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COMPENDIUM

THE USAID CLIMATE-RESILIENT DEVELOPMENT PROJECT



Prepared for: United States Agency for International Development
Global Climate Change Office, Climate Change Resilient Development Project
Washington, DC

PROJECT REPORT
OCTOBER 2015

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The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government

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LIST OF ACRONYMS AND ABBREVIATIONS

ACDI	Agricultural Cooperative Development International
ACMAD	African Center for Meteorological Applications for Development
AgMIP	Agricultural Model Inter-comparison and Improvement Project
AGRHYMET	Agriculture, Hydrology, and Meteorology
AP	Adaptation Partnership
ATREE	Ashoka Trust for Research in Ecology and the Environment
CAR	Central Asian Republics
Cascadia	Cascadia Consulting Group
CATIE	Centro Agronomico Tropical de Investigacion y Ensenanza
CCRD	Climate Change Resilient Development
CEDEPAS Norte	Ecumenical Center for Promotion and Social Action North
CIMPACT-DST	Climate Impacts Decision Support Tool
CLA	Climate Leadership Academy
CO ₂	carbon dioxide
CoP	Community of Practice
CRIS	Climate Resilient Infrastructure Services
CRW	Climate-Resilient Wheat
CSP	Climate Services Partnership
DHM	Department of Hydrology and Meteorology
DOS	U.S. Department of State
ETH	Eidgenössische Technische Hochschule

GCC	Global Climate Change
GHG	greenhouse gas
GLOF	glacial lake outburst flood
GPR	ground-penetrating radar
HiMAP	High Mountains Adaptation Program
HMGWP	High Mountain Glacial Watershed Program
HPI	Hue Planning Institute
ICIMOD	International Centre for Integrated Mountain Development
IDDI	Instituto Dominicano de Desarrollo Integral
IEDRO	International Environmental Data Rescue Organization
IPCC	Intergovernmental Panel on Climate Change
IPSS	Infrastructure Planning Support Systems Tool
IRAP	International Research and Applications Project
IRI	International Research Institute for Climate and Society
IRURE	Institute for Environmental Planning, Urban-Rural Infrastructure
ISC	Institute for Sustainable Communities
ISET	Institute for Social and Environmental Transition
KM	Knowledge management
LAPA	Local Adaptation Plan for Action
LIG	Livelihoods as Intimate Government
MCCS	Municipal Climate Change Strategies
MKM	Milieukontakt Macedonia
MMFR	Mount Mulanje Forest Reserve
MPA	marine-protected area

NAP	National Adaptation Plan
NDRI	Nepal Development Research Institute
NDVI	Normalized Difference Vegetation Index
NGO	nongovernmental organization
NMHSs	National Meteorological and Hydrological Services
NSRI	National Space Research Institute
pSIMS	Parallel System for Integrating Impact Models and Sectors
RADA	Rural Agricultural Development Authority
RDMA	Regional Development Mission for Asia
RMIT	Royal Melbourne Institute of Technology
SCIFODE	Science Foundation for Livelihoods and Development
SCLA	Sustainable Communities Leadership Academy
SDI	Spatial Development International
SUNY	State University of New York
TAW	Tigum-Aganan Watershed
TCA	Transboundary Conservation Area
TERI	The Energy and Resources Institute
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VIUP	Vietnam Institute for Urban and Rural Planning
VOCA	Volunteers in Overseas Cooperative Assistance
WIO	Western Indian Ocean
WIOMSA	Western Indian Ocean Marine Science Association
WMO	World Meteorological Organization

PURPOSE AND OBJECTIVES

The Climate Change Resilient Development (CCRD) project was a four-year project (2011-2015) implemented under the leadership of the Global Climate Change Office in the United States Agency for International Development's (USAID's) Bureau for Economic Growth, Education, and Environment (E3). The project goal was to “enhance resilience of developing country peoples, assets, and livelihoods through improved design of USAID programs and increased capacity to respond to climate change impacts.”

This compendium has been prepared to describe CCRD activities, products, findings, and key accomplishments. It also provides links to connect USAID Bureaus and Missions and international practitioners to the large library of project resources, including tools, guidance, training materials, technical reports, and journal articles. In addition, the CCRD team provided some suggestions for future work to advance USAID's development first approach to climate adaptation.

Over the course of the project, the CCRD team conducted a wide range of activities¹ to help define and advance climate-resilient development in developing countries. CCRD collaborated with the GCC Office to create, test, and implement a climate-resilient development framework. Technical assistance and training were provided by the CCRD team on climate services, climate risks related to rapidly changing glaciers and glacial lakes, and climate-resilient agriculture and urban infrastructure services. The CCRD team conducted adaptation-focused stakeholder and training-of-trainer workshops, convened peer learning and knowledge-sharing events, developed climate planning tools, and provided small grants to researchers, trainers, and practitioners.

The CCRD team was led by International Resources Group, now Engility, and included a consortium of partners – ICF International, Stratus Consulting (now a wholly owned subsidiary of Abt Associates), the International Research Institute for Climate and Society at Columbia University, The Mountain Institute, Cascadia Consulting Group, the Environmental Law Institute, the Cockrell School of Engineering at the University of Texas, the Department of Geography at the University of South Carolina, and the Manoff Group. CCRD also contracted with 44 consulting firms and vendors and issued 35 small grants. The CCRD team and grantees worked in 35 developing countries and prepared more than 250 products – including tools, fact sheets, reports, journal articles, websites, and videos – that describe the CCRD programs, communicate results and lessons learned, and present guidance, training, and tools (ccrdproject.com).

The remainder of this section provides background on USAID's development of the CCRD project and a roadmap to the compendium. While the CCRD project has made many advances in addressing the development challenges presented by climate change, there is still much work to do. We invite you to learn from the CCRD team's work and join USAID and their partners in continuing efforts to improve welfare worldwide by addressing the considerable obstacles presented by climate change.



SECTION I
INTRODUCTION

BACKGROUND

In the past decade, USAID has devoted increasingly more staff and project resources to climate adaptation. Early on, the GCC team (later, the GCC Office) developed guidance on adaptation planning and carried out pilots to test the guidance and build local capacity to assess climate concerns and identify and implement adaptation options. Following the UNFCCC Conference of Parties in Copenhagen in December 2009, the U.S. launched the Global Climate Change Initiative (GCCCI). The GCCCI committed resources to three pillars – mitigation, sustainable landscapes, and adaptation – to help developing countries address climate change while maintaining development gains.

The GCC Office has primary responsibility within USAID to provide technical leadership and guidance on adaptation and disseminate information on climate information and good practices in assessing and implementing adaptations to address climate vulnerability. In addition, the GCC Office provides support to USAID field missions and headquarters bureaus and offices, covering training and program/project design and evaluation. CCRD was designed to support the GCC Office in fulfilling its responsibilities for adaptation within the Agency. The CCRD team was tasked to develop tools and information resources to support adaptation actions on the ground, build capacity to adapt to climate change within USAID and among its partners, and pilot innovative adaptation approaches. Figure 1.1 illustrates the strategic framework for CCRD.

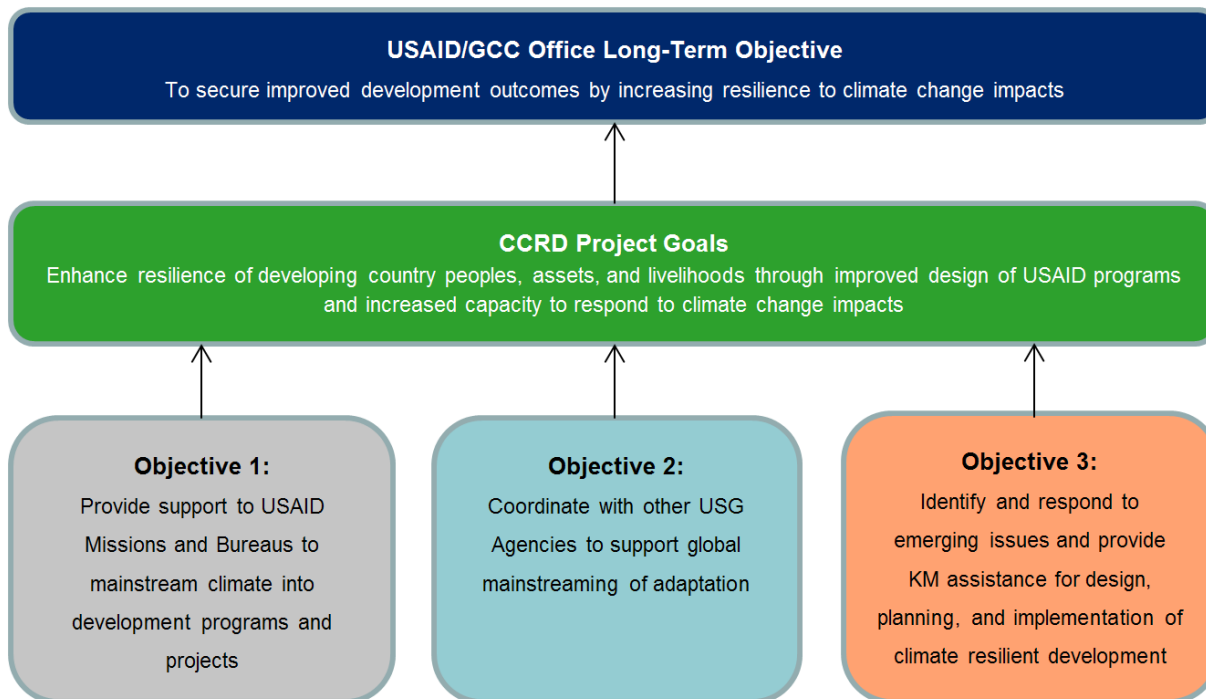


FIGURE 1.1. CCRD STRATEGIC FRAMEWORK

ROADMAP

Chapters 2 through 10 provide detailed descriptions of CCRD activities. These chapters have been sequenced to a certain extent to follow the chronological development of CCRD activities over the course of implementation. The cornerstone of all CCRD work has been the development of the Climate-Resilient Development Framework, a flexible approach for mainstreaming climate concerns into development planning. From the outset of the project, CCRD worked with staff in USAID's GCC Office to improve on previous USAID adaptation guidance that had taken more of a project rather than a broader strategic development focus. This collaboration, described in **Chapter 2**, culminated in the preparation of the Framework and a series of technical annexes. **Chapter 3** describes selected applications of the Framework under CCRD. It should be noted that the Framework also features prominently in CCRD's urban and high mountain adaptation initiatives.

A key opportunity for USAID to connect with international practitioners, other donors, and multi-lateral development banks was a series of Adaptation Partnership workshops convened in 2011 and 2012. The Adaptation Partnership was established by the Governments of Costa Rica, Spain, and the United States to provide a forum for discussion of salient adaptation topics outside of UNFCCC negotiations. CCRD supported these workshops in different capacities ranging from logistic support to participation in the design of workshops. **Chapter 4** provides a description of the seven Adaptation Partnership workshops that were supported by CCRD.

In addition to their networking and knowledge management value, the Adaptation Workshops served as a catalyst for CCRD's development of three major activities under Objective 3 – Identify and respond to emerging issues. **Chapter 5** describes CCRD activities and support for the High Mountain Adaptation Partnership that included creation of a community of practice, research on methods for assessing glacial lake outburst floods, and facilitation of adaptation planning efforts in high mountain areas.

Chapter 6 describes the CCRD activities related to climate services. These activities included support for the Climate Services Partnership (CSP) through the CSP Secretariat, creation of new climate services, capacity building on the use of climate services in developing countries, and technical, institutional and economic assessment of existing and new climate services and products.

In **Chapter 7**, CCRD activities related to urban adaptation planning and implementation are presented. The largest of these efforts was the Climate Resilient Infrastructure Services (CRIS) Program involving pilots in cities in Peru, the Dominican Republic and Mozambique. CCRD also tested a climate impacts decision support tool in Vietnam, and provided technical support for a Macedonian NGO, tasked to assist small municipalities to mainstream climate into their municipal development plans.

The Adaptation Partnership workshops connected CCRD with communities of practice and provided the impetus for CCRD to engage these participants in research, policy analysis and outreach through small grants. **Chapter 8** describes CCRD's small grant program, which awarded 35 grants for projects that piloted innovative adaptation approaches; built adaptation capacity; developed tools, methods, and information resources; or tested the climate-resilient development framework. Project categories included climate change research in high-mountain regions, climate-resilient infrastructure services, climate-resilient agriculture, climate services, and other topics related to CCRD's objectives.

Over the course of CCRD, the team responded to a variety of requests from USAID Bureaus and Missions for technical assistance and capacity building. Some of these requests were focused on preparation of background documents and support for internal Agency activities, while other requests called for CCRD to support USAID's implementation partners. Some of these support activities were described in earlier chapters while the rest are described in **Chapter 9**.

The final chapter reviews the project's accomplishments, focusing on the integration of the climate-resilient framework into all of the CCRD programs, and proposes an approach for applying the climate-resilient development framework in a single location and assessing its effectiveness to enable a systematic and comprehensive way for USAID to apply the framework into the future.

HOW TO USE THE COMPENDIUM

The compendium is organized to make it easy to find high-level information about each CCRD activity and to locate additional resources that provide more in-depth information. Chapters are generally structured as follows:

- Purpose and objectives
- Description
- Outcomes
- Tools developed for the program (with links to the tools)
- Key products (e.g., fact sheets, technical reports, websites) developed for the CCRD activity (with links to the products)

Each section contains a box with the key terms and climate impacts that the CCRD program covered. This information provides a snapshot of the content and enables users to quickly search on a term of interest to find a relevant program.

Internal links are provided to enable the reader to move among the compendium sections, as needed.

CLIMATE-RESILIENT DEVELOPMENT FRAMEWORK



 **USAID** 

Jonathan Cook



PURPOSE AND OBJECTIVES

The United States Agency for International Development (USAID) is committed to helping developing countries achieve their development goals, which could include, for example, reducing poverty, increasing access to education, improving child health, combating disease, and managing natural resources sustainably. Climate change presents an additional challenge to countries' abilities to achieve these objectives. Accordingly, USAID helps developing countries recognize and respond to current and future climate risks, and avert or manage negative impacts on people, resources, and economies.

To support these efforts, USAID's Climate Change Resilient Development (CCRD) project team collaborated with the GCC office to construct a new, "development-first" approach to effectively and efficiently incorporate the consideration of both climate impacts and non-climate stressors into the development decision-making process. This approach, laid out in the Climate-resilient Development: A Framework for Understanding and Addressing Climate Change report (Framework report), is accompanied by six related annexes. The Framework report describes a practical, participatory, and cost-effective process designed to help obtain buy-in from decision-makers who might otherwise believe climate change falls outside their mandate. By applying the climate-resilient development framework, developing countries can protect the development gains they have already made and improve the outcome and sustainability of future development investments.



SECTION 2

ADVANCING CLIMATE-RESILIENT DEVELOPMENT

DESCRIPTION

The Climate-Resilient Development Framework is the result of USAID's efforts to over the past decade to understand and address the impacts of climate change and variability on development outcomes. Early on, USAID worked with Stratus Consulting to conduct a series of pilot studies in Honduras, Mali, and South Africa to test a process for assessing and addressing climate stressors in projects. The pilots confirmed that climate stressors posed risks that were great enough to undermine project outcomes, and therefore worth addressing through revised project design. Lessons from the pilots were subsequently reflected in USAID's 2007 report, *Adapting to Climate Variability and Change: A Guidance Manual for Development Planning*. This manual was designed to help development planners and practitioners determine whether projects are sensitive to climate stressors and, if so, how to adapt project designs to achieve desired outcomes.

Following the release of the guidance, USAID continued to support adaptation planning and training activities. In discussions with stakeholders and practitioners, USAID was encouraged to apply the guidance more broadly to plans and strategies at the national, sub-national, sector, and geographical scales. USAID supported new adaptation case studies to test the guidance in sector (freshwater resources management in the Marshall Islands) and river basin (Rio Santa in Peru) applications. USAID also funded new adaptation guidance focused on coastal adaptation planning, *Adapting to Coastal Climate Change – A Guidebook for Development Planners*, prepared by the Coastal Resources Center at the University of Rhode Island and International Resources Group in 2009.

An important contribution to USAID's understanding of how to effectively conduct adaptation planning was the lesson learned from participation in a MacArthur Foundation funded project that looked at potential climate change impacts on marine and terrestrial protected areas in Madagascar.² The project identified areas in Madagascar that were particularly important for biodiversity and should be protected from development. However, at a workshop held towards the end of the assessment, stakeholders identified many of these same areas as being important for development as well as conservation; the best places for conservation were also ideal for horticulture, rice production and livestock. Since the assessment did not consider development needs and important tradeoffs with conservation, the results were incomplete.

Furthermore, the Madagascar Action Plan, the country's development plan, revealed that a number of the goals of that Plan would each contribute to development, but were not compatible with one another or realistic in terms of limited resources. Ambitions for increasing tourist visits, transport infrastructure, agricultural and livestock production, and protected area acreage assumed that much of the remaining forested lands could be used for competing purposes. The components of the plan appeared to have been developed in isolation from one another, and the components of the plan had not been considered in their entirety to see if the multiple goals were in competition for scarce resources. The conflicts within the MAP furthered USAID's thinking that an approach that started with a systematic look at all development goals would drive a better planning process, ensuring that scarce adaptation funds were dedicated to the highest priority uses.

In 2010, USAID had the opportunity to directly relate climate to development objectives when it facilitated adaptation workshops in St. Lucia and Barbados. In the workshops, participants first discussed what was important to them and from this discussion, identified development goals for their countries and the inputs, resources and conditions needed to achieve those goals, with participation by several sectors. Once this development baseline had been described, participants then identified climate stressors and discussed how climate stressors might make it difficult to reach their development goals. They also discussed non-climate constraints to achieving their goals. This shift in how to introduce



RELEVANT DEVELOPMENT SECTORS

- Relevant development sectors
- Agriculture
- Coastal
- Tourism
- Water
- Infrastructure
- Natural resources management
- Health

RELEVANT CLIMATE IMPACTS

- Extreme weather events
- Glacial events
- Precipitation changes
- Sea level rise
- Temperature changes

climate issues into stakeholder processes represented a departure from the traditional climate-first approach focused on assessing climate impacts and vulnerability. By taking a “**development-first**” view, climate could be considered more explicitly in terms of how it impacts efforts to achieve development outcomes. It also allowed workshop participants to spend more time talking about what they knew best – their economic sector or the responsibilities of their ministry or department. Keeping them in their comfort zone allowed them to more thoroughly engage.

While adaptation planning was evolving from a climate-first to a development-first approach, numerous efforts were underway to integrate or “mainstream” climate into development strategies and plans. Development planning involves a sequence of steps to set goals, diagnose problems, and design, assess, implement, and evaluate solutions. By “mainstreaming” climate change into development planning processes, planners could ensure that climate stressors were considered alongside other development constraints during problem diagnosis and that solutions were developed to address both climate stressors and development constraints. These adjustments to development planning processes to explicitly consider climate would help planners to promote “climate-resilient” development.

USAID’s **Climate-Resilient Development Framework**³ represents the convergence of traditional adaptation and development planning processes described above and has been designed to more closely link climate with development. The Framework can be viewed as modification of the 2007 guidance that explicitly considers climate in the context of development goals and outcomes. It also represents an effort to ensure that typical development constraints, referred to in the Framework as non-climate stressors, are considered alongside climate stressors. For each community of planners and practitioners, USAID’s Framework is not intended as a replacement for current adaptation and planning approaches. Rather, its value is in providing a comprehensive list of the elements of a development-first, climate-resilient approach to consider in adjusting planning processes.⁴ The Climate-Resilient Development Framework is a flexible approach that is applicable to a variety of strategic planning and project scales. The intended audience for the Framework includes development practitioners, adaptation practitioners, planners, resource managers, and other decision-makers in national, regional, and local government agencies.

Figure 2.1 illustrates the five stages of the climate-resilient development framework. During the first stage, Scope, users first identify the development outcomes that a country, community, or USAID mission hopes to achieve, and then assess how climate change could hinder the achievement of these goals. This approach helps users perform information-gathering and analysis efficiently, guided by the need to understand threats to key development goals rather than necessitating an exhaustive analysis of all climate exposure considerations for the country at the outset of the process.

The remaining four stages cover assessing vulnerabilities; identifying, evaluating, and selecting adaptation options; implementing and managing adaptation actions; and evaluating and adjusting performance and impacts. The Framework report offers explicit step-by-step directions and practical examples for implementing each stage of the climate-resilient development framework to advance climate-resilient development.

USAID and CCRD also produced six companion annexes that serve several purposes: adding depth to the description of the five-stage process; applying the framework to specific sector issues; and exploring special challenges in applying the framework. The annexes are described below:

- **Climate Change Vulnerability Assessment** – a collaborative effort of the USAID GCC Office and CCRD that describes the steps in conducting vulnerability assessments in detail, examines the three elements of climate vulnerability – exposure, sensitivity, and adaptive capacity – and provides examples and resources on vulnerability assessment methods and studies.



FIGURE 2.1. USAID'S CLIMATE-RESILIENT DEVELOPMENT FRAMEWORK

- **Climate Change and Water** – prepared by CCRD, this annex examines the impacts of climate change on water resources and includes a survey of adaptations to address the problems of too little water, too much water, and impaired quality of water.
- **Climate Change and Coastal Zones** – prepared by CCRD, this annex focuses on climate issues related to estuaries, coastal ecosystems, shorelines, and marine ecosystems. Similarly to the water annex, it includes a survey of adaptations to address climate impacts on coastal resources.
- **Climate Change and Conflict** – prepared under the leadership of USAID’s DCHA Bureau, this annex provides detailed on non-climate stressors related to conflict and examines the nexus between climate and conflict issues and the implications for development planning.
- **Governing for Resilience** – prepared by CCRD, this annex recognizes the key role of governance in assessing and addressing climate stressors. The annex highlights governance issues that arise at all stages of the Framework.
- **Working with Marginal Populations** – prepared by CCRD, this annex explores the special issues related to climate vulnerability and adaptation for a range of differentiating factors such as gender, age, culture, social, economic, religious, and ethnicity.

OUTCOMES

The Climate-Resilient Development Framework provided the foundation for the bulk of CCRD technical work. The 5-stage process and concepts of the Framework provided a logical and relevant approach for mainstreaming climate into development planning that was embraced by USAID and its developing country partners.

Three of the main applications of the Framework are presented in the next chapter, while others are described in later chapters. Overall, the Framework has been applied in stakeholder workshops, training-of-training workshops, national and local adaptation planning and climate adaptation case studies and pilots. Elements of the Framework have been integrated into an environmental planning process in Macedonia (see Section 3.3) and tested in a series of competitive grants (see Chapter 8).

Through these activities, decision-makers were able to more clearly perceive the relevance of climate change to their priorities and investments, promote consistency between adaptation planning efforts and broader ongoing development planning initiatives, characterize and consider interactions between climate and non-climate stressors, and begin to identify locally appropriate adaptation measures that could facilitate the realization of development goals in the context of a changing climate.

KEY PRODUCTS

Title and URL	Description
Adapting to Climate Variability and Change: A Guidance Manual for Development Planning https://www.usaid.gov/climate/adaptation-guide	This 2007 guidance manual is intended to help development practitioners determine whether a project is vulnerable to climate stressors, and describes options for reduce vulnerabilities.
Climate-Resilient Development: A Framework for Understanding and Addressing Climate Change https://www.usaid.gov/climate/climate-resilient-development-framework	This report, a centerpiece for the CCRD project, discusses the rationale behind climate-resilient development and describes the five stages of the Framework.
Climate Change Vulnerability Assessment: An Annex to the USAID Climate-Resilient Development Framework https://www.usaid.gov/climate/climate-resilient-development-framework	This annex describes how to analyze climate impacts and presents a process and good practices for conducting a climate change vulnerability assessment.
Climate Change and Water: An Annex to the USAID Climate-Resilient Development Framework https://www.usaid.gov/climate/climate-resilient-development-framework	This annex summarizes the potential impacts of climate and non-climate stressors on water resources, and describes adaptation actions that can improve climate resilience in the water sector.
Climate Change and Coastal Zones: An Annex to the USAID Climate-Resilient Development Framework https://www.usaid.gov/climate/climate-resilient-development-framework	This annex summarizes the potential impacts of climate and non-climate stressors on coastal zones, and describes adaptation actions that can improve coastal resilience to climate impacts.
Climate Change and Conflict: An Annex to the USAID Climate-Resilient Development Framework https://www.usaid.gov/climate/climate-resilient-development-framework	This annex considers how climate and non-climate stressors interact, and how they can contribute to or exacerbate conflict and security challenges.
Governing for Resilience: An Annex to the USAID Climate-Resilient Development Framework https://www.usaid.gov/climate/climate-resilient-development-framework	This annex identifies entry points for governance considerations and lays out a process for identifying governance barriers and opportunities in the Climate-Resilient Development Framework.
Working with Marginal Populations: An Annex to the USAID Climate-Resilient Development Framework https://www.usaid.gov/climate/climate-resilient-development-framework	This annex discusses factors that contribute to differences in vulnerability across populations, and provides guidelines and entry points for considering these differences in the Framework.

