USAID
FROM THE AMERICAN PEOPLE

ADAPTING TO CLIMATE VARIABILITY AND CHANGE

A GUIDANCE MANUAL FOR DEVELOPMENT PLANNING

August 2007

Photo Credits (Clockwise from Upper Left):

(Upper Left) An aerial view shows flooded fields after heavy monsoon rains on the outskirts of the central Indian city of Raipur, June 30, 2007. The onset of the rainy season brought severe weather to much of South Asia, killing more than 500 people in storms and floods in Afghanistan, India and Pakistan. REUTERS/Desmond Boylan(India).

(Upper Right) Fishing in seasonal wetlands in the Lower Songkram River Basin in Thailand. IUCN, 2006.

(Lower Right) An India farmer inspects what's left of his crop during a drought near Patiala in the northern state of Punjab, July 17, 2002. REUTERS/Dipak Kumar.

(Lower Left) A farmer in Northern Niger drinks from a well used for irrigating dates, grain and other crops in the Sahara. John Furlow, Niger, 2003.

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ACRONYMS

USAID	United States Agency for International Development
GCC	Global Climate Change
GHG	Greenhouse Gas
GDP	Gross Domestic Product
V&A	Vulnerability and Adaptation
IPCC	Intergovernmental Panel on Climate Change
EGAT	Bureau for Economic Growth, Agriculture and Trade
CRiSTAL	Community-based Risk Screening Tool – Adaptation & Livelihoods
CFR	Code of Federal Regulations
GCM	General Circulation Models (Global Climate Models)
NGO	Non-Governmental Organization
MIRA	Manejo Integrado de Recursos Ambientales (Integrated Management of Environmental Resources - USAID project in Honduras)
UNEP	United Nations Environment Programme

PREFACE

Climate change may pose risks and/or create opportunities for development efforts in many countries. The USAID Global Climate Change Team developed this Adaptation Guidance Manual to assist Missions and other partners to understand how climate change may affect their project outcomes and identify adaptation options to integrate into the design for more resilient projects. In developing the Manual we worked under the following assumptions:

- Climate variability already impacts economic sectors in developing countries and addressing climate variability and change will be important for the long-term success of development assistance;
- Project managers and stakeholders will know more about a project than we will (or than a tool can anticipate); project managers are already dealing with uncertainty such as weather and markets;
- We can assist missions/project managers/project designers by providing methods and information (and we are developing a tool to provide access to appropriate climate information, past and future) to facilitate assessment of possible impacts and adaptation options for projects;
- Stakeholder involvement is critical – local knowledge and memory of climate changes over time can help identify adaptation options; building stakeholder ownership of project design and implementation is key to project success.
- The methods employed should be simple enough to meet needs in the field, but provide rigorous enough information on which to base decisions.

This Adaptation Guidance Manual is the first of several tools we are developing to assist planners and stakeholders as they cope with a changing climate. As we work with Missions to apply the methods described here, we will revise the Manual to reflect Mission feedback and needs. We will also develop additional tools as needed. We look forward to working with Missions and other development partners to build more robust and resilient development activities.

ACKNOWLEDGEMENTS

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We appreciate the support and guidance of the USAID/EGAT Global Climate Change Team. In particular, we wish to thank John Furlow, Jonathan Padgham, Duane Muller, and Bill Breed. We also want to thank Ko Barrett, now at the National Oceanographic and Atmospheric Administration's Climate Program Office, for initiating the project and beginning the pilot studies.

We would also like to thank Joel B. Smith and Stratus Consulting for work done to develop the original version of this Manual. Stratus also led three of the pilots that informed and tested the development of the manual. Ken Strzepek and Kris Ebi provided invaluable support to Stratus and USAID in the conduct of the pilots and the development of the manual, and continue to provide support as we move from development to implementation. (A full list of contributors to all the pilots is included in Annex 1.)

We would especially like to thank the staff and contractors of the USAID Missions in the pilot countries. In particular, we wish to thank Peter Hearne of the USAID Mission in Tegucigalpa, Honduras; Sarah Wines, Melissa Knight, Nkosiphambili Ndlovu, and Plaatjie Mahlobogoane of the USAID Mission in Pretoria, South Africa; Jean Harman and Augustin Dembele of the USAID Mission in Bamako, Mali; and Orestes Anastasia and Winston Bowman of the Regional Development Mission for Asia in Bangkok, Thailand. Without their support and guidance, we would have been unable to carry out the pilot studies.

Finally, we appreciate the useful comments and suggestions on the draft guidance manual from a number of climate change and policy specialists including: James Hansen and Steve Zebiak (The International Research Institute for Climate and Society, Columbia University); Habiba Gitay (World Bank Institute); Richard Volk, Doreen Robinson, and Ken Baum (USAID/EGAT); Heather D'Agnes (USAID Global Health Bureau); and Jean Brennan (formerly USAID/EGAT).

WHY IS CLIMATE CHANGE IMPORTANT?

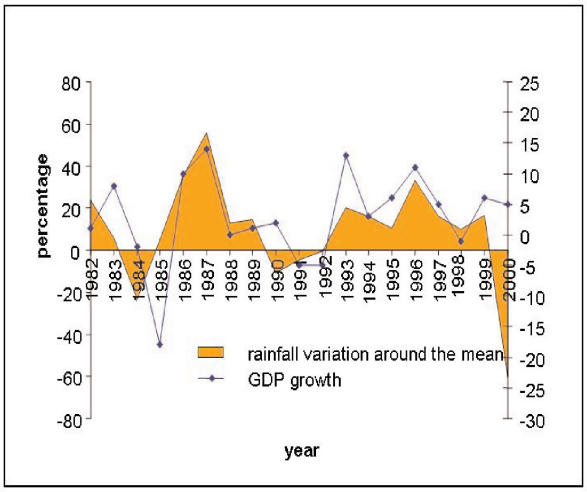
Climate change creates both risks and opportunities worldwide. By understanding, planning for and adapting to a changing climate, individuals and societies can take advantage of opportunities and reduce risks.

The consequences of climate variability and climate change are potentially more significant for the poor in developing countries than for those living in more prosperous nations. Vulnerability to the impacts of climate change is a function of exposure to climate variables, sensitivity to those variables, and the adaptive capacity of the affected community. Often, the poor are dependent on economic activities that are sensitive to the climate. For example, agriculture and forestry activities depend on local weather and climate conditions; a change in those conditions could directly impact productivity levels and diminish livelihoods. Climate change has the potential to affect USAID activities in all objective areas described in the Policy Framework (See Exhibit 4). Adapting to climate change involves reducing exposure and sensitivity and increasing adaptive capacity. Depending upon the development challenge being addressed, this may be done by modifying a traditional approach or by taking a new approach.

Climate variability can cause abrupt disruptions, such as floods, droughts, or tropical storms. These disruptions can take a major toll on a country's economy if a significant part of economic activity is sensitive to the weather and climate. Ethiopia provides a good example of the influence of climate variability on a developing country's economy. Exhibit 1 shows that GDP in Ethiopia rises or falls about a year behind changes in average rainfall. With agriculture accounting for half of GDP and 80% of jobs, the Ethiopian economy is sensitive to climate variability, particularly variations in rainfall.

Small countries with GDP concentrated in a few climate-sensitive sectors can see substantial portions of their land area and economic sectors affected by extreme weather events and disasters. Resources spent on disaster response can tie up a significant share of GDP; recovery, rather than growth, becomes the goal. Hurricane Mitch hit Honduras in October, 1998. Coastal areas were lashed by winds and waves, but some of the worst damage resulted from several

EXHIBIT 1 - GDP AND RAINFALL IN ETHIOPIA



Source: The World Bank. "Managing Water Resources to Maximize Sustainable Growth: A Country Water Resources Assistance Strategy for Ethiopia." 2005.

TEGUCIGALPA - NOVEMBER 2: Tegucigalapa residents look at some of the homes destroyed by a mudslide on Cerro El Berrinche on November 2, 1998. The mudslide was triggered by heavy rains from what was Hurricane Mitch. Honduran officials put the death toll at 5,000 people with half a million left homeless. (Photo by: Yuri Cortez/AFP/Getty Images)

straight days of torrential rains. Over a meter of rain fell and contributed to flooding and landslides. Before it was over, more than 5,000 people were reported dead or missing, and 1.5 million people lost their homes. Damages totaled $3 billion, including the loss of the entire banana crop. Roads were damaged and 68 bridges were swept away.[1]

Anticipating climatic variability and change while designing resilience into development assistance can lead to more robust projects that serve their target populations better. In some cases, projects may not be designed to cope adequately with current climate variability. In even more cases, they may not be able to cope with climate change. This creates the risk that services provided will be inadequate or that projects will become obsolete prematurely.

For example, flood protection projects are designed to protect against a flood of some magnitude and frequency, such as "the 50-year flood." This designation means that a flood of a certain level has a probability of occurring once every 50 years, or a 1-in-50 chance of occurring in any year. Over time, flood risks may change due to land use and/or climatic changes. A flood level that in the past would have been expected to occur once in a 50-year period could now be expected to occur more frequently (e.g., once in 25 years) and, in general, floods will be of greater magnitude. This clearly has implications for the design of flood protection projects, infrastructure, water management, and development planning in general. In another example, the World Bank estimates that maximum hurricane losses can be reduced by a third in the Caribbean by investing just 1% of a structure's value in measures to reduce vulnerability.[2]

About a quarter of the World Bank's portfolio is subject to a significant degree of risk from current and future climates. As of 2005, only about 2% of projects discuss these risks in the project design documents.[3] USAID has not conducted a comparable analysis, but USAID invests hundreds of millions of dollars in programs to improve agriculture, human health, urban programs, natural resource management, and disaster response and management. If we hope to promote sustainable development, it seems we must consider the role that climate plays in the success or failure of development efforts.

CLIMATE CHANGE TERMINOLOGY

"Climate is what you expect, weather is what you get"

WEATHER describes atmospheric conditions at a particular place in terms of air temperature, pressure, humidity, wind speed, and precipitation.

CLIMATE is often defined as the weather averaged over time (typically, 30 years).

CLIMATE VARIABILITY refers to variations in the mean state of climate on all temporal and spatial scales beyond that of individual weather events. Examples of climate variability include extended droughts, floods, and conditions that result from periodic El Niño and La Niña events.

CLIMATE CHANGE refers to shifts in the mean state of the climate or in its variability, persisting for an extended period (decades or longer). Climate change may be due to natural changes or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

VULNERABILITY to the impacts of climate change is a function of exposure to climate conditions, sensitivity to those conditions, and the capacity to adapt to the changes.

ADAPTATIONS are actions taken to help communities and ecosystems moderate, cope with, or take advantage of actual or expected changes in climate conditions.

Definitions are based on IPCC Climate Change 2001 and 2007 Impacts, Adaptation and Vulnerability reports as well as OECD's report, "Bridge Over Troubled Waters" and an article prepared by OECD staff, Levina and Tirpak.

WHAT IS USAID DOING ABOUT CLIMATE CHANGE?

USAID's Global Climate Change Team, in the Bureau for Economic Growth, Agriculture and Trade (EGAT), has been working to address the causes and effects of climate change since 1991. USAID has funded programs that have reduced growth in GHG emissions while promoting energy efficiency, forest conservation, biodiversity, and other development

[1] (http://honduras.usembassy.gov/english/mission/sections/eco_11.htm).

[2] Charlotte Benson "Guidance Note 1," Tools for Mainstreaming Disaster Risk Reduction," Provention Consortium, http://www.proventionconsortium.org/themes/default/pdfs/tools_for_mainstreaming_GN1.PDF

[3] Clean Energy and Development: Towards an Investment Framework." Prepared for the World Bank-International Monetary Fund Development Committee meeting, April 23, 2006, World Bank, Washington, DC, p. 120.

EXHIBIT 2 - V&A PILOT STUDIES

PILOT STUDY	CLIMATE ISSUES	ILLUSTRATIVE ADAPTATIONS
La Ceiba, Honduras Coastal city supported by USAID to develop tourism	Flooding, storm surges, and sea level rise (coastal erosion)	Urban drainage system, higher levees, watershed restoration, lining the river bed and building channels through the city to divert flood waters, construction of groins, construction of breakwaters offshore
Polokwane, South Africa Rapidly growing city supported by USAID to develop water infrastructure	Water supply reduction	Construction of water dams, water conservation and demand management, recycling of water
Zignasso, Mali Agricultural village supported by USAID to develop livelihoods strategy	Rise in temperatures and increase in variability of precipitation	Construction of a water gate for flood irrigation, increase crop diversification, use of improved soil management practices, access to agriculture equipment and fertilizer
Lower Songkram River Basin, Thailand Area with diversified fisheries / agricultural livelihoods strategy	Flooding, longer wet season	Shifts to flood-tolerant crops, agro-forestry, and aquaculture, construction of weirs, provision of upland grazing areas, new market development, reformed compensation programs for flood loss

goals. To help project planners understand and address the climate's impacts on their projects, the GCC Team has developed this Guidance Manual. The Team conducted four pilot studies to develop and test the approaches described here. The studies focused on different sectors and different vulnerabilities on three continents where USAID works. Exhibit 2 describes the location of each study, the vulnerability addressed, and adaptation options identified. This Manual provides guidance on how to assess vulnerability to climate variability and change, as well as how to design or adapt projects so that they are more resilient to a range of climatic conditions. The GCC Team is available to further assist Missions as they use the Manual.

CLIMATE IMPACTS AND DEVELOPMENT

While climate change is global in nature, potential changes are not expected to be globally uniform; rather, there may be dramatic regional differences. Considerable effort has been invested to understand climate change at the regional level.

The key impacts of climate change are associated with the climate-related parameters of sea level rise, changes in the intensity, timing and spatial distribution of precipitation, changes in temperature (variation and mean values), and the frequency, intensity, and duration of extreme climate events such as droughts, floods, and tropical storms. Exhibit 3, on the next page, summarizes some of the anticipated trends in climate and related impacts.

Climate may impact projects and programs in a variety of sectors and operational areas. A cursory review of the U.S. Foreign Assistance Guidance on Operational Plans suggests that all five Objective Areas could feature projects and programs potentially impacted by climate (see Exhibit 4 on p. 5).

Wet season rice cultivation: In the Lower Songkram River Basin in Northeast Thailand, livelihoods are adapted to seasonal flooding (IUCN, 2006)

EXHIBIT 3 - CLIMATE CHANGES AND IMPACTS

PHENOMENON AND DIRECTION OF TREND	LIKELIHOOD OF FUTURE TRENDS BASED ON SRES SCENARIOS	EXAMPLES OF MAJOR PROJECTED IMPACTS BY SECTOR			
		AGRICULTURE, FORESTRY AND ECOSYSTEMS	WATER RESOURCES	HUMAN HEALTH	INDUSTRY SETTLEMENT AND SOCIETY
Over most land areas, fewer cold days and nights, warmer and more frequent hot days and nights	Virtually certain	Increased yields in colder environments; decreased yields in warmer environments; increased insect outbreaks	Effects on water resources relying on snow melt; effects on some water supply	Reduced human mortality from decreased cold exposure, increased mortality and illness due to malaria	Reduced energy demand for heating; increased demand for cooling; declining air quality in cities; reduced disruption to transport due to snow, ice; effects on winter tourism
Warm spells/heat waves. Frequency increases over most areas	Very likely	Reduced yields in warmer regions due to heat stress; wild fire danger increase	Increased water demands; water quality problems, e.g., algal blooms	Increased risk of heat-related mortality, especially for the elderly, chronically sick, very young and socially-isolated	Reduction in quality of life for people in warm areas without appropriate housing; impacts on elderly, very young and poor
Heavy precipitation events. Frequency increases over most areas	Very likely	Damage to crops; soil erosion, inability to cultivate land due to water logging of soils	Adverse effects on quality of surface and groundwater; contamination of water supply; water scarcity may be relieved	Increased risk of deaths, injuries, infectious, respiratory and skin disease	Disruption of settlements, commerce, transport and societies due to flooding; pressures on urban and rural infrastructures; loss of property
Area affected by drought increases	Likely	Land degradation, lower yields/crop damage and failure; increased livestock deaths; increased risk of wildfire	More widespread stress on water supply or availability	Increased risk of food and water shortage; increased risk of malnutrition; increased risk of water- and food-borne diseases	Water shortages for settlements, industry and societies; reduced hydropower generation potentials; potential for population migration
Increased incidence of extreme high sea level (excludes tsunamis)	Likely	Salinization of irrigation water, estuaries and freshwater systems	Decreased freshwater availability due to saltwater intrusion	Increased risk of deaths and injuries by drowning in floods; migration-related health effects	Costs of coastal protection versus costs of land-use relocation; potential for movement of populations and infrastructure

Information for this exhibit was taken from "Climate Change Impacts, Adaptation and Vulnerability - Summary for Policy Makers of the Working Group II (World)," IPCC, http://www.ipcc-wg2.org/.

EXHIBIT 4 - CLIMATE CHANGE IMPACTS AND ADAPTATIONS IN USAID OBJECTIVE AREAS

OBJECTIVE AREAS	IMPACTS OF CLIMATE CHANGE	ADAPTATION RESPONSES
Peace and Security	**Extreme weather** events, **including droughts and floods, sea level rise,** and increased **spread of disease** act as threat multipliers that can foster instability, reduce living standards, rekindle or engender internal or transnational conflicts, and undermine ongoing support to promote peace and security.	Mitigate risk of conflict by strengthening institutional capacity to respond to extreme climate events, promote resilience in livelihood strategies, develop early warning response and mitigation programs, support insurance and other safety net programs, support capacity to manage conflicts at local and national level. Climate resilience can mitigate risk of conflict.
Governing Justly and Democratically	**Extreme weather** events, including **droughts** and floods, and **sea level rise** can disrupt efforts to strengthen civil society and increase participation of marginalized groups in governance. Governance is a tool for building resilience; failure to implement and enforce zoning and environmental regulations often results in development that increases vulnerability to climatic stresses.	Incorporate disaster planning response and mitigation into governance systems; engage vulnerable civil society groups in participatory fora to address their vulnerability and identify adaptations to climate impacts; examine existing laws and regulations for opportunities to improve governance and resilience to climate variables.
Investing in People	Increased prevalence of **vector-borne diseases** (e.g., malaria, dengue), increased risk of **malnutrition** due to decreased food availability and quality, **ill health effects** of reduced access to clean drinking water, increased **risk of death** from extreme weather events.	Broad scale immunization; early warning systems and public information (e.g., high ozone days, heat index); increased access to primary care and preventive care (e.g., mosquito nets, broad spectrum drugs); improved disaster preparation and emergency response.
Economic Growth	*Agriculture* – Increased **temperatures** result in higher yields in some areas but lower yields due to higher rate of evapotranspiration and water deficits, increased incidence and range of **pests and diseases, extreme weather** events cause flooding, crop loss and erosion, drought results in reduced crop yields.	*Agriculture* – Genetic improvement to produce drought-tolerant crops, translocation of crops and changes in cropping patterns; afforestation to condition soils, improve water infiltration, and provide shade, increased water use efficiency, diversification into non-farm activities, crop insurance and microcredit schemes.
	Environment – Higher **temperatures** and **drought** lead to increased incidence of **forest fires**, changes in temperature and **precipitation** can cause changes in flora and fauna ranges and potential losses of biodiversity, **extreme weather events** can damage coastal ecosystems, coral reefs and mangroves.	*Environment* – Seawalls, beach nourishment, regulation to discourage development in coastal and other threatened areas; forest management to reduce potential for forest fires, set aside protected areas for threatened flora and fauna; enforce ban on trade in endangered species; afforestation and reforestation; community management of forests and natural resources to ensure sustainable harvest and regeneration.
	Economic Growth and Trade – Damage and **losses to livelihood assets,** straining of traditional coping systems, increