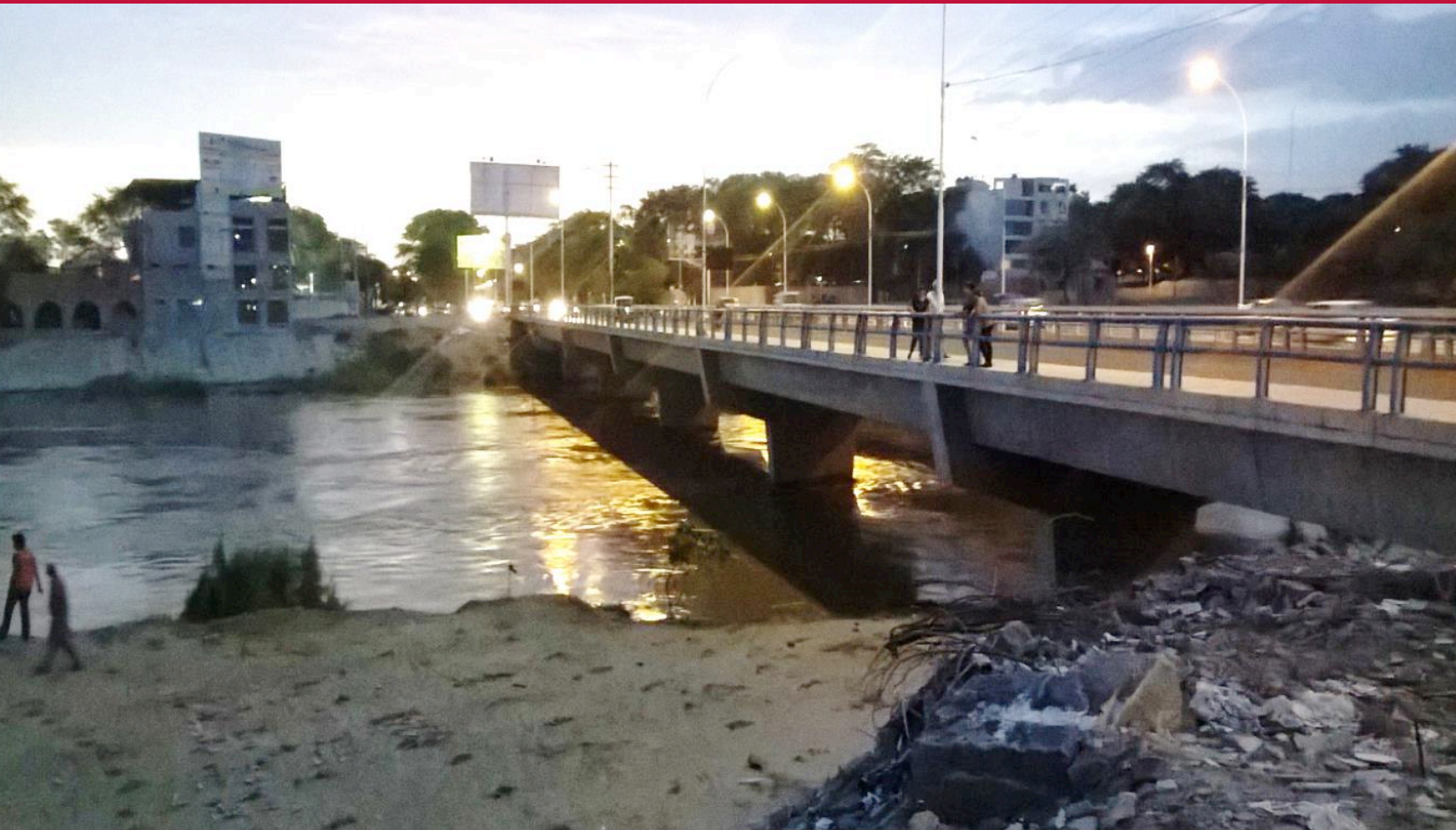




**USAID**  
FROM THE AMERICAN PEOPLE

TECHNICAL REPORT

# CLIMATE RESILIENT INFRASTRUCTURE SERVICES: LESSONS LEARNED



**JULY 2015**

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# ACRONYMS

CCRD	Climate Change Resilient Development
CRD	Climate-Resilient Development
CRIS	Climate Resilient Infrastructure Services
FTI	Fast track implementation
GIS	Geographic Information Systems
USAID	United States Agency for International Development

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# EXECUTIVE SUMMARY

The Climate Resilient Infrastructure Services (CRIS) program was an initiative of USAID’s Climate Change Resilient Development (CCRD) project. CRIS worked to improve the ability of cities in developing countries to provide reliable and sustainable infrastructure services that support smart and lasting development, even in a changing climate.

For two-and-a-half years the CRIS program worked with cities to develop, test, and implement approaches to improve the climate resilience of infrastructure services. These services—which include transportation, water, sanitation and waste management, energy, communications, and shelter services—are essential to cities’ ability to create healthy, sustainable, and thriving communities. This report shares 17 lessons from CRIS program activities that reflect the following themes:

## Implementing USAID’s Climate-Resilient Development Framework

1. **Cities need technical support to implement a “development-first” approach using USAID’s Climate-Resilient Development Framework.** With support, cities can successfully integrate climate considerations into municipal decisions and benefit from an approach that focuses on achieving development goals despite climate change. But most developing cities are not familiar enough with climate resilience concepts to take up the Framework on their own; they need support to: (i) interpret climate information to inform decisions, (ii) screen for system-level vulnerability (in addition to project-specific risks), (iii) develop portfolios of short- and long-term adaptation options, (iv) access funding and technical assistance to implement options, and (v) monitor to track progress.

## Supporting climate-resilient institutions and capacity in cities

2. **Support for cities should focus on building internal technical capacity, improving access to local experts, and strengthening relationships with provincial and national decision-makers.** Internally, capacity needs to be built among technical staff, particularly within capital investment, planning, public works, emergency management, and environment departments. Collaboration across different operating units helps build understanding and buy-in. Externally, well-designed working groups are effective mechanisms for engaging expertise and linking to regional and national strategies.
3. **City staff can be empowered to take action by learning from their peers and participating in interactive training.** Cities are more likely to take ownership of climate resilient activities when they are actively engaged in collaborative training—as opposed to one-way technical assistance. Effective strategies include emphasizing hands-on activities in small groups during trainings, using interactive games to demonstrate concepts, and bringing together municipal staff with similar roles in different cities to share challenges and discuss strategies.
4. **The private sector is a large funder of public infrastructure and requires a distinct strategy for engagement on urban climate resilience.** Involving the private sector requires a different approach and level of effort than that for civil society groups and academics. Municipal governments must have sufficient capacity to work effectively with companies on resilience strategies; companies are also very cautious about participation unless there is a clear business interest at play. Strategies to test further include planning ahead by working with cities to develop clear policy objectives for private sector engagement, targeting specific sectors that are sensitive to climate impacts and that play a strong role in the city’s development objectives, and using municipal oversight of private sector activities as opportunities for engagement.

## **Mainstreaming climate change into policies and city decision making**

5. **Engagement should start with current city priorities and be tailored to local decision-making processes.** Climate resilience strategies are most effective if they are incorporated into existing municipal practices (a process referred to as mainstreaming). The most promising opportunities for mainstreaming are functions under the municipality's direct jurisdiction where past climate is already being considered and there are immediate decisions that need to be taken.

## **Developing approaches and tools for climate-resilient infrastructure**

6. **Cities are eager for user-friendly tools, tailored to their needs and processes.** Cities are looking for tools that: (i) translate climate data into information municipal staff can apply to inform decisions (referred to as “decision-ready” information); (ii) screen existing assets, planned investments, and infrastructure systems and networks for vulnerability to current and future climate impacts, and (iii) help staff identify adaptation strategies and build a case for their adoption.
7. **Tools should be replicated through modular components that can be tailored to different local contexts.** While cities share common challenges regarding climate resilience, their specific needs are distinct. Rather than a one-size-fits all approach to tool development, a more flexible approach is needed based on modular components that can be combined to meet specific needs. These core components include: (i) structures for translating climate data into decision-ready information, (ii) information about climate stressor/infrastructure asset impact relationships, (iii) reference guides for vulnerability indicators and adaptation options, (iv) methods to assess and quantify the costs and benefits of adaptation options, and (v) performance tracking metrics.

## **Building a better pilot: program design and implementation**

8. **Well-designed city pilots enabled USAID to develop and test innovative climate resilient solutions in different contexts over a relatively short period of time.** It is important to balance the overall goal of testing replicable approaches with the need to provide practical support to the individual cities; pilot cities need flexibility to align their pilot activities with city needs. Investing in the scoping stage is therefore critical to understand city priorities and identify where there is alignment with USAID's objectives. A strong local coordinator is essential for pilot success. Pilots must think about what will happen after the pilot project is over, developing a strategy to manage expectations and encourage sustainable action at the end of pilot activities. The active participation of Missions helped promote collaboration with other USAID projects and increased the likelihood of follow-on efforts.

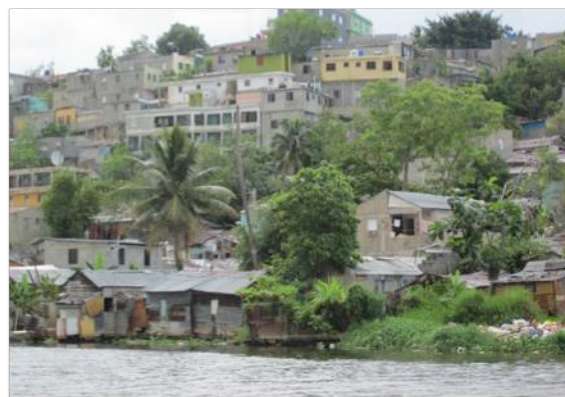
CRIS's experience offers insights for future work by adaptation and development practitioners, donors, and development agencies—particularly USAID. Practitioners and donors can achieve progress in urban resilience strategies by building on CRIS's innovative approaches in the following areas:

1. **Develop practical approaches to evaluate the net benefits or cost-effectiveness of adaptation options.** Cities need better metrics, such as net present value, internal rate of return, or cost-effectiveness that can help them select adaptation options.
2. **Translate climate projections into decision-ready information and disseminate it to cities.** Future efforts should continue to focus on helping cities interpret climate information in terms that they understand and are relevant to their responsibilities.
3. **Develop core components to design tools that are tailored to cities' own local contexts.** Instead of disseminating specific tools that do not scale well to other contexts, practitioners should focus on sharing modular components that can be combined to generate tailored outputs that align with municipalities' own decision-making processes.

4. **Link municipal-level adaptation strategies to provincial and national planning.** Donors and practitioners should promote stronger links between cities and regional and national governments. Relationships can be built through peer learning events and by implementing programs that help cities and regional actors work together.
5. **Target the private sector in urban climate resilience strategies.** Future programs should test the effectiveness of engaging the private sector as a primary means of promoting urban resilience, and compare this approach with programs focused on local governments.

# I. INTRODUCTION

This report summarizes lessons learned from the Climate Resilient Infrastructure Services (CRIS) program, an initiative of USAID’s Climate Change Resilient Development (CCRD) project that ran from January 2013 through August 2015. The objective of CRIS was to develop, test, and implement climate risk assessment and adaptation strategies as an integral part of city development and then share the lessons learned through peer learning networks. The program was guided by USAID’s Climate-Resilient Development (CRD) Framework,<sup>1</sup> which adopts a “development-first” approach to ensure that climate considerations are integrated into city development goals and decisions.



**Figure 1: Settlements in Santo Domingo**

**Photo credit: Joanne Potter, ICF International**

CRIS focused on infrastructure services (including transportation, water, sanitation and waste management, energy, communications, and shelter services) because these services are essential to development. Countries need infrastructure services to achieve economic development, provide clean water and sanitation, address malnutrition and poverty, and support rapidly growing populations. Developing cities are already challenged by the pace of growth and limited financial and institutional resources. These pressures are compounded by the added stress of climate change, which threatens infrastructure investments and the reliability of infrastructure services. Unless it is climate resilient, infrastructure may fail to provide intended services, jeopardizing development objectives and wasting valuable resources.

The CRIS program contained four primary components:

1. **Technical assistance** to four pilot cities to develop and test approaches for promoting climate resilient infrastructure services;

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<sup>1</sup> See USAID (2014). *Climate-Resilient Development: A Framework for Understanding and Addressing Climate Change*. Available at <http://www.usaid.gov/climate/climate-resilient-development-framework>, accessed 4/15/2015.

2. **Peer learning events** to promote sharing among government officials at municipal, regional, and national levels; civil society groups; and local experts;
3. **Communication activities** to raise awareness about the relevance of climate risks to city development goals, promote the CRD Framework, and disseminate products and lessons on CRIS activities, and
4. **Small grants** to five organizations to respond to unmet needs at the local level, and to test implementation of innovative approaches to climate vulnerability assessment and adaptation.

The breadth of CRIS was global, with activities in Africa, Asia, Latin America, and the Caribbean. A map of CRIS engagements is shown in Figure 2. The four pilot cities were Piura and Trujillo, Peru; Santo Domingo, Dominican Republic; and Nacala-Porto, Mozambique.<sup>2</sup> The five grants were awarded to non-governmental organizations for work in Piura, Peru; Santo Domingo, Dominican Republic; Nacala-Porto, Mozambique; Panaji and Visahkapatanam, India; and Manado, Indonesia.

Two peer learning events were held in Santo Domingo and Mozambique.

The CRIS program made important contributions to climate resilience at the city level. Each of the CRIS pilot cities has increased its capacity to consider climate change issues in urban planning and infrastructure development. Cities have demonstrated this capacity by making changes in the design of planned investments so they are less vulnerable to climate impacts, establishing technical working groups to focus on climate change issues, and pursuing funding opportunities at the national level—including through national associations of municipalities. CRIS has successfully developed and demonstrated a



**Figure 2: Map of CRIS engagements**

<sup>2</sup> This report does not include lessons learned from the CRIS pilot in Hue, Vietnam. The pilot was implemented by CCRD partner Cascadia Consulting Group and Cascadia is capturing lessons in separate reporting.

portfolio of tools to identify climate vulnerabilities, respond to risks, and identify funding sources for adaptation. It has served as one of the few field tests of USAID’s CRD Framework, validating the “development-first” approach, adding real-world insights, and developing resources to support implementation of the Framework.

Finally, CRIS has generated useful information about the process of building city-level climate resilience: it has identified some of the key elements of success, ways to overcome a range of barriers, and strategies to help ensure long-term continuity. The knowledge gained through CRIS is captured in the lessons described in Section 2 of this report. These lessons fall into five categories: (i) implementing the CRD Framework, (ii) improving the technical capacity of municipal governments and local institutions on climate resilience, (iii) incorporating climate considerations into city decisions and policies, (iv) developing tools to help decision-makers evaluate climate change, and (v) program design and implementation practices.

The lessons in this report may be useful for USAID program managers, adaptation and development practitioners, and other donors focused on climate resilience in urban contexts. To guide future investments and assistance, Section 3 outlines key unmet needs and areas for future work. These areas have been informed by CRIS’s achievements but also by needs that the program has not addressed; they remain as necessary next steps for cities to meet their development goals sustainably, now and in a changing future climate.

## 2. LESSONS LEARNED

Many lessons have been learned from across the CRIS program’s activities through two-and-a-half years of implementation. In this report, a “lesson” is an insight, approach, or recommendation that helps advance climate resilient solutions, based on successes, failures, or observations from CRIS program interventions. These lessons are provided for USAID staff, climate resilience practitioners, and the broader development community. They focus primarily on what the program has learned about implementing climate resilience interventions in infrastructure, as opposed to general lessons that are not specific to climate change or infrastructure. The final sub-section on program design and implementation is targeted primarily at USAID programming and contains lessons that could be applied broadly to other development programs.

### 2.1. IMPLEMENTING USAID’S CLIMATE-RESILIENT DEVELOPMENT FRAMEWORK

USAID’s CRD Framework, shown in Figure 3, is a “development-first” approach that systematically includes climate considerations in development planning and decision-making. It contains five steps: *scoping* to understand development goals and priorities, *assessing* vulnerability to climate stressors, *designing* and selecting high-priority adaptation options, *implementing and managing* options to reduce vulnerability, and tracking and *evaluating* performance.



**Figure 3: USAID's CRD Framework**

A key objective of the CRIS program was to test the CRD Framework in pilot cities; this section summarizes lessons about the Framework from its implementation in the urban context.

### **2.1.1. LESSON 1: THE FRAMEWORK'S DEVELOPMENT-FIRST APPROACH IS A CRITICAL ELEMENT OF SUCCESS**

The CRIS program's experience validated the Framework's development-first approach. In each pilot, the CRIS team observed significant benefits from investing time and resources to first understand city priorities and their development context. The approach was a key element in generating interest and ownership in the program's outcomes among municipal staff. Specifically, the CRIS team found that a development-first approach:

- Increased and broadened engagement from the cities by convincing city staff to view climate change as a development issue rather than just an environmental issue.
- Helped connect climate change considerations with existing municipal processes, making it easier for decision-makers to understand how climate change related to their respective responsibilities. As understanding increased, municipal staff became increasingly able to identify how adding climate change information to other information used by the municipality could support better decisions.
- Facilitated decision making—and reduced the time and resources spent on analysis—by focusing CRIS teams and pilots on first identifying the decisions that mattered to the cities, and then conducting only the level of analysis needed to inform those decisions (see Lesson 4 for details).
- Not only encouraged, but *required* the city to take shared ownership of activities with the CRIS team, in order to ensure that cities provided their input and expertise. Only city staff—not project team members or consultants—can appropriately represent local development goals.



Understanding the city's development context and priorities can take more time and resources at the beginning than more conventional approaches that start with climate projections, but the initial investment is worthwhile: A clear articulation of the relevance of climate vulnerability to municipal priorities helps ensure that the ultimate findings will not be ignored.

For example, the CRIS team found that many municipal officials in Trujillo, Peru, were not familiar with the findings of a recent climate vulnerability assessment conducted for the municipality, and were not incorporating the information into their planning. While the analysis was well done, decision-makers did not see a connection between the study's findings and their responsibilities. The CRIS team addressed this gap by working with Trujillo staff to first identify their development objectives, and then explore the potential effects of climate change on their ability to meet these goals. This approach provided the context they needed to examine some of the climate analysis that had already been produced.

In Piura, Peru, CRIS team members applied the development-first approach by conducting interviews with municipal officials to identify specific city responsibilities where a climate vulnerability screening could support more resilient decisions. City staff chose municipal responsibilities such as evaluating public infrastructure projects for vulnerability at a pre-investment stage, and planning for climate impacts in city operations related to solid waste management and city parks. Once these priority responsibilities were defined, the CRIS team then worked with municipal staff to identify the climate information that was relevant to those decisions.

### **2.1.2. LESSON 2: CITIES NEED SUPPORT, APPROACHES, AND TOOLS TO SUCCESSFULLY IMPLEMENT THE FRAMEWORK**

The CRIS pilots and small grants demonstrated that the Framework is useful as a flexible and logical step-by-step process. The CRIS team worked with cities to understand and apply the Framework's concepts to detailed decision making and to develop tools for implementation. . Cities required additional resources, tools, and support in the following areas:

- Accessing appropriate climate information at the right level of detail to inform decisions. For more information on strategies, see Lesson 13.
- Translating the Framework into terms that relate to municipal decisions. The Framework's language is oriented toward development and climate practitioners and does not translate directly to municipal processes. Pilot teams found it challenging to articulate work plans and longer-term action plans that both reflected city priorities and aligned with CRD Framework steps. To address this problem, CRIS teams conducted basic climate training and awareness-raising workshops in pilot cities to familiarize staff members with foundational climate concepts and CRD Framework steps, and did not adhere to a strict linear approach in implementing the Framework concepts. In practice, municipalities are in an ongoing and iterative cycle of planning and implementation of city objectives; there are multiple opportunities throughout this process for climate information to be introduced.

- Applying vulnerability assessments at a broader systems level rather than only a project-specific level. For example, in Peru and Mozambique, vulnerability assessments are conducted on individual planned investment projects, but there is less attention on system-wide vulnerabilities in existing infrastructure networks. This is a concern because the most effective strategies to increase resilience may well be at a network or systems level. Cities need help in applying the Framework at this broader level to prioritize and address existing climate risks—rather than focusing solely on the resilience of individual planned infrastructure projects.
- Selecting a course of action after evaluating adaptation options. The CRD Framework does not prescribe an approach for selecting and implementing options, but evaluating adaptation options does not automatically suggest which should be implemented. CRIS teams helped cities define criteria to evaluate adaptation options and conduct a screening level assessment of promising approaches. Through this process the municipalities developed a portfolio of options, including both short- and long-term measures to move to implementation.
- Accessing funding and technical assistance for implementation of adaptation options. In Nacala-Porto, CRIS team members implemented a “writeshop” (a proposal-writing workshop) to help the city identify and pursue sources of adaptation funding. The writeshop led participants through hands-on exercises to build skills in acquiring adaptation funding. This training included building a concept proposal from pre-proposal activities to the project concept, reporting, budgeting, and oral presentations.
- Implementing monitoring and evaluation programs to track progress. Guidance at this stage could help cities identify ways of using existing monitoring processes to assess progress on plans or the performance of adaptation options. CRIS pilots developed action plans to support longer-term activities that included activities to measure performance.

### **2.1.3. LESSON 3: FOCUS ON IMPLEMENTATION FROM THE START**

The current vulnerabilities of infrastructure services to weather and extreme events are generally understood by technical city staff. The challenge is in getting to actual implementation of strategies to manage these risks, respond to severe events, reduce impacts, and prepare for future changes. Taking specific action to increase resilience provides early success that serves to motivate staff to continue their efforts to address climate change more systematically. Although “implement and manage” is the fourth step in the CRD Framework, a surprising result from the pilots was that some of the best opportunities to begin implementing resilience strategies manifest at the Framework’s earliest stages, including:

- Identifying opportunities for implementation at the scoping stage. This enabled the pilots to link adaptation options with city priorities (see Lesson 10). For example, in the Dominican Republic, CRIS took advantage of a planned wastewater treatment project to help the water utility of Santo Domingo consider changes in facility siting and the design of pumping stations at initial stages of the project.
- Scoping to identify where to focus limited resources. In Nacala-Porto, scoping helped the CRIS team realize early on that it was necessary to make a strong case for action by linking climate stressors to their economic impacts on the community. The CRIS team identified erosion triggered by rainfall as a critical limiting factor to the reliability of the city’s infrastructure services. The team used this insight to tailor the delivery of an awareness-raising workshop and in the development of a rapid assessment tool that helps staff members identify measures to reduce impacts from erosion caused by heavy rains.
- Involving “implementers” at the scope stage of the Framework. Implementers are city staff members responsible for infrastructure construction, operations, and maintenance. They often have

considerable knowledge of vulnerabilities and feasible options, and they will be the ones to implement adaptation options—particularly measures such as changes in asset management or operational practices. Frequently, however, they are engaged late in the process and may be less familiar with climate change concepts than planners and environmental managers. In Piura, Peru, there was poor communication between the environmental, planning, and budget departments with the technical implementers of infrastructure projects; as a result, the appropriate staff members were identified late in the process. This had two disadvantages: the implementing staff required careful engagement to be oriented to the work that had been done, and the actions defined by the planning staff did not reflect the implementing staff’s input and expertise.

## 2.2. SUPPORTING CLIMATE-RESILIENT INSTITUTIONS AND CAPACITY IN CITIES

Cities need the internal capacity to support adaptation strategies over the long term and to access external expertise when needed. Alongside internal capacity, external support helps cities increase public awareness and stakeholder buy-in for resilience strategies; it can supplement the sometimes limited institutional memory of city governments and build internal capacity by helping cities identify tools, leverage resources, and access training. External support from consultants or academic groups also provides specialized technical skills needed to understand and manage climate risks. This section contains lessons from CRIS’s experience with increasing internal capacity in municipalities as well as building effective external networks of support.

### 2.2.1. LESSON 4: ANTICIPATE INSTITUTIONAL CHALLENGES TO SUSTAIN CITIES’ INTERNAL CAPACITY FOR CLIMATE RESILIENCE

The CRIS team encountered several common institutional challenges across the pilots in working at the municipal level. These issues are relevant to any program focused on local governments, but there are some specific considerations for climate resilient infrastructure services. The following table suggests specific strategies, drawn from the CRIS pilots, for addressing these challenges in programs designed to promote urban climate resilience.

**Table 1: Challenges and Strategies Drawn from CRIS Pilots**

Challenge	Strategy
Election cycles and turnover make it difficult to retain capacity built within the municipality.	<ul style="list-style-type: none"> <li>Because technical staff members have lower rates of turnover across election cycles, focus on building relationships and technical skills with these technical staff as well as with policy makers and political leadership.</li> <li>Engage a broader circle of local experts in climate, infrastructure, and disaster risk management from outside government (e.g., academics, NGOs, national and provincial government agencies) to increase cities’ access to expertise from stable, external sources.</li> <li>Recognize that roles change over time. Provide training to build capacity across a network of professionals who may be involved in municipal development as government staff, consultants, advocates, researchers, or entrepreneurs.</li> </ul>

Challenge	Strategy
Municipalities may have limited decision-making authority, especially in countries with strong centralized governments. They also have limited control over funding for public infrastructure, and cities face barriers in accessing adaptation funding directly from donors.	<ul style="list-style-type: none"> <li>Pursue opportunities for local governments to participate in discussions with relevant provincial and national agencies, and develop stronger vertical relationships with these levels of government to focus on urban climate resilience issues.</li> <li>Build the case for the significance of urban climate resilience to regional and national priorities.</li> <li>Focus on improving the city's ability to attract both national and international funding through writeshops, other training, and the building of relationships.</li> </ul>
Cities face non-climate stressors (e.g., poverty, rapid growth, crime, limited or unreliable services, and disease vectors) that take priority over climate risks.	<ul style="list-style-type: none"> <li>Focus on the city's objectives to address priority problems, and then explore how climate change may interact with and potentially exacerbate these challenges. Work with cities to identify strategies that will both improve climate resilience and contribute to solving non-climate priorities.</li> </ul>
Infrastructure investment decisions may be driven by politics rather than sound technical advice.	<ul style="list-style-type: none"> <li>Consider community awareness-raising activities that can indirectly increase pressure on leaders to show they are considering climate risks in their decisions.</li> <li>Develop policies that require consideration of climate risk in public investments, and documentation of this process.</li> </ul>
Climate projections may not be available at a level of resolution considered necessary to inform decision-making at the municipal level.	<ul style="list-style-type: none"> <li>Instead of focusing on obtaining higher-resolution climate data, consider the types of decisions that existing information can inform, and how the information could be made relevant to city decision-making (see Lesson 13).</li> </ul>

### 2.2.2. LESSON 5: ENGAGE AND RETAIN THE RIGHT MUNICIPAL STAFF

Convening the right representatives from different municipal departments and at different levels is a key challenge: failing to engage the right people early on can limit what can be achieved in later stages, particularly at implementation. Buy-in from high-level, political decision-makers is necessary to allow staff to spend time and resources on climate issues; and the work must be supported by a sense of ownership among departmental managers and technical staff members across a range of disciplines and roles. The CRIS program found that the following general department areas were the most critical to engage (note that the specific title of a department will differ across countries and municipalities):

- Budgeting, capital planning, and long-term projects
- Land use or urban/metropolitan development planning
- Civil defense or emergency management
- Infrastructure or public works: municipalities may also have departments for specific services, such as transportation, water and sanitation, and energy services
- Utilities, including water
- Environment, including sanitation and waste and parks
- Citizen liaisons and outreach
- Local economic development.

These departments may have roles relevant to climate resilience, but this doesn't mean they will be easy to engage. In Nacala-Porto, the planning department did not get involved because the CRIS program could not provide capital funding for projects. In Piura and Trujillo, engaging the right public works and

transportation members was very difficult, largely due to poor communication and compartmentalized processes between planners and staff responsible for implementation in the municipality. Challenges in engagement are unavoidable but can be reduced by demonstrating why resilience efforts are relevant to each department's motivations and priorities. Staff need to understand how a department's work will benefit from participation..

### **2.2.3. LESSON 6: FIND ADVOCATES FOR URBAN RESILIENCE**

The CRIS program found that engaged and well-connected advocates are critical to engaging key stakeholders and sustaining action over time. In many ways, the role of an advocate for urban resilience is the same as an advocate for any cause, but there are also some unique considerations. CRIS found that the following characteristics were especially helpful in a resilience advocate:

- The advocate does not need to understand climate change, but s/he does need to understand the importance of infrastructure resilience in providing reliable services for economic growth and the wellbeing of citizens. Linking climate risks to their impacts on infrastructure reliability is a key motivating factor that a good advocate can harness to engage others.
- An ideal advocate has some level of authority or influence over other departments (in order to engage them), and works well with both high-level politicians and on-the-ground implementers. For example, staff members in budgeting, planning, and priority-setting roles were good candidates for advocates.
- Effective advocates demonstrate an eagerness to learn, collaborate, and help others to improve their work. Resilience advocates should be well-respected and connected to key stakeholders; a polarizing advocate may limit participation from important groups.
- Importantly, it is best if a person transitions into the advocate role as the process of collaboration with a municipality proceeds. Initial, higher-level points of contact or liaisons are in the best positions to transition into an advocate role. The resilience advocate should have no immediate plans to leave the organization, since he or she will help ensure continuity.

The CRIS program had both good and challenging experiences with advocates. The National District pilot in Santo Domingo benefited from an advocate who was a strong leader and a compelling figure in the district government; this bolstered engagement and communication of CRIS activities to other stakeholders in the District. In contrast, a very effective advocate in the Nacala-Porto pilot transitioned to a new role with different priorities over the course of the project, which created challenges in ensuring continuity across the effort; the CRIS team engaged other participants as secondary leaders to continue the work. This points to the value of cultivating multiple leaders through working groups that engage and draw on the expertise and roles of different staff.

### **2.2.4. LESSON 7: LEVERAGE THE VALUE OF WORKING GROUPS**

Working groups can be effective mechanisms for engaging the right people and keeping them engaged over time (see Lesson 6). They are a common organizational structure, and are typically groups with

fixed membership that meet periodically to share information, update progress, set priorities, and establish next steps on activities to promote climate resilience.

Working groups can bring compartmentalized municipal departments together to share information on climate data, infrastructure vulnerabilities, and impacts; strategies for coping with or responding to impacts; and approaches for coordinating on funding opportunities. Working groups can also bring in external expertise and knowledge by engaging professional organizations, non-profit groups, or academic institutions. They provide a structure for collaboration and encourage accountability and longer-term engagement.

On the other hand, ineffective working groups can be a drain on limited time and resources and fail to achieve longer-term goals of continuity and collaboration.

#### NATIONAL DISTRICT WORKING GROUP IN SANTO DOMINGO

The CRIS pilot in the National District of Santo Domingo established a notably effective working group. The group included members from the National District government, the local water utility, several national government agencies, an NGO, and the Dominican association of municipalities. The group achieved several outcomes, including:

- Increasing group members' own awareness of the CRD Framework, climate resilience, infrastructure vulnerabilities, and adaptation
- Spreading CRIS tools and approaches within group members' own organizations
- Evaluating the most-promising adaptation options for planned wastewater treatment infrastructure, two of which are currently being considered for implementation by the local water utility

The group has plans to continue following the CRIS program. Establishing self-sustaining working groups is a challenge, but the benefits that the Dominican working group has provided have assured participants of its value.

Considerations for effective working groups include the following:

- First consider existing mechanisms before forming a new working group. Using existing groups can leverage existing relationships, processes, and momentum to save time and increase the chances of success. If no groups exist, however, it may be necessary to establish a new group.
- Structure working groups so they have a *technical* mandate, not a *political* mandate. Participants need to be able to make decisions or recommendations based on technical information rather than political considerations. In defining the role and membership of the group, consider sensitivities in what can be shared between groups (e.g., between a municipality and external organizations).
- Provide incentives to participate. Incentives may take the form of small grants, technical assistance, recognition, and professional stature. This can help encourage stakeholders to participate. Over the long term, participants will stay engaged if their involvement provides value to their own priorities.
- Explore involving government staff members working on climate resilience at regional and national levels. These relationships can be effective ways of bridging jurisdictional boundaries, identifying funding opportunities, raising the profile of the work, and ensuring continuity and support for working groups over time.

New working groups were established in the Piura and Santo Domingo pilots (see the text box for details on the National District working group in Santo Domingo). In Piura, a key technical expert at the



local university declined to participate because the technical staff members in the group did not have decision-making authority. This limited the local technical expertise that was available to the municipality, but it did not limit the municipality's ability to engage with CRIS and incorporate tools and guidance into its own decision-making processes.

In Trujillo, the CRIS team worked with an existing climate change technical group founded under a separate donor-supported resilience effort. In Nacala-Porto, the provincial office of the National Disasters Management Institute was heavily involved and added credibility and technical expertise to the pilot.

### **2.2.5. LESSON 8: ENGAGE THE PRIVATE SECTOR WITH A DISTINCT STRATEGY**

Engaging the private sector is important because companies are large funders of public infrastructure and build, own, and operate infrastructure services of their own. Involving the private sector, however, requires an approach that is very different from that used to engage civil society groups or academics. Although an objective of CRIS was to involve the private sector in climate resilient infrastructure strategies, little formal progress was made in this area.

Several factors contributed to the limited engagement with businesses. Most importantly, the CRIS team concluded that engaging the private sector before the municipality was prepared to work with them effectively on climate resilience would be counterproductive. Private sector companies are typically very cautious in disclosing information on risks and vulnerabilities to their operations, and are often reluctant to participate in programs such as CRIS unless there is a clear business interest at play. Overall, engagement of the private sector required a longer time frame and sustained level of effort that was beyond the resources of the CRIS program. Therefore the team focused on internal capacity building in municipalities themselves—a primary objective of the CRIS program. This laid essential groundwork for eventual outreach over time to a broader network of stakeholders, including the private sector.

Effective outreach to private sector businesses and industries requires a specific strategy that identifies key actors and is tailored to their interests. CRIS helped identify potential entry points for private sector involvement. In Piura, the team assisted the municipality in developing draft language that requires consideration of climate risk in new development projects that receive public support. At the national level, the Peru Ministry of Finance has released new guidance that requires all publicly funded projects to address climate risk; this will affect private sector developers that draw on public funds. Peruvian companies can use a tax-offsetting arrangement to execute public infrastructure projects and discount the investment from income taxes; this provides one potential opportunity for engaging some companies

in investments that support climate resilience of the municipalities in which they are located. In Mozambique, Nacala-Porto is trying to establish a private sector fund for disaster mitigation.

In addition to these opportunities for private sector involvement, the program identified the following considerations to help design effective strategies to engage the private sector:

- Consider sequencing: plan ahead to engage the private sector once municipalities have clearly articulated policy objectives and have sufficient expertise and capacity to work with businesses effectively on climate change resilience.
- Develop an engagement strategy targeting selected sectors that have particular influence in the city's development objectives.
- Consider engaging businesses through local trade associations or chambers of commerce, rather than reaching out to individual companies.
- Leverage municipal oversight of private sector activities, for example, in permitting the construction of new developments, or environmental impact assessments of private sector projects.
- Incorporate requirements to consider climate change risks and adaptation options in terms of reference or requests for proposals for infrastructure studies or projects.
- Establish partnerships or infrastructure funding arrangements between cities and the private sector, such as through tax offsetting arrangements (e.g., in Peru).
- Leverage financial risk, liability, and the need for social acceptance by local communities and stakeholders as drivers for engagement. Companies are facing increasing pressures to disclose risks from climate change to investors and the public; engagement on these issues can help them demonstrate they are proactively addressing these concerns.

The CRD Framework does not comment on the role of the private sector. Although the steps in the Framework may be similar to company risk management practices, the Framework is not targeted at private institutions. Guidance on the role of the private sector in supporting climate resilient development could help inform strategies to engage this stakeholder group.

## **2.3. INTEGRATING CLIMATE CHANGE INTO POLICIES AND CITY DECISION MAKING**

Action on climate change adaptation is most likely to occur if it is integrated into existing policies, practices, and processes. The process of integration is often referred to as “mainstreaming.” This section contains lessons learned from testing approaches for incorporating climate change considerations into municipal processes, policies, planning, and other functions.

### **2.3.1. LESSON 9: TAKE ADVANTAGE OF OPPORTUNITIES TO INTRODUCE CLIMATE CONSIDERATIONS INTO DECISION MAKING**

The CRIS pilots identified a number of opportunities for integrating climate considerations into municipal functions (see text box). To identify opportunities at the “Scope” stage of the CRD Framework, CRIS pilot teams asked departmental officials to describe:



- Functions within a department that required information on current or past climate conditions (to identify where climate projections could be applied to improve decision-making);
- Upcoming investments in long-lived infrastructure projects;
- Medium- or long-term planning activities, such as urban or metropolitan development plans, and infrastructure master plans;
- Existing vulnerabilities to extreme weather events or issues from gradual exposure to climate stressors;
- Areas of jurisdiction and oversight relative to regional or national government bodies.

#### ENTRY POINTS FOR MAINSTREAMING CLIMATE CONSIDERATIONS IN CITIES

- Infrastructure master plans
- National-level requirements for public investment in infrastructure projects
- Project- and system-level risk assessment requirements
- Environmental impact assessments
- Urban and land use plans under development
- Ecological and economic zoning
- Emergency management planning and protocols

The most promising opportunities for mainstreaming climate considerations generally have the following characteristics:

- The activities are under a municipality's direct jurisdiction or oversight.
- They involve decisions that already consider current or past climate variables.
- The timing is right for input on decisions that need to be taken. Decisions that are in the process of being made offer early implementation opportunities, with little additional effort needed to reflect climate change information. In the National District, a planned overhaul of wastewater treatment infrastructure provided an opportunity to re-evaluate the location of a new treatment facility and the elevation of pumps. The CRIS team worked with the Municipality of Piura to identify planned infrastructure projects that were at the right stage of development for incorporating climate resilience considerations.
- They involve incentives or deterrents to motivate staff members. For example, in Peru, the release of new requirements by the national government to incorporate climate change in public investment projects provided an incentive; in Santo Domingo, the risk and liability of impacts to planned wastewater infrastructure was a motivating factor; in Nacala-Porto, funding available through the Clim-Dev Special Fund motivated the municipality to develop a project proposal on climate resilient infrastructure.

### 2.3.2. LESSON 10: BUILD OWNERSHIP AND ACCOUNTABILITY TO ENSURE ONGOING WORK ON CLIMATE RESILIENCE

For benefits from CRIS to be sustained, local stakeholders needed to take ownership of these efforts.

The following strategies were effective in building ownership of climate resilience activities; the extent to which these approaches will be successful in the long term will be seen over time:

- Use participatory learning opportunities that encourage local partners to apply the concepts, tools, and approaches they learn through trainings. For example, CRIS used participatory games to teach key adaptation concepts (see text box below) and peer learning approaches (see Lesson 14).
- Emphasize collaboration and shared production of knowledge. In working sessions, municipal staff shared information on municipal services and infrastructure performance, while CRIS experts provided information on future climate change and developed easy to use tools and frameworks with input from city participants. Shared production of knowledge in this way helps stakeholders identify how concepts from trainings can be practically applied to their decisions, and helped the CRIS team

better design tools and resources based on user needs. For example, at the end of a workshop on CRIS tools for vulnerability assessment, one participant noted “with this vulnerability analysis tool and its indicators [of exposure, sensitivity, and adaptive capacity] we can measure impacts and prioritize budget expenditures [on planned infrastructure projects].”

- Conduct training of trainers to disseminate knowledge. Training a small group of stakeholders to teach others both increases the trainers’ capacity and engages audiences more effectively. Training of trainer activities worked well in disseminating simple concepts on climate change impacts and frameworks such as the CRD Framework (demonstrated by an awareness-raising event in Nacala-Porto), once staff were comfortable with the material. However, it is important to set realistic expectations on the material that can be disseminated and the level of effort needed to prepare trainers; this is particularly important for more complex tools and technical concepts. For example, in support of a CRIS small grant to a local NGO in Piura, municipal staff members were asked to present on CRIS tools before sufficient training and resources had been provided; this injured relationships between the NGO and municipality and it was necessary for CRIS team members to facilitate to clarify misunderstandings.
- Solicit input from stakeholders on tools and approaches. The earlier stakeholders are engaged in the development process, the more likely they are to use and share products. For example, in developing a climate information application tool for Piura, CRIS worked with the municipality to develop a list of action steps for the tool that improved its interface while also familiarizing staff members with the tool. Staff are now applying the tool to inform an example case study that will help test the tool and improve its utility in developing proposals for funding from the national government.
- Incorporate climate resilience into formal responsibilities and job positions through municipal ordinances. This approach was taken in Piura to form a formal working group within the municipality, established by the mayor, that will remain following the CRIS program. This provides a formal structure and role for the group, but maintaining momentum will still require initiative from the team members or a staff advocate.
- Help stakeholders articulate next steps and communicate achievements. Each pilot developed action plans to serve as an internal roadmap for action and as a communication tool to convey plans to donors. These plans ensure the pilots have concrete next steps that identify responsibilities and timetables. Opportunities for incorporating action planning into city processes were limited, so the action plans are separate climate resilience plans that are not fully incorporated into broader city planning and agenda-setting, but they can serve as a resource to these processes.

### ACCELERATING ADAPTATION: A GAME TO TEACH CLIMATE RESILIENCE

CRIS developed “Accelerating Adaptation,” a game to increase awareness of climate resilient development concepts. Participants act as city managers who must allocate their budgets to promote growth and protect investments from uncertain flood events.

The game was successfully tested in the CRIS pilots in Peru, in a training event in Macedonia, and at USAID’s Infrastructure Workshop in December 2014. It is a fun and innovative way to engage stakeholders on key adaptation concepts.



**Figure 4: Representatives from the Municipality of Trujillo and the Municipality of Piura play Accelerating Adaptation in Piura, Peru**

*Photo Credit: Maria Sofia Dunin-Borkowski*

## 2.4. DEVELOPING APPROACHES AND TOOLS FOR CLIMATE-RESILIENT INFRASTRUCTURE

There is a strong demand for easy-to-use tools that can help municipalities address climate risks to infrastructure services. In collaboration with municipalities, CRIS developed a suite of tools to support climate resilient infrastructure. This section provides lessons from tool development, and identifies opportunities to further extend these resources.

### 2.4.1. LESSON 11: DEVELOP MODULAR COMPONENTS THAT CAN BE APPLIED TO TAILOR TOOLS

Each CRIS pilot developed specific tools that were tailored to a pilot city's decision-making process. The CRIS team found it impossible (and inappropriate) to develop a generic tool that could be applied consistently across cities, given the different levels of capacity, development priorities, institutional arrangements, and interests of the different cities. Even within one municipality, different departments have specific needs that can't be met by a one standardized approach: an office managing solid waste collection, for example, has different objectives, climate concerns, and decision timeframes than an office developing long-term land use plans.

CRIS's experience suggests that the idea of modular components may be a valuable concept for future tool development. Modular components are a set of core elements that can be assembled in different ways by practitioners to develop tailored tools that meet specific needs defined by a city's local context. For example, common resources such as CCRD fact sheets on climate change impacts to infrastructure services, a library of adaptation measures, and adaptation evaluation strategies were implemented across multiple tools and trainings developed under CRIS, each tailored to the pilots' unique context and decision-making processes.

The suite of tools developed under CRIS (see box) generally cover three purposes: providing climate information, assessing climate vulnerability, and planning for adaptation. An initial list of core components that form flexible building blocks for tailored tools includes:

- A **repository of climate indicators** that is relevant to infrastructure design decisions, operations and maintenance, or other infrastructure asset management.

#### A SUITE OF TOOLS FOR CITY-LEVEL RESILIENCE

The CRIS program developed and implemented the following tools in pilot cities in Peru, the Dominican Republic, and Mozambique:

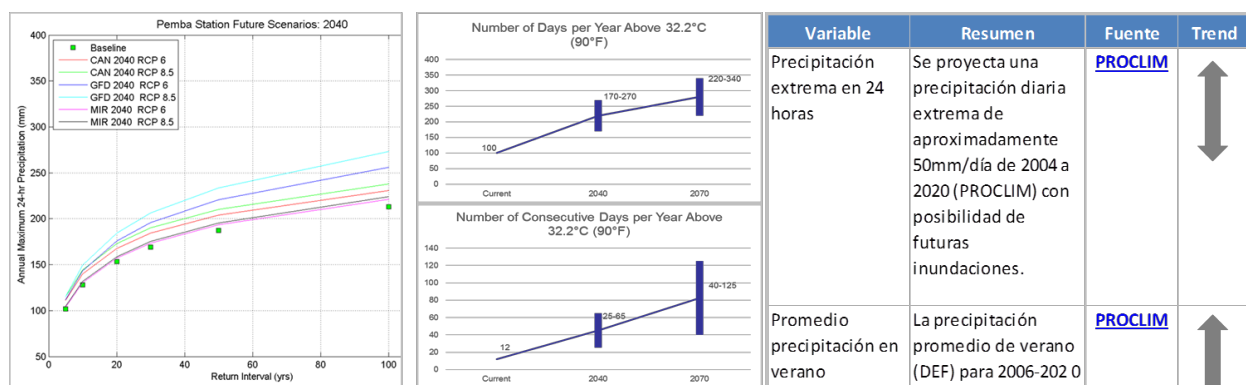
- A Rapid Assessment Tool for Climate-Resilient Infrastructure to Erosion Impacts (Nacala-Porto)
- Sensitivity Matrix for Wastewater Treatment Infrastructure (Dominican Republic)
- Vulnerability Assessment Screening Tool (Piura and Trujillo)
- Adaptation Planning Tools (Piura)
- Climate Information Application Tool (Piura)

- **Templates for housing and translating climate information** into indicators that can be easily understood by municipal stakeholders.
- Matrices that explain **relationships between climate stressors and their impacts** on infrastructure or other non-climate stressors.
- **Compilations of adaptation options**, their characteristics (e.g., cost, effectiveness, examples, etc.), and the climate stressors and infrastructure sectors to which they apply.
- **Ranking systems** (qualitative or quantitative) for determining high, medium, and low priorities (for both vulnerability assessment and adaptation option selection).
- Resources for **evaluating the benefits of adaptation options** to support cost-benefit or cost-effectiveness analyses.
- Indicators, metrics, and templates for **monitoring and evaluation of adaptation options** and strategies.

#### 2.4.2. LESSON 12: USE DECISION-READY CLIMATE INFORMATION

Translating climate information to inform decision making was one of the largest barriers for pilot cities in implementing climate resilience tools and strategies. This is because available climate information was not in a format ready to be used in decision making; it had to be translated into indicators that were relevant to municipal decisions. CRIS used the following strategies to help cities apply climate information:

- Identify where climate information is already used or specific decisions that are related to climate and weather conditions. Help staff articulate thresholds or design standards above which impacts may occur: for example, “we have big flooding problems if we get 5 inches of rain in 24 hours,” or “we design bridges to a 20-year return period.”
- Collect existing information on historical and future climate information. Sources will likely include data from meteorological services and other monitoring stations, if available. If not available locally, consider climate projection data from outside sources such as the World Bank’s Climate Change Knowledge Portal.
- Perform a high-level review of the available climate information to evaluate its robustness and how to translate it into a format that can inform decisions. Ensure climate information is vetted with local stakeholders and approved if necessary; for example, sources from national government agencies may be more acceptable than others.
- Translate the available information into a “decision-ready” resource (e.g., graphs, tables, simplified summaries of indicators, or interactive charts). Link climate information back to thresholds and indicators that are already used in municipal decision making. Examples of climate information used in the Nacala-Porto, Santo Domingo, and Piura pilots are shown in Figure 5.
- Address data gaps or limitations by determining which decisions can be supported by the available information. For example, detailed vulnerability assessments of specific facilities or systems may require a level of detail that cannot be supported by available information, but the available information may still help identify high-vulnerability areas for monitoring, or no-regrets measures that should be implemented.



**Figure 5: Climate information used in the Nacala-Porto, Santo Domingo, and Piura pilots**

### 2.4.3. LESSON 13: CONSIDER SHORT-TERM AND LONG-TERM OPTIONS IN AN ADAPTATION PORTFOLIO

Rather than selecting individual adaptation options, CRIS pilot cities found a portfolio approach to be a more effective strategy for adaptation planning. This approach encouraged municipal staff members to brainstorm and select a mixture of options across the full range of adaptation responses—for example, the CRD Framework identifies a number of adaptation approaches, from coping with climate stressors, to protecting against impacts, to relocating from high-risk areas.

When considering adaptation measures with municipal staff, the CRIS teams found that it was difficult to focus solely on short-term options; instead, municipal staff members were more comfortable brainstorming a mix of short- and long-term options at the same time. This approach supports the development of a portfolio of options that can address both short-term, immediate impacts and prepare for longer-term changes in climate stressors. It also complements the idea of implementing adaptation options in phases, so that short-term options are coordinated with longer-term strategies.

This lesson is particularly relevant for fast track implementation (FTI), an approach developed by USAID to speed the process of moving from analysis to implementation of adaptation options. It focuses on quickly implementing the most promising options that can reduce climate vulnerability in the short term. FTI was tested most explicitly in the Trujillo, Peru pilot, where a full-day session on FTI and adaptation planning was conducted (see text box). The pilot demonstrated that FTI is a useful complement to the Framework, but also showed that short-term options should not be identified without also considering a broader range of medium- and longer-term options. FTI guidance should also clarify that it may still take time to identify and implement even short-term, low-cost measures.

#### **2.4.4. LESSON 14: CREATE PEER LEARNING OPPORTUNITIES TO PROMOTE KNOWLEDGE TRANSFER—BUT ENSURE THAT RESOURCES ARE AVAILABLE TO SUSTAIN MOMENTUM**

CRIS validated the benefits of peer learning, a two-way, reciprocal learning activity that facilitates an exchange of experiences between people in similar situations, where neither has a role as teacher or expert practitioner.<sup>3</sup> Peer learning enables the transfer of innovations and best practices by leveraging the trust and credibility of peer relationships. It provides a valuable opportunity for practitioners to see their challenges through the perspective of their peers. Furthermore, peer learning can foster a sense of empowerment, shared challenge, community, ownership, engagement, and motivation. Peer learning benefits, however, do not extend beyond an individual event without a strong motivating factor to drive collaboration or additional resources to support continued engagement.

CRIS developed insights on peer learning from three different peer learning events: a Climate Leadership Academy held in Santo Domingo (see text box), a joint Piura-Trujillo peer learning workshop, and a three-city study tour in Quelimane, Beira, and Maputo, Mozambique.

- The topic of climate resilient urban infrastructure was a particularly relevant topic for peer learning. Since climate resilience is not yet a central component of municipal responsibility, participants were heartened to meet others who were struggling with the same challenges. The events motivated participants to promote resilient strategies in their cities, improved learning outcomes, and built ownership of climate resilient strategies among stakeholders.
- Peer learning was an effective strategy for developing ownership in pilot cities. By talking through climate-related development issues with other municipalities, the Mozambique study tour participants were able to effectively communicate their work to international donors and national government agencies. They now plan to develop a working group under the Mozambican Association of Municipalities.
- Although the Climate Leadership Academy in Santo Domingo was successful, the momentum created for further collaboration among the participants dissipated without resources for additional support. Developing a peer learning network requires ongoing investment, or a strong motivating issue to encourage ongoing engagement—it cannot be expected to spring from a single event. To develop a stable network, peer learning events must be supported with resources to promote continued engagement after the event. This continued investment does not need to be extensive but must provide the infrastructure and incentives or nudges to promote continued participation.

### **2.5. BUILDING A BETTER PILOT: PROGRAM DESIGN AND IMPLEMENTATION**

Working with pilot cities allowed CRIS to develop and test innovative climate resilient solutions in different contexts over a relatively short time (two and a half years). This section provides lessons on the city pilot approach that CRIS implemented and considerations for designing similar programs.

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<sup>3</sup> Boud, D., Cohen, R., and Sampson, J. 2001. *Peer Learning in Higher Education*. Sterling, VA: Stylus Publishing Inc.



### **2.5.1. LESSON 15: INVEST IN PILOT SELECTION**

Given the resources required to implement pilots, it makes sense to invest in a robust selection process. The CRIS program benefited from screening candidate cities based on a set of prerequisite criteria (i.e., medium-sized, coastal cities located in Africa or Latin America and the Caribbean), then collecting background information and conducting visits to a subset of candidate cities.

At this stage, the most useful criteria in selecting pilots were: (i) USAID interest—specifically, the level of engagement of USAID Missions, (ii) the level of city interest and staff availability, and (iii) the availability of prior analyses, existing data, or evidence of recent work related to climate resilience.

The engagement of USAID Missions was important to ensure there was internal buy-in for pilot activities in each country. Having engaged Missions made it easier to establish contact with officials at local, regional, and national levels of government, and also helped the Mission further build relationships at these levels. It allowed collaboration with other USAID projects, such as USAID’s Coastal City Adaptation Project in Mozambique and PARA-Agua in Peru. Finally, Mission engagement increased the likelihood of follow-on efforts to continue to support pilot cities at the end of the CRIS program.

Pilots conducted in-country by USAID Missions could consider the availability of opportunities as an alternative criterion to engagement of USAID Missions. Missions are in a better position than remotely funded programs to evaluate opportunities for influencing infrastructure planning decisions, urban planning, or specific projects at the right time in their development. This criterion would require knowledge of municipal planning and budgeting cycles, election cycles, planned investments, and high-level city priorities.

### **2.5.2. LESSON 16: BUILD FLEXIBLE DESIGN AND CITY-IDENTIFIED PRIORITIES INTO PILOT PROJECTS**

The following considerations explain several program design and implementation approaches that helped CRIS meet its objectives:

- Focus on city needs. Implementing a development-first approach requires flexibility in order to align activities with a city’s development priorities and timelines. Timelines need to be realistic and not overly prescriptive. For example, CRIS invested significantly at the “Scope” stage of the CRD Framework to develop work plans that met both city priorities and USAID objectives; this process was aided by a flexible program design that allowed different concepts and approaches to be tested in each pilot depending on the local context.
- Build in early wins. Pilot managers need to consider how to demonstrate benefits from the program early on to keep momentum, generate interest and ownership in the process, and avoid stakeholder fatigue—particularly with busy municipal officials. This was not specifically considered in CRIS program design, but pilot teams addressed city expectations early on by delivering training and

awareness-raising activities on the CRD Framework and foundational concepts covering climate data, vulnerability assessment, and adaptation planning.

- Engage a local coordinator. A strong local coordinator is essential for pilots that will be implemented remotely, in contrast with longer-term programs with in-country staff. In climate resilience work, it is also helpful if the coordinator has some level of technical experience so he or she can support logistics and coordination with municipal staff members while also advancing the technical work.
- Plan for post-pilot activities. Pilot design needs to include a strategy to manage local expectations at the end of the program. Although CRIS's objective was to globally disseminate resources developed and tested under the pilots, the pilots themselves also generated local demand for additional support. The active participation of USAID Missions has increased the likelihood of support for follow-on efforts in each country.

### **2.5.3. LESSON 17: COMPLEMENT PILOT ACTIVITIES BY SUPPORTING LOCAL INSTITUTIONS AND EXPERTS IN AN ACTIVELY MANAGED GRANT PROCESS**

The CRIS program found that providing grants<sup>4</sup> to local organizations alongside pilot activities requires careful consideration of strengths in the local community that can be supported. Grants can enable a greater level of support and assistance at the local level, but they can also cause confusion if grant activities are not coordinated with the pilot work. Weaknesses in the capacity of local organizations can cause challenges in meeting grant requirements. These issues require active management to resolve, and limited control over grant activities makes it difficult to adjust if grantees' efforts become misaligned with pilot activities.

The following are important considerations for designing complementary grant-pilot activities:

- Limited capacity is a key constraint in working with local city-level organizations on climate resilience. The CRIS program received a surprisingly low number of responses to grant solicitations in all three pilot cities, and proposals that were received generally failed to demonstrate an understanding of USAID's objectives.
- The objectives for solicitations at the city level need to be simple and targeted at activities where prospective organizations have experience. Grantees had very limited technical capacity to incorporate climate change into their activities; they were much stronger in engaging local groups—particularly grassroots organizations that would have been difficult to reach otherwise, bringing key external stakeholders to the table, and increasing awareness about CRIS program activities.
- Grant activities must be adequately supported by resources for monitoring grantees and providing technical assistance to ensure that grant activities maintain high quality and are aligned with pilots. Channels for monitoring grantee performance are essential in remote pilots. The CRIS program used local coordinators as resources to support grantees as well as to monitor their progress and the quality, consistency, and alignment of their work alongside CRIS pilot activities.

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<sup>4</sup> CRIS provided separate funding to local organizations working in each pilot city through three small grant awards. The objectives of these grants were to develop capacity at the community level, test innovative solutions developed under CRIS and CCRD, and encourage local groups to move from planning to implementation.



# 3. CONCLUSIONS AND NEXT STEPS

The CRIS program achieved the following outcomes toward CCRD’s strategic objective of increasing the resilience of people, places, and livelihoods through investments in adaptation:

- In CRIS pilot cities, the program developed significant capacity for understanding and responding to climate change impacts on urban infrastructure. Cities have taken steps to mainstream climate change considerations into their decision-making and governance systems. CRIS delivered nearly 3,000 person-hours of training to 340 men and 200 women in CRIS pilot cities. The program contributed to the proposal, and in some cases, adoption, of seven policies, ordinances, plans, or agreements addressing climate change at the municipal level.
- The program developed, tested, and implemented practical tools in collaboration with city pilots and grantees that are valuable resources to inform resilience work in other urban contexts. Cities will have better access to climate information for decision-making, as well as approaches to identify and disseminate actions that increase resilience to climate change.
- By testing the USAID CRD Framework, CRIS validated its development-first approach and made real progress toward implementation of adaptation measures in pilot cities.
- CRIS validated peer learning strategies as an important program component for building momentum, strengthening learning, and creating ownership over program outcomes and follow-on work.
- Each pilot city has improved prospects for continued support of climate resilience work through USAID Mission programs, donor interest, or national government collaboration.

Ensuring that urban infrastructure services in developing countries are resilient to climate change is a long-term challenge. As this work continues, CRIS’s experience offers insights for adaptation and development practitioners, donors, and development agencies—particularly USAID. The following areas of future work are important next steps to build on the progress made by the CRIS program. They offer practitioners and donors opportunities to achieve significant progress in implementing urban resilience strategies that build directly on the innovative approaches piloted by the CRIS program:

1. **Develop practical approaches to evaluate the net benefits or cost-effectiveness of adaptation options.** City officials generally understand the existing vulnerabilities in their infrastructure systems, but they lack approaches for quantifying the costs of future, uncertain climate impacts and the benefits of adaptation options to reduce those risks. Cities need better approaches, skills, and information that: (i) allow them to project the cost of future impacts from existing cost information and past events; (ii) apply climate information to account for uncertainty in the magnitude, frequency, and damage from future events, (iii) estimate the costs of adaptation options, and (iv) develop financial metrics, such as net present value, internal rate of return, or cost-effectiveness that can help them select adaptation options.
2. **Translate climate projections into decision-ready information and disseminate it to cities.** Collecting and interpreting information on future changes in climate remains one of the largest

stumbling blocks to building urban resilience. Future efforts should continue to focus on helping cities: (i) identify authoritative climate information available for their region or city, (ii) translate data on climate change into terms that relate to impacts, metrics, and thresholds that they understand, (iii) apply this information consistently across municipal functions, and (iv) update data sources with new information as it comes available. Cities need better strategies for making robust decisions with imperfect climate information that may not provide enough resolution or certainty to fully inform decisions. Information technologies, including Geographic Information Systems (GIS), Web-based applications, and data visualization tools, play an important role in helping cities access and interpret climate information.

3. **Develop modular components to design tools that are tailored to cities' own local contexts.** Cities need tools that are tailored to their own municipal decision-making processes. Rather than trying to develop a generic one-size-fits-all approach, CRIS demonstrated the value of developing modular tools that build on common resources and can be scaled to other contexts. These tools were best suited to the pilots for which they were developed, but common components were developed that were useful across tools. These components included climate indicators, climate information summaries, climate stressor-asset relationships, adaptation option libraries, ranking systems, and adaptation option evaluation approaches. Instead of disseminating specific, tailored tools that do not scale well to other contexts, practitioners should focus on defining and sharing modular components that can be combined to generate specific outputs that align with municipalities' own decision-making processes.
4. **Link municipal-level adaptation strategies to provincial and national planning.** Cities need to better leverage funding, resources, capacity, and planning at regional and national levels to support adaptation. Donors and practitioners should focus on making these linkages, and can encourage collaboration through peer learning events and activities and by implementing programs that help cities and regional actors work together. This vertical collaboration can help mainstream climate issues into regional land and watershed management activities, and ensure consideration of urban issues as regional strategies are developed. Associations of municipalities are key allies that can help promote municipal issues at regional and national levels. Through peer learning opportunities, cities may discover opportunities to cooperate on addressing common issues, increasing their impact at provincial and national levels while improving attractiveness of projects to international funders.
5. **Target the private sector in urban climate resilience strategies.** The CRIS program's focus was on building municipal capacity, but the private sector actors are also critical financiers and developers of city infrastructure. Future programs should test the effectiveness of engaging the private sector as a primary means of promoting urban resilience, and compare this approach with programs focused on local governments. Practitioners and donors should also encourage better collaboration between municipalities and the private sector, through peer learning or by mainstreaming climate considerations into municipal oversight of private sector activities and services (e.g., permitting, environmental impact assessments, and consultant terms of reference). Municipalities should continue to explore innovative structures for financing resilient infrastructure through the private sector.



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