OTHER APPLICATIONS OF USAID'S CLIMATE-RESILIENT DEVELOPMENT FRAMEWORK

In the course of working with the GCC Office to prepare the Climate-Resilient Development Framework, CCRD had numerous opportunities to test and apply the framework in adaptation planning, capacity building, and case studies. Three of the larger efforts to apply the Framework are described in this chapter: Section 3.1 – support for National Adaptation Planning; Section 3.2 – preparation of the Iloilo Water Security case study; and Section 3.3 – support for the Climate-resilient Wheat Integrated Pilot in Kazakhstan. The information below provides a list of applications of the Framework that are featured in other chapters.

Nepal: Training of trainers, stakeholder workshops, local adaptation plan (Chapter 5)

Peru: Local adaptation plan (Chapter 5)

Dominican Republic, Mozambique and Peru: Municipal adaptation planning and capacity building (Section 7.1)

Macedonia: Training of trainers, support to revise municipal planning process (Section 7.3)





SECTION 3

APPLICATIONS OF THE CLIMATE-RESILIENT DEVELOPMENT FRAMEWORK



PURPOSE AND OBJECTIVES

USAID supports developing countries as they build climate change resilience through the United Nations Framework Convention on Climate Change's (UNFCCC's) National Adaptation Plan (NAP) process. This process helps developing countries integrate climate change adaptation into national processes, such as development planning to ensure that decisions made today promote medium- and long-term climate resilience and do not increase future vulnerability to climate change.

The CCRD project team supported USAID in advancing national adaptation planning in Jamaica, Tanzania, West Africa, and Cambodia. The objective of this work was to encourage these countries to embed adaptation planning efforts in the larger context of broader development goals.



SECTION 3.1

NATIONAL ADAPTATION PLANNING

DESCRIPTION

CCRD worked with USAID and other partners to support the early stages of national adaptation planning in several developing countries. This support included the convening and facilitating stakeholder workshops in Jamaica, Tanzania and West Africa and technical assistance in Cambodia in collaboration with USAID and the German development agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

The stakeholder workshops focused on the first three stages of the Framework – Scope, Assess, and Design – to help countries set the development context for discussions of stressors, climate vulnerability, and adaptation. These steps, which are highlighted in the blue box in Figure 3.1, included:

- Identifying development goals (e.g., increasing tourism, increasing agricultural production, promoting food security and sustainable livelihoods).
- Identifying requirements for achieving development goals, including inputs and enabling conditions (e.g., labor supply, water supply, roads).
- Assessing the climate and non-climate stressors and constraints pertinent to these development goals (e.g., drought, floods, sea level rise, and risks to human health).
- Identifying and prioritizing potential solutions that reduce the vulnerability of the development priorities to climate risks. Although planners would not immediately go from the preliminary identification of adaptation options to the implementation stage, identifying adaptation options builds on the momentum of group discussions in the scoping stage and leads to a sense of empowerment. Later analytical work might focus on the assess stage to generate the information needed to actually design an adaptation option.

Through the workshop process, participants reached consensus on the priorities that would guide their next steps and actions, building ownership and momentum for their NAP process. The next steps in the process entail developing a detailed analysis of vulnerabilities (i.e., following the assessment stage of the climate-resilient development framework), and conducting more participatory and detailed consideration of adaptation options (i.e., the design stage of the framework). Implementation and evaluation of the NAPs will follow the steps outlined in the last two stages of the framework.



RELEVANT DEVELOPMENT SECTORS

- Agriculture
- Coastal
- Infrastructure
- Water

RELEVANT CLIMATE IMPACTS

- Extreme weather events
- Precipitation changes
- Sea level rise
- Temperature changes

Specific NAP activities are described below:

- **Climate Change: Towards the Development of a Policy Framework for Jamaica**, held in Kingston, Jamaica on July 26–27, 2012. One hundred and fifty people, including Jamaica government representatives, stakeholders, and development partners, attended the workshop and helped build support for the NAP process. Participants developed inputs for a policy framework that will help Jamaica address climate risks while achieving the goals of its Vision 2030 Jamaica: National Development Plan – a plan intended to enable Jamaica to become a developed country by 2030. Building on the momentum from the workshop, Jamaica developed a national climate policy that shares responsibilities for addressing climate risk across sector ministries; those responsibilities will be codified in updated sector policies.
- **Tanzania: Coastal Climate Change National Adaptation Workshop**, held in Bagamoyo, Tanzania, on March 7–8, 2013. Tanzania’s workshop focused on coastal priorities. Participants came from a number of ministries and departments within the national government, plus a broad array of coastal stakeholders. The workshop laid the groundwork for Tanzania’s NAP process and demonstrated an approach for mainstreaming climate considerations into development and sector planning. Since the workshop, Tanzania has prepared a roadmap for its broader NAP process, and key ministries such as the water and agriculture ministries have initiated the development of action plans.
- **West Africa: Coastal Climate Change National Adaptation Workshop**, held in Accra, Ghana, on June 18–20, 2013. This workshop brought together policymakers from 11 West African coastal countries within the Economic Community of West African States (ECOWAS) to promote national action on adaptation planning and regional cooperation on coastal adaptation. Countries tested the development-first approach to national adaptation planning, began to identify coastal adaptation priorities, and developed a common road map for addressing those priorities in their NAP process.
- **Cambodia NAP Process** – USAID and CCRD staff met with GiZ representatives and accompanied them to meetings with the Cambodian government and other donors to assess how national adaptation planning could best be supported. As a result of the meetings, GiZ, in coordination with CCRD, agreed to provide technical support for mainstreaming climate change into planning and budgeting through the Ministry of Environment (MoE) and to support the Ministry of Health (MoH) on climate change adaptation.

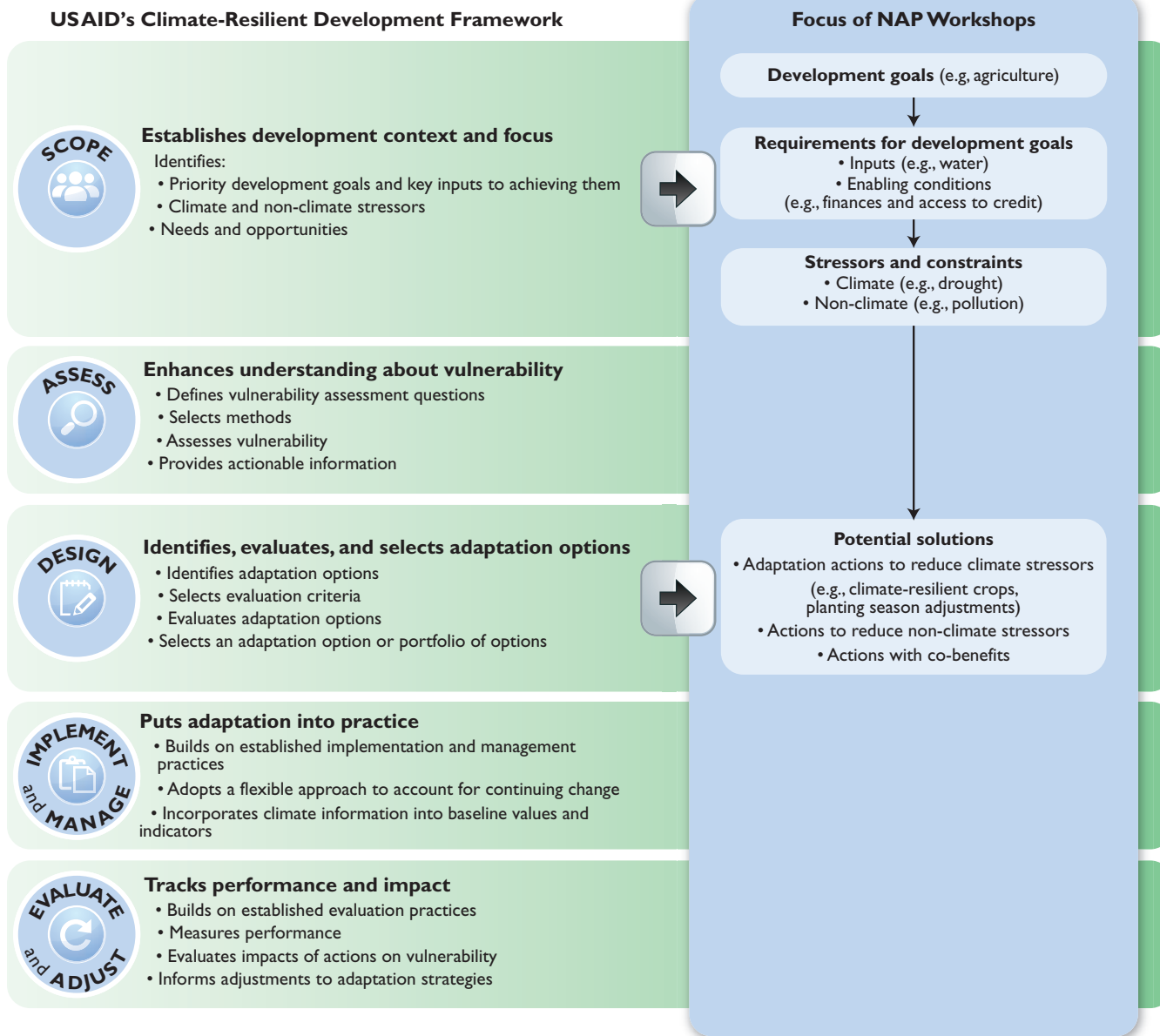


FIGURE 3.1. NAP WORKSHOP OUTCOMES IN THE CONTEXT OF THE CLIMATE-RESILIENT DEVELOPMENT FRAMEWORK.

OUTCOMES

The three NAP workshops are examples of how CCRD has supported developing countries as they took initial steps to develop their NAP processes. Through a combination of introductory presentations, interactive working groups, and facilitated plenary discussions, workshop participants were able to take the first steps in the NAP process for their countries.

Overall, the three workshops demonstrated that there are many similarities across nations in how climate change and other stressors can affect development goals and how countries can identify and prioritize the actions, policies, and resources necessary to respond to these risks and achieve their development vision. Thus, it is important for countries to share findings, experiences, and lessons learned about integrating climate change into their economic development processes.

The workshops also demonstrated that the NAP process works best when it is well-coordinated, integrated, and inclusive. Involving relevant ministries, different levels of government, and a broad range of stakeholders can help to produce effective policies. Thus, it is important for sufficient capacity, tools, and information to be developed and made available to continue to support the NAP process in these and other developing countries.

The technical support for Cambodia's NAP process is in early stages of implementation but may provide a mechanism to integrate climate change adaptation considerations into national budgeting processes. With USAID financial support, GiZ will provide technical support to the Government of Cambodia's program-based budgeting process.

KEY PRODUCTS

Title and URL	Description
<p>Climate Change: Towards the Development of a Policy Framework for Jamaica</p> <p>https://www.usaid.gov/climate/jamaica-climate-workshop-report</p>	<p>This report presents the findings from a workshop in Kingston, Jamaica, in July 2012. The purpose of the workshop was to develop inputs for a policy framework that would enable Jamaica to achieve its Vision 2030 national development goals in the context of climate.</p>
<p>National Adaptation Planning: Developing Countries Can Become More Resilient to Climate Change by Integrating Adaptation and Development</p> <p>https://www.climatelinks.org/resources/national-adaptation-planning-nap-fact-sheet</p>	<p>The fact sheet introduces the experiences of Jamaica and Tanzania, which have already organized NAP workshops and are following USAID's approach.</p>

Title and URL	Description
<p>National Adaptation Planning: A Report on Three Workshops</p> <p>http://pdf.usaid.gov/pdf_docs/PA00K2TB.pdf</p>	<p>This report presents the findings from USAID workshops held in support of NAP development for Jamaica, Tanzania, and Ghana in 2012 and 2013.</p>
<p>A Perspective on Climate-Resilient Development and National Adaptation Planning Based on USAID's Experience</p> <p>http://www.tandfonline.com/loi/tclid20#.VjFBFCtlbGk</p>	<p>This draft journal article to be published in Climate and Development describes how USAID is applying its Climate-resilient Development Framework to the NAP process in developing countries. A “development-first” approach enables climate change to be more effectively integrated into development planning and decision-making.</p>
<p>Policy Brief for West Africa</p> <p>https://www.usaid.gov/sites/default/files/documents/1860/NAP%20Policy%20brief.pdf</p>	
<p>West Africa Coastal Climate Change: National Adaptation Planning Workshop, June 18–20, 2013, Accra, Ghana</p> <p>https://goo.gl/MkK3lu</p>	<p>This report presents the findings from a workshop that took place in Accra, Ghana, in June 2013; the workshop focused on climate change impacts, specifically to the coastal and marine environments.</p>
<p>Workshop Proceedings: Tanzania Coastal Climate Change National Adaptation Planning Workshop, March 7–8, 2013</p> <p>http://www.usaid.gov/sites/default/files/documents/1865/Tanzania-NAP-Coastal-Workshop-Report-March-2013.pdf</p>	<p>This report presents the findings from a workshop in Tanzania in March 2013. Its objective was to build momentum and provide experience in the NAP process, which the Government of Tanzania is committed to under the UNFCCC.</p>



PURPOSE AND OBJECTIVES

The Iloilo region of the Philippines is vulnerable to water shortages, poor water quality, and flooding from heavy rain events and coastal storm surge, and climate change has the potential to exacerbate these problems. The Iloilo case study was prepared by CCRD in 2012 at the request of USAID/Philippines to share with potential bidders on the “Water Security for Resilient Economic Growth and Stability” project (Be Secure), awarded in 2013.

The objectives of the case study were to (1) identify climate risks to Iloilo’s current and future water security and economic growth; (2) engage local partners in the assessment, laying the foundation to build capacity and ownership of adaptation responses; and (3) identify and analyze a set of options for addressing these risks.

The case study also provided CCRD with an opportunity to apply the draft Climate-Resilient Development Framework and Water Annex in assessing climate vulnerability and development problems and identifying potential actions to promote water security in Iloilo and share lessons learned with the teams tasked to draft these guidance documents.



SECTION 3.2

AN ASSESSMENT OF WATER SECURITY,
DEVELOPMENT, AND CLIMATE CHANGE
IN ILOILO, PHILIPPINES, AND THE
TIGUM-AGANAN WATERSHED

DESCRIPTION

Iloilo Province is located on Panay Island in the Philippines. The Province extends along the southeastern coast of the island and into the mountainous regions in the island's center. Iloilo Province is home to approximately 2.1 million people, 700,000 of whom live in the Metro Iloilo area, which includes Iloilo City and its surrounding municipalities within the Tigum-Aganan and Iloilo watersheds.

In July 2012, the case study team comprised of four CCRD technical experts, a communication expert from the USAID/Philippines Mission, and two USAID staff traveled to Iloilo to assess water security in the area, engage local stakeholders, and identify options for improving water management. The team consulted with community members and stakeholders across multiple levels of government; they also conducted site visits to water infrastructure projects, reforestation projects, private and government housing developments, and commercial developments.

Municipal, provincial, and regional decision-makers have elaborated development objectives for the Metro Iloilo area focused on promoting tourism, spurring commercial development, and expanding local agriculture and many development activities are underway. However, water insecurity is a major limitation to development in Metro Iloilo, and improving water availability and water quality are priorities in the region.

The Philippines has a tropical climate and monsoon rain patterns that create a relatively dry season from December to June and a wet season from July to November. Although the region receives significant rainfall, potable water is often scarce in Metro Iloilo because of inadequate infrastructure, surface water contamination, and ineffective utilization of available water resources.

The study team identified a number of climate stressors facing the region include warming temperatures, which decrease water supplies, increase demand for crops and domestic use, and decrease water quality; drought and a longer dry season, which reduce water supplies and stream flows and increase demand for crops and domestic uses; precipitation changes, which increase precipitation intensity and flooding; typhoons, which cause major flooding and damage and increase risks to water quality and public health; and sea level rise, which increases salinization of shallow coastal groundwater resources and storm surge impacts in low-lying areas.

Non-climate stressors identified during site visits and meetings with stakeholders included: low levels of investment in construction and maintenance of water storage, distribution, and wastewater collection systems; inadequate tariffs to support investment, maintenance and operation of water systems; increasing water demand due to high population growth and migration; and high unemployment and poverty that weaken the financial basis for financing water and wastewater system. Finally, the lack of an integrated and coordinated governance framework constrains effective water resource management in Metro Iloilo. Currently, more than 30 institutions at the federal, regional, and local levels administer more than 20 government policies on water management, often with unclear or overlapping mandates and authorities.

The CCRD team developed 22 preliminary options for improving water security that addressed the problems of too much water (by reducing flood risks), too little water (by improving storage, utilization, and leak management), and poor water quality (due to poor management practices and inadequate infrastructure). With the exception of investments in new and upgraded infrastructure, most of the recommended options could be categorized as “governance” options: capacity building, improved management practices, and strengthened water governance.



RELEVANT DEVELOPMENT SECTORS

- Water
- Agriculture
- Coastal
- Health
- Natural resources management
- Infrastructure

RELEVANT CLIMATE IMPACTS

- Relevant climate impacts
- Extreme weather events
- Precipitation changes
- Sea level rise

FIGURE 3.2. MAP OF PANAY ISLAND.

The provinces of Panay Island are outlined in red, and the municipalities of Iloilo Province are outlined in grey. Iloilo City is colored dark red and the Metro Iloilo area (municipalities in the Tigum-Aganan and Iloilo watersheds are shaded yellow.)

OUTCOMES

The case study served its purpose of providing bidders on USAID’s Be Secure procurement with a detailed vulnerability and adaptation assessment for one of the regions covered by the project. The case study also provided useful lessons learned that were incorporated into the Framework and Water Annex. The Framework document discusses experience from the Iloilo case in a series of illustrative text boxes to provide tangible examples of what each step of the framework entails. Finally, the case study provided an opportunity to familiarize one of the Be Secure project’s beneficiary communities with USAID’s participatory process for assessing and addressing development problems and giving explicit consideration to climate stressors and their impact on water sector and higher level development goals.

KEY PRODUCTS

Title and URL	Description
An Assessment of Water Security, Development, and Climate Change in Iloilo, Philippines, and the Tigum-Aganan Watershed. February 2013. https://www.usaid.gov/climate/iloilo-water-security	This report provides context for Iloilo’s water security problems, describes climate and non-climate stressors on water security, and details adaptation options for improving water resource management.



PURPOSE AND OBJECTIVES

Kazakhstan is the ninth largest producer and the seventh largest exporter of wheat in the world. Kazakhstan ships almost half of its wheat exports to other Central Asian Republics (CAR). The predominantly rain-fed wheat sector in Kazakhstan must cope with drought, heat extremes during flowering, hail and wind storms, and heavy rains during harvesting. Climate variability affects wheat yields and quality, resulting in significant year-to-year profit fluctuations. Medium- to longer-term changes in temperature and precipitation patterns, including a decrease in rainfall during the growing season, could have significant impacts on annual wheat yields. The wheat sector's ability to adapt to climate variability will have a direct effect on food security in the region.

The United States Agency for International Development (USAID) awarded a grant to its Regional Mission for CAR (USAID/CAR) for a four-year Global Climate Change (GCC) integration pilot, "Improving the Climate Resiliency of Kazakhstan Wheat and Central Asian Food Security" or "Climate-Resilient Wheat" (CRW) for short. Climate Change Resilient Development (CCRD) staff provided technical assistance and support capacity building on climate adaptation and climate services for CRW in cooperation with the United Nations Development Programme (UNDP) project office in Astana, Kazakhstan. The objectives of CRW were to:

- Improve monitoring and information-sharing for CRW production
- Develop climate resilience through mainstreaming of adaptation measures
- Support a regional dialogue on wheat, climate change, and regional food security.



SECTION 3.3

KAZAKHSTAN: BUILDING CLIMATE RESILIENCE IN THE WHEAT SECTOR

DESCRIPTION

CCRD staff participated in inception meetings and co-organized stakeholder workshops that clarified technical assistance priorities related to the three CRW objectives. The CRW team convened four stakeholder workshops in early 2013 – one with national government and nongovernment stakeholders, and three with wheat growers, agricultural extension services and research staff, and other local stakeholders. During the stakeholder workshops, the CCRD and CRW project teams built awareness about climate variability and change and elicited information about related topics. Topics included:

- Major challenges facing the wheat sector
- Perceptions of climate change and climate impacts
- Role of weather and climate information in decision-making
- Current efforts to adapt to climate change
- Kazakhstan’s role in promoting food security in Central Asia.

Workshop results confirmed the need for higher-quality and more easily available weather and climate information. They also highlighted Kazakhstan’s challenges to improving its climate services and to increasing awareness and understanding of climate impacts in the wheat sector. The CRW team described the workshop exercises and results in detail in *Kazakhstan Stakeholder Consultations – Workshop Report*, February–March 2013 (April 2013).

In May 2013, CCRD and the CRW project team organized a three-day Climate Services Roundtable in Almaty, Kazakhstan. The roundtable included three sessions. In the first session, Kazakh weather and climate services providers provided self-assessments of the types and quality of information and products they currently deliver to farmers and agricultural businesses. They enumerated planned improvements and gaps to address. In the second session, experts from the United States described a range of climate services offered in support of agriculture in other countries. In the third session, Kazakh climate services providers and U.S. experts met with staff members from USAID/CAR, CCRD, and the CRW project to develop a program of technical assistance to strengthen weather and climate services information and products in Kazakhstan.⁵

CCRD’s activities in support of the CRW pilot are described below.

- **Strengthening access to and use of climate information.** CCRD consultants and partner organizations International Research Institute for Climate and Society (IRI) and Spatial Development International (SDI) have provided training to improve the availability and visualization of climate information. Specific activities included seminars for Kazhydromet and the National Space Research Institute (NSRI), training on data visualization and geoportals design for NSRI, and installation of the IRI Data Library at Kazhydromet.
- **Building capacity in monthly and seasonal forecasting.** IRI staff upgraded Kazhydromet’s capabilities in forecasting and monitoring of drought conditions. IRI provided training in alternative monthly and seasonal forecasting methods using multiple and negative analogues (as opposed to the current forecasting approach using single analogues) and in making probabilistic forecasts. These alternative methods will allow Kazhydromet to verify and adjust its forecasts based on analogues.



RELEVANT DEVELOPMENT SECTORS

- Agriculture
- Natural resources management
- Governance

RELEVANT CLIMATE IMPACTS

- Relevant climate impacts
- Extreme weather events
- Precipitation changes
- Temperature changes

- **Using remote sensing to improve analytical and forecasting products.** CCRD partners worked with NSRI staff to consider remote-sensed data in developing estimates of soil moisture and improving crop yield forecasts. Building a better understanding of wetness and soil moisture dynamics can help researchers apply this information across the wheat-growing regions, and provide farmers with better guidance on planting decisions under various environmental conditions.
- **Developing climate resilience through mainstreaming adaptation measures.** CCRD outreach efforts included presentations to farmers and a professionally developed video, *World of Wheat*, on Kazakhstan’s wheat production. More than 100 farmers participated in 3 “field days” on climate change and agriculture co-organized by CRW and KazAgroInnovation in August 2013. These events demonstrated potential adaptations related to the crop calendar, soil management, and crop diversification.
- **Training-of-trainers and curriculum development.** CCRD staff conducted a February 2014 train-the-trainers workshop structured around the climate-resilient development framework and observed a stakeholder workshop that trainees led in Shortandy at the Baraev Grain Institute. In addition, CCRD developed curriculum, presentations, and small group exercises for an agricultural extension course on climate and agriculture for KazAgroInnovation, Kazakhstan’s agricultural extension agency. CCRD staff presented the course in a workshop in November 2014 in Almaty and provided training in facilitating an adaptation game on farm decision-making for trainers in attendance.
- **Study Tour.** In March 2014, CCRD co-organized and hosted a study tour to the United States for participants from Kazakhstan’s agricultural and climate sectors, the CRW project office, and USAID/CAR. Site visits to learn about climate research and crop management under a changing climate included the Agricultural Research Center and National Drought Mitigation Center in Lincoln, Nebraska; USAID, the U.S. Department of Agriculture, the National Oceanic and Atmospheric Administration, and the American Meteorological Society in Washington, DC; and IRI in New York City.
- **Supporting a regional dialogue on wheat, climate change, and regional food security.** The CRW project launched its efforts to foster a regional dialogue on food security by convening a conference in Dushanbe, Tajikistan, in May 2014, which attracted more than 180 policymakers, researchers, and practitioners from CAR and Afghanistan. CCRD presented on climate change and agriculture (i.e., wheat and livestock) and the use of climate information in the agricultural sector.

OUTCOMES

CCRD’s support helped increase the awareness of and the capacity to assess and respond to climate change among farmers and agribusinesses in the wheat sector. In addition to the more than 100 farmers that participated in 3 “field days” on climate change and agriculture in August 2013, local trainers convened training workshops for more than 400 farmers following the training-of-trainers in February 2014. The presentation of CCRD’s climate and agriculture work in Tajikistan led to a request of the other participating countries for training similar to that received by Kazakhstan farmers. CRW engaged CCRD-educated Kazakh trainers in providing training on climate and agriculture for Central Asian participants.

The Roundtable on Climate Services and the follow-up technical assistance and capacity building for Kazakh experts in meteorology and agrometeorology led to labor- and time-saving improvements in the monthly preparation and release of the country’s drought index and maps. The joint research with NSRI improved basic forecasting algorithms related to soil moisture and crop forecasts.

The video and stakeholder workshops have increased awareness of climate variability and change on the production of wheat in Kazakhstan and helped farmers to identify practices to better respond to climate variability in making decisions on the annual crop calendar. The study tour facilitated networking for Kazhydromet with U.S. organizations including NOAA's Weather and Climate Prediction Center and the National Drought Mitigation Center.

TOOLS

Title and URL	Description
IRI Data Library at Kazhydromet http://iri.columbia.edu/resources/data-library/	This tool facilitates uploading precipitation and temperature data and enables Kazhydromet to make statistical predictions of drought conditions, while also allowing more frequent drought index updates at a lower cost and reduced staff time.

KEY PRODUCTS

Title and URL	Description
Kazakhstan Stakeholder Consultations – Workshop Report, February-March 2013, April 2013 https://goo.gl/A8IDBb	Describes activities and outcomes of four stakeholder consultation workshops held in early 2013.
Soil Moisture in Kazakhstan: In Situ Probes and Satellite Data, July 2014 https://goo.gl/ZDd5g4	Describes methods, results, and application of research on relationship between soil moisture and wheat yields.
Video: Kazakhstan: World of Wheat http://www.ccrdproject.com/adaptation-partnership/crw	Filmed and edited by Daniel Byers, the video features interviews with Kazakh farmers, Kazakh and Central Asian and stakeholders, and USAID and CRW staff. The video is available in English and Russian.
Kazakhstan Yield Report, August 2014 https://goo.gl/QfdSv7	Provides yield prediction of spring wheat in Northern Kazakhstan using surface wetness and temperature anomalies.
Monitoring the Impact of Climate Change on Temperature and Surface Wetness Values in Kazakhstan, September 2014 https://goo.gl/txD50g	Describes research on trends and fluctuations in temperature and wetness data and explains how land surface conditions are changing.
Mid-Level Assessment: Climate Forecasting in Kazakhstan, October 2014 https://goo.gl/pT0Fms	Describes and evaluates weather and climate services in Kazakhstan and provides options for improving services.



PURPOSE AND OBJECTIVES

The Adaptation Partnership (“Partnership”) (www.adaptationpartnership.org) was formally established in May 2010 by the Governments of Costa Rica, Spain, and the United States. It grew out of discussions at the United Nations Framework Convention on Climate Change (UNFCCC) Conference of Parties in Copenhagen in 2009 to provide a forum for policymakers and practitioners to share information and experiences on salient adaptation topics. Over the period, 2010–2012, the Partnership commissioned a series of regional adaptation summaries⁶ and engaged participants from more than 50 developed and developing countries in a series of global and regional adaptation workshops. The workshops were designed to foster communities of practice and encourage effective adaptation to scale up adaptation and climate resilience at the regional, national, community, sector, and geographical scales.

Through an inter-agency agreement with USAID, the U.S. Department of State provided resources to CCRD to support Adaptation Partnership Workshops. The initial intent of CCRD support was to provide assistance to local workshop planners in convening workshops and supporting travel for developing country participants, but this assistance expanded to include assistance in planning of technical programs and engagement of CCRD staff in workshops.⁷



SECTION 4

ADAPTATION PARTNERSHIP WORKSHOPS

DESCRIPTION

CCRD supported seven Adaptation Partnership workshops between September 2011 and November 2012 as well as follow-up workshops in 2013. The workshops focused on climate services, climate-resilient agriculture, climate and conflict, monitoring and evaluation of adaptation programs and projects, and site-based issues related to high mountain ecosystems and glaciers, marine protected areas, and urban areas.

The Partnership workshops featured topical presentations, panel discussions, training sessions, site visits, risk-analysis games, and working group activities to identify new directions for policy analysis and research. The workshops were limited in size to facilitate networking and several workshops drew the majority of participants from limited geographic areas, i.e., agricultural interests in Latin America and the Caribbean, urban adaptation practitioners from East and Southeast Asia, and marine protected area managers from Western Indian Ocean countries of Africa. Outputs from the workshops included:

- Workshop proceedings and participant evaluations
- Action-oriented follow up activities, including development of communities of practice
- Documentation of plans, gaps, opportunities, lessons learned (including additional sources of information on results of implementation of adaptation measures)

The planning, convening, and financial support for Adaptation Partnership workshops involved host country governments and local organizations, international donors, international and regional NGOs, and U.S. Government organizations – USAID, Department of State, and the National Oceanic and Atmospheric Administration (NOAA). CCRD's role varied from workshop to workshop depending on resources that were committed by other planning and implementing organizations. For all workshops, CCRD provide financial support to some or all developing country participants to cover their travel expenses. Other CCRD roles are described for individual workshops in the summaries provided below.

THE ANDEAN-ASIAN IMJA GLACIAL LAKE EXPEDITION AND GLOBAL KNOWLEDGE EXCHANGE ON GLACIERS, GLACIAL LAKES, WATER AND HAZARD MANAGEMENT, AND WRITERS' WORKSHOP

KATHMANDU, NEPAL SEPTEMBER 3–28, 2011

More than 35 high altitude professional from 15 countries participated in an 18-day field expedition to assess the potential for glacial lake outburst floods (GLOFs) at Imja Lake in the Mt. Everest (Khumbu) Region of Nepal. Following the expedition, a three-day workshop was held in Katmandu. The first two days provided an opportunity for members of the Imja Lake expedition to report on their assessment of the lake and other climate-related risks with other workshop participants and time for all participants to discuss their research and experiences related to climate and high mountain risks. On the third day, about 25 participants were engaged in a writer's workshop to develop recommendations for future research, local high mountain adaptation planning, and a community of practice. Videos and reports are available on both the CCRD and the High Mountains Adaptation Partnership (HiMAP) websites. CCRD staff and partners were engaged in planning the technical program, participated in the expeditions, made presentations during the knowledge exchange and organized and facilitated the writer's workshop.



**ADAPTATION PARTNERSHIP:
Building Urban Climate Change Resilience in Asia**
31 July - 2 August 2012
Bangkok, Thailand



INTERNATIONAL CONFERENCE ON CLIMATE SERVICES (ICCS-1) AND “DEVELOPING COUNTRY” WORKSHOP

NEW YORK CITY, NY, U.S. OCTOBER 17–20, 2011

ICCS-1 was a 2 ½ day event that served as a platform for sharing experiences in delivering and using climate services and launching the Climate Services Partnership (CSP). With support from the Adaptation Partnership, an additional day was added to ICCS-1 for the “Developing Country” workshop. This workshop provided a forum for the Developing Countries Task Team, comprised of 39 members from 20 countries, to examine climate services issues from a developing country’s perspective and propose activities to address major gaps in research and capacity to deliver and use climate services in developing countries. CCRD staff participated in all four days of ICCS-1 and the planning of the Developing Country workshop.

WESTERN INDIAN OCEAN WORKSHOP FOR COASTAL AND MARINE PROTECTED AREAS

CAPE TOWN, SOUTH AFRICA, FEBRUARY 8–10, 2012

In collaboration with NOAA, USAID, and the Western Indian Ocean Marine Science Association (WIOMSA), CCRD supported a 3-day workshop for 39 decision makers and practitioners from nine Western Indian Ocean (WIO) countries. Participants identified climate change capacity buildings needs to conduct vulnerability assessments for coastal and marine protected areas (MPA) in the Agulhas and Somalia Current Large Marine Ecosystem regions. Participants worked to strengthen the WIO MPA network and build a stronger community of adaptation practice among MPA practitioners. CCRD provided logistic support, facilitated small group discussions and prepared the workshop report.

ASSESSING CLIMATE CHANGE VULNERABILITY AND BUILDING RESILIENCE IN THE AGRICULTURAL SECTOR TO PROMOTE ECONOMIC DEVELOPMENT AND FOOD SECURITY

SAN JOSE, COSTA RICA MARCH 27–29, 2012

Seventy-eight representatives from Central America and the Dominican Republic participated in the three-day workshop with a focus on options for increasing climate resilience in the agricultural sector. The first two days involved plenary presentations and small group discussions and the third day featured a field trip to EARTH University to view adaptation and mitigation practices in the production of bananas and livestock. Workshop participants developed recommendations for follow-on activities to compile information and resources on climate change and agriculture; map the institutional actors in the region to be targeted for outreach, information sharing, and collaboration; identify mechanisms to share lessons learned and climate-resilient practices for key regional crops (coffee, beans, sugarcane, rice, bananas, corn) and livestock; and increase regional capacity to provide and use climate and weather information in the agricultural sector. CCRD provided logistical and content planning support and organized the venue for the field trip.

TRACKING SUCCESSFUL ADAPTATION: SMART MONITORING FOR GOOD RESULTS

BONN, GERMANY MAY 7–8, 2012

Over 100 experts including more than 40 from developing countries gathered to discuss the challenges of improving adaptation-oriented monitoring and evaluation (M&E) methods and mechanisms in developing country-contexts. The objectives of the workshop were to take stock of existing approaches and share lessons learned on how to validate and apply M&E approaches at the project, national, and portfolio levels. Participants prepared a set of recommendations for concrete next steps (available in the workshop report). CCRD provided logistical and content planning support.

BUILDING URBAN CLIMATE CHANGE RESILIENCE IN ASIA

BANGKOK, THAILAND JULY 31–AUGUST 2, 2012

Over 70 practitioners from 15 countries participated in this 3-day workshop focused on building urban climate resilience in Asia. The aims of the workshop were to improve understanding of current models, methods, and practices for urban adaptation planning, connect practitioners to share knowledge, and generate concrete follow-up activities to take effective and cutting-edge approaches to urban climate resilience planning. CCRD contracted with the Institute for Social and Environmental Transition (ISET) to lead the development of the technical program and chair several sessions and small group discussions. CCRD staff also provided logistics support and participated in small group discussions.

ADAPTATION AND PEACEBUILDING IN AFRICA

WASHINGTON DC, U.S., NOVEMBER 2012

Co-sponsored by USAID, Department of State, and the Woodrow Wilson International Center for Scholars, and with logistical and content support by CCRD, the primary goal of the Adaptation Partnership workshop was to provide an opportunity for leading African scholars and practitioners to engage with U.S.-based experts from multiple levels of the climate change, adaptation, humanitarian, and peacebuilding communities. Twenty-eight participants attended the workshop to identify synergies between the climate change adaptation and peacebuilding communities. Participants worked together over the course of two days to share lessons from integrated efforts in the field, and to better understand one another's priorities, objectives, and needs. The event concluded with a preliminary identification of ways to work collaboratively around climate change adaptation and peacebuilding efforts.

With financial support from USAID, Department of State, NOAA, and other partners, the Adaptation Partnership developed several follow-on activities carried out and supported by CCRD. As discussed throughout the Compendium, several activities and projects under CCRD will sustain well into the future.

Activities that developed into fully supported programs under CCRD are documented in detail in respective chapters of this Compendium.

OUTCOMES

The Adaptation Partnership ended in December 2012. The Partnership workshops achieved their goal of providing a forum for networking, sharing experiences and addressing gaps in research and knowledge more generally. The Partnership also played a role in stimulating follow-on adaptation activities, including additional workshops and the creation of communities of practice. In response to the ideas generated and gaps identified in research and practice during Adaptation Partnership workshops, CCRD implemented three major initiatives and awarded a number of small grants. The outcomes stemming from the Adaptation partnership workshops are described below.

Follow-on workshops

Several workshops were convened to build on the discussions at selected Adaptation Partnership workshops. CCRD provided logistic and/or technical support for all of the follow-on workshops:

- West Africa Regional Adaptation: Climate Services for Development, convened in Senegal in December 2012. This workshop was a follow-on to an Adaptation Partnership workshop in Senegal in June/July 2011 and also a response to discussions in the Developing Country workshop at ICCS-1.
- Climate Change Adaptation and Peacebuilding: Developing conflict-sensitivity guidelines for adaptation policy in Africa workshop convened in October 2013 in Addis Ababa, Ethiopia. CCRD staff contributed to the technical program and facilitated small group discussions.
- Two training workshops for MPA managers on climate change basics in South Africa in November 2013 and Zanzibar in June/July 2014. CCRD and NOAA staff served as trainers for these workshops. One additional MPA workshop is planned for November 2015, led by NOAA and WIOMSA.

Communities of practice

Participants in Adaptation Partnership workshops in Nepal and Costa Rica expressed interest in creating communities of practice.

- The High Mountains Community of Practice (www.highmountains.org) comprises climber-scientists, engineers, researchers, and local-community members and connects with the community through newsletters, virtual meetings, facilitated online discussions, and workshops (see also, Chapter 5).
- The Everest Alliance (<http://everestalliance.org/>) is of community of people, organizations, government agencies, and businesses who promote the sustainable management of the world's highest mountains and their watersheds. This community of practice brings together stakeholders to cooperatively solve problems related to high mountain tourism, climate and environmental impacts, and local economies.
- The Central American Climate-Resilient Agriculture CoP (La Comunidad de Práctica Centroamericana para reforzar la Resiliencia de la Comunidad Agropecuaria ante el Cambio Climático) (www.adaptationpartnership.org) serves as a medium through which farmers, practitioners, and others in Central America and the Dominican Republic can correspond, exchange, and share information, practices, and resources regarding adaptation efforts in the agricultural sector.
- The Climate Services Partnership (CSP) – while the CSP was created during the ICCS-1 event and was not a direct result of the Developing Country workshop, it has helped to connect developing country practitioners with the global climate services community.

CCRD Initiatives

The Adaptation Partnership workshops in Nepal, New York, and Bangkok provided rich ideas on future work and knowledge gaps and led USAID and CCRD to develop activities related to high mountain climate risks, climate services, and urban adaptation.

- High Mountains Adaptation Partnership (HiMAP) – this initiative resulted from the Adaptation Partnership expedition and workshop in Nepal. The expedition demonstrated the need for improved participatory assessments of glacial lake and climate risks and the knowledge exchange and writer’s workshop generated ideas for activities that could be implemented under CCRD and the concept for the HiMAP community of practice (see Chapter 5).
- Climate Services – ICCS-1 and the Developing Country workshop provided the impetus for USAID to commit substantial resources through CCRD to support the CSP Secretariat, annual climate services conferences, CSP working groups, and a work program to advance the development and delivery of new climate services, improved technical and economic assessment methods, and increased use of climate services in developing countries (see Chapter 6).
- Climate Resilient Infrastructure Services (CRIS) – the Adaptation Partnership workshop in Bangkok provided a comprehensive review of urban adaptation efforts in Asia and helped to crystallize plans to implement the CRIS program. While urban adaptation efforts were quite advanced in Asia and CCRD was already supporting the demonstration of an adaptation planning tool in Vietnam (see Section 7.2), USAID and CCRD decided to focus the CRIS program on pilot studies in medium-sized cities in Africa, Latin America and the Caribbean, applying the Climate-Resilient Development Framework in facilitated adaptation planning and building capacity among partners to access and use climate information and vulnerability and adaptation assessment tools (see Section 7.1).

CCRD Small Grants Program

In several of the Adaptation Partnership workshops, participants expressed concern that financing was quite limited to support fieldwork on adaptation topics. USAID/GCC and CCRD worked together to develop priorities for competitive small grant solicitations that would respond to the needs expressed by workshop participants. Four solicitations were tailored to the topics of high mountain adaptation, urban adaptation, climate services, and climate-resilient agriculture (in Central America) and 20 small grants were awarded to individual researchers, NGOs and universities, and one private organization. In addition, a fifth solicitation resulted in the award of 8 academic small grants covering a range of adaptation topics (See Chapter 8).

KEY PRODUCTS

Title and URL	Description
<p>The Andean-Asian Imja Glacial Lake Expedition and Global Knowledge Exchange on Glaciers, Glacial Lakes, Water and Hazard Management, and Writers' Workshop, Kathmandu, Nepal September 3-28, 2011 http://goo.gl/8G2AZx</p>	<p>Comprehensive collection of science- and policy-based background papers on the climate impacts in high mountain regions and needs for managing risks. The report covers the field expedition to Imja Lake and workshops in Katmandu.</p>
<p>International Conference on Climate Services (ICCS-I) and "Developing Country" Workshop, New York City, NY, USA October 17–20, 2011 http://goo.gl/GWJzC5</p>	<p>Now a sustainable, annual event, the first ICCS-I workshop established the CSP and initiated an ongoing dialog between climate information providers and stakeholders. Archived workshop agendas, reports, videos, presentations, interviews, and tools are available on the CSP website.</p>
<p>Western Indian Ocean Workshop for Coastal and Marine Protected Areas Cape Town, South Africa, February 8–10, 2012 https://goo.gl/BGP3UA</p>	<p>USAID, NOAA, and DoS worked with 40 participants from nine Western Indian Ocean countries to identify capacity requirements for managers of Marine Protected Areas to conduct vulnerability assessments and build adaptive responses to climate impacts within their areas.</p>
<p>Assessing Climate Change Vulnerability and Building Resilience in the Agricultural Sector to Promote Economic Development and Food Security, San Jose, Costa Rica March 27–29, 2012. https://goo.gl/PLEIsu</p>	<p>This workshop focused on assessing vulnerability to build resilience of key agricultural products in Dominican Republic and Central America countries. USAID, DoS, and Costa Rica held presentations, small group exercises, and a field visit to EARTH University on adaptation measures for bananas and livestock.</p>
<p>Tracking Successful Adaptation: Smart Monitoring for Good Results, Bonn, Germany May 7-8, 2012 https://goo.gl/77fGsd</p>	<p>Workshop on rationale, techniques, and operational aspects of monitoring adaptation with a focus on sound practices and demands of M&E.</p>
<p>Building Urban Climate Change Resilience in Asia Bangkok, Thailand July 31 – August 2, 2012 https://goo.gl/qXZYzu</p>	<p>USAID, DoS, IRG/Engility, and the Institute for Social and Environmental Transition (ISET), hosted a three-day Adaptation Partnership workshop on building urban climate resilience in Asia. Attendees were from governments and development agencies from over 15 countries, including Thailand, Vietnam, China, Indonesia, India, Nepal, Pakistan, Laos, Malaysia, Australia, South Africa, the United Kingdom, and the United States.</p>
<p>Adaptation and Peacebuilding in Africa Washington DC, U.S. November 2012 https://goo.gl/h3dlo5</p>	<p>In partnership with the Woodrow Wilson International Center for Scholars, Institute for Security Studies, USAID, and DoS, stakeholders from the U.S. and Africa discussed synergies between climate change adaptation and peacebuilding, shared lessons learned from integrated efforts and identify tools to assist in the establishment of effective climate change adaptation efforts in fragile and conflict-affected countries.</p>





PURPOSE AND OBJECTIVES

The High Mountains Adaptation Partnership (HiMAP) is an international Community of Practice (CoP) dedicated to advancing the understanding of climate change risks in glaciated regions of the world. The Partnership helps mountain and downstream communities integrate research results into adaptation and disaster risk planning and management. The Partnership provides a forum for the sharing and exchange of knowledge and connects researchers to local communities, national policymakers and donors.

From the inception of HiMAP, CCRD supported efforts to establish and sustain the CoP, mobilized researchers and climate adaptation specialists to conduct field research and assessments of the threats of glacial lake outburst floods (GLOFs), aided communities in Nepal and Peru to develop Local Adaptation Plans of Action (LAPAs), and helped build awareness and capacity to manage climate threats in high-altitude glaciated landscapes of South America and Asia.



SECTION 5

HIGH MOUNTAINS ADAPTATION PARTNERSHIP

DESCRIPTION

HiMAP is the result of the interest generated by workshops on glacial recession and related impacts in 2009 and 2011. The July 2009 workshop, “Adapting to a World without Glaciers: Realities, Challenges, and Actions,” took place in Lima and Huaraz, Peru with support from USAID and the National Science Foundation. The workshop initiated discussions between the research and policy communities from Latin America, Asia, Europe and the United States about climate change vulnerabilities, risks, and adaptation options for high-mountain glacial communities. At this workshop, Nepali participants expressed interest in a future “south-south” exchange that would enable Nepal and other Asian countries to learn more about methods for assessing and managing the risks of GLOFs from Peruvian engineers, who had managed glacial lakes for more than 70 years.

With support from the Adaptation Partnership (see Chapter 4), a second high mountain event was organized in September 2011 in Nepal. The first part of this event involved an expedition to Imja Lake in the Khumbu (Mt. Everest) region of Nepal. During the three-week trek, more than 30 researchers from ten countries, including experts from Peru, assessed GLOF risks for the lake and met with local organizations and community members to share assessment findings. Back in Katmandu, expedition members were joined by other practitioners, policymakers and donor representatives for the Global Knowledge Exchange on Glaciers, Glacial Lakes, Water and Hazard Management, hosted by ICIMOD (International Centre for Integrated Mountain Development).

The final day of the workshop in Katmandu was a “writeshop” that provided an opportunity for participants to work collaboratively to formulate ideas for follow-on research and the community of practice. The proposals from the writeshop were reviewed by CCRD and incorporated into the CCRD initiative to support glacial lake management activities. Initially, these activities were called the High Mountain Glacial Watershed Program (HMGWP), but later renamed HiMAP to emphasize links to climate change and adaptation.

HiMAP engaged high mountain researchers and adaptation practitioners through two CCRD mechanisms: direct support for CCRD staff and partners (The Mountain Institute – TMI and the University of Texas at Austin – UT); and through “climber-scientist” small grants (see also, Chapter 8). HiMAP activities supported by CCRD have included (1) research on GLOF and glacial retreat assessment; (2) GLOF assessments in Nepal and Peru; (3) capacity building and support for LAPAs in Nepal and Peru; and (4) networking, knowledge management and outreach through the CoP and follow-on workshops. Specific HiMAP activities included:

RESEARCH ON GLOFS AND OTHER CLIMATE RISKS

Researchers conducted critical scientific studies on climate change threats in glaciated landscapes, such as GLOFs, reduced freshwater supplies, and landslides. The HiMAP team developed a Glacial Lake Rapid Reconnaissance approach to rapidly, inexpensively, and safely conduct glacial lake risk analysis. As part of the reconnaissance approach, the HiMAP team tested new assessment methods including the use of ground-penetrating radar and bathymetric volumetric assessment and applied flood modeling and risk-reduction engineering to enhance understanding of glacial retreat, physical characteristics of glacial lakes and potential for downstream GLOFs.



RELEVANT DEVELOPMENT SECTORS

- Water
- Tourism
- Agriculture
- Natural resources management

RELEVANT CLIMATE IMPACTS

- Glacial lake outburst floods
- Temperature changes



GLACIAL LAKE ASSESSMENTS

CCRD partners, TMI and UT, assessed numerous glacial lakes in the Khumbu and Hinku valleys of Nepal and Palcacocha Lake in the Quilcay watershed in Peru. Following the devastating earthquake and tremors in Nepal in May 2015, TMI and UT conducted studies to assess post-earthquake damage to potentially dangerous glacial lakes. Research included detailed remote sensing, which is ongoing through USAID/NASA SERVIR and field-based reconnaissance assessments of Nepal's most potentially dangerous glacial lakes. The field assessments were conducted in partnership with Nepal's Department of Hydrology and Meteorology (DHM), ICIMOD, and the Nepalese Army.

CAPACITY BUILDING AND SUPPORT FOR LAPAS

The HiMAP team provided adaptation training-of-trainers for Nepali climate and mountain practitioners and helped local TMI staff organize and convene a series of stakeholder workshops in the Khumbu to assess climate vulnerabilities and identify adaptation options. The resulting LAPA for the Khumbu region was science-based and community-driven. In addition, HiMAP supported the preparation of a LAPA for the city of Huaraz and communities potentially exposed to GLOFs in the Quilcay watershed.

NETWORKING, KNOWLEDGE MANAGEMENT, AND OUTREACH

The HiMAP CoP numbers 125 international members and serves to increase awareness of the critical importance of high-mountain watersheds in the context of climate change, highland-lowland interactions, and ecosystem services.

THE COP WEBSITE

The CoP distributes quarterly newsletters, posts information online, and engages practitioners located in high-mountain regions. The CoP website was launched in May 2012 (see <http://www.highmountains.org/>) and includes introductory documents that outline the HiMAP's CoP, a blog and supplemental multimedia (photographs and videos) products covering HiMAP fieldwork in Nepal and Peru.

HiMAP also convened the third international conference, “Glacial Flooding and Disaster Risk Management Knowledge Exchange and Field Training,” in Huaraz, Peru, in 2013. Participants presented 33 papers and organized five field-based training sessions. Approximately 40 international scientists and development practitioners participated in a 3-day field-visit to Palcacocha Lake in the Quilcay watershed.

OUTCOMES

HiMAP activities resulted in a variety of achievements that have helped increase awareness of the effects of climate change on high-mountain communities, engendered new research, and provided the “science” for on-the-ground options to better manage these climate risks. Specific outcomes include:

- **Increased awareness of climate change in high-mountain communities**

In addition to the reports and multi-media material posted on the HiMAP website, the HiMAP team has prepared 19 journal articles and 13 technical reports covering research and LAPA support in Nepal and Peru. In addition, the team made 41 presentations featuring the HiMAP work in venues ranging from professional meetings to public meetings hosted by the National Geographic Society. Also, the work in Nepal is featured in a short film, “Himalayas: The Abode of Snow,” produced by the French Canadian “Nova Media” firm in 2013 as part of their four-part “Planet Ice” series covering the Andes, Polar regions, Alps, and Himalayas.

- **New research on GLOFs and other climate-related risks**

Under CCRD, significant advances were made in the tools used to assess glacial lake and landslide risks by CCRD partner, TMI and UT, and recipients of climber-scientist small grants. The value of these tools for assessment was recently validated by the Government of Nepal's selection of the HiMAP team to conduct the post-earthquake assessment of GLOF risks in the Himalayas. The post-earthquake assessment is expected to continue in the coming years until all of Nepal's dangerous glacial lakes have been surveyed and effective monitoring systems installed. The HiMAP team's strong technical work was recently recognized with the award of a \$1.5 million research grant from the National Science Foundation.

- **Improved management of glacial lakes and downstream risks**

In Nepal and Peru, HiMAP's assessment of GLOFs and capacity building efforts in the affected communities has facilitated follow-on

activities that will improve the management of climate risks. In Nepal, UNDP implemented a participatory, community-based project in the Khumbu – Imja Glacial Lake Outburst Risk Reduction Project – that builds on HiMAP assessments of the lake and the Khumbu LAPA. The project plans to lower lake levels by several meters to lessen the potential risks of a GLOF. In Peru’s Cordillera Blanca mountain range, HiMAP conducted GLOF assessments and built capacity in communities to understand and plan for the potential risks of GLOFs. This effort culminated in the preparation of a LAPA, a plan that has received \$100,000 in financial support from the national government and a commitment to reduce the risk of a GLOF in Palcacocha Lake that could potentially affect up to 50,000 residents of the city of Huaraz.

- **Sustaining glacial risk research and awareness beyond CCRD**

As USAID’s support for HiMAP through CCRD comes to an end, there are promising signs that the research and community planning efforts will continue. The Mountain Institute received \$3 million in additional funding from USAID/Peru for “Securing Mountain Water and Livelihoods,” which will build the capacity of universities, municipal governments, and communities to grow their resilience to climate change. In addition, the HiMAP team’s strong technical work was recently recognized with the award of a \$1.49 million research grant from the National Science Foundation to UT and the University of Colorado.

TOOLS

Title and URL	Description
A Global Glacial Lake Partnership: Reflections from an Expedition http://highmountains.org/video/global-glacial-lake-partnership-2011	This eight-minute video provides footage and first-person accounts of a 2011 expedition to Nepal’s Imja Lake. The video illustrates the growing problem of GLOFs and shows participating researchers talking with members of the affected community.
High Mountains Adaptation Partnership – Peru Climate Workshop 2013 https://vimeo.com/77387853	This 10-minute video captures the highlights of the 2013 USAID climate workshop held in Peru.
High Mountain Glacial Watershed Program https://vimeo.com/61653211	This nine-minute video provides footage of Lake Imja and discusses research by HiMAP and TMI to better understand the potential risk of GLOFs to downstream communities.
Post-Earthquake Glacial Lake Assessment: Imja, Tsho Rolpa, and Thulagi Glacial Lakes in Nepal http://www.ccrdproject.com/high-mountains-adaptation-partnership/nepal-earthquake-survey-2015	Highly detailed, demonstrated rapid reconnaissance methods to enable the assessment of the impacts of earthquakes and aftershocks on glacial lake stability and risk to downstream communities.
Glacial Lakes of the Hinku and Hongu Valleys, Makalu-Barun National Park and Buffer Zone, Nepal http://link.springer.com/article/10.1007%2Fs11069-013-0689-8#/page-1	This paper describes three separate, interdisciplinary expeditions to the Hinku and Hongu valleys between 2009 and 2012 designed to close information gaps regarding glacial melt and climate change. Remote sensing with field-based analyses, repeat photography, interviews with local people, bathymetric surveys, ground penetrating radar, and flood modeling are shown.

KEY PRODUCTS

Title and URL	Description
<p>Andean-Asian Mountains Global Knowledge Exchange: On Glaciers, Glacial Lakes, Water & Hazard Management: An Adaptation Partnership Workshop</p> <p>http://www.highmountains.org/sites/default/files/HiMAP_AndeanAsianExchange_Proceedings2011(rfs).pdf</p>	<p>This workshop report presents the findings from a series of Adaptation Partnership workshops about glacial, water and hazard management in the Andean-Asian mountains. The report captures the experiences, lessons learned, and recommendations that emerged from the field expedition and knowledge-sharing workshop.</p>
<p>Climber-Scientist Small Grants Promote Climate Resilience in the High Mountains</p> <p>https://goo.gl/Eqwk5h</p>	<p>The Climber-Scientist Small Grants program provides field-based, hands-on research opportunities to scientists and practitioners working in high-mountain regions. This fact sheet summarizes 11 grants that USAID awarded in July 2012.</p>
<p>Contemporary Human Impacts on Subalpine and Alpine Ecosystems of the Hinku Valley, Makalu-Barun National Park, Nepal</p> <p>http://digitalcommons.macalester.edu/himalaya/vol33/iss1/8/</p>	<p>A reconnaissance of the upper Hinku valley, Makalu-Barun National Park and Buffer Zone, Nepal to determine the impacts of contemporary adventure tourism upon its subalpine and alpine ecosystems.</p>
<p>Glacial Flooding and Disaster Risk Management: Knowledge Exchange and Field Training Workshop</p> <p>https://goo.gl/XYE9Gz</p>	<p>This workshop report presents the findings of the third international workshop of the High Mountains Adaptation Partnership (HiMAP). The workshop presented key HiMAP research results and provided training modules on new field methods in the high-mountain sciences, conflict-resolution methods, and new systems for developing local adaptation management plans.</p>
<p>The Glacial Lake Handbook: Reducing Risk from Dangerous Glacial Lakes in the Cordillera Blanca, Peru</p> <p>http://pdf.usaid.gov/pdf_docs/PBAAA087.pdf</p>	<p>Groundbreaking technical report presents a series of case studies to (1) highlight the challenges associated with managing and reducing risk from glacial lakes in the Cordillera Blanca, Peru; and (2) provide governments, stakeholders, and practitioners with practical guidance and best practices for managing glacial lakes in high-mountain regions worldwide.</p>
<p>The Time Bomb – Lake 464 (2010)</p> <p>https://vimeo.com/69665582</p>	<p>This six-minute video provides footage of the Hongu River Valley. It highlights Lake 464, the most dangerous lake in this valley because of its depth, proximity to an active calving glacier, proximity to large masses of hanging ice, and small terminal moraine.</p>

Title and URL	Description
<p>Ground Penetrating Radar Survey for Risk Reduction at Imja Lake, Nepal</p> <p>https://repositories.lib.utexas.edu/handle/2152/19751</p>	<p>This study presents observations of the structure of the terminal moraine complex at Imja Lake, one of the most dangerous lakes in the world. Detailed ground penetrating radar (GPR) surveys were conducted at Imja Lake.</p>
<p>The High Mountains Adaptation Partnership: Helping High-Mountain Countries Adapt to Climate Change</p> <p>https://www.usaid.gov/climate/adaptation-fs-himap</p>	<p>This fact sheet describes HiMAP, a partnership to help communities work together to strengthen adaptation planning capacity, knowledge-sharing, and research capabilities related to climate-resilient development and disaster risk management in the glaciated regions of Peru, Nepal, and other mountainous countries.</p>
<p>HiMAP: Case Studies and Lessons Learned from Nepal and Peru</p> <p>https://goo.gl/nJUQxh</p>	<p>This case study summarizes the HiMAP experience in Nepal and Peru, with detailed discussions of lessons learned in the community consultation, applied research, and LAPA implementation process.</p>
<p>HiMAP website</p> <p>http://www.highmountains.org/</p>	<p>The HiMAP website provides information on a range of research, events, and workshops related to high-mountain glacial watersheds, including links to the Climber-Scientist Small Grants program.</p>
<p>Importance of Field Work in Natural Disaster Risk Assessments in High Mountains</p> <p>http://adsabs.harvard.edu/abs/2012AGUFMGC11A0959M</p>	<p>This work highlights the idea that to have an accurate risk assessment, fieldwork needs to be one of the main sources of information, which could be mixed with remote sensing and numerical modeling.</p>
<p>Inundation Modeling of a Potential Glacial Lake Outburst Flood in Huaraz, Peru (Risk Perception Study)</p> <p>http://www.crrw.utexas.edu/reports/pdf/2014/rpt14-01.pdf</p>	<p>This report concerns risk perceptions posed by Palcacocha Lake in rural and urban areas that experienced a Palcacocha Lake GLOF in the 1940s.</p>
<p>humbu, Nepal: Local Adaptation Plan of Action (LAPA) – Process for Mainstreaming Adaptation</p> <p>https://goo.gl/OpRkIT</p>	<p>The Khumbu Local Adaptation Plan of Action contains descriptions of key methods, processes, findings, results, and materials used in a series of community consultations and District-level meetings held between September 2012 and September 2014. This LAPA is considered among the most comprehensive and thoroughly produced LAPAs in Nepal to date. This LAPA serves as a model for USAID and development practitioners working on LAPAs, and is based on unparalleled fluency in the unique physical and cultural aspects of Nepalese people and the Himalayan ecosystems.</p>

Title and URL	Description
Peru Climate Change Vulnerability and Adaptation – Desktop Study https://goo.gl/jKVn4j	This report is intended to inform the in-country assessment process for possible future USAID/Peru-funded adaptation activities addressing climate change challenges. The report may also serve as a model for other USAID Missions that are beginning similar processes, by demonstrating what kinds of knowledge sources to review and what level of detail is appropriate and useful for project planning and design.
Promoting Science-Based, Community-Driven Approaches to Climate Change Adaptation in Glaciated Mountain Ranges: HiMAP http://pdf.usaid.gov/pdf_docs/PA00KK2N.pdf	This journal article – published in Geography – documents the origins, establishment, implementation, and experiences of HiMAP in the Sagarmatha (Mount Everest) National Park and the Buffer Zone in Khumbu, Nepal, from the partnership’s formation in March 2012 up to August 2014.
Quilcay Disaster Management Plans http://goo.gl/IClyO	The disaster management plan for the Quilcay watershed is in process, proposing strategies for protecting the city of Huaraz from the possible effects of a GLOF from Lake Palcacocha.

An aerial photograph of a river valley, likely the Colorado River, showing a winding river through a brown, hilly landscape. A blue semi-transparent text box is overlaid on the right side of the image. The sky is bright blue with some clouds on the right edge.

PURPOSE AND OBJECTIVES

Just as weather services provide us with forecasts of daily temperatures and the chance of rain or snow, climate services provide information about longer-term weather conditions. Climate services deliver data, statistical analyses, tools, and other information resources about historical weather patterns and expected future climate conditions (e.g., seasonal temperature and precipitation forecasts, longer-term projections of temperature, sea level changes). These climate services support improved decision-making, policy, and planning in agriculture, infrastructure, health, and other climate-sensitive sectors.

As noted in Chapter 4, the Climate Services Partnership (CSP) was established at the First International Conference on Climate Services in 2011 and shortly thereafter, CCRD developed a climate services initiative to support the activities of the CSP. CCRD's climate services work, led by Columbia University's International Research Institute for Climate and Society (IRI), is designed to support networking between climate services providers and users, build capacity and increase awareness in developing countries on the use and value of climate services, promote innovations in climate services, and improve methods for evaluating climate services performance and outcomes.



SECTION 6
CLIMATE SERVICES

DESCRIPTION

CCRD's climate services activities include support for the CSP Secretariat and CSP conferences, webinars, and working groups, capacity building in the design and use of climate services in developing countries, and development and application of methods to evaluate climate services.

CSP SECRETARIAT

The CSP is an informal, interdisciplinary partnership of climate services users, providers, funders, and researchers. The CSP serves as a mechanism for pooling knowledge and resources to accelerate learning, identify and promote good practices, and foster new ideas and collaborations to improve the delivery and effectiveness of climate services. Similar to most communities of practice, CSP requires proactive leadership and capacity to connect members, share knowledge, facilitate research and analysis, and plan events designed to provide a forum to exchange ideas and renew and build new connections within the partnership.

With funding support through CCRD, IRI staffed the CSP Secretariat. In this capacity, IRI managed the CSP website <http://www.climate-services.org>, produced a quarterly online newsletter, hosted discussion forums and community webinars, and coordinated the planning of the annual International Conference on Climate Services (ICCS 2 in Brussels, Belgium, ICCS 3 in Montego Bay, Jamaica, and ICCS 4 in Montevideo, Uruguay), a global-scale forum for discussing recent experiences, new ideas, and emerging topics on climate services.

CAPACITY BUILDING IN THE PROVISION AND USE OF CLIMATE SERVICES (SEE PAGES 60–63)

CCRD helped more than 25 developing countries throughout Africa, Central America, and the Caribbean build skills and capacity to provide and improve the quality of climate services that respond to user needs. These efforts were primarily focused on the demand for climate services in the agricultural sector and to improve planning and response to climate-related disasters. Specific activities included the development of new forecasting tools and climate information, data rescue, and capacity building in delivering and using climate services.

CLIMATE SERVICES EVALUATION (SEE PAGES 64–66)

CCRD supported a range of evaluation activities designed to provide information on the quality and value of climate services. This work included the preparation of several evaluation studies, elaboration of methods for conducting resource constrained evaluations, and a primer and training program for helping climate services providers design socioeconomic benefit studies.



RELEVANT DEVELOPMENT SECTORS

- Agriculture
- Coastal
- Health
- Infrastructure
- Natural resource management
- Tourism
- Water

RELEVANT CLIMATE IMPACTS

- Extreme weather events
- Precipitation changes
- Temperature changes



JAMAICAN DROUGHT FORECASTING AND CLIMATE SERVICES

USAID and IRI coordinated with Jamaica's Meteorological Service; Rural Agricultural Development Authority (RADA); the Ministry of Water, Land, Environment and Climate Change; and local agricultural nongovernmental organizations such as the Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance (ACDI/VOCA) to provide forecasts and early warnings to local farmers, including first-of-a-kind seasonal drought forecasts. RADA used this information to guide farmers on their agricultural practices, such as selecting seed varieties that are most likely to thrive under projected climate conditions. As part of a strictly “demand-driven” approach, the program relied on farmer forums and stakeholder workshops to solicit feedback and identify the most-needed services.



CLIMATE SERVICES PRODUCTS FOR THE AGRICULTURAL SECTOR

With USAID support, the Agricultural Model Inter-comparison and Improvement Project (AgMIP) created new tools for projecting climate, soil conditions, and agricultural productivity and applied them in locations in Sub-Saharan Africa and South Asia. IRI's statistical climate projection methodology produces climate data in a form suitable for input into agricultural and hydrological models. Its primary innovation is in accounting for both long-term trends and inter-annual to decadal natural climate fluctuations that drive inter-annual extremes. In partnership with the University of Chicago, AgMIP established a framework for advancing the next generation of gridded crop-productivity models and studying uncertainties in agricultural assessments. The team used the method to conduct a multi-model simulation of African maize yields for Southern and Eastern Africa.



INTEGRATING CLIMATE INFORMATION AND DECISION PROCESSES FOR REGIONAL CLIMATE RESILIENCE, INTERNATIONAL RESEARCH APPLICATIONS PROJECT (IRAP)

Funded by USAID and NOAA, the IRAP project brings together a multidisciplinary team of climate, sectoral, and social scientists from IRI and the University of Arizona. This team collaborates with regional and national/sub-national partners to advance climate information and decision-support systems for enhancing regional climate resilience in the Caribbean. Under USAID funding in its first year, prototype climate-information map rooms were developed for the Caribbean region and made available through the project website. The map room tools, built upon the IRI Data Library, can be used for monitoring and forecasting across many time scales. IRAP collaborated with the Caribbean Institute of Meteorology and Hydrology to hold a two-day stakeholder workshop in May 2014, following the spring 2014 Caribbean Climate Outlook Forum. The workshop used the new drought forecast tool, originally developed in Jamaica and scaled up to the eastern Caribbean region, as the focus of discussion with stakeholders in the water, disaster management, health, and agriculture sectors to assess local capacities, needs, vulnerabilities, and information networks.

CLIMATE SERVICES CAPACITY BUILDING IN WEST AFRICA

IRI supported technical assistance and training efforts in collaboration with the Agriculture, Hydrology, and Meteorology (AGRHYMET) Regional Center in Niamey, Niger. This activity built the capacity within AGRHYMET and West African national meteorological services to develop new high-resolution climate information products, including both historical and current monitoring information. New climate information incorporated satellite rainfall estimation and state-of-the-art technology in blending satellite and station data. Also, IRI provided training and support for AGRHYMET to implement IRI's powerful Data Library tool and online Climate Map Room facility. These resources allow access, visualization, and analysis of historical and real-time climate data. Stakeholder outreach activities engaged meteorologists and agriculture, water, and disaster-management specialists from 16 West African countries in reviewing initial information products and their uses.

DATA RESCUE

The International Environmental Data Rescue Organization (IEDRO) partnered with the African Center for Meteorological Applications for Development (ACMAD) in a data-rescue effort to salvage a vast holding of African historical climate data contained in the form of microfiche images of paper records. IEDRO provided training and support for the establishment of ACMAD's West Africa Climate Data Rescue and Digitization Facility, while CCRD supported the purchase of scanning equipment and IRI staff served as technical reviewers for the data rescue effort. From 2013 to 2015, IEDRO worked closely with ACMAD staff to assist them in inventorying and scanning 20,000 microfiche records each month.

CLIMATE SERVICES CAPACITY BUILDING IN CENTRAL AMERICA

In late 2013, representatives from Guatemala, Honduras, the Dominican Republic, and Jamaica were invited to IRI, where they worked side-by-side with climate scientists to transform raw data into useful information and to develop tools that could be used in their home countries to monitor and forecast the amount of water in the soil. With information about soil moisture, farmers will be able to make better decisions about planting and crop management, including which crops and seeds to use, whether to buy fertilizer, and when to plant and harvest.

AGRICULTURAL ADAPTATION PROJECTS AND SMALL GRANTS IN CENTRAL AMERICA

IRI team members helped administer the CCRD small grants program for climate-resilient agriculture in Central America. They held initial workshops in three countries that received grants (Guatemala, the Dominican Republic, and Honduras) to identify climate information needs, and then held another workshop to help scientists understand how to build climate information tools. For additional information about these small grants for climate-resilient agriculture in Central America, see Chapter 8.



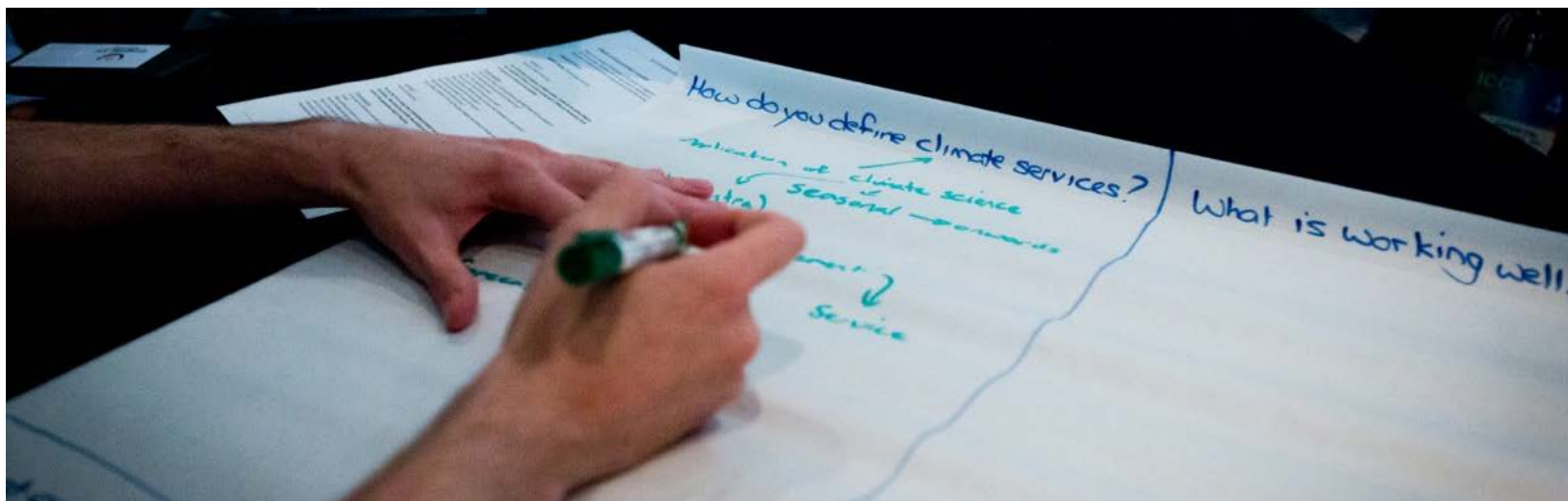
MALI PROGRAM ASSESSMENT

In 2012, CCRD partner, IRI, collaborated with USAID and local partners to evaluate the Mali Agrometeorological Advisory Program (MAAP). These services had been provided to rural communities in Mali since the 1980s, when a major drought and famine affected the region. The project team investigated how Mali's farmers received and applied climate services information, the quality of the information communicated to farmers, and how to replicate the program in other West African countries. Field assessment involved 640 structured interviews and 132 focus groups in 33 villages in southern Mali spread across 4 agro-ecological zones. The assessment revealed low use of the Mali program's climate advisories, low female participation in the program, and low influence on agricultural practices. However, farmers who used the advisories used them consistently, and patterns of low use did not reflect a lack of trust in the service. Instead, low-use patterns reflected farmers' limited abilities to use climate services information based on their community roles (e.g., junior men and married women, both of whom do not have complete autonomy to make decisions, were unable to apply the advisories). The assessment report provided design recommendations for future similar programs. See also <http://www.climate-services.org/evaluations/mali-agromet-project>.



RESEARCH ON THE EVALUATION AND ASSESSMENT OF CLIMATE SERVICES

The CSP Working Group on Climate Service Evaluation incorporated lessons from the evaluation in Mali and other CSP evaluations to articulate guidelines for climate service evaluations that could be conducted at relatively modest levels of investment and limited timeframes. Evaluators used these “mid-level” guidelines to assess the relative contributions of agro-climatic services activities in Indonesia, Kazakhstan, and the Caribbean, and a package of climate service activities in South Africa. The authors of these studies shared lessons learned in applying the evaluation methods and helped the Working Group refine the mid-level evaluation methods for future climate service evaluation. The findings are available at <http://www.climate-services.org/evaluation>.



RESEARCH ON THE ECONOMIC VALUE OF CLIMATE SERVICES

Through CCRD, Stratus Consulting, in coordination with the CSP Working Group on the Economic Valuation of Climate Services, reviewed 183 studies related to the use and value of climate services. This literature review provided important insights on the value of climate services, provided a synthesis of the methods used to value climate services, and identified key gaps and limitations in the existing research. In addition, this research provided the catalyst and a key reference for the book, *Valuing Weather and Climate: Economic Assessment of Hydrometeorological and Hydrological Services*, a joint effort of the CSP Working Group, with substantial support from CCRD, the World Bank, and the World Meteorological Organization (WMO). The book, published by WMO in May 2015, is available in hard copy and on the WMO website.

CAPACITY BUILDING IN THE DESIGN OF SOCIOECONOMIC BENEFIT STUDIES

In 2013, CCRD and WMO co-organized three seminars for staff in the National Meteorological and Hydrological Services (NMHSs) in Southeast Asia, Southern Africa, and the Caribbean. Close to 80 people received a total of more than 1,800 hours of training. The seminars introduced methods for valuing climate services and solicited comments on the proposed content of the book described above. In 2015, CCRD and WMO co-organized a series of three one-week training workshops for NMHSs staff and other stakeholders from 44 countries in Africa, the Middle East, Caucasus, Europe, Latin America, and the Caribbean to build their capacity to design and commission socioeconomic benefit studies of their current or planned investments in climate services. During the workshops, participants worked in small groups on the design of socioeconomic benefit studies and made “mock” presentations to request financial support for studies.

OUTCOMES

CCRD played a pivotal role in supporting and building the CSP as a viable community of practice. Since 2011, CSP has reached more than 2,000 partners and online members and has been successful in advancing climate services by building the knowledge base on climate services through case studies and assessments. With the end of CCRD, responsibility for the CSP Secretariat has been shifted to the German Climate Services Center, ensuring the continuation of the CSP newsletter and annual international climate services conferences.

A major thrust of the climate services work under CCRD was to improve products and strengthen capacity to help farmers access climate services and help farmers make better-informed decisions about when to plant, what to plant, how to manage pests, and what kinds of fertilizer and other inputs to use (see Figure 6.1). The right crop-management decisions can result in increased revenue per hectare or acre farmed.

Outcomes attributable to this work included:

- Farmers and herders in Jamaica can more easily access and understand weather and climate information and learn ways to reduce risks from drought and other climate-related events
- Technical staff at 20 African national meteorological agencies and NGOs are better able to analyze and communicate weather and climate information
- Climate information providers in Central America have established more collaborative relationships with users
- Policymakers in the Caribbean can better understand the effects of climate variability and change on different communities and devise appropriate response strategies.

The drought forecast, developed for Jamaica, is now used across the Caribbean. Other technical innovations have been made in the areas of climate forecasting and projection, and agricultural impacts and assessments and these have been demonstrated in Caribbean, African, and South Asian settings.

The valuation book and related training workshops responded to unmet demand for guidance on the design of socioeconomic benefits of climate services. This gap had been identified in the recommendations of the international conference, “Secure and Sustainable Living: Social and Economic Benefits of Weather, Climate and Water Services,” in Madrid in 2007. The collaboration between CSP, CCRD, WMO and the World Bank has renewed interest in climate services valuation and WMO recently committed to support “Madrid +10” in 2017, an opportunity to share advances in methods and socioeconomic valuation studies on climate services.

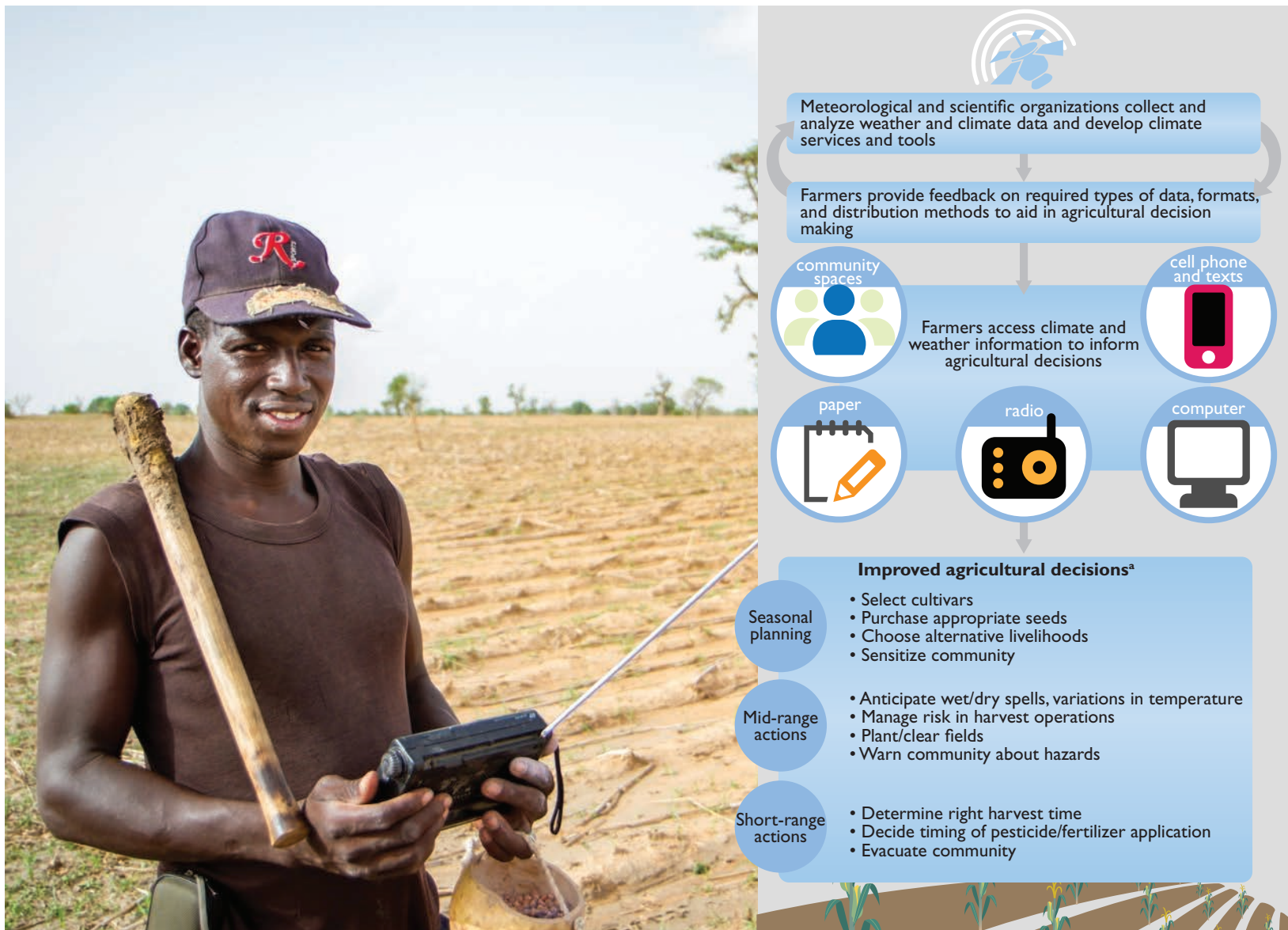


FIGURE 6.1. PUTTING CLIMATE SERVICES TO WORK FOR FARMERS.

a. Tall, A. 2013. Who Gets the Information? Equity Considerations in the Design of Climate Services for Farmers. CGIAR, Research Program on Climate Change, Agriculture and Food Security. February 18. Available: <http://www.slideshare.net/cgiarclimate/who-gets-the-information-arame-tall>. Accessed June 4, 2015.

“Support from USAID and the IRI has helped us establish links between users of climate information and providers of meteorological services. Now we’re working to improve our capacity to process and disseminate useful climate information. We see a lot of potential for this sort of information to improve our understanding of climate effects on production, and to help farmers cope with climate variations now and in the future.”

Erika Tenorio, Associate Professor at *Zamorano*

TOOLS

Title and URL	Description
Drought Forecasting Tool for Jamaica http://www.jamaicacclimate.net	This tool draws on the IRI’s Climate Predictability tool, providing seasonal outlooks for drought (based on a standardized precipitation index).
IRI Climate Data Library http://iridl.ldeo.columbia.edu	This tool is an integrated software system for holding, accessing, visualizing, analyzing, and distributing climate and multidisciplinary environmental, natural, and social sciences data.
IRI Climate: Analysis, Monitoring and Forecasts Maproom http://iridl.ldeo.columbia.edu/maproom/Global/index.html	These are web-accessible, user-friendly maps for access and display of targeted climate information.
AgMIP Near-Term Climate Scenario Generation Code git@bitbucket.org:jchryssanthacopoulos/simgenwa.git	This tool is a complete codebase with documentation for generating the AgMIP simulations (expertise required for full exploitation).
AgMIP Simulation Tool (incorporated in the Parallel System for Integrating Impact Models and Sectors (pSIMS)) http://github.com/RDCEP/psims	This tool is a complete codebase with documentation for generating the AgMIP simulations.

KEY PRODUCTS

Title and URL	Description
Climate Services Partnership Website http://www.climate-services.org/	This website presents information on how to participate in the partnership and associated collaborations, as well as provides access to a collection of relevant resources, including an interactive map of global climate services projects.
Assessing Mali's L'agence Nationale De La Météorologie's (Mali Meteo) Agrometeorological Advisory Program: Final Report on the Farmer Use of Advisories and Implications for Climate Service Design https://goo.gl/igCcoV	This report presents a program evaluation of an innovative climate services program in Mali. It defines criteria that can inform the programming, design, and implementation of climate services for farmers in the Global South.
Assessing Climate Service Needs In Kaffrine, Senegal: Livelihoods, Identity, And Vulnerability To Climate Variability and Change https://goo.gl/yinD5I	Conducted in Kaffrine, Senegal, this assessment demonstrates an approach to identifying farmer needs to inform the design of effective climate services and the monitoring and evaluation of new services as they are implemented.
Climate Services: Better Information for Climate-Resilient Decision Making https://goo.gl/zbU5av	This fact sheet provides a broad overview of CCRD projects that are designed to foster development and promote effective use of climate services.
Climate-Resilient Farming: Improving Agricultural Decision Making in Central America and the Caribbean https://docs.google.com/file/d/0BwnttilnBdksQ2NqRHIXekRzNW8/edit	This fact sheet describes climate-resilient farming programs in Honduras, El Salvador, Nicaragua, Guatemala, and Jamaica.
Jamaica's Success Story: Becoming More Resilient and Less Vulnerable to Climate Change https://drive.google.com/file/d/0BwnttilnBdkseUVrN05NVTcwMTQ/edit	This fact sheet summarizes USAID's work with Jamaica to improve the nation's weather and climate information services and help integrate climate considerations into Jamaica's national development planning.
The Value of Climate Services Across Economic and Public Sectors: A Review of Relevant Literature https://docs.google.com/file/d/0BwnttilnBdksOG5BczhraFQ0NnM/edit	This report summarizes a review of literature related to the use and value of climate services and lists the practical applications and benefit metrics of climate services for various economic and public sectors.

Title and URL	Description
Toward and Ethical Framework for Climate Services http://www.climate-services.org/ethics	This white paper developed by the CSP Ethics Working Group presents the case for establishing ethical guidelines/standards for climate services and proposes core values and principles on which an ethical framework could be developed.
Valuing Weather and Climate: Economic Assessment of Meteorological and Hydrological Services http://library.wmo.int/opac/index.php?lvl=notice_display&id=17225	This book is designed to help NMHSs develop scopes of work and commission socioeconomic benefit studies.
CSP Case Studies and Case Study Synthesis Paper http://www.climate-services.org/case-studies	This publication contains 35 case studies on climate services worldwide and a synthesis paper that identifies overreaching lessons from the studies.
Evaluation studies http://www.climate-services.org/evaluation	This collection of documents evaluates climate services in Mali, India, Indonesia, Kazakhstan, South Africa, and the Caribbean.
AgMIP Climate Simulations for West Africa and Southern India http://iridl.ldeo.columbia.edu/SOURCES/IRI/FD/AgMIP/	This document presents eight sets of simulations (four each at monthly and daily time resolution) spanning 1901–2050.
AgMIP Near-Term Climate Scenario Generation Methodology http://www.sciencedirect.com/science/article/pii/S016819231500009X	This document describes the methods developed for climate scenario generation, incorporating both anthropogenic and natural climate variations.
The pSIMS Agricultural Simulation Methodology http://dx.doi.org/10.1016/j.envsoft.2014.04.008	This document describes the multi-model-based method developed for assessing projected agricultural productivity, soils, and environmental conditions.
IRAP Climate Analysis, Monitoring and Forecast Products http://irap.iri.columbia.edu/projects/data-library-maprooms	These web-accessible maps and analysis are useful for analyzing climate in the Caribbean region. Results can be manipulated and viewed online as well as downloaded into analysis tools, software, and social media platforms.
Integrating Climate Information and Decision Processes for Regional Climate Resilience in the Caribbean http://irap.iri.columbia.edu/?wpdmdl=340 http://irap.iri.columbia.edu/projects/data-library-maprooms	This workshop report describes the inaugural regional engagement process of IRAP, focusing on themes of climate vulnerability, social networks, regional disasters, and the evaluation of climate information.

The background image shows two construction workers on a roof. They are wearing yellow hard hats and high-visibility yellow safety vests over grey long-sleeved shirts. They are leaning over a wooden structure, possibly a roof truss or formwork, which is partially covered with a grey plastic sheet. The setting is outdoors with trees and a building in the background. A blue metal gate is visible in the lower-left foreground, and a red caution tape is strung across the middle ground.

OVERVIEW

CCRD supported urban adaptation through one of its major initiatives – the Climate Resilient Infrastructure Services Program (CRIS) and two other activities: demonstration, tailoring and capacity building in the use of the Cascadia Consulting Group's Climate Impacts Decision Support Tool (CIMPACT-DST) in Vietnam; and support for a local Macedonian NGO in mainstreaming climate change into their environmental planning process used to help municipalities develop climate strategies.



SECTION 7
URBAN ADAPTATION



PURPOSE AND OBJECTIVES

Infrastructure services – such as transportation, water, waste management, energy, communications, and shelter – are crucial to the ability of cities to achieve economic development, provide clean water and sanitation, protect public health, address poverty, and support rapidly growing populations. Climate change poses significant risks to infrastructure. Designed to withstand only current climate conditions, the failure of infrastructure jeopardizes the security and growth of affected cities.

If building resilience to climate change is better understood by cities as a development challenge, then cities can address this challenge through integrated city planning. This can lead to the improved protection of long-term investments, human lives and livelihoods, and ultimately result in smart, lasting development.

Given how important it is that cities recognize the connection between climate change resiliency and development, the Climate Resilient Infrastructure Services program (CRIS), led by CCRD partner ICF International, works with cities to raise awareness of the development impacts of climate change. Over a 2+ year period, CRIS developed, tested, implemented, and shared approaches to improve the climate resilience of infrastructure services.



SECTION 7.1

CLIMATE RESILIENT INFRASTRUCTURE SERVICES

DESCRIPTION

CRIS features technical assistance to four pilot cities to develop and test approaches for promoting climate-resilient development in urban areas; peer learning and communications to raise awareness of climate impacts and share lessons learned by CRIS pilot cities with a broader audience; and small grants to help local organizations respond to unmet needs at the local level and to test the implementation of innovative approaches to climate vulnerability assessment and adaptation.

Technical assistance to pilot cities. The CCRD team conducted CRIS pilots in four fast-growing cities located in coastal or low-lying areas in three countries:

SANTO DOMINGO, DOMINICAN REPUBLIC

City planners in this rapidly growing city are challenged to meet critical infrastructure service needs, including housing, water supply wastewater treatment, and solid waste management. Informal settlements and neighborhoods are expanding into areas that are highly vulnerable to coastal and riverine flooding, which threaten the population's health and safety, as well as the integrity and functionality of infrastructure.

PIURA, PERU

A strong agricultural sector fuels the city's rapid growth and drives expansion into high-risk areas of the Piura River floodplain. The city is expanding water supply, sanitation, and roads in these new neighborhoods, but seasonal flooding and extreme rainfall during El Niño conditions jeopardize public health and the reliability of these expanded services.

TRUJILLO, PERU

This city serves as an important commercial and transportation center for the surrounding farming areas. The expansion of irrigated agriculture has contributed to tremendous economic growth, but irrigation relies on a glacier-fed water supply that is highly sensitive to climate change. The municipality is expanding its water supply and sanitation, coastal protection, and transportation networks. However, flooding and erosion threaten these investments. Several coastal districts and a tourist-friendly beach are disappearing because of severe coastal erosion; unregulated expansion into quebradas – areas subject to flooding during heavy precipitation events – puts an increasing number of homes and businesses at risk.

NACALA-PORTO, MOZAMBIQUE

Located on the steep bank of a natural deep water bay, this city is a hub for economic activity attracted by the local port. Increasing port traffic is stimulating private investment, attracting new residents, and encouraging construction of informal settlements. However, Nacala-Porto is highly vulnerable to heavy or prolonged rainfall events, which trigger erosion and sedimentation of roads, housing, and other infrastructure and is exacerbated by the new development. To help address these concerns, the city has established development objectives to combat erosion, improve municipal services, and implement an urban development master plan.



RELEVANT DEVELOPMENT SECTORS

- Coastal
- Infrastructure
- Transportation
- Water

RELEVANT CLIMATE IMPACTS

- Extreme weather events
- Precipitation changes
- Sea level rise
- Temperature changes

SUSTAINING ACTIVITIES IN NACALA-PORTO

The multi-donor program, led by the Danish International Development Agency, PRODEM (Programme for Municipal Development in North and North-Central Mozambique) focuses on municipal governance with a focus on climate-resilient development. Nacala-Porto is one of 13 municipalities to benefit from PRODEM during the program's first phase. Nacala-Porto's inclusion was recommended by Irish Aid following a donor group meeting with the CRIS team during the CRIS peer-learning study tour in Mozambique.

CRIS staff collaborated with each city to develop work plans that addressed city priorities, actively engaged key stakeholders in work plan development and pilot implementation, and tailored work plans to the unique circumstances and challenges facing each city, while also helping build knowledge and approaches that could prove beneficial if replicated in other cities worldwide. CRIS staff also worked across pilots to develop and implement a suite of trainings and tools to support climate-resilient development, guided by the climate-resilient development framework (see Figure 7.1). The trainings and tools contained core “building blocks” but were also tailored to each pilot project’s context.

The four pilot project cities developed climate change action plans that served as both an internal roadmap for further action in building climate resilience and to communicate priorities and plans to donors and stakeholders. Each action plan outlined the ways the cities could continue to address climate vulnerability and ensure that public infrastructure investments are long-lasting and support the pilot cities’ development goals.

Peer learning and communication to raise awareness and build momentum for action. The CRIS program actively promoted sharing of lessons learned among stakeholders and raising awareness of climate risks to city development. The CRIS program sponsored the following peer-learning events:

- The Climate Leadership Academy (CLA) engaged eight cities across Latin America and the Caribbean in a peer-learning event in Santo Domingo to share experiences in climate change adaptation.
- The Mozambique study tour engaged representatives from three coastal cities in Mozambique to visit the host cities of Quelimane, Beira, and Maputo. The representatives observed the host cities’ climate-related challenges and related adaptation solutions.
- The Peruvian peer-learning event with Piura and Trujillo officials helped participants discuss common challenges, opportunities for climate financing, and adaptation strategies. Participants played CCRD’s “Accelerating Adaptation” game, which encouraged participants to think about both short- and long-term options for adapting to climate impacts.
- One more to be added following the final workshop in Lima, Peru

Small grants for climate resilience at the local level. Under the CCRD small grants program, four small grants were awarded to support activities at the city and sub-city levels in the Dominican Republic, India, Peru, and Indonesia. The purpose of these grants was to develop and test approaches that can increase the climate resilience of infrastructure assets – and the services they provide, particularly in coastal and low-lying cities. See Chapter 8 and Table 8.2 which provides a summary of the four CRIS grants.






CLIMATE-RESILIENT DEVELOPMENT PHASE		PILOT CITY ACTIVITIES			
		Nacala -Porto	Piura	Santo Domingo	Trujillo
 SCOPE	Establish development context and focus	Identified barriers to understanding climate impacts; engaged NGOs, and regional and community actors	Aligned work with city priorities and Peru's national system of public investment	Established an interagency working group on climate resilience	Integrated existing assessment of climate risks into work plan activities
 ASSESS	Enhances understanding about vulnerability	Conducted a train-the-trainers and awareness-raising workshop	Screened 47 planned projects for risks to flooding and extreme heat	Analyzed climate model data to incorporate climate change into long-term planning	Trained municipality on screening projects for vulnerability
 DESIGN	Identifies, evaluates, and selects adaptation options	Improved capacity to access adaptation finance through an innovative "writeshop" approach	Identified alternative project designs to reduce flood impacts and assessed risk reduction measures for a road project	Used a sensitivity matrix to identify adaptation options for a wastewater treatment plant	Employed a "fast track" approach to identify a set of near-term, highly implementable adaptation options
 IMPLEMENT and MANAGE	Puts adaptation into practice	Implemented program of cleaning drainage canals to reduce vulnerability to flooding	Incorporated climate risks in a test proposal for the design and care of a road project	Helped a water utility consider an alternate site location, elevating critical pumps for the treatment plant	
 EVALUATE and ADJUST	Tracks performance and impact	Development of work plans to align pilot activities with city priorities and longer-term action plans to continue efforts to build climate resilience. All action plans included a monitoring and evaluating component for measuring the performance and impact of developed strategies and programs.			

FIGURE 7.1. PILOT CITY ACTIVITIES BY CLIMATE-RESILIENT DEVELOPMENT STEP.

OUTCOMES

The four CRIS pilot cities developed work plans and initiated activities to help address climate risk to infrastructure services, plan for a changing climate, and build resilience for a total of 2.6 million residents. The cities have taken steps to mainstream climate change considerations into their decision-making and governance systems. Local partners in the pilot cities maintain ownership of the projects and will continue to build on the momentum of these efforts.

The CRIS pilot cities applied and validated the climate-resilient development framework. The development-centric approach helped align the CRIS pilot scoping and analysis with the cities' priority goals and objectives. This contributed to a significant feeling of municipal ownership of the CRIS work plans, which sustained interest and participation in the pilot activities. The CRIS program catalyzed the following outcomes:

- Delivered nearly 3,000 person-hours of training and technical assistance to 340 men and 200 women in CRIS pilot cities.
- Contributed to the proposal or adoption of seven policies, ordinances, plans, and agreements addressing climate change at the municipal level.
- The local water utility in Santo Domingo incorporated the findings of a CRIS vulnerability and adaptation assessment into revised plans for wastewater and sewer investments.
- Peru's national system of public investment now includes CRIS approaches and tools in a process for evaluating climate risks to planned infrastructure projects.
- Through the engagement of national associations of municipalities and international donors, the pilot cities pursued funding opportunities for climate resilience.
- Nacala-Porto developed a Climate Change Working Group to improve municipal capacity and readiness to compete for and access adaptation financing and has invested in staff capacity to continue adaptation work. Efforts to plan and implement climate-resilient development in the Municipality will be sustained beyond CRIS as Nacala-Porto has been selected as a "PRODEM city" (see page 77).
- The Mozambique peer-learning study tour resulted in the establishment of an ongoing inter-municipal technical climate change network. By talking through climate-related development issues with other municipalities, the study tour participants effectively communicated their work to international donors and national government agencies.

Additionally, CRIS developed an interactive training method to communicate key CCRD concepts that enable participants to grapple with adaptation challenges and tradeoffs. The CRIS program developed, tested, and implemented practical tools in collaboration with city pilots and grantees that will be valuable resources to inform resilience work in other urban contexts. As a result, non-pilot cities will have better access to tools to help them quickly identify and disseminate actions that increase resilience to climate change.

While CRIS tools will be available beyond CCRD on websites, there is likely to be greater uptake if combined with knowledge sharing and exchange that enables cities to learn from CRIS pilot cities and other successful urban adaptation efforts. The CRIS program demonstrated that peer learning was an effective strategy for developing a sense of ownership over adaptation activities, sharing lessons learned with other cities, and generating excitement and building momentum, but continued investment is required to maintain and sustain these efforts.

TOOLS

Title and URL	Description
<p>A Rapid Assessment Tool for Building Climate-Resilient Infrastructure</p> <p>http://www.ccrdproject.com/adaptation-partnership/cris/tools-and-resources</p>	<p>This tool integrates climate vulnerability assessment and adaptation planning into a single resource to support municipal project planning focused on erosion, flooding, and sedimentation. It employs a checklist of questions to help municipal decision-makers identify and rate climate-related vulnerabilities of the project, as well as areas and assets surrounding the project.</p>
<p>Adaptation Planning Tool</p> <p>http://www.ccrdproject.com/adaptation-partnership/cris/tools-and-resources</p>	<p>This tool was developed to support the identification and evaluation of adaptation options (near-term and long-range) that can reduce the vulnerability of municipal infrastructure to climate impacts. The tool also encourages consideration of measures for “Fast Track Implementation” to identify low-cost, near-term options to reduce vulnerability.</p>
<p>Vulnerability Assessment Screening Tool</p> <p>http://www.ccrdproject.com/adaptation-partnership/cris/tools-and-resources</p>	<p>This tool supports municipal decision-making by screening the vulnerability of infrastructure projects, assets, and operations to current and future climate impacts. It consists of a workbook to record vulnerability scores, a guide with additional information, and a set of overview slides. Users integrate climate information and their knowledge of potential impacts to score vulnerability.</p>
<p>Sensitivity Matrix for Infrastructure</p> <p>http://www.ccrdproject.com/adaptation-partnership/cris/tools-and-resources</p>	<p>This matrix summarizes potential climate change impacts on sanitation infrastructure, and adaptation considerations and options for responding to these impacts. The matrix is focused on heat, heavy precipitation, sea level rise, storm surge, and drought impacts to wastewater treatment plants, pumping stations, and access roads.</p>
<p>Accelerating Adaptation Game</p> <p>http://www.ccrdproject.com/adaptation-partnership/cris/tools-and-resources</p>	<p>This game-based activity aims to increase awareness and understanding of climate-resilient development concepts and approaches developed and implemented under the CCRD project and CRIS programs. It serves as a fun, participatory, and interactive climate change adaptation activity that supports experiential learning.</p>

KEY PRODUCTS

Title and URL	Description
Lessons Learned from the Climate Resilient Infrastructure Services Pilots https://goo.gl/qvulxT	This important report shares 17 lessons from CRIS program activities, including implementation of the CRD Framework and opportunities discovered for sound capacity building and mainstreaming climate information.
Final Report of the Climate Infrastructure Services Pilots in Peru http://www.ccrdproject.com/adaptation-partnership/cris	A participatory training on climate vulnerability assessment for infrastructure services and planned investments.
Addressing Climate Change Impacts on Infrastructure: Preparing for Change https://goo.gl/z462cS	This publication compiles a series of fact sheets describing climate change impacts and adaptation strategies in the context of USAID’s climate-resilient development framework for nine infrastructure categories.
Attracting Climate Financing at Regional and Municipality Levels http://www.ccrdproject.com/adaptation-partnership/cris/tools-and-resources	Applying an innovative “writeshop” approach, this interactive workshop addresses capacity issues and barriers to accessing funds at local, municipal, and regional levels.
Climate Resilient Infrastructure Services (CRIS): Factsheet https://goo.gl/rWXWN0	This factsheet provides an overview of the CRIS program.
Final Reports from the CRIS Pilot Cities: Nacala-Porto, Mozambique; Piura, Peru; Santo Domingo, DR; Trujillo, Peru http://www.ccrdproject.com/adaptation-partnership/cris	These reports explore in detail processes and lessons learned from integrating climate adaptation and risk management strategies into municipal-level development.



PURPOSE AND OBJECTIVES

Vietnam is at a critical juncture in considering climate change in land-use designations and urban planning. Climate change is exposing the country to sea level rise, increasingly severe seasonal typhoons, extreme heat, and other impacts. Simultaneously, Vietnam is developing quickly across its more than 3,000 kilometers of coastline and 300 coastal cities. More than half of the Vietnamese population lives within 10 meters of current sea level.

In response, Vietnam recently established a legal framework promoting the integration of climate change considerations into local development strategies. This includes the 2008 National Target Program on Response to Climate Change (Decision No. 158/2008/QĐ TTg) and the 2013 Urban Development of Vietnam Responding to Climate Change in the Period 2013–2020 (Decision No. 2623/ QĐ-TTg).⁸ Under these policies, every ministry and local authority will develop an action plan on climate change adaptation.

Under CCRD, Cascadia Consulting Group (Cascadia) customized an easy-to-use software tool for Vietnam to help urban planners consider climate change as part of their land-use planning decision-making. The Climate Impacts Decision Support Tool (CIMPACT-DST) brings together information about the local projected impacts of climate change – information that is typically found in multiple places and is difficult to interpret. The tool pulls the data together into one place, using accessible language, and applies a filter to present the information and guidance that are most relevant to each planner's sector and timeframe of interest.

Cascadia originally developed CIMPACT-DST for application in the City of Seattle. Cascadia collaborated closely with the Hue Planning Institute (HPI) to tailor the tool for use in the City of Hue, Vietnam. Following pilot testing in Hue, HPI and Cascadia began working with the Vietnam Institute for Urban and Rural Planning (VIUP) and the Vietnam Institute for Environmental Planning, Urban-Rural Infrastructure (IRURE). The team expanded CIMPACT-DST to cover multiple additional cities and provinces and developed a scaled-up version of the tool for national application.



SECTION 7.2

CLIMATE IMPACTS DECISION SUPPORT TOOL IN VIETNAM

DESCRIPTION

USAID selected Hue, a growing city on central Vietnam's coast, as the initial pilot city for several reasons. The city is highly exposed to climate risks; significant flooding occurs in Hue several each year, most commonly caused by typhoons. The floods of 1999 and 2006 were particularly severe, inundating thousands of homes throughout the city and surrounding province, damaging roads and other public and commercial infrastructure, and spawning water-borne illnesses. These and other impacts are projected to increase as the climate continues to change.

Pilot city selection also considered complementary work in Hue funded by USAID's Regional Development Mission for Asia (RDMA). Under that project, the Institute for Social and Environmental Transition (ISET) had recently facilitated a participatory vulnerability assessment that provided up-to-date climate impacts information; the information was useful for populating CIMPACT-DST.

The team began customizing CIMPACT-DST for use in Vietnam in 2012, tailoring the tool to local conditions and development objectives. Working closely with HPI staff and other stakeholders, the team first assessed the needs and motivations of the intended users in Hue. Next, the team defined the tool's scope and priority sectors for analysis, and conducted early planning for rolling out the tool across Vietnam. The team then collected local and regional climate projections, climate vulnerability data, and sector-specific impacts information, drawing from existing reports, government climate projections, and other sources.

The tool development continued through an iterative process. Users beta-tested the tool and the team made adjustments to accommodate their feedback. For example, users requested hyperlinks to references in case they wanted to read more detailed information about climate impacts or potential adaptation strategies. Additional climate impacts not included in the original Seattle version, such as landslides, were also added at the Vietnamese users' request.

Finally, the team transferred the Hue version of CIMPACT-DST to local ownership. CCRD staff trained local partners to serve as tool administrators who can manage and update the tool in the future as new information becomes available. HPI staff later demonstrated this new capacity by integrating new local spatial information.

Subsequently, the team partnered with IRURE and VIUP to develop an expanded version of the Hue tool that could apply to urban planning activities throughout the 63 provinces and more than 750 cities, towns, and districts of Vietnam. After additional beta-testing in the cities of Ba Ria-Vung Tau and Can Tho, the team transferred ownership of the national tool to VIUP, IRURE, and the Ministry of Construction in mid-2014. The maps used in the tool are housed on the VIUP server, so Vietnamese government staff have full control and can update maps as needed in the future. VIUP staff have also digitized and geo-referenced available climate impact maps to provide provinces with locally specific climate information.



HOW CIMPACT-DST WORKS

Users of this Excel-based tool can get outputs specific to their plan or project in only 15 minutes. Planners enter simple specifications on the type, intended lifetime or planning horizon (from 2030 to 2090), and intended location of their infrastructure project or master plan, and the tool provides tailored spatial impacts visualizations and guidance summaries that can help them formulate effective response strategies. Figure 7.2 displays a rendering of the CIMPACT-DST interface, including instructional information for users.

Project Exposure

New Coastal Development Project (General Planning - Transportation - Quảng Điền)

PLANNING HORIZON ?

🕒 2050

TEMPERATURE IMPACTS

Temperature Exposure:

🌡️ + 1.6 to 2.0 degrees C

PRECIPITATION IMPACTS ?

Rainfall Exposure:

💧 4.1 to 12%

Drought Exposure:

🌵 LOWEST value is between -0.1 and -6%

Flood Exposure:

🌊 0 - 1.5 m

Landslide Exposure:

🏠 MODERATE landslide risk

SEA LEVEL RISE IMPACTS

Sea Level Rise Inundation Exposure:

🌊 Within an inundation zone

Coastal Erosion Exposure:

🌊 MODERATE coastal erosion risk

Salinity Intrusion Exposure:

🐟 MODERATE salinity intrusion risk

2. Select the most appropriate planning horizon for your project.

3. For each impact, first click on the dropdown to view the exposure zones.

Then, click the icon to identify exposure classifications for your project area.

Next, select the identified zone from the respective dropdown list.

If your project straddles two or more zones, select the zone with the highest hazard.

If a map is not available for your area, then choose the most appropriate option based on local knowledge or studies.

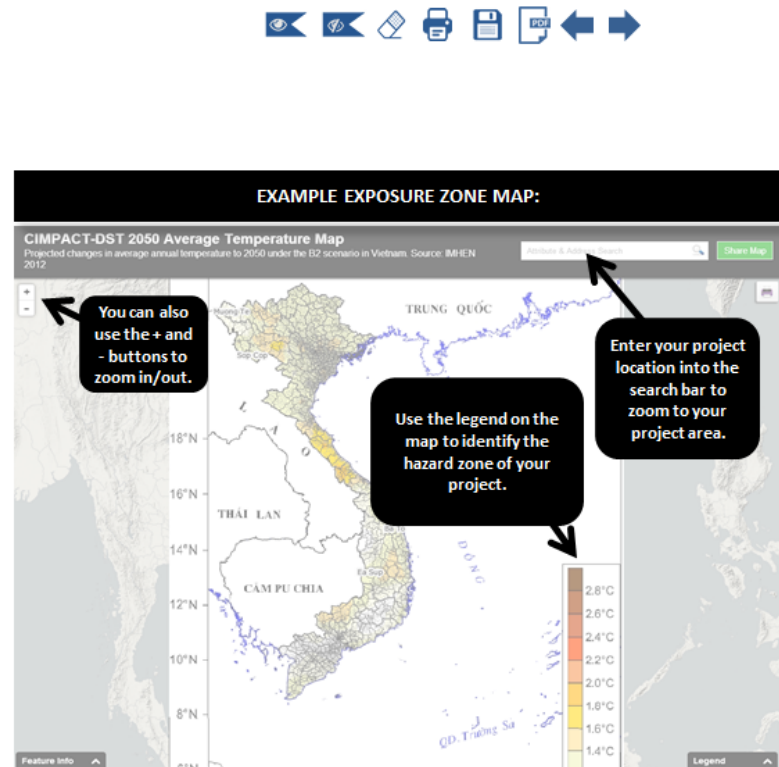


FIGURE 7.2. ILLUSTRATION OF CIMPACT-DST USER INTERFACE.

OUTCOMES

This effort supported the CCRD project objectives by offering Vietnamese urban planners a resource for synthesizing and streamlining project-relevant climate impact and adaptation guidance at a level and timescale applicable to their needs. Previously, many urban planners had not received training on climate change and relied on Google searches to locate relevant climate information. CIMPACT-DST acts as a springboard for taking Vietnam’s climate-resiliency goals and strategies from policies on paper to implementation on the ground. The tool enables government staff across sectors and departments to conveniently view plans and projects through a climate lens.

CIMPACT-DST enabled Hue’s urban planners to identify location-specific climate impacts and make land-use decisions that improved the climate resilience of new infrastructure investments. In late 2013, HPI planners applied the tool to update master plans for four rural communes slated for further urbanization in Thua Thien-Hue Province, near the City of Hue. The planners integrated several new resiliency features into these plans, including softer infrastructure along coastlines and conservation of natural floodplain areas. Together, these four climate-resilient master plans will reduce the vulnerability of tens of thousands of residents by 2030.

Similarly, in Vung Tau, urban planners used CIMPACT-DST to review the zoning plans for Nui Lon-Nui Nho, Go Gang Island, and Long Son Island. At the national level, VIUP used the tool to revisit the plans for four major economic zones; planners looked at how key infrastructure, such as national roads and regional water supply plants, could be affected by sea level rise and other projected climate change impacts, and recommended siting changes to the planning review committee.

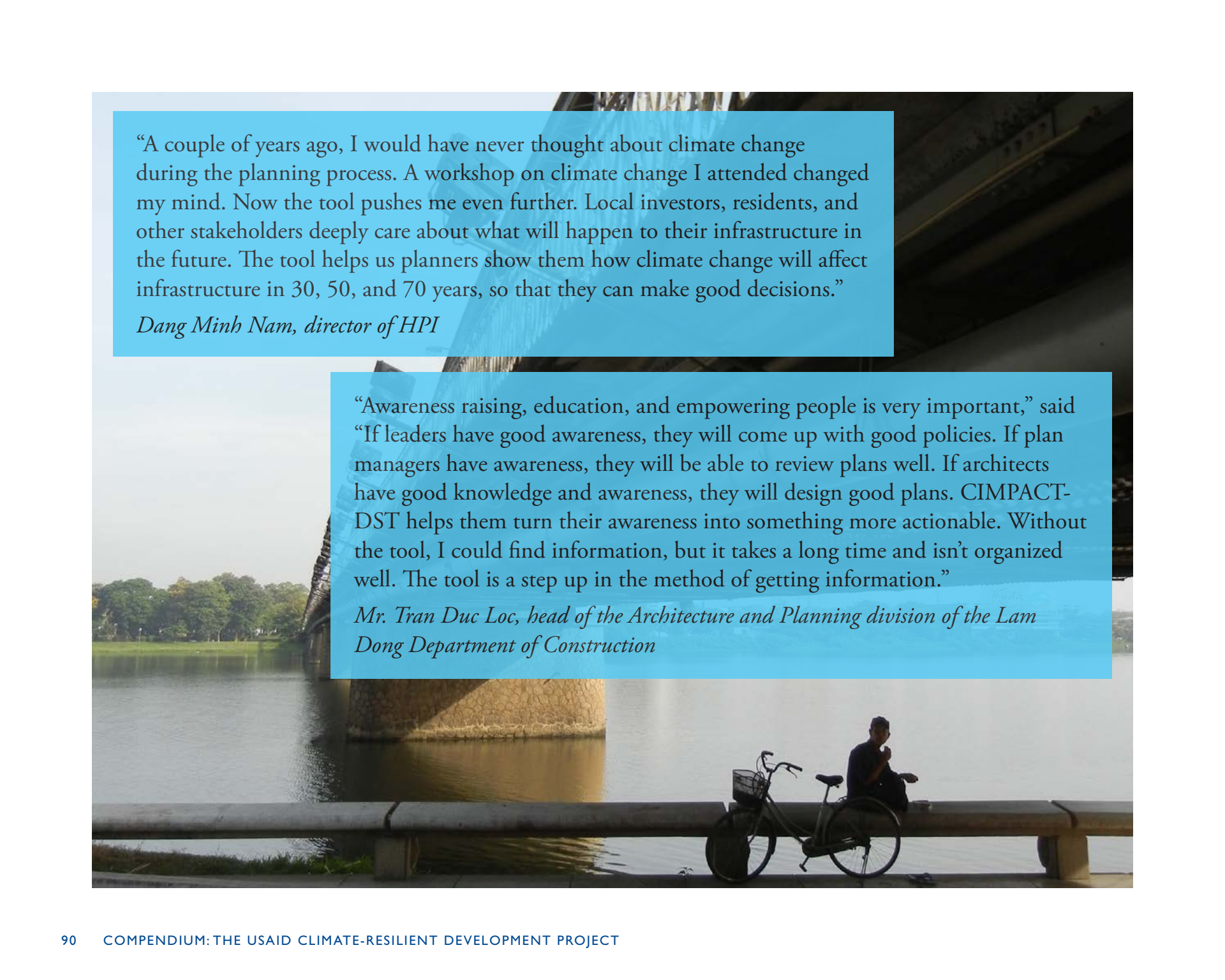
At a final CIMPACT-DST national dissemination workshop in 2014, Cascadia staff distributed the tool software to participants. This equipped more than 75 practitioners and 65 government planners and architects from more than 11 provinces to use Vietnam CIMPACT-DST for their climate-resilient development plans. The team also trained VIUP staff as tool administrators and transferred all of the maps to the VIUP server.

VIUP plans to continue to deploy CIMPACT-DST and monitor its use throughout the country after the CCRD project ends. In 2015, Cascadia worked with VIUP to develop a sustainability plan to help ensure that the tool:

- Will be updated in the future as new climate projections become available in Vietnam
- Continues to be expanded to new provinces and users
- Is used consistently and version control is maintained.

TOOLS

Title and URL	Description
CIMPACT-DST Tool in Vietnamese, for download http://www.ccrdproject.com/adaptation-partnership/climate-impacts-decision-support-tool	The CIMPACT-DST tool is an easy-to-use decision support tool for urban planners throughout Vietnam. The tool supports systematic integration of climate change considerations into urban planning and land-use decision-making, with the ultimate goal of contributing to building climate resilience in Vietnam.



“A couple of years ago, I would have never thought about climate change during the planning process. A workshop on climate change I attended changed my mind. Now the tool pushes me even further. Local investors, residents, and other stakeholders deeply care about what will happen to their infrastructure in the future. The tool helps us planners show them how climate change will affect infrastructure in 30, 50, and 70 years, so that they can make good decisions.”

Dang Minh Nam, director of HPI

“Awareness raising, education, and empowering people is very important,” said “If leaders have good awareness, they will come up with good policies. If plan managers have awareness, they will be able to review plans well. If architects have good knowledge and awareness, they will design good plans. CIMPACT-DST helps them turn their awareness into something more actionable. Without the tool, I could find information, but it takes a long time and isn’t organized well. The tool is a step up in the method of getting information.”

Mr. Tran Duc Loc, head of the Architecture and Planning division of the Lam Dong Department of Construction

KEY PRODUCTS

Title and URL	Description
<p>The Vietnam Climate Impacts Decision Support Tool: A Case Study in Pilot Project Sustainability</p> <p>https://goo.gl/gbZKf5</p>	<p>This report summarizes complete project activities and describes lessons learned about scaling up sustainable pilots based on the development and distribution of CIMPACT-DST in Vietnam.</p>
<p>The Climate Impacts Decision Support Tool: Integrating Climate Information into Land-Use Decisions in Vietnam</p> <p>https://goo.gl/SISEm0</p>	<p>This fact sheet describes why the tool was created and how it is used.</p>
<p>Project Summary: Hue Climate Impacts Decision Support Tool</p> <p>https://goo.gl/HCB9uE</p>	<p>This report describes tool customization and deployment in Thua Thien-Hue Province.</p>
<p>Climate Impact Decision-Support Tool User Guide</p> <p>https://goo.gl/Sfzl8</p>	<p>This manual provides a comprehensive set of instructions that will help users understand and use the tool.</p>
<p>Building a Climate-Smart Vietnam</p> <p>http://www.usaid.gov/news-information/frontlines/energy-infrastructure/building-climate-smart-vietnam</p>	<p>This USAID Frontlines article describes how CIMPACT-DST has been used in Hue, Vietnam.</p>
<p>Vietnam Climate Impacts Decision-Support Tool website</p> <p>http://www.ccrdproject.com/adaptation-partnership/climate-impacts-decision-support-tool</p>	<p>This website provides a project overview, and hyperlinks to more detailed information about the tool and the latest Vietnamese version of CIMPACT-DST for download.</p>

PURPOSE AND OBJECTIVES

Macedonia presents unique challenges and opportunities for work on climate change policy. It is a small, landlocked country with a relatively new government regime. Although the Macedonian government submits routine National Communications to the United Nations Framework Convention on Climate Change (UNFCCC), the country has made little progress toward increasing awareness of or responding to the impacts of climate change.

Beginning in 2013, CCRD provided training and other collaborative assistance to the ongoing USAID Municipal Climate Change Strategies (MCCS) project, implemented by Milieukontakt Macedonia (MKM). MKM is a nongovernmental organization (NGO) that specializes in environmental movements and sustainable development initiatives. MKM staff members received adaptation training from USAID and CCRD that enabled them to (1) disseminate advanced climate adaptation information across multiple Macedonian localities, and (2) test the adaptability of USAID's Climate-Resilient Development Framework as MKM integrated its lessons into a pre-existing municipal planning process.



SECTION 7.3

CLIMATE-RESILIENT DEVELOPMENT IN MACEDONIA

DESCRIPTION

In 2012, USAID's Mission in Macedonia designed the MCCA project and awarded it to MKM with the objective of strengthening civil society and raising awareness about local resilience to climate change. Currently in its final year, the project has centered on the Green Agenda, an innovative methodology based on the United Nations' Agenda 21 that Milieukontakt International (the parent organization to MKM) has used in more than 10 countries in Europe and Asia.

The Green Agenda is a participatory process that engages local stakeholders (including NGOs, citizens, the private sector, and municipal authorities) in developing municipal-level sustainable development plans that incorporate aspects of climate change adaptation and mitigation. This open process involves engaging citizens in the strategy development by focusing on the preservation of cultural and environmental values. Through this approach, municipal stakeholders become better prepared to manage their local climate change challenges by strengthening civil society, raising awareness, boosting activism, and bolstering climate resilience. The process involves significant training on climate change topics [e.g., basic information on climate change, greenhouse gas (GHG) inventory preparation, vulnerability assessments, adaptation and mitigation measures, monitoring and evaluation] to raise awareness, along with collaborative planning, on creating a common vision and strategic approach to reducing the impacts of climate change on local economic sectors and infrastructure.

The CCRD team played a key role in providing training to help build the capacity necessary to integrated climate concerns into the Green Agenda process. In October 2013, USAID and CCRD staff conducted a three-day training event for MKM staff on the Climate-Resilient Development Framework and, more generally, climate change adaptation. The CCRD training team helped MKM integrate adaptation considerations into the formerly emissions-reduction-focused Green Agenda process, and they worked with MKM staff and their local trainers to weave the framework training into MKM's work with small municipalities in Macedonia. Following the training, the CCRD team traveled to the municipality of Bogdanci in Southern Macedonia to observe the trainers present a one-day stakeholder workshop.

In August 2014, the CCRD team returned to Macedonia to conduct a four-day advanced adaptation training for MKM and its local trainers. The training described the final revisions in the Framework (adding the Scope Stage) since the previous training and covered additional and more detailed topics on climate information, cost/benefit analysis, and adaptation financing. The training also featured the two adaptation games that had previously been developed by the Red Cross/Red Crescent Climate Centre.

Following this workshop, CCRD was asked to assist MKM in revising the Green Agenda to incorporate elements of USAID's Framework and explicitly address climate stressors, impacts and vulnerability. CCRD and MKM staff discovered many synergies between the framework and the original Green Agenda, making integration relatively simple. Illustratively, the first step of the Green Agenda, "Community Values," easily maps to the "Scope" Stage in the USAID Framework. The Green Agenda already asked communities to select natural, social, or economic resources that are highly valued by citizens and integral to the economic output of the community. The revised Green Agenda links these valued resources to the development goals identified in the framework and challenges citizens to also consider how climate and non-climate stressors will affect inputs to the valued resources.



RELEVANT DEVELOPMENT SECTORS

- Infrastructure
- Transportation
- Water

RELEVANT CLIMATE IMPACTS

- Extreme weather events
- Precipitation changes

WATER AND CLIMATE CHANGE IN MACEDONIA

Macedonia's water resources are its most vulnerable sector. With climate change, precipitation is expected to continue to decrease, stressing already depleted surface and groundwater resources. Poor governance, including water pricing and consumption laws, are expected to intensify the vulnerabilities. In the agricultural sector, farms are expected to be exposed to prolonged heat waves in addition to more severe droughts and floods. The likelihood of these extreme events is particularly high for the southeast region of the country, which is considered extremely vulnerable.

OUTCOMES

The revised version of MKM’s Green Agenda process integrates elements of the climate-resilient development framework, making its lessons accessible to municipal stakeholders who need to understand adaptation and vulnerability analysis, and select adaptation options. For USAID’s GCC Office and CCRD, the collaboration with MKM and USAID/Macedonia represented a true test of whether the Climate-Resilient Development Framework could be effectively mainstreamed into existing planning and decision-making processes. The Green Agenda was an appealing test subject for CCRD. The Green Agenda was originally intended as a participatory environmental planning process that MKM had already adjusted to encourage municipalities to address GHG mitigation as part of their environmental plans. CCRD and MKM added greater focus on development goals and climate stressors in the revised Green Agenda.

MKM implemented the Green Agenda process in eight small municipalities in Macedonia: Pehcevo, Tearce, Bogdanci, Krivogashtani, Mavrovo/Rostushe, Bogovinje, Studenicani, and Vinica. Each municipality formally adopted the Green Agenda as a legal document and implemented a number of impressive urgent actions. In the wake of CCRD’s participation, two larger municipalities, Delchevo and Prilip, will participate in the process as well. These new municipalities have committed to conducting only adaptation-related urgent actions.

MKM also plans to leverage an extensive regional network to scale up Green Agenda for implementation in neighboring Balkan nations, and the MKM team has already begun to publicize the work undertaken with CCRD at various conferences, including at the Second International Climate Change Conference that took place in Macedonia in June 2015 and the CCRD-sponsored March 2015 Advancing Climate Resilient Development Symposium in Washington, DC.

KEY PRODUCTS

Title and URL	Description
Green Agenda 3.0 Available from: http://milieukontakt.net/en/?page_id=8	This version of the Green Agenda process document incorporates steps from the climate-resilient development framework.





PURPOSE AND OBJECTIVES

The CCRD small grants program provided funding for a wide range of activities that contributed to the United States Agency for International Development's (USAID's) goal to increase the resilience of people, assets, and livelihoods to climate change impacts by integrating adaptive strategies into their broader development agendas. Several grants served as seed projects, linking grantees to larger projects in the region or positioning them to attract funding from other donors. The program served several objectives, including to pilot innovative adaptation approaches; build capacity to adapt to climate change; develop tools, methods, and information resources; and test USAID's Climate-Resilient Development Framework (see Section 2).



SECTION 8

SMALL GRANTS PROGRAM

DESCRIPTION

The CCRD small grants program awarded a total of 35 grants⁹ for projects in 23 countries. The total amount of small grant awards was \$3.3 million, with individual grants ranging in value from \$18,000 to \$171,500. Thirty small grants were awarded in response to five thematic competitive solicitations and five grants were issued on a “sole source” basis to organizations uniquely qualified to carry out CCRD supporting activities. Figure 8.1 shows the location of the grants.

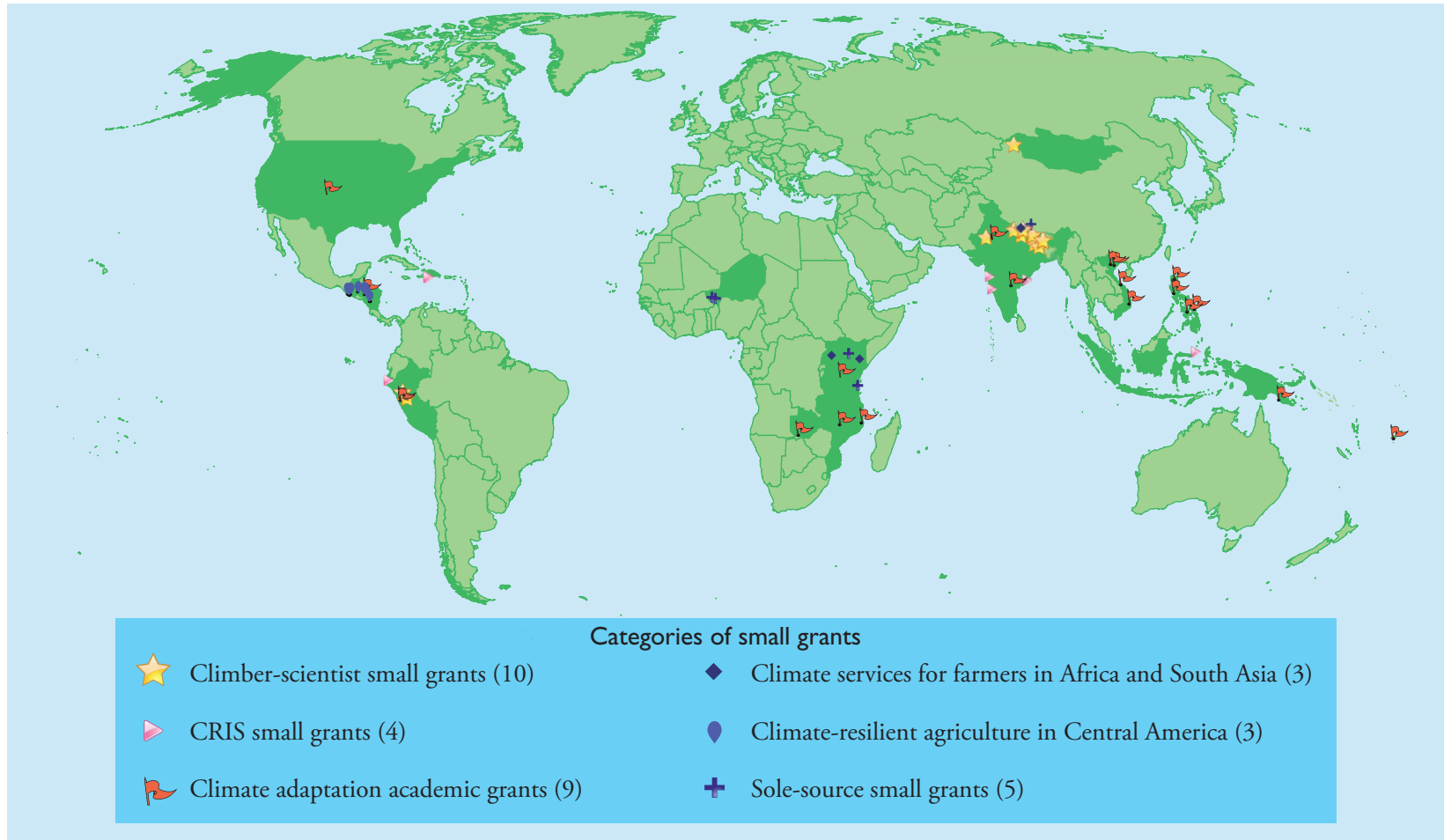


FIGURE 8.1. LOCATION OF CCRD SMALL GRANTS.



CLIMBER-SCIENTIST SMALL GRANTS

This program was administered through the High Mountains Adaptation Partnership (HiMAP). The goal of these grants was to nurture a new generation of specialized climate change adaptation researchers working on field-based, hands-on opportunities in high-mountain regions. Objectives included strengthening the research capacity of local mountain organizations and generating knowledge relevant to climate change adaptation and climate-smart development in high-mountain areas. Table 8.1 details the ten Climber-Scientist Small Grants that were awarded through the HiMAP program.

Table 8.1. Summary of Climber-Scientist Small Grants

Grantee: Resources Himalaya Foundation

Title: Building Climate Change Resilience Capacity of Mountain People in Nepal

Description: Helped build the capacity of local governments and organizations to develop climate change vulnerability assessments, prepare local adaptation plans, implement pilot adaptation activities, and share the outcome of local activities with central government authorities.

Categories: Adaptation planning, capacity building and training, scientific research, vulnerability assessment

Grantee: Ashoka Trust for Research in Ecology and the Environment (ATREE)

Title: Climate Change in the Kanchenjunga Transboundary Conservation Area: Vulnerabilities and Adaptive Capacities (India and Nepal)

Description: Used community-level data collection, stakeholder surveys, regional climate modeling, and capacity-building to develop a framework for climate-resilient development and adaptation to climate change risks.

Categories: Adaptation planning, capacity building and training, scientific research

Grantee: Research Foundation for SUNY

Title: Engaging Climber Scientists and Indigenous Herders on Grazing and Climate Change Issues in the Altai Mountain Region of Mongolia

Description: Assessed the impacts of grazing on biodiversity and developed a policy for the sustainable use of pasturelands, created a strategy to promote sustainable tourism, strengthened cooperation with civil society and indigenous communities, and strengthened management capacity in parks.

Categories: Communication and networking, capacity building and training, scientific research

Grantee: ETH (Eidgenössische Technische Hochschule) Zurich, Institute of Environmental Engineering

Title: Including the Sherpa Factor in Water Resources Projections in the Nepalese Himalaya

Description: Combined quantitative observations in the field with qualitative knowledge from local communities to develop information on changes in glaciers and snow cover.

Category: Scientific research

Grantee: Adam French, University of California, Santa Cruz

Title: Integrated and Participatory Risk Management in Peru's Lake Paron Glacier Basin

Description: Conducted outreach, education, and relationship-building with key stakeholders in the Cruz de Mayo Campesino community to disseminate findings on integrated water resource management, natural risk/hazard mitigation, and institutional capacity-building.

Categories: Capacity building and training, communication and networking

Table 8.1. Summary of Climber-Scientist Small Grants

Grantee: Geo-Science Innovations

Title: Investigation of the Seti River Disaster (May 5, 2012) and Assessment of Past and Future Mountain Hazards Facing Pokhara, Nepal and Upstream Communities

Description: Used remote sensing and field data to better understand the causes of the May 5, 2012, Seti River outburst in Nepal.

Category: Scientific research

Grantee: Raul Augusto Loayza Muro, Universidad Peruana Cayetano Heredia

Title: Natural Acid and Metal Leaching in Andean Headwaters: An Interdisciplinary Approach to Evaluate Water Quality and Potential Sources for Remediation in a Climate Change Context in the Cordillera Blanca (Peru)

Description: Monitored the highland-lowland impacts of climate change and pollution on a glacial watershed in the Cordillera Blanca mountains of Peru.

Category: Scientific research

Grantee: Ulyana Nadia Horodyskyj, University of Colorado-Boulder

Title: Quantifying Supraglacial Lake Changes: Contributions to Glacial Ice Volume Loss and Runoff Inputs to Rivers in Nepal and Tibet

Description: Gathered information on the contribution of supraglacial lakes to ice volume loss and other meteorological factors – such as rainfall and temperature – that affect melt rates of mountain glaciers.

Category: Scientific research

Grantee: Stephanie Spray, Harvard University **Title:** Snow River Film Project (Nepal)

Description: Conceptualized and conducted field work for a proposed film to raise awareness of the impacts of climate change in the Himalaya, the importance of high-mountain glacial environments, and the peoples who inhabit them.

Category: Communication and networking

Grantee: Laura Read, Tufts University

Title: Tres Cuencas Commonwealth (Peru)

Description: Collaborated with Peru's Tres Cuencas Commonwealth to support its goal to develop technical solutions for water and climate challenges.

Categories: Capacity building and training, tool development

CLIMATE RESILIENT INFRASTRUCTURE SERVICES (CRIS) SMALL GRANTS

The CRIS program developed and tested approaches to increase the climate resilience of infrastructure assets – and the services they provide – in developing countries, particularly in coastal and low-lying cities. CCRD awarded grants to support the CRIS program through collaborations with city governments to increase the climate resilience of infrastructure services. An additional grant focused on working with a CRIS pilot city in Indonesia to test CCRD’s FastTrack Implementation approach, which streamlines the vulnerability assessment process to implement adaptation options more quickly. Table 8.2 summarizes the four CRIS small grants.

Table 8.2. Summary of CRIS Small Grants

Grantee: Instituto Dominicano de Desarrollo Integral (IDDI)

Title: Increasing Resilience to Climate Change of Santo Domingo’s Infrastructure Services

Description: Implemented a local community outreach program and climate adaptation needs assessment. Developed policies, capacities, and structures to sustainably incorporate climate change adaptation measures into city planning, with a focus on water and sanitation, access, and shelter centers.

Categories: Adaptation planning, capacity building and training

Grantee: The Energy and Resources Institute (TERI)

Title: Urban Infrastructure Inventory and Rapid Vulnerability Assessment for Resilience Planning in Two Coastal Cities in India

Description: Conducted a vulnerability assessment of two coastal cities in India; developed a database management system for tracking the condition and vulnerability of infrastructure; and populated an initial inventory of infrastructure assets for the two cities. Produced a video on climate risks in the cities and held a one-day national conference in India to share lessons and outcomes.

Categories: Capacity building and training, communication and networking

Grantee: Ecumenical Center for Promotion and Social Action North (CEDEPAS Norte)

Title: Validating and Mainstreaming CCRD Tools and Approaches in the Provincial Municipality of Piura, Peru

Description: Incorporated the climate-resilient development framework into a training course on urban resilience, conducted workshops, and worked to mainstream urban resilience approaches in city decision-making.

Category: Vulnerability assessment

Grantee: Yayasan Kota Kita, Surakarta

Title: Vulnerability Assessment, Infrastructure Inventory, Resilience Planning and Capacity Building for the City of Manado, Indonesia

Description: Conducted rapid assessments of the urban infrastructure networks to identify climate change vulnerabilities in the city infrastructure and systems. Developed a series of training modules to communicate the results of the assessment to city officials.

Category: Vulnerability assessment

CLIMATE ADAPTATION ACADEMIC GRANTS

CCRD provided nine grants to U.S. and international universities and research institutes that conduct research on methods and tools to support adaptation planning and implementation. CCRD also sought to validate adaptation approaches, with an emphasis on mainstreaming the consideration of climate change into existing decision-making processes. Grantees were required to either use USAID's Climate-Resilient Development Framework, or demonstrate how their work would contribute directly to advancing knowledge related to one or more elements of the framework. Table 8.3 summarizes the climate adaptation academic grants.

Table 8.3. Summary of Climate Adaptation Academic Grants

Grantee: West Virginia University

Title: Climate Forecasting, Adaptation Backcasting: Promoting Resilient Adaptation in Malawi

Description: Developed state-of-the-art regional climate change scenarios and identified past and current coping mechanisms.

Category: Adaptation planning

Grantee: Royal Melbourne Institute of Technology (RMIT), Australia

Title: Decision Support Toolkit: Towards Climate Smart Seaports in the Pacific Islands

Description: Developed a decision-support toolkit, tailored to local conditions and needs, to increase the engineering and functional resilience of Pacific Island seaports (Fiji and Papua New Guinea)

Category: Tool development

Grantee: University of North Carolina at Chapel Hill

Title: Diagnosing the Vulnerability of Drinking Water Infrastructure to Synergistic Climate Related Hazards in Coastal Cities

Description: Developed, validated, and applied a model to diagnose the risk and vulnerability of drinking water systems in coastal cities to synergistic climate change hazards. (Vietnam and Philippines)

Category: Vulnerability assessment

Grantee: Red Cross/Red Crescent Climate Centre

Title: From Vulnerability Assessments to Adaptive Action: A Demand Driven Approach to Forecast-Based Decisions for Development (Zambia)

Description: Developed a framework for assessing the impact and rationale of existing activities on mitigating disaster-related losses.

Category: Adaptation planning

Table 8.3. Summary of Climate Adaptation Academic Grants

Grantee: University of Colorado-Boulder

Title: Identifying Constraints to and Opportunities for Coproduction of Climate Information for Improved Food Security among Agro-pastoral Populations in Tanzania

Description: Identified opportunities and constraints related to the use of climate forecasts for adaptation planning in Tanzania.

Category: Adaptation planning

Grantee: University of Colorado-Boulder

Title: An Online Planning Tool for Climate Change Resiliency Development Support

Description: Developed a climate tool to model the costs of infrastructure investment strategies based on predicted impacts of climate change. Developed case studies to enable adaptation planners to review lessons learned.

Categories: Adaptation planning, tool development

Grantee: Western Kentucky

Title: Tropical Andean Climate Change Adaptation and Ecosystem Services Monitoring, Cordillera Blanca, Peru

Description: Created a water quality and waste management plan, established ecological monitoring plots to test how burning and grazing affect native plant communities, and documented and quantified current socioeconomic factors for communities living in the park buffer.

Categories: Adaptation planning, scientific research

Grantee: Pan American School of Agriculture (Zamorano)

Title: Water, Climate and Development Training Program

Description: Developed national capacity for innovative applied research, training, technology transfer, and information dissemination across a range of water resource management stakeholders.

Category: Capacity building and training

Grantee: University of Michigan School of Natural Resources and Environment

Title: Water Demand Management for Improved Adaptation by Small Farmers in Semi-Arid India

Description: Evaluated water demand-management programs to assess effectiveness and identify areas of improvement in program design and implementation.

Categories: Adaptation planning

SMALL GRANTS TO SCALE UP CLIMATE SERVICES FOR FARMERS IN AFRICA AND SOUTH ASIA

These three small grants supported a number of innovative projects to fill critical gaps in the design, delivery, and effective use of climate-related information for risk management among smallholder farmers in Africa and South Asia. The ideas for these projects emerged from a workshop on scaling up climate services for farmers, held in Saly, Senegal, in December 2012 (see Section 4, Adaptation Partnership Workshops, for more information about this workshop). Table 8.4 presents information about these grants.

Table 8.4. Summary of Small Grants to Scale up Climate Services for Farmers in Africa and South Asia

Grantee: University of Reading

Title: Investigating the Potential and Opportunities for Scaling up Climate Services for Farmers in Africa

Description: Assessed the availability of climate information including the needs of farmers in several African countries; identified opportunities for scaling up the provision of climate services; and developed an implementation plan.

Category: Adaptation planning

Grantee: Science Foundation for Livelihoods and Development (SCIFODE)

Title: Laying the Foundation for Establishing Networks Linking Farmers across Africa and South Asia for Demand-Driven Climate Services

Description: Held a series of workshops to establish regional networks of farmers in eight Africa and South Asia countries to enhance knowledge-sharing of climate products and services for on-farm decision-making.

Category: Communication and networking

Grantee: Nepal Development Research Institute (NDRI)

Title: Strengthening Generation and Dissemination of Climate-Based Agro-Advisories for Smallholder Farmers in South Asia

Description: Conducted workshops and surveys to identify needs and opportunities for climate-based agricultural advisories for farmers, and held a five-day training for meteorologists and experts on developing and disseminating agro-advisories.

Categories: Communication and networking, capacity building and training

SMALL GRANTS FOR CLIMATE-RESILIENT AGRICULTURE IN CENTRAL AMERICA

In March 2012, the Adaptation Partnership convened a regional workshop on assessing climate vulnerability and building climate resilience in agriculture (see also Section 4). At the close of the workshop, attendees from Central America and the Dominican Republic highlighted a need for increased learning and cooperation among developing countries and opportunities to directly observe and learn from existing efforts to build climate resilience in key agricultural value chains.

CCRD conducted a competitive small grants solicitation open to organizations in Central America and awarded three grants designed to help smallholder farmers to better cope with increasingly severe droughts and other climate change impacts. They also generated lessons and educational materials to assist vulnerable farming communities throughout the region and worldwide. Table 8.5 presents information about these grants.

Table 8.5. Summary of Small Grants for Climate-Resilient Agriculture in Central America

Grantee: Pan American School of Agriculture (Zamorano)

Title: Building Capacity for Climate-Resilient Agriculture in the Dry Corridor of Northern Central America (Nicaragua, Honduras, and El Salvador)

Description: Developed an understanding of climate change challenges in productive sectors (e.g., agriculture and forestry), along with an improved capacity among stakeholders to implement adaptation measures. Established demonstration farms, developed a university curriculum, and conducted a “train-the-trainers” event around managing drought.

Category: Capacity building and training

Grantee: Private Institute for Climate Change Research, part of the Guatemalan Sugar Association (Asociacion de Azucareros de Guatemala)

Title: Developing a Mechanism for Climate Change Technology Transfer for Staple Crops within the Guatemalan Pacific Slopes

Description: Facilitated technology transfer and capacity building for climate change adaptation for crops. Trained maize and bean producers in sustainable farming practices in context of changing climate.

Categories: Capacity building and training, communication and networking

Grantee: Tropical Agricultural Research and Higher Education Center (CATIE)

Title: Strengthening the Resilience of Cattle Farms to Climate Variability and Climate Change in Honduras and Nicaragua

Description: Collected and systematized knowledge of silvopastoral systems, analyzed the viability of different actions, and strengthened local and regional capacity to develop and implement adaptation strategies and sustainable farming practices.

Categories: Capacity building and training, communication and networking

SOLE SOURCE SMALL GRANTS

Five grants were awarded to organizations for specific tasks, such as implementing workshops, providing training, or providing logistical support for projects. Table 8.6 summarizes these grants.

Table 8.6. Summary of Sole Source Small Grants

Grantee: The Mountain Institute

Title: The Everest Alliance: Cooperatively Protecting and Restoring the Mt. Everest Ecosystem from Villages to Summit

Description: Explored interest in a new organization linking local and international stakeholders focused on protecting and restoring the Everest ecosystem through the coordination of projects and access to international expertise and fundraising networks.

Category: Communication and networking

Grantee: AGRHYMET (Agriculture, Hydrology, and Meteorology) Regional Center

Title: Improving Resilience to Climate Impacts in West Africa through Improved Availability, Access and Use of Climate Information: Dialogue with Users (Niger)

Description: Engaged stakeholders on the value and application of new climate-information products.

Category: Communication and networking

Grantee: Western Indian Ocean Marine Science Association (WIOMSA)

Title: Training on Vulnerability Assessment, Scenario Planning and Analyzing Adaptation Strategies 2014 WIO Climate Capacity Building Program

Description: Planned a climate change capacity-building training.

Category: Capacity building and training

Grantee: Trustees of Columbia University in the City of New York

Title: Improving the Use of Soil Data in Climate Impact Assessments for East Africa

Description: Developed a rigorous multi-model simulation framework and convened a workshop of key experts.

Categories: Tool development, capacity building and training

Grantee: International Environmental Data Rescue Organization (IEDRO)

Title: West Africa Data Rescue and Digitization Facility

Description: Established a West Africa Data Rescue and Digitization Facility in Niamey

Category: Tool development

OUTCOMES

The small grants program contributed to CCRD’s overall objectives, particularly by fostering new research to fill scientific and analytical gaps. Specific outcomes included:

- Improving local awareness and knowledge of climate change, including issues such as sustainable resource management, risk assessment, and adaptation options
- Building local capacity to monitor and interpret climate data, conduct vulnerability assessments, and prepare adaptation plans on various geographic scales
- Training farmers to understand climate issues and identify adaptation options to promote climate-resilient agriculture
- Developing new tools for vulnerability assessment, adaptation planning and decision support
- Fostering information exchange and collaboration between developing countries and within communities of practice
- Deepening understanding of climate-driven impacts and risks related to glacial lakes, agriculture and urban and coastal infrastructure

The CCRD small grants program also contributed the project’s success in meeting performance targets. Table 8.7 lists the indicator results for the small grants program.

Table 8.7. Small Grants Program Outcomes by Indicator	
Indicator	Number
Stakeholders with increased capacity to adapt to the impacts of climate variability and change	125 (including 22 women)
Hours spent on climate change training	69,506
People who received training in climate change	3,721 (including 1,448 women)
Laws, policies, strategies, plans, agreements, or regulations addressing climate change officially proposed, adopted, or implemented	5
Amount of investment leveraged from private and public sources, for climate change	\$156,886
Institutions with improved capacity to address climate change issues	211
Days of technical assistance in climate change provided to counterparts or stakeholders	345

Table 8.7. Small Grants Program Outcomes by Indicator

Indicator	Number
Climate adaptation tools, technologies and methodologies developed, tested, and/or adopted	86
Climate vulnerability assessments conducted	6
Adaptation financing proposals benefited	3

TOOLS

Two tools were developed under the CCRD small grants program: an online planning tool for climate-resilient development support, and a decision-support toolkit for Pacific island seaports. Grantees tested several tools, including tools developed under other CCRD programs, and provided training on the use of other existing tools.

Title and URL	Description
Online Infrastructure Planning Support Systems Tool (IPSS) http://www.innovationcenteroftherockies.com/CUIPSS.html	Models the costs of infrastructure investment strategies when considering projected impacts of climate change. Note that this project involved developing a Web-based extension to the existing IPSS tool.
Climate Smart Seaports – Pacific https://code.google.com/p/climate-smart-seaports/	Interprets climate- and non-climate data to support decisions in adaptation planning, particularly for seaports.

KEY PRODUCTS

The grantees developed a wide range of products through their CCRD-funded projects, including videos, training materials, reports, and scientific papers.

Title	Description
The Climate Change Resilient Development Small Grants Program http://www.ccrdproject.com/adaptation-partnership/small-grants	This report summarizes each of the 35 grantees' work. The CCRD Small Grants program focused on thought leadership, research, piloting the CRD Framework, and capacity building across several categories.



PURPOSE AND OBJECTIVES

Under Objective 1, CCRD responded to numerous requests from USAID Bureaus and Missions covering technical assistance, capacity building for USAID's implementation partners, preparation of background papers and case studies, and support for workshops and working groups. Table 9.1 provides a summary of CCRD's support to Bureaus and Missions. Several of these support activities have been previously described in the Compendium and the relevant sections are noted in the table. Support activities not previously described are presented in Section 9.1, with the exception of CCRD's support for the Gender Development and Empowerment Office, which is presented in Section 9.2.



SECTION 9

SUPPORT FOR USAID BUREAUS AND MISSIONS





SECTION 9.1

SUMMARY OF CCRD SUPPORT FOR USAID BUREAUS AND MISSIONS

CCRD activities in support USAID's GCC Office in the E3 Bureau and USAID Missions are described below:

USAID FEDERAL AGENCY CLIMATE CHANGE ADAPTATION PLAN

Under Executive Order 13514 – Federal Leadership in Environmental, Energy, and Economic Performance – CCRD prepared a number of products in support of USAID's first Adaptation Plan (finalized in December 2012), including: country vulnerability profiles and technical memoranda on near- and long-term vulnerability and potential adaptation actions covering the Agency's missions, operations and programs. CCRD assisted the Agency in responding to public comments on the first draft of the Plan and preparing sections on governance programming, monitoring and evaluation and the coordination of the Plan with USAID's new Resilience Policy.

REVIEW OF IPCC 5TH ASSESSMENT REPORT

CCRD assisted USAID in responding to the request from the US Global Climate Research Program (USGCRP) for comments on draft chapters of the IPCC Working Group II 5th Assessment Report. CCRD staff, partners and consultants commented on Chapter 24 (Asia) and Chapter 25 (Australasia) and CCRD organized a telephone conference for USAID for USAID and CCRD reviewers and coordinated the summary of comments submitted to USGCRP.

WORKING GROUP ON CLIMATE VULNERABILITY SCREENING – UNDER EXECUTIVE ORDER 13677 – CLIMATE-RESILIENT INTERNATIONAL DEVELOPMENT

USAID participates in an interagency working group on climate vulnerability screening and has established a agency working group to develop an approach and tools to support a range of Agency planning processes and investments, including the Country Development Cooperation Strategy (CDCS) and Project Appraisal Document processes. For the Agency Working Group, CCRD prepared an extensive survey of vulnerability screening tools and provides coordination support (meeting summaries and agendas) and technical inputs including a template for a new CDCS annex and sector-specific guidance for a CDCS screening tool.

DESKTOP STUDIES

CCRD prepared a series of desktop studies for USAID Missions covering current information on climate vulnerability and adaptation responses:

- Niger and Burkina Faso – the USAID Joint Planning Cell is developing strategies and programs to increase the resilience of poor populations in marginal agricultural and agro-pastoral zones in the Sahel. To support this planning process, CCRD conducted a desk review of key climate change vulnerabilities and adaptation challenges. The study focused on agriculture and food security; natural resources management; water and WASH; health and nutrition; disaster risk management; rural infrastructure; and climate and early warning information.

- Peru – for the USAID Mission in Peru, CCRD assessed the climate vulnerability of key economic sectors and ecosystems and summarized adaptation activities undertaken by the Government of Peru, international NGOs and bilateral and multilateral donors.
- Timor L'Este – CCRD prepared a background paper in support of a TDY mission by Washington-based USAID staff to Timor L'Este to identify investment opportunities in climate change adaptation. The paper provides a literature review on climate impacts and vulnerability for the agriculture, health, water resources, tourism and natural resources sectors and summarized national adaptation priorities and key in-country organizations.

BENIN SITE VISIT AND THE CLIMATE AND EDUCATION INTEGRATION PILOT

The GCC Office and CCRD conducted a site visit to Benin to assist in developing the project tasks and activities to be implemented under the Climate Change Integration Pilot Project that was awarded to USAID/Benin on climate change and education. In addition to stakeholder meetings, the team visited five villages that are prone to frequent and intense flooding that impedes children from traveling to schools due to flooded roads and river crossings.



PURPOSE AND OBJECTIVES

The United States Agency for International Development (USAID) supports gender equality and women's empowerment worldwide. A recent focus of this work was on the interactions of gender and climate vulnerability, especially among the rural poor in the global south. Existing research on gender and climate suggests that the impacts of climate variability and change are "gendered," meaning that men and women experience different livelihood outcomes from climate-related impacts and that they develop different means of coping.

One objective of the CCRD's support for USAID's Office of Gender Equality and Women's Empowerment was to strengthen development practitioners' understanding of the interactions between gender and climate change vulnerabilities. Much of the existing literature on gender and climate relies on a binary framing of gender, describing women's and men's vulnerabilities. However, other recent work by various gender and climate researchers suggests that this frame is too simplistic to capture the interplay of climate impacts and gender in particular social, economic, cultural, and geographical settings. The synthesis of this work, led by CCRD's partner, the University of South Carolina, expands the field of gender and climate studies and informs the development of more targeted and nuanced adaptation strategies that focus on the social factors and intra-gender differences that shape the climate vulnerabilities of individuals and communities.



SECTION 9.2

GENDER AND CLIMATE CHANGE

DESCRIPTION

The CCRD technical report, *Gender and Climate Change in Agrarian Settings*, reviewed the existing literature on climate change adaptation and gender in agrarian settings, capturing the state of knowledge in the field. Key findings from this review were:

- Gender influences access to resources, livelihood activities, and even crop selection; this varied access can produce gender-based vulnerabilities to climate variability and change
- In many cases, women are able to mobilize their unique roles, responsibilities, and resources to produce promising adaptation strategies
- Women are broadly excluded from agricultural and livelihood decision-making across scales and institutional settings, limiting the impact of their unique strategies
- Development, extension, and adaptation programs generally fail to identify women's activities and resources as appropriate targets for intervention.

However, the report also found that the literature was moving in new directions that added significant nuance to conventional understanding of gender and adaptation. This emerging literature argued that:

- Framing gender analysis around the broad differences between men and women tends to over-generalize these categories, failing to capture important differences within each category.
- Several cross-cutting identities and activities affect gender-based vulnerability to climate change and variability. These include age, class/ livelihood roles, caste, and ethnicity.
- Gender analyses that focus exclusively on the differences between men and women risk overlooking other, potentially more important social determinants of vulnerability to climate variability and change.

To empirically illustrate these points, the report focused on Ghana, Mali, and Malawi case studies, which are further detailed below. These studies illustrated that gender is only one of the key elements of the context-sensitive identities that determine individuals' vulnerabilities and influence decision-making; at times, gender may not be a central factor shaping vulnerability. Furthermore, each study compared its findings to those that would have been revealed by a basic "man versus woman" gender analysis to show how much information is lost through assessments that oversimplify gender and its role in the creation of vulnerability. Considering the complexities of the interactions among climate vulnerability, livelihoods, and multiple social factors – not gender alone – will give development practitioners a more comprehensive understanding of who is vulnerable to which potential climate impacts. This, in turn, will help practitioners identify more effective adaptation strategies for each development context.



RELEVANT DEVELOPMENT SECTORS

- Agriculture
- Health
- Natural resource management
- Water
- Governance

RELEVANT CLIMATE IMPACTS

- Extreme weather events
- Precipitation changes
- Temperature changes

GHANA

Ghana's Central Region is experiencing a steady decline in annual precipitation and continued variability in the timing and frequency of precipitation. This case study focused on two villages where agriculture was the primary source of household income. Residents of both villages faced the same climate, environmental, and economic challenges, but individuals experienced different vulnerabilities based on their livelihood roles and household structures. Men were less vulnerable to climate variability because they were responsible for growing mostly tree crops, which were relatively resistant to variability in precipitation. Women, however, did not own land and were less able to plan for long-term production, so their livelihoods depended on the cultivation of short-term vegetable crops that were highly sensitive to changes in the timing or amount of seasonal precipitation.

Intra-gender differences were also important determinants of individuals' vulnerability to precipitation variability. For example, some women lived in households where their production was aimed principally at market sales, while others lived in households that expected them to farm for subsistence. Although these women lived in the same community and farmed the same crops, the two groups experienced different stressors. Women working toward market production had to negotiate an uncertain environment and market, while subsistence producers generally worried about the environment. This created different vulnerabilities among women in these communities that a single "women's intervention" could not easily address.

Binary gender analysis of these villages revealed gender differences in climate vulnerability, but these oversimplified analyses did not account for ways in which different vulnerabilities emerge among those of a particular gender, and they effectively obscured the vulnerabilities of the poorest members of these communities. In these villages, it was the intersection of gender and the household livelihood strategy that produced the social differences that determined climate vulnerability. Exploring this intersection could provide more information about potential contextually appropriate adaptation interventions.

MALI

The Mali case presented another example of intra-gender differences in vulnerability to climate variability, and provided a counterexample to the dominant story that agricultural work conducted by women is more vulnerable than men's agricultural work. Southern Mali experiences a long dry season and variable rainfall, and precipitation has declined overall since the 1950s. The start of the rainy season in May–June has become less reliable, and the end of the rainy season in August–September has seen a decline in precipitation. An extended dry season greatly increases the vulnerability of Malian farmers who depend on agriculture for subsistence and for income. In Mali, men generally produce rain-fed staple crops, which make them more vulnerable to decreases in precipitation than women, who grow a greater diversity of garden crops, irrigated manually from hand-dug wells.

However, the difference in vulnerability is not just binary; seniority in the community also has an important influence on intra-gender vulnerability of individuals. In some communities, women with a high level of seniority produce a surplus of rain-fed peanuts to supplement income from hand-irrigated garden crops; more-junior women rely on trading activities. This dependency on rain makes senior women more vulnerable to decreases in rain than more-junior women, who grow rain-fed crops only for subsistence and engage in more trading activities. Similarly, junior-level men are expected to produce a greater surplus of rain-fed crops than more-senior men, leading to greater vulnerability to climate variability. In addition, senior members of both genders, especially senior-level men, raise more livestock than junior members of both genders. This gives senior-level men

a great deal of adaptive capacity, giving them the resources needed to purchase food or materials during difficult years. However, men who own livestock are more vulnerable to changes in the amount and quality of pastureland for grazing their animals.

To understand the different vulnerabilities to climate variability and change that emerged in southern Mali, practitioners would need to look beyond the differences between men and women. Practitioners would need to consider a more complex construction of identity that considers gender and seniority, together, as the factors that shape individual exposure and sensitivity to climate variability and change, and that shape people's adaptive capacity to address those stressors.

MALAWI

The Malawi case examined two villages near the Mount Mulanje Forest Reserve (MMFR) in the Mulanje District. MMFR experiences variable and highly seasonal precipitation, and has a high-population density and limited access to farmland. Average annual precipitation, which has declined since the 1950s, has had lasting impacts on the region. Most people depend primarily on agriculture as a livelihood, though many residents, especially men, also participate in other forms of work in various sectors. Because of the high-population density and the limited amount of cropland in the region, residents depend on agricultural inputs, which the government subsidizes in some, but not all, years. The unreliable delivery of fertilizer subsidies makes livelihood planning difficult, especially for the poorest members of the community.

The MMFR case study found that gendered vulnerability was not particularly prominent in these villages. Men controlled their household's farmland, and women did most of the planting, but both husbands and wives worked on their farms and depended on their farmland for food and income and, therefore, experienced the same vulnerabilities to precipitation changes. Non-farm incomes appeared to be pooled within the household, so both genders were exposed to variability in markets and in the availability of employment opportunities. Women-headed households differed from men-headed households in that they did not own farmland and generally did not have the resources to diversify their livelihood strategies by operating businesses. These women depended solely on the agricultural labor market for the income they earned farming on other people's land, making them more vulnerable to variability in demand for the crops they helped grow and sell, and to variability in input subsidies and precipitation.

Proximity to the MMFR and access to labor opportunities associated with logging work in and around the reserve, had a stronger effect on vulnerability than gender. In the village of Muhiyo, which is closer to the MMFR, men had more opportunities to perform logging work and women had more opportunities to sell firewood. Their livelihoods, therefore, were more vulnerable to changes in forest-related income, and therefore to changes in forest governance. In Monjomo, just one village away from the MMFR, opportunities for work in the MMFR were more limited; men were more dependent on non-farm work in business and were more vulnerable to economic conditions that affect consumer trends. Similarly, Monjomo's women were more insulated from changes in forest activities, but were also more dependent on farm income.

The Malawi case demonstrated that women were not always more vulnerable to climate variability; the pooling of resources in the household helped balance risk and vulnerabilities between men and women. Spatial proximity to non-farm work opportunities, and people's degree of reliance on agricultural income, also had an important role that binary gender analysis would not have captured in determining intra-gender differences in vulnerabilities across villages.

OUTCOMES

Gender and Climate Change in Agrarian Settings has been disseminated widely to academic and development practitioner communities through publications, networks, and presentations. It established USAID's thought leadership in the vulnerability assessment process, particularly as it related to comprehensive analysis of the intersection between gender and other social identities, such as age, livelihood, and ethnicity. The technical report argued that gender issues need to be addressed in a manner that moves beyond conventional binary approaches, providing guidance on which factors to consider, which techniques and methods to use, and what type of analysis to conduct to capture distinct and differentiated vulnerabilities.

The suggested research methods for similar studies included the use of the Livelihoods as Intimate Government (LIG) approach; as well as qualitative assessment tools, such as interviews, participant observation, and focus groups. The report indicated that findings could then be generalized, translated into a broader context, and linked to large-scale datasets to contribute to a better understanding of decision-making processes. The cross-cutting information and case studies in the research benefits both gender and adaptation practitioners as they identify effective adaptation strategies for each development context. The study also suggested that adaptation interventions would benefit from moving beyond binary gender analysis in project design, implementation, monitoring, and evaluation.

Although outcomes of using the approach presented in the technical report have not yet been documented, USAID is taking key next steps to ensure these findings and recommendations are put into practice. The steps include conducting focused pilot studies that (1) identify more effective means of incorporating the new understanding of gender and socioeconomic identity into the design and implementation of adaptation interventions, and (2) help inform new tools and guidance. USAID is also building training modules for USAID staff and partners that reflect the current state of knowledge, present pilot findings, and demonstrate how to conduct gender analysis differently. In addition, CCRD's Working with Marginal Populations: An Annex to the USAID Climate-resilient Development Framework (see Chapter 2) provides guidance for USAID staff and development practitioners on considering differences in vulnerability across populations.

KEY PRODUCTS

Title and URL	Description
Gender and Climate Change in Agrarian Settings, 2013 https://goo.gl/gohxrR	This report described in detail the Ghana, Mali, and Malawi case studies and how each contributed to understanding the interactions between climate change and gender roles.
Piloting Intersectional Gender Assessments in Malawi: Challenges and Lessons Learned https://goo.gl/VLcyux	A lessons learned report from a pilot program in Malawi. The pilot explores how gender matters in the context of the activities and stressors addressed by a proposed project or program.
Assessing Climate Service Needs In Kaffrine, Senegal: Livelihoods, Identity, And Vulnerability To Climate Variability and Change https://goo.gl/yinD5I	Conducted in Kaffrine, Senegal, this assessment demonstrates an approach to identifying farmer needs to inform the design of effective climate services and the monitoring and evaluation of new services as they are implemented.
Gender and Climate Change in Agrarian Settings, Factsheet, 2014 https://goo.gl/WEsraF	Provided a summary of the Gender and Climate Change in Agrarian Settings report.
Gender and climate change adaptation in agrarian settings: Current thinking, new directions, and research frontiers, Geography Compass 8(3):182–197, 2014 http://onlinelibrary.wiley.com/doi/10.1111/gec3.12121/abstract	An expanded version of the literature review, aimed at academic community members who are interested in adaptation and gender.





SECTION 10
LOOKING AHEAD

INTRODUCTION

The previous chapters of the Compendium have described the work of the CCRD team over the last four years. The work has included collaboration with USAID to prepare the Climate-Resilient Development Framework and annexes, application of the Framework in support of national and local adaptation planning, case studies, and capacity building, and gap-filling research, knowledge management, and technical assistance related to climate risks in high mountain communities, climate services, and urban adaptation. In addition, CCRD's small grants program has engaged researchers, analysts, and trainers to test the Framework, improve assessment methods, and build capacity in local communities through training and outreach.

While the CCRD team has completed a substantial volume of work, these efforts in sum are merely a “work in progress.” Over the last few months, CCRD has had the opportunity to share the team's work in the Advancing Climate-Resilient Development Symposium in March 2015 and engage with USAID and adaptation implementers and practitioners to explore ideas that build on CCRD's work. This chapter provides a summary of some of the next steps that could be carried out under USAID's leadership. For each of the four main topical areas – the Framework and annexes, high mountain adaptation, climate services, and urban adaptation, CCRD results are summarized, followed by a short discussion of new directions. The list of next steps described in the chapter is not prioritized or exhaustive. Hopefully, this discussion will engender new work and continue the dialogue needed to help developing countries respond to climate change and variability.

CLIMATE-RESILIENT DEVELOPMENT FRAMEWORK

The Climate-Resilient Development Framework provides a flexible approach for mainstreaming climate into development planning and implementation. The Framework represents a convergence of adaptation and development planning designed to strengthen the development context of the former and the consideration of climate stressors in the latter. CCRD and USAID have tested the Framework in national adaptation planning, helped local communities develop LAPAs, applied the Framework in a sector case study, and trained local experts in applying the Framework in sector and community adaptation planning.

In reviewing this body of work, the CCRD team has identified three areas for follow-on activities:

CONTINUED TESTING AND APPLICATION OF THE FRAMEWORK

Over the last decade, the majority of USAID's adaptation pilots and case studies have focused on assessment and design, and more recently scoping the development context. Getting to implementation has been difficult because of the limited engagement of the CCRD technical assistance teams and the lack of resources and commitment to operationalize plans and strategies by developing country governments and community partners. USAID has the opportunity with the global interest in NAPs and the potential for significant financing through the

Green Climate Fund to support national adaptation planning efforts that would cover all five stages of the Framework. This would likely require commitments to longer timeframes than are typical of USAID and other donor projects. In addition, getting to implementation at sub-national, community, sector scales is essential to gain experience in the full development-first process.

EVALUATION OF THE FRAMEWORK

Related to the point above, it is difficult to evaluate applications of the Framework unless there is continuation to implementation after the strategy or plan has been designed. There are two levels of evaluation of interest: (1) assessing the performance of adaptations and other measures implemented in terms of their contribution to desired development outcomes; and (2) assessing the process by which the implementation plan was developed. Clearly, the second type of assessment occurs if the development outcomes are deficient to determine if the poor outcomes are a result of poor assessment, poor design, or poor implementation

IMPROVEMENTS TO THE FRAMEWORK

Throughout the process of preparing and testing the Framework, the CCRD team and USAID have discussed a number of areas for potential improvement. Three areas of improvement are discussed below.

- **Integrated assessment.** The most important of these improvements concerns the current treatment of climate and non-climate stressors in assessment and design. After climate and non-climate stressors are identified in the Scope stage, the focus in both the Assess and Design stages is limited to climate stressors, although some recognition is given to potential interdependencies with non-climate stressors. This limitation means that climate issues are prioritized against other climate issues, and adaptations are selected based on a comparative analysis of adaptation options. For development planning at all scales, it may be the case that the most urgent and highest priority problems relate to non-climate stressors rather than climate stressors. What is required is an integrated assessment approach with both types of stressors considered in assessing problems and solutions.
- **Horizontal and vertical linkages.** Even with growing attention on NAPs, there will continue to be considerable planning at other scales. An issue that the Framework does not address is how vertical and horizontal linkages in development contexts should be addressed. A good example of this issue was discussed in Chapter 2. In Madagascar, several sector plans were developed without recognizing or accounting for finite availability of land for new roads, agriculture, tourism development, and protected area management. Also, the LAPA for the Khumbu region in Nepal included actions and investments where implementation would be difficult without financial support from the national government. Accounting for development context in other plans has both process and methodological aspects; how to bring other contexts into the planning process and how to adjust the first three stages of the Framework to account for these vertical and horizontal linkages.
- **Monitoring and evaluation.** M&E continues to be one of the key challenges associated both with development and adaptation planning and implementation. If climate-resilient development planning is to be successful, attention must be focused on establishing an effective program to monitor performance of strategies, plans, and projects in order to facilitate adjustments in either the design or implementation of options. In addition, climate and non-climate stressors are dynamic, not static. Options that seemed to be an appropriate response to stressors at the time the plan was developed may no longer be optimal in light of new information. The Framework recognizes the importance of M&E in the Evaluate and Adjust stage. However, there is considerable work still needed to help communities select and monitor performance indicators and design evaluations that definitively determine root causes of poor performance.

HIGH MOUNTAIN ADAPTATION

Under CCRD, significant advances were made in the science of GLOF assessments. The new assessment tools have been applied in the Himalayas and Andes regions and the results of climate risk/GLOF studies have helped mountain communities address climate risks in local planning. With support from CCRD under HiMAP and climber-scientist grants, the community of practice has increased the knowledge base and raised awareness of high mountain adaptation issues.

Although GLOFs are a risk in only a few mountain ranges, there are still unmet needs to inventory glacial lakes, assess risks, and integrate this information into local plans. The recent decision by the Government of Nepal in the aftermath of the recent earthquake and aftershocks to expand the assessment of GLOF risks to a larger number of glacial lakes than had previously been assessed is a step in the right direction. There needs to be financial support and a commitment among researchers to sustain the HiMAP community of practice and continue the highly successful south-south exchanges that were initiated in 2009 in Peru and continued with support from the Adaptation Partnership in 2011 and CCRD in 2013. Also, there are opportunities to build on the relationships forged with those facing GLOF risks in Central Asia.

While lessons learned and glacial lake management case studies have been developed for Peru and Nepal, the practice of assessing and addressing GLOF risk needs to be compiled to determine similarities and differences in approaches in Asia and South America. There are also interesting applied research questions associated with understanding how climate change is affecting the contributions of snow and ice to downstream water supplies.

CLIMATE SERVICES

The Climate Services Partnership has become a viable global network of scientists, services providers, donors, and users of climate services. Through its support for the CSP Secretariat, development of new forecasting tools, transfer of technologies, capacity building and assessment, CCRD has contributed in advancing awareness, knowledge, and the adoption of climate services.

Similar to HiMAP, financing resources will be required to sustain the activities of the CSP. While funding is in place to support the CSP Secretariat, many of the technical assistance, capacity building, and assessment activities will be difficult to continue without support from donors and the WMO. In some cases, the costs of facilitating the adoption or scaling up of new tools such as the drought forecast developed for Jamaica may not be very high.

The collaboration between CCRD, WMO, and the World Bank has created considerable interest among national climate services providers to conduct valuation studies of their services. If the capacity to conduct valuation studies can be increased in developing countries, it may be possible to carry out studies at reasonable costs using universities and research institutes in the region. Such work would build capacity to conduct studies and help climate services providers make the case for current and/or higher levels of funding. There is a window of opportunity to make a significant contribution to the knowledge base and generate success stories in developing countries in advance of the upcoming Madrid +10 conference in 2017 that will focus on valuing weather, hydrometeorological, and climate services.

URBAN ADAPTATION

In the CRIS pilots and cities in Vietnam and Macedonia, municipal partners have taken steps to mainstream climate considerations into planning process and decision making on adaptation actions and investments. CRIS tools have been developed, Cascadia's CIMPACT-DST assessment tool has been tailored for use in Vietnam, and Milieucontact in Macedonia has revised their Green Agenda planning process to explicitly consider climate stressors.

With four CRIS pilots and work in Vietnam and Macedonia, we have only begun to tackle the opportunities in terms of the range of climate concerns faced by communities. It would be beneficial to test the climate-resilient development approach and assessment tools in urban areas of varying populations and development and economic contexts. While lessons learned from CCRD's urban adaptation work has been compiled and all tools are readily accessible on various websites, a more proactive approach for sharing knowledge may be needed to supply the appropriate catalyst for new pilots and projects to support urban adaptation planning and implementation.

The other important challenge relates to financing for urban adaptation. There is a need to build capacity in urban areas to compete for project resources that will be increasingly available as the Green Climate Fund becomes operational. Success in accessing non-budget or project resources for investments and other adaptation actions will depend on the quality of proposals, drawing on good assessments of specific climate and non-climate stressors and credible processes for prioritizing problems and developing solutions. Regional and national adaptation financing capacity may be required to provide training for city staff on adaptation planning and financing or provide project preparation assistance for smaller cities with limited staff.

REFERENCES

1. Throughout the compendium, “activities” refer to individual tasks and to groups of tasks organized under major initiatives termed “programs” (e.g., Climate Services Program) or “partnerships” (e.g., High Mountain Adaptation Partnership).
2. National Workshop on Assessing Climate Change Impacts to Madagascar’s Biodiversity & Livelihoods with Recommendations for Adaptation, January 2008, Antananarivo, Madagascar.
3. USAID (2014) *Climate-Resilient Development: A Framework for Understanding and Addressing Climate Change*, Washington, DC.
4. See Section 3.3 for an illustration of how elements of the Climate-Resilient Development Framework were incorporated into an existing planning process.
5. In conjunction with the Climate Services Roundtable, the CRW project commissioned an independent study on weather and climate services to support the wheat sector and agriculture more generally: S.S. Baisholanov, *Agrometeorological Support of Agriculture of the Republic of Kazakhstan*, UNDP, 2013. Under the Climate Services Partnership (CSP), CCRD prepared an assessment of Kazakh climate services using an assessment methodology developed by CSP: G. Anderson and Y. Kim, *Mid-Level Assessment: Climate Forecasting in Kazakhstan*, USAID, 2014.
6. Twelve regional adaptation summaries were prepared for the Adaptation Partnership by the International Institute for Sustainable Development. They can be downloaded on the Adaptation Partnership website.
7. Three Adaptation Partnership workshops were conducted prior to CCRD in Uruguay (2010) and Samoa and Senegal (2011). Summaries of these workshops are provided on the Adaptation Partnership website.
8. Decision No. 15812008/QĐ-TTg. 2008. Approving the National Target Program on Response to Climate Change. December 2. Available: <http://faolex.fao.org/docs/pdf/vie85707.pdf>. Accessed June 2, 2015 and Decision No. 2623/QĐ-TTg. 2013. Approval of Scheme “Urban Development of Vietnam Responding to Climate Change in the Period 2013–2020. December 31. Available: www.ngocentre.org.vn/webfm_send/6483. Accessed June 2, 2015.
9. Note that one additional grant, for a project in Pakistan, was canceled due to security concerns.



www.CCRDProject.com



Climate Change Resilient Development library:
www.CCRDProject.com/ccrd-library



www.usaid.gov/climate