and economic burden to already poor households. Semarang needs to find alternative inexpensive technologies to address the water scarcity and flood issues.

Project Overview

This project conducted a pre-feasibility study to determine the potential of rainwater harvesting in reducing climate change vulnerability, particularly flood and drought, in Semarang. A greater understanding of potential for rainwater harvesting allows the city to better manage the anticipated shortfall in the water supply system and enables households to use clean water without exploiting surface and groundwater resources.

Key activities included:

- Data collection and analysis: available methods of rainwater harvesting; Semarang hydrological, geographical, and socio-economic data; water systems, supply, and demand; and the cost of the relevant technology.
- Pre-feasibility study of rainwater-harvesting models which are suitable for Semarang.
- Feasibility mapping: production of a map and model of the potential area for implementing rainwater-harvesting technology along with its appropriate method. This enables a proposal for the citywide implementation of a rainwater-harvesting system to be developed.

Expected Impact

The key recommendations and lessons learned were:

- Individual rainwater harvesting systems are a financial burden for poor people to develop while communal systems are more feasible. A community participation process also promotes a sense of ownership and assures the maintenance of the rainwater harvesting installation.
- The involvement of the private sector helps to boost sustainability. Many private sector participants are seeking further information about the possibility of using such systems at their sites.
- The Environment Agency of Semarang has begun replication of the rain harvesting systems. In 2011, the Environment Agency built an individual model of rainwater harvesting in 10 locations, for both households and official administration offices. In 2012, they have allocated funds to build another 7 individual systems in locations recommended by this study.

The project contributes to building 3 resilience characteristics. ***'Resourcefulness'*** -undertaking the study generates a shared knowledge base among a diverse group of stakeholders, enabling them to identify problems, define practical citywide solutions and mobilize resources to act. ***'Responsiveness'***: better understanding of water demand and the potential for rainwater harvesting will increase resilience by allowing the city to better manage the water supply system. ***'Learning'*** -the establishment of a city team, including diverse stakeholders, provides an opportunity for interdisciplinary learning from this and future projects.

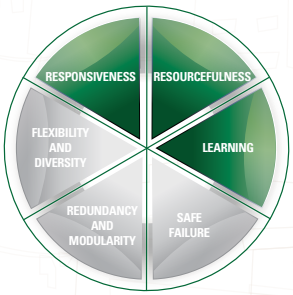
Key Beneficiaries

Around 44% of the population not currently served by municipal water authorities benefits from rainwater-harvesting technology. These populations are particularly vulnerable to disruptions of clean water, contamination in floods, loss of groundwater, and drought.

Urban Climate Change Resilience Action Areas

Water demand & conservation systems

Resilience Characteristics



Semarang: Flood Forecasting and Warning System

Proponents

Project Holder: Mercy Corps
Project Implementer: The Project Management Unit including representatives from Semarang Development Planning Board and Environmental Board
Project Period: January 2012 – December 2014 (36 months)
Budget: $552,230

Other Partners: Disaster Management Board; Environment for Sustainable Development Board; Meteorology, Climatology and Geophysics Board of Semarang; Diponegoro University; LMB Soegijapranata Catholic University; Asian Disaster Preparedness Center; ARUP; Red Cross-Indonesia; Dinkes Local Health Agency; PERDIKAN Community groups
Contact: Omar Saracho (osaracho@id.mercycorps.org)

Population **1,460,000**

Project Rationale

- ***The need for flood forecasting and warning system:*** Semarang has had long experience with flooding, including tidal flooding, and the areas being inundated are increasing over time. Tidal flooding is occurring more frequently over the duration of the day, making it more difficult to predict. Whilst some communities have made adaptive efforts, by raising the level of their houses to prevent flood intrusion, there is no flood early warning system.
- ***Climate change risks:*** Although there are on-going efforts to improve the city's drainage infrastructure, increasing ***rainfall variability*** and ***sea level rise*** will increase vulnerability to flooding, in particular during the wet season. It is estimated that the number of households living in flood-prone areas will increase approximately by 50% by 2050.

Project Overview

The project aims to reduce vulnerability to and impact of flood disasters by building preparedness capacity of the most vulnerable communities and local government through the development of an early warning system and evacuation strategies. Consequently, communities will become more resilient to flood and other climate related disasters.

The key project activities are:

- Disaster Risk Assessment: to identify existing community responses that work towards minimizing risks, injury and casualty.
- Flood Forecast Information and Warning System: The Meteorology, Climatology and Geophysics Agencies of Semarang, climatologist, hydrology experts and community institutions will develop this system and disseminate it to vulnerable communities and local government institutions responsible for infrastructure development.
- Identification of Flood Shelters: identified based on results from flood information system and preliminary assessment with targeted communities.
- Disaster Risk Management Training: provided for targeted communities. Community-based disaster preparedness groups will also be developed in selected flood prone areas.
- Pilot Project: to assess feasibility and benefits of implementing flood forecasting and warning systems. It will assess community's response time in the event of disaster and their preparedness before and after the development of early warning system.

Urban Climate Change Resilience Action Areas

Expected Impact

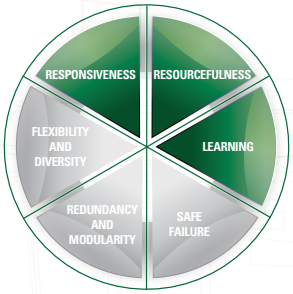
It is anticipated that the project will not only lead to a reduction in climate change vulnerability but also will have a positive impact on disaster risk reduction in Semarang. Flood forecast information will enable the community to better prepare measures so that flood risk reduction and early evacuation reduce damages. The Public Works Agency will be better informed about areas where infrastructure capacity needs to be strengthened in order to minimize the flood impact, as well as areas that need to be kept as natural water catchment sinks to minimize flood potential.

The project contributes to building the following resilience characteristics in Semarang. ***'Responsiveness'***- both communities and local government will be better prepared to take action in the face of disruption through the introduction of an early warning system and evacuation strategies. Community-based disaster preparedness groups will also be developed so that communities can respond effectively. ***'Resourcefulness'*** -the training will allow individuals to gain additional information and capacity through networks whilst the community-based disaster preparedness groups will be best placed to take action to mobilize resources. ***'Learning'*** -the project will reflect upon previously used flood response mechanisms in order to build upon these and the pilot project will provide a further opportunity to build in lessons to the final design.

Key Beneficiaries

This program will directly benefit vulnerable groups affected by flooding as identified in the City Resilience Strategy: poor communities residing in coastal areas, communities living along the riverbanks and communities in downtown areas with dense settlement conditions.

Resilience Characteristics



Chiang Rai: Restoration of Kok River for Urban Flood Management

Proponents

Project Holder: Thailand Environment Institute
Project Implementer: Chiang Rai Municipality
Project Period: January - September 2012 (9 months)
Budget: $250,000

Other Partners: Royal Irrigation Dept, Dept of Public Works, Town & Country Planning; Chulalongkorn University; Rajabhat University Chiang Rai; and Khon Kaen University
Contact: Pakamas Thinphanga (pakamas@tei.or.th)

Population **70,000**

Project Rationale

- ***The need to restore Kok River:*** The inner section of the Kok River, Mae Kok Noi, ran dry due to the building of a resort's diversion channel at the Mae Kok Noi's upper reaches some 20 years ago. Today, the channel is overgrown with vegetation. The ecological condition has been further damaged by uncontrolled garbage dumping and untreated wastewater. The project proposes an ecological restoration approach in order to minimize the use of energy and new construction materials, protect biodiversity, and ensure easy maintenance.
- ***Climate change risks:*** The city overall is expected to be affected by climate-induced drought as a result of changing rainfall patterns; rain which may also be heavy at times leading to excessive runoff into such channels; and ***flooding***. The channel's unsanitary condition has the potential to become a breeding ground for disease vectors. With ***temperature increase,*** this could lead to ***increased waterborne/ vector-borne disease***.

Project Overview

A feasibility study is being conducted to provide technical recommendations to Chiang Rai municipality on the restoration and redevelopment of areas along the riverbanks and to identify impacts on different community groups. This will aim to get the water flowing again and allow the channel to serve several ecological, physical and social purposes for the urban area. The enhanced water quality will improve disease and pest control, increase the effectiveness of flood reduction measures, and provide a local source of water for eco-agriculture and recreation.

Some of the key activities include:

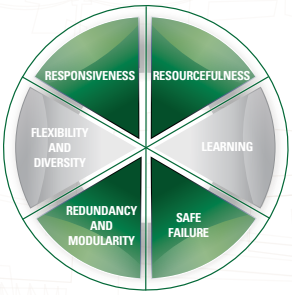
- Develop concepts of river restoration design alternatives. Two variations have been discussed: returning the channel to a free flowing river connected to the Kok River at both ends; and utilizing the channel as an ecologically engineered water treatment system for urban surface-runoff discharged to the Kok River at one end. Stakeholders will be engaged through meetings to determine the best restoration alternatives.
- Study the technical viability of restoration approaches including gathering information on public utilities, hydrology, hydraulics, biodiversity, topography, land use and ownership.
- Solidify the concepts into a technically feasible, community supported, self-sustaining environmental restoration plan; and construct the restoration design in the pilot phase to demonstrate a more ecological sustainable option.

Urban Climate Change Resilience Action Areas

Drainage, flood & solid waste management

Ecosystems service strengthening

Resilience Characteristics



Expected Impact

The restoration will improve water circulation and water quality, consequently eliminating vector breeding places, benefiting the poor communities living next to the Mae Kok Noi channel. Sustainable conservation of the urban environment will also be demonstrated. Moreover, the project will strengthen knowledge capacities of the Chiang Rai municipality.

The project contributes to building 4 resilience characteristics in Chiang Rai. ***'Responsiveness'***- the restoration of the channel will serve a number of different functions including the provision of an alternative source of water for eco-agriculture and support to flood reduction measures. ***'Resourcefulness'***-the multi-stakeholder process and consideration of various options for restoration will enhance community and local government's ability to identify problems and establish priorities. ***'Redundancy'***- Rehabilitated river will act as a reserve water source, building redundancy into the system. ***'Safe Failure'***-river rehabilitation acts as a by-pass during flooding events when key thresholds are exceeded.

Key Beneficiaries

The primary beneficiaries are the poor and vulnerable 2,749 people in 5 communities residing by the river. The urban communities of Chiang Rai city will indirectly benefit from the ecologically restored system since the river will provide additional water storage, flood reduction and urban greening.

Hat Yai: Community-based Flood Preparedness and Institutional Coordination Systems

Proponents

Project Holder: Thailand Environment Institute
Project Implementer: The Songkhla Community Foundation
Project Period: January 2012- December 2013 (24 months)
Budget: $196,750

Other Partners: Hat Yai Working Group comprising; Local governments: Hat Yai Municipality & Kutao Municipality; Office of Disease Prevention and Control, District Office of Public Health, and Public Health Services Centre; Office of Social Development and Human Security; Provincial Office of Natural Resources and Environment; Provincial Office of Energy; Provincial Office of Community Development; Provincial Office of Public Works and Town Planning; Prince of Songkhla University
Contact: Pakamas Thinphanga (pakamas@tei.or.th)

Population **160,000**

Project Rationale

- ***The need for Hat Yai flood preparedness:*** Urbanization, modern agricultural practices and new construction have obstructed waterways, consequently exacerbating seasonal flooding problems. Land use decisions do not adequately consider the implications for the passage of flood water. The insufficient drainage causes long-lasting inundation, environmental and property damage, and negative impacts on people's lives. There is a lack of integration of key systems such as the early warning system, health services system, and welfare system, constraining the ability to tackle flooding effectively.
- ***Climate change risks:*** The ACCCRN vulnerability assessment of Hat Yai indicated more frequent ***flooding*** in the U-Tapao Canal Basin due to periods of ***more intense rainfall***. This severely affects vulnerable groups, who already bear huge losses and health burdens during floods; and usually have limited capacity to adapt to such challenges.

Project Overview

The project aims to improve the life of vulnerable communities through strengthened capacities of community-based services for the preparation and mitigation of flood-related impacts. The project will promote collaboration between communities and local governments to tackle disaster risk reduction, welfare and health issues, and to develop an integrated plan on these issues. The project involves two key components:

- Community assessment and planning: This encompasses identifying community needs in strengthening capacities to cope with climate disasters, and development of an action plan. Local communities will provide information on disaster preparedness, and community-based management including waste management, neighborhood watch, basic services revolving fund systems, and land use management.
- Knowledge capacity building on climate implications and flood related risks, preparedness and adaptation within the selected communities.

Expected Impact

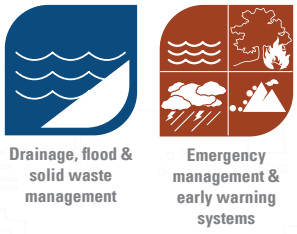
The project will reduce the vulnerabilities of local communities who are repeatedly impacted by floods. Integrated community plans will ensure that the local communities have access to healthcare, better land use zoning, improved sanitation, provision of basic infrastructure, and improved environmental conditions. Communities will have access to climate information and a community-based early warning system, as well as essential equipment, goods and services to assist the communities before, during and after flood hazards. Mapping of vulnerable groups within the community will provide faster responses. Furthermore, flood management of Kutao sub-district will directly benefit flood drainage of Hat Yai city.

This project contributes to building 3 resilience characteristics in Hat Yai. ***'Responsiveness'***- the project strengthens local community's flood adaptive capacities and the local government's ability to support these processes in an integrated way. ***'Resourcefulness'***-the process of assessment and planning will build the community's capacity to identify problems and establish priorities. ***'Safe Failure'***-catastrophic failure is lessened through more secure natural habitats and improved surroundings.

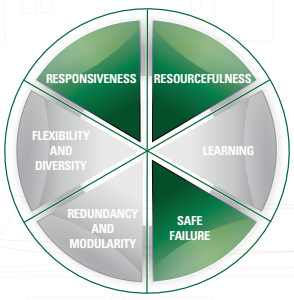
Key Beneficiaries

The project will directly benefit Kutao sub-district, which has a total population of 12,990, most of whom are poor farmers and fishermen. Communities from other areas will also indirectly benefit from the project through lessons learned.

Urban Climate Change Resilience Action Areas



Resilience Characteristics



Can Tho, Da Nang, Quy Nhon: Climate Change Resilience Coordination Offices

Proponents

Project Holder: Institute for Social and Environmental Transition
Project Implementer: People's Committees of Can Tho City, Da Nang City and Binh Dinh Province
Project Period: December 2010 – December 2012 (25 months)
Budget: $1,582,240

Other Partners: City Climate Change Steering Committees; Challenge to Change; National Institute for Science and Technology Policy and Strategy Studies; Arup
Contact: Da Nang: Nguyễn Đình Anh (anhnddn@gmail.com)
Quy Nhon: Đinh Văn Tiên (dinhvantienvn@gmail.com)
Can Tho: Mr. Kỷ Quang (quangvinh@cantho.gov.vn)

Population

Can Tho:	**1,200,000**
Da Nang:	**900,000**
Quy Nhon:	**270,000**

Project Rationale

Can Tho, Da Nang and Quy Nhon cities are encouraging rapid urban development, which creates additional stresses including pollution, migration, inadequate water supply and other infrastructural deficits.

- ***Climate change risks:*** the three cities are all exposed to ***sea level rise, temperature increase, flooding, rainfall variability*** and ***more intense/frequent storms*** which will exacerbate the urban issue stresses.
- ***The need for Climate Change Resilience Coordination Offices:*** faced with making many costly and often irreversible planning decisions related to infrastructure and urban development, the cities recognize the need to incorporate climate change into their plans. However, there is an absence of clear and effective coordination mechanisms and a lack of understanding of climate change and its implications.

Project Overview

The overall goal is to create and implement a sustainable, effective mechanism for local government planning, decision-making and policy implementation for climate change resilience and adaptation in Can Tho, Da Nang and Quy Nhon cities. Specific project objectives are to:

- Establish City Climate Change Coordination Offices (CCCO) in all three cities which are placed within existing institutions but work across multiple departments.
- Support the newly-established Coordination Offices to undertake the following activities:
  - Assemble and provide access to the data required to assess future climate impacts in relation to urban development plans, vulnerable social groups and economic sectors.
  - Coordinate the climate change resilience analysis for all relevant city / provincial departments to ensure that they make use of the best available information in planning and decision-making.
  - Coordinate climate change planning and programming at the city level to ensure synergy and consistency in data use, assumptions and implementation across departments and agencies.
- Strengthen the capacity of the Offices to understand and implement their responsibilities effectively.
- Strengthen the participation of vulnerable communities in climate resilience planning/decision-making.

Urban Climate Change Resilience Action Areas

Land use & Urban planning

Institutional coordinatiion mechanisms & capacity support

Expected Impact

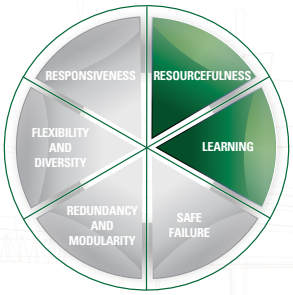
The CCCO's establishment will mean that the cities can undertake a system-wide approach to urban climate resilience. Local government partners will have staff trained to implement effective climate resilience management, coordinate interventions, and update resilience strategies. City climate resilience plans and proposals will incorporate the perspectives of vulnerable communities and these communities will have increased awareness of climate change risks and interventions to reduce these. The project will see the emergence of a community of practice for urban climate resilience in Vietnam based on CCCOs' interaction.

The project contributes to building the following resilience characteristics: ***'Resourcefulness'***- through the increased understanding of climate change impacts and enhancement of the cities' capacity to identify problems, establish priorities and mobilize resources. ***'Learning'***- there will be improvement in the capacity of city level agents in planning for climate change, and to internalize past experiences and failures.

Key Beneficiaries

The three city authorities will gain a dedicated and capable professional staff unit to analyze, promote and coordinate urban climate resilience interventions. This initiative will also pay particular attention to integrating the views of women, the poor and other marginal social groups into the climate resilience planning process.

Resilience Characteristics



Can Tho, Da Nang, Quy Nhon: Vietnam Youth Urban Resilience Competition

Proponents

Project Holder: Challenge to Change
Project Implementer: Challenge to Change
Project Period: December 2011 – July 2013 (20 months)
Budget: $149,820

Other Partners: Provincial/City Youth Union; City Climate Change Coordination Offices; formal and informal youth groups
Contact: Vu Thi My Hanh (myhanh@challengetochange.org)

Project Rationale

The need to focus on youth in the context of urban climate change resilience (UCCR):

- They are the primary stakeholders of the medium-term future, when climate change will have its greatest impact.
- Youth are marginalized from current decisions about how to cope with the future impacts of climate change due to their age status.
- Youth can be highly motivated to make positive changes, are trend-setters, and are active internationally in raising their voices. Their participation in deciding the best ways to support the building of UCCR is fundamental as it raises community ownership and engagement.

Population

Can Tho:	**1,200,000**
Da Nang:	**900,000**
Quy Nhon:	**270,000**

Project Overview

The project aims to create more widespread understanding of urban vulnerability and to stimulate communities to build their own UCCR, through the active engagement of youth in related initiatives. The process includes:

- A Call for Proposals for UCCR building initiatives in the three ACCCRN cities: youth groups were invited to submit proposals that present tangible outputs delivered within 12 months. The total number of Initiatives supported is around 20 (value $500-$5,000 each).
- Each initiative will contribute to the City Resilience Strategy, with the priority given to resilience building of poor and vulnerable people. Furthermore, the initiatives shall support existing ACCCRN projects, or enable documentation and research on climate change resilience issues and on existing climate adaptive behaviors in the city.

Urban Climate Change Resilience Action Areas

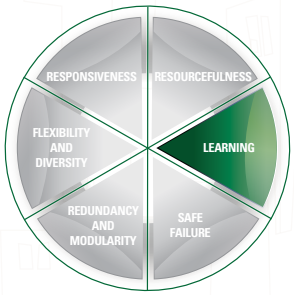
Education & capacity building of citizens

Expected Impact

The project will generate community-based ideas and activities for communities to build UCCR. It provides opportunities for youth to participate in decisions relating to climate change resilience. The process of mentoring, workshops, and 'learning by doing' will enhance youth's capacity in building UCCR.

The project contributes to the resilience characteristic of ***'Resourcefulness'***- young people and youth groups will have greater capacity with respect to urban climate change resilience following the training activities and implementation of their own initiatives. This experience may help them to secure additional funding to continue work in this sphere.

Resilience Characteristics



Key Beneficiaries

The experience of implementing UCCR initiatives will increase the youth's knowledge, motivation, values, and networks. The initiative will target all sectors of youth society, and an estimated 200 youth per city are likely to participate directly in the Youth Initiatives. Other ACCCRN stakeholders and government officials concerned with UCCR will also benefit from learning about how UCCR is perceived through the eyes of youth.

Can Tho: Strengthening Dengue Fever Surveillance and Response System

Proponents

Project Holder: Institute for Social and Environmental Transition
Project Implementer: Preventive Health Center of Can Tho City
Project Period: January 2012 – December 2014 (36 months)
Budget: $518,720

Other Partners: Can Tho City Dept of Health; Can Tho Medical College; Challenge to Change; Can Tho Meteorology Centre; Dept of Natural Resources; Dept of Agriculture and Rural Development; Committee for Flood and Storm Control
Contact: Kỷ Quang (quangvinh@cantho.gov.vn)

Population 1,200,000

Project Rationale

- ***The need to strengthen dengue fever surveillance and response system:*** in recent years dengue fever cases have increased in both severity and number. The disease is most common in low-income areas with poor living conditions and polluted environments. This presents a financial burden on both the government's resources and those who become ill and must pay for treatment and lose working days. There is limited integration of climatic issues into the health sector's plans, strategies and policies which is chiefly due to an ineffective surveillance system for epidemics and lack of detailed climate-related information
- ***Climate change risks:*** whilst there are a number of contributing factors such as urbanization, climate change is a major cause in changes in ***vector-borne disease*** pattern. Factors such as ***drought***, ***temperature increase*** and ***flooding*** can disturb the ecological balance and lead to epidemic outbreaks.

Project Overview

The project's objective is to reduce the risk of dengue fever outbreaks in two districts of Can Tho as the climate changes. The specific objectives are to:

- Enhance knowledge about the linkages between climate change and dengue fever, and improve early detection and warnings of dengue fever outbreaks possibilities.
- Provide evidence and a baseline for designing dengue fever intervention activities so that sustainable behavioral change for dengue fever prevention can be achieved.
- Enable the accessibility of vulnerable communities to public health services so that they better respond to outbreaks.
- Strengthen the health system's capacity to respond to abnormal trends of dengue fever outbreaks.

The project's first year focuses on research, the establishment of a monitoring and surveillance system for future analysis of dengue fever outbreaks, and assessment of the accessibility of vulnerable groups to public health services. The second and third year will study the knowledge, attitude and practices of health workers and communities, and experiences in responding to dengue fever in the context of climate change. Pilots will then be implemented.

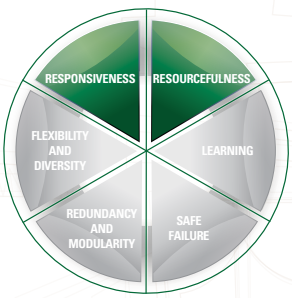
Urban Climate Change Resilience Action Areas

Expected Impact

The project will improve the knowledge and practice of public health professionals and policy makers, regarding linkages between climate and dengue fever. It will also lead to better early detection and prevention of dengue fever transmission in the climate change context. The project will improve vulnerable communities' health service accessibility and knowledge and practice in responding to dengue fever.

The project contributes to these resilience characteristics: ***'Responsiveness'***- the project will enable both health workers and community members to organize themselves more effectively to respond to dengue fever outbreaks. ***'Resourcefulness'***- the surveillance system, combined with capacity building, will improve capabilities to identify outbreaks and will support the health sector in targeting their resources effectively.

Resilience Characteristics



Key Beneficiaries

Direct beneficiaries will be 20,000 community members in 4 wards. These wards have high concentrations of poor people and immigrants who have limited finances, and thus limited access to health services and dengue fever education. Preventive health workers will also benefit by improved knowledge on dengue prevention, control and transmitting factors, and greater understanding of the links with climatic factors.

Can Tho: Developing and Implementing Real-time Salinity Monitoring, Dissemination and Response Mechanisms

Proponents

Project Holder: Institute for Social and Environmental Transition
Project Implementer: Centre for Environment and Natural Resources Monitoring of Can Tho City
Project Period: January 2012 – December 2014 (36 months)
Budget: $521,410

Other Partners: Climate Change Coordination Office, Can Tho; Dept of Natural Resources and Environment; Dept of Agricultural and Rural Development; Mekong Delta Hydrology Center; Can Tho University; Challenge to Change; Women's Union; Farmers' Association
Contact: Kỷ Quang (quangvinh@cantho.gov.vn)

Population 1,200,000

Project Rationale

- ***Heavy reliance on river water:*** about two thirds of all households in the city, most of whom are poor and vulnerable, do not have access to piped and treated water. Some rely on groundwater but many others use surface river water for drinking, cooking and other household uses. Farmers also use river water to irrigate crops and freshwater aquaculture is a popular livelihood.
- ***Climate change risks:*** historically unaffected due to its distance from the sea, ***saline intrusion*** has begun to influence river water in Can Tho city in recent years. ***Sea level rises*** due to climate change will exacerbate this situation. This will impact upon livelihood activities and households that rely on river water, as well as corroding public infrastructure along the riverbank. Currently, there is not a robust, regular system to monitor salinity levels in Can Tho - salinity monitoring has only been conducted twice a year in the rainy and dry season.

Project Overview

The project seeks to enhance Can Tho's resilience to the salinization of surface water resources, through:

- Establishment of salinity monitoring stations and data transmission system - automatic real-time water quality monitoring stations will be installed together with a data transmission and management system.
- On-line real time data management and presentation system - this establishes a communication and online warning system to make known the city's saline intrusion situation. This includes a SMS salinity warning system to deliver warnings when salinity is out of acceptable safety levels.
- Identification of saline intrusion thresholds and response actions - the impacts of salinization in high risk wards will be surveyed. It will then be possible to agree on action plans in case of salinity alarm levels.
- Improvement of public awareness - especially among poor people in areas of high risk, about the influence of saline intrusion and climate change impacts.
- Pilot implementation of saline resilient models – these models will introduce water storage and supply options to suit different usage scales, including household and community reservoir models.

Urban Climate Change Resilience Action Areas

Expected Impact

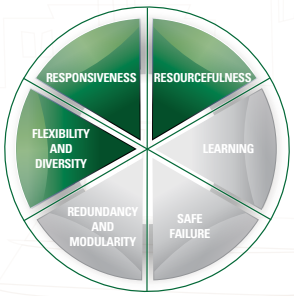
This project improves the city's surface water monitoring system to provide water users with timely information about water salinity levels, to support saline resilient behavior. This information will be accessible to a wide group of stakeholders so that people's health and livelihoods are less affected. Practices to respond to saline intrusion will be improved and models adopted by local communities.

The project contributes to the following resilience characteristics: ***'Flexibility and Diversity'***- the pilot activities will support river water users to identify alternative means of water storage and supply, which can be employed when saline levels are high. ***'Responsiveness'***- the availability of real-time data will enable local authorities, households and farmers to organize themselves effectively and adjust behaviors in a timely fashion as saline intrusion begins to affect fresh water supplies. ***'Resourcefulness'***- farmers may choose to shift to salinity tolerant crops and cultivation practices once armed with increased knowledge.

Key Beneficiaries

Direct beneficiaries of this project are expected to be the 3-400,000 people currently without information on salinity and the poor who are most vulnerable when water salinity levels rise.

Resilience Characteristics



Da Nang: Hydrology, Hydraulic and Urban Development Simulation Model

Proponents

Project Holder: Institute for Social and Environmental Transition, Dept of Construction and City Climate Change Coordination Office
Project Implementer: Centre for Environment and Natural Resources Monitoring of Can Tho City
Project Period: December 2010 – June 2012 (19 months); extended to June 2013
Budget: $367,160

Other Partners: People's Committee of Da Nang City; Da Nang Dept of Construction; Da Nang University of Technology; Da Nang Urban Planning Institute; Southern Institute of Water Resources Research; Institute of Meteorology, Hydrology and Environment; Dept of Transportation; Dept of Agriculture and Rural Development; City Committee for Flood and Storm Control; Municipal water supply company; ARUP
Contact: Nguyễn Đình Anh (anhnddn@gmail.com)

Population **900,000**

Project Rationale

- ***Urbanization of Da Nang city:*** rapid transformation of Da Nang's urban landscape took place between 1997 and 2009 in terms of infrastructure projects, real-estate development, and expansion of service sector industries, particularly in coastal areas. Over the same period, Da Nang's urban population grew by 20%, and the population within urbanized areas of the city is expected to more than double from current levels to reach 1.5 million people by 2025.
- ***Climate change risks and the need for this project:*** projections suggest that Da Nang will witness ***sea level rise***, and ***more intense/ frequent storms***, which will exacerbate current ***flooding*** issues. None of these climate factors have been incorporated into current plans and many have highlighted a need to rethink the current development agenda in light of climate change impacts.

Project Overview

The project aims to construct a linked hydrologic-hydraulic model and supporting database for Da Nang that takes into consideration potential impacts of climate change and urban development, to simulate urban planning and development options under future climate conditions for sustainable urban development planning and decision making purposes. The project's specific objectives are to:

- Develop a database to house data on climate change impacts on socio-economic development and urban planning. This will comprise hydrological, topographic and urban development data.
- Simulate hydrologic scenarios for the Da Nang river basins using existing and integrated flood models.
- Increase capacity of staff to apply the hydrologic-hydraulic model to assess the potential for development projects to impact flooding under current or future climate conditions.
- Prepare a multi-agency guidance document regarding urban development under future climate conditions and develop a set of regulations for the city's planning that specifically require that urban development planning address climate impacts on hydrological, environmental and natural resources.

Urban Climate Change Resilience Action Areas

Land use & Urban planning

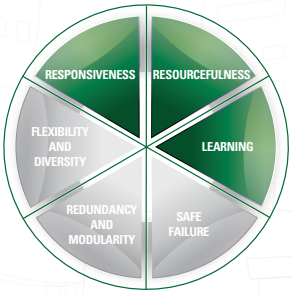
Drainage, flood & solid waste management

Expected Impact

This project will provide Da Nang with modeling tools capable of simulating the interactions of basin and city hydrology and hydraulics with climate change and infrastructure development. Simulation results will allow the city to make informed decisions about urban development. Basic information about climate impacts will be made publicly available, allowing local communities to better mitigate disaster risk and damage.

The project contributes to the following resilience characteristics: ***'Resourcefulness'***- the development of the modeling tool and capacity building increases ability to model potential climate change and urban development scenarios, identify problems and develop solutions. ***'Responsiveness'***- sharing of project outcomes with a wide range of government departments and municipal service providers supports effective management of urban systems. ***'Learning'***- the development of a modeling tool supports learning from historical and future events. The participatory process of the project supports cross-sectoral learning.

Resilience Characteristics



Key Beneficiaries

The direct beneficiaries will be the local authority staff who participate in the project and its capacity building activities. Indirectly, inhabitants of peripheral areas bordering development will benefit. If development is pursued without consideration for climate or development impacts on hydrology, the impacts of floods and droughts are likely to be far greater, and these will be disproportionately felt by these often poor and vulnerable communities into which floodwaters will be forced.

Da Nang: Storm and Flood-resistant Credit and Housing Scheme

Proponents

Project Holder: Institute for Social and Environmental Transition
Project Implementer: Climate Change Coordination Office
Project Period: October 2011 – September 2014 (36 months)
Budget: $639,820

Other Partners: Women's Union of Da Nang City; Dept of Construction; Fatherland Front; Vietnam Red Cross; Dept of Foreign Affairs; Development Workshop France
Contact: Nguyễn Đình Anh (anhnddn@gmail.com)

Population 900,000

Project Rationale

- ***Climate change risks:*** Parts of Da Nang are considered highly vulnerable due to exposure and limited socioeconomic ability to respond to increasingly ***more intense/frequent storms*** and ***flooding***.
- ***The need for storm and flood-resistant credit and housing scheme:*** homes are often poorly constructed and maintained, and households frequently struggle to recover from storm damages due to low income, limited compensation payments, and rising costs. The ACCCRN-supported feasibility study conducted in 2011 confirmed the technical need and household demand for affordable loans for reconstruction or reinforcement of housing among poor and near poor households in exposed areas. Of the approximately 400 households surveyed, over 80% indicated desire to borrow for house improvements.

Project Overview

This project aims to enhance the climate resilience of vulnerable wards in Da Nang through a revolving loan fund for storm resistant housing through the Women's Union. The project will achieve this through:

- Provision of credit to improve the homes of poor households in 8 disaster prone wards, as well as professional technical assistance in constructing, and monitoring construction progress.
- Establishment of a revolving loan fund for small business, to support at least 30 poor households to improve credit worthiness.
- Supporting 20 extremely poor families to build new houses that withstand typhoon and floods.
- Building capacity among program participants and community members to undertake community-based disaster risk management, manage finances, and maintain houses.

Expected Impact

An estimated 320 households in the first three years and up to 376 in six years will have reinforced or reconstructed their homes to withstand typhoons. In addition 20 extremely poor households will receive project grants, so that new constructions are adequately financed to provide protection against storms. Project participants will have new skills and capacities for financial management and disaster preparedness.

The project contributes to the resilience characteristics of: ***'Resourcefulness'***- the feasibility study provided an opportunity for several organizations to work together in identifying problems and solutions, mobilizing their collective resources and developing a shared vision for reducing vulnerability to climate change. **'Responsiveness'**- capacity to organize/reorganize is enhanced through forming a network with vulnerable communities and other stakeholders. ***'Learning'***- training on climate change impacts, city resilience measures and storm resistant housing for the urban poor develops the capacity of the Women's Union to learn and stakeholder workshops support the internalization of learning within partner organizations.

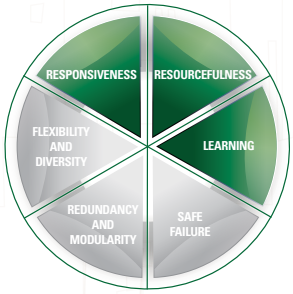
Key Beneficiaries

Project beneficiaries will be households who benefit from affordable loans for housing reinforcement as well as gaining new skills and experiences, which they will promote within their communities to build awareness of storm resistant housing and to generate additional demand for credit access. The Women's Union of Da Nang will also be a key beneficiary as it will develop skills for managing and scaling a fund for storm-resistant housing and emerge as a key agent of change for climate resilience for poor and vulnerable households.

Urban Climate Change Resilience Action Areas

Resillent housing & transport systems

Resilience Characteristics



Da Nang: Developing, Testing and Promoting New Education Modules to Increase Youth Awareness on Urban Climate Change Resilience

Proponents

Project Holder: Institute for Social and Environmental Transition
Project Implementer: Dept of Education and Training of Da Nang City and of Cam Le district
Project Period: January 2012 – December 2014 (36 months)
Budget: $335,830

Other Partners: Climate Change Coordination Office, Da Nang; Da Nang University of Technology; Hanoi University of Education; Kyoto University; SEEDS Asia; Education Promotion Association; Red Cross
Contact: Nguyễn Đình Anh (anhnddn@gmail.com)

Population 900,000

Project Rationale

- ***Climate change risks:*** Each year Da Nang experiences about three or four times of ***flooding,*** which are caused by some extreme storms. Over the past decade the number and ***intensity of storms*** has more than doubled. Annually, climate induced disasters destroy many schools, educational equipment, and cause risk to students and disruption of their education.
- ***The need to increase youth awareness on urban climate change resilience:*** The young generation will bear the burden of climate change impacts and can act as proponents of improved practices in the future yet knowledge on climate change and response to climate change has not been incorporated into education systems.

Project Overview

The project seeks to enhance awareness, knowledge and strengthen behaviors and skills to respond to climate change for students, teachers and parents so that they can actively contribute to the climate resilience of the vulnerable Cam Le district and Da Nang city. Specific objectives are:

- To develop integrative education models for urban climate resilience education in Cam Le district through school curricular and extracurricular activities.
- To develop guidelines for integrating urban climate resilience education into school curriculum for three subjects and two grades at each level of education.
- To enhance the capacity of teachers for developing teaching contents around urban climate resilience, and undertaking integrative urban climate resilience education in the schools. They will be able to act as trainers for replicating the models for other teachers in the district.

Expected Impact

The climate change knowledge and capacity of students to undertake adaptation actions and the capacity of teachers to conduct integrative urban climate resilience education will be enhanced. It is anticipated that skills to respond to climate change and extreme climate events will be transferred to families and communities because of the cultural value placed on education in Vietnam.

The project's resilience characteristics are: ***'Responsiveness'***- students, teachers and communities, through their enhanced understanding of climate change and adaptation measures will be better equipped to organize themselves in advance of and immediately after a disaster or disruptive event. ***'Resourcefulness'***- planning capabilities will have been built and the youth will be able to support their communities in advocating for resources to address climatic threats in their residential areas.

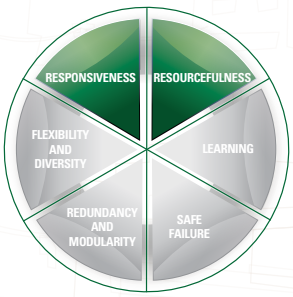
Key Beneficiaries

This intervention will directly benefit 580 teachers and 11,585 students in Cam Le district who come from some of the poorest households in the city. Support for education of children on climate change preparedness creates an avenue to equip other members of their communities for climate change impacts, including some of the most vulnerable groups in Da Nang. It will also benefit the education sector of the entire city as lessons learned and the modules have high potential for replication and scaling up in other districts and other parts of the country.

Urban Climate Change Resilience Action Areas

Education & capacity building of citizens

Resilience Characteristics



Da Nang: Pathways to Water Resilience - A Comprehensive Assessment

Proponents

Project Holder: Institute for Social and Environmental Transition
Project Implementer: Da Nang Climate Change Coordination Office (CCCO)
Project Period: *November 2012-October 2014 (24 Months)*
Budget: $400,000

Other Partners: Dept of Natural Resources and Environment; Da Nang water supplying company (Dawaco); the National Center for Hydro-meteorological Forecasting
Contact: Nguyễn Đình Anh (anhnddn@gmail.com)

Population **900,000**

Project Rationale

- ***The need for a comprehensive assessment of water resilience:*** demand for fresh water is increasing due to growing population, industry, tourism, and competition from upstream water users. Access to scalable, exploitable water sources to meet demands is constrained and groundwater resources are very limited. The city currently principally relies on extraction from 2 rivers; however these rivers are subject to pollution. Information on water demands is limited both for key sectors and potential demand management strategies, and there are no studies that address water access for vulnerable populations.
- ***Climate change risks:*** there are concerns that climate induced ***drought, saline intrusion***, and contamination from ***flooding*** will further threaten surface water. Water strain is likely to be felt most by the poor, who already lack adequate access to uncontaminated fresh water.

Project Overview

This project will forecast imbalances in supply, demand, and water access under future climate and development scenarios. It will also identify sustainable solutions to meet the city's fresh water needs. The key activities will include:

- Assessment of current surface water availability and water quality, including saline content during the dry and rainy seasons based on secondary data review and field studies.
- Evaluation of current freshwater usage, demand, and access in four key sectors in Da Nang-domestic usage, tourism, industry, and agriculture-and identification of water stresses among vulnerable groups.
- Development of scenarios for future supply and demand of fresh water based on climate and urban development scenarios.
- Testing and evaluation of intervention strategies to manage demand and/or enhance water supply to meet the needs of the general population, sustainable economic development, and vulnerable groups.

Expected Impact

The expected impact will be felt city-wide by identifying and initiating cost effective and sustainable water resources for future development and populations. The project outputs will allow for the determination of an optimum suite of water management interventions with consideration of economic development and climate change.

The project contributes to the resilience characteristics of: ***'Flexibility and Diversity'***- the study will seek to identify ways in which fresh water can be provided under a wide range of climatic conditions. **'Resourcefulness'**- the project will assist city stakeholders in identifying and anticipating problems in the supply of fresh water under certain climatic conditions and they will be able to mobilize/influence resources.

Key Beneficiaries

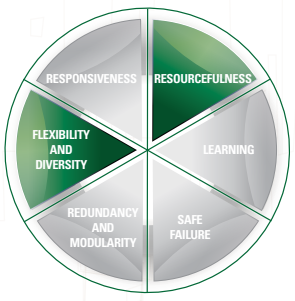
The project will benefit Da Nang City as a whole, with its results critical for achieving socioeconomic and environmental targets. The study will create a knowledge base and draw attention to issues of unequal water access, and propose appropriate responses. Selected community groups and members of key water consuming sectors will benefit directly from public awareness programs based on study findings.

Urban Climate Change Resilience Action Areas


Water demand & conservation systems


Land use & Urban planning

Resilience Characteristics



Quy Nhon: Hydrology and Urban Development Modeling for Flood-related Land Use Planning

Proponents

Project Holder: Institute for Social and Environmental Transition
Project Implementer: Quy Nhon Climate Change Coordination Office
Project Period: December 2010 – June 2012 (19 months); extended to June 2013
Budget: $337,800

Other Partners: People's Committee of Quy Nhon; Southern Institute for Water Resource Research; Center for Construction Planning and Appraisal; Urban Planning Division, Quy Nhon City; Dept of Planning and Investment; Dept of Construction; Center for Hydrology and Meteorology Forecasting; Committee for Flood and Storm Control of Binh Dinh Province; Quy Nhon University; People's Committee of Nhon Binh Commune; ARUP
Contact: Đinh Văn Tiên (dinhvantienvn@gmail.com)

Population 270,000

Project Rationale

- ***Climate change risks:*** urbanization of formerly rural farming areas has been taking place since the mid-1980s in areas historically impacted by ***temperature increase, more intense/frequent storms***, seasonal ***flooding, drought, saline intrusion and rainfall variability***, all of which will potentially increase over the coming years.
- ***The need for flood-related land use planning:*** New homes have been generally built higher, giving some safety from seasonal floods. However, sudden and intense flooding in 2009 saw this lead to increased vulnerabilities for villagers with homes traditionally built near ground level. Instead of flood waters flowing evenly over the fields, they built up behind roads and new construction built above the surrounding fields, and which created barriers that concentrated the flow. The city government has recognized that current development plans do not take into account such impacts and that those most affected will include thousands of poor local residents, mainly farmers, living in small houses built at ground level.

Project Overview

The objective is to identify and assess the impacts of alternative flood scenarios on planned urban development in the environmentally vulnerable Nhon Binh Ward, in the context of recent extreme storm events and potential climate change impacts. The key activities are:

- Review historic flooding in Nhon Binh ward and the 2009 storm event: using the normal cycle of annual flooding as a baseline, conduct a detailed analysis of the November 2009 storm event to assess the climatic and hydrological impacts, as well as impacts on lives and property.
- Develop a hydrological model for Kon and Ha Thanh river basins: to assess current conditions, the effects of increased urban development and infrastructure, and potential impacts of climate change.
- Assess the impact of future flood on Nhon Binh's urban plan: this will consider the impacts of urban development on the hydrology of the estuary, using damage caused by the 2009 storm to assess potential damage to urban development currently being constructed or planned. Existing plans will then be modified for better adaptation to climate risks.

Expected Impact

The project will provide the knowledge, tools and working relationships needed to take into account the potential impacts of climate change on urban development in Nhon Binh ward and other low lying areas of the two rivers. The type of data compilation, models, and flood mapping produced are currently unavailable for most areas of Vietnam and lessons for planning will be broadly applicable to coastal cities in Vietnam. Experience from the 2009 flood suggests that should currently proposed development plans be approved, those most affected will include thousands of poor local residents living in small houses built at ground level, many of whom are farmers or migrants.

The resilience characteristics contributed to are: ***'Resourcefulness'***- the increased knowledge of the relationship between climate change impacts and urban development among stakeholders increases their capacity to identify and prioritize problems and mobilize resources. ***'Responsiveness'***- undertaking this study through a multi-sectoral working group builds organizational capacity within the city and supports more effective management of urban systems. ***'Learning'***- documentation of the 2009 floods and creation of a shared flood and urban development model captures and supports learning from past events. The findings of the 2009 flood study were shared at the Vietnam Urban Forum hosted by the Urban Development Agency in July 2012

Key Beneficiaries

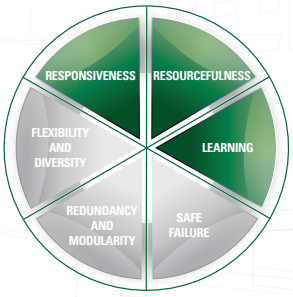
The results of the project proposed here will provide local authorities with strong scientific arguments for limiting or modifying the development plans for Nhon Binh.

Urban Climate Change Resilience Action Areas

Land use & Urban planning

Drainage, flood & solid waste management

Resilience Characteristics



Quy Nhon: Urban Mangrove Restoration for Storm Surge Protection and Resilient Land Use Practice

Proponents

Project Holder: Institute for Social and Environmental Transition
Project Implementer: Binh Dinh Climate Change Coordination Office
Project Period: January 2012 – December 2015 (48 months)
Budget: $548,280

Other Partners: People's Committee of Binh Dinh province; Con Chim – Thi Nai lagoon Ecosystem Management Unit; Nha Trang Institute of Oceanography; Dept of Exploitation and Protection of Aquatic Products; Hue University; Research Center for Resources and Rural Development
Contact: Đinh Văn Tiên (dinhvantienvn@gmail.com)

Population **270,000**

Project Rationale

- ***The need for urban mangrove restoration:*** Loss of mangrove forests has taken place along Thi Nai lagoon shores over the past 15-20 years, in part through government policies that encouraged conversion to aquaculture ponds for export-oriented production and in part through increased settlement which has seen the annexation of adjacent rural communes and expansion of urban services such as roads and dikes.
- ***Climate change risks:*** Plans for city expansion to the north have generated controversy, since major ***flooding*** in 2009 revealed the area's vulnerability to flood risks which is exacerbated by ***rainfall variability*** and ***more intense/frequent storms***, both expected to increase due to climate change. The loss of mangroves makes communities vulnerable since forests protect housing and infrastructure from storm damage and help protect against sea level rise by stabilizing weak shorelines. It also leads to declining livelihood opportunities.

Project Overview

The overall objective is to reduce the climate vulnerability of poor people living on the edge of the expanding city by restoring the ecosystem of the mangrove forest in Thi Nai lagoon. In addition, the project aims to inform the planning policy of the risks of urban development expansion into vulnerable low-lying coastal sites along the lagoon. The activities focus on:

- Ecosystem assessment –including an assessment of the mangrove forest's current situations, ecological conditions relevant to planting of mangrove seedlings, current water and sediment situation. Mangrove reforestation activities include a review of other mangrove reforestation models in Vietnam, development of community mangrove nurseries as a commercial venture, and negotiation of rights to mangrove resources for community members on a sustainable basis.
- Community-Based Disaster Risk Management –engaging communities in identifying potential climate related hazards, and proposing risk reduction measures. The project also provides support for non-extractive livelihood activities in order to reduce mangrove destruction.
- Development of a co-management agreement – to ensure local people provide key inputs to decision-making on how to plant, protect and manage mangrove ecosystems.

Expected Impact

150 ha of mangrove forests will be restored, providing protection to 3 km of lagoon shoreline and 14,000 households living along the coast. Climate change resilience will be enhanced through improved capacity to respond to extreme climate events and development of viable alternative livelihoods. It is also expected that modifications to urban development plans will ensure long-term protection and use of mangroves for eco-tourism and environmental education.

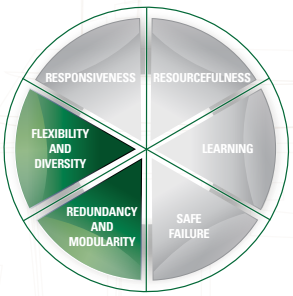
The project contributes to the following resilience characteristics: ***'Flexibility and Diversity'***- the ability to secure alternative livelihoods demonstrates flexibility, whilst promoting climate resilience through restored mangrove forests acting as buffers. ***'Responsiveness'***- the disaster risk management activities support local communities to organize themselves ahead of and after a disaster. The co-management form of organization is emerging to ensure strong community participation and therefore promote intervention sustainability.

Key Beneficiaries

The initial beneficiaries will be poor households who live along the shores of the lagoon and exploit aquatic resources. In the longer term, other urban residents will benefit from the protective and food production services offered by the restored mangrove areas.

Urban Climate Change Resilience Action Areas

Resilience Characteristics



APPENDIX

Photo: Nic Dunlop

ACCCRN City Projects and UCCR Action Areas

Current ACCCRN City Interventions	Climate sensitive 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
INDIA										
Gorakhpur: Implementing and promoting ward-level micro resilience planning	√	√							√	√
Gorakhpur: Implementing and promoting adaptive peri- urban agriculture	√	√					√	√		
Indore: Testing and promoting decentralised systems for differential water sources and uses			√			√				
Indore: Strengthening vector-borne disease surveillance and response systems				√	√				√	
Surat: End-to-end early warning system		√		√						√
Surat: Urban health and climate resilience center	√									√
INDONESIA										
Bandar Lampung: Integrated solid waste management master plan		√								
Bandar Lampung: Ground water conservation (Biopores)	√	√	√							
Bandar Lampung: Building teachers and students climate change resilience capacity				√					√	
Semarang: Pre-feasibility study for expanding rainwater harvesting systems			√							
Semarang: Flood forecasting and warning system		√		√						√
THAILAND										
Chiang Rai: Restoration of Kok River for urban flood management		√					√			
Hat Yai: Community based flood preparedness and institutional coordination systems		√		√					√	√

ACCCRN City Projects and UCCR Action Areas

Current ACCCRN City Interventions	Climate sensitive 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
VIETNAM										
Can Tho, Da Nang, Quy Nhon: Climate Change Resilience Coordination Offices (CCCOs)	√									√
Can Tho, Da Nang, Quy Nhon: Vietnam youth urban resilience competition									√	
Can Tho: Strengthening dengue fever surveillance and response system				√	√				√	
Can Tho: Developing and implementing real-time salinity monitoring, dissemination and response mechanisms					√			√	√	
Da Nang: Hydrology, hydraulic and urban development simulation model	√	√								
Da Nang: Storm and flood resistant credit and housing scheme						√				
Da Nang: Developing, testing and promoting new education modules to increase youth awareness on UCCR									√	
Da Nang: Pathways to water resilience: a comprehensive assessment	√		√							
Quy Nhon: Hydrology and urban development modelling for flood-related land-use planning	√	√								
Quy Nhon: Urban mangrove restoration for storm surge protection and resilient land-use practice	√	√		√			√	√		

Note: The critical UCCR action areas are derived from the base of specific interventions proposed by ACCCRN city and national partners in India, Indonesia, Thailand, and Vietnam as well as the ten City Resilience Strategies prepared by the multi-stakeholder Climate Working Groups of each ACCCRN city. The CRS's are available at www.acccrn.org.
Source: Brown, Dayal, et al. (2012)

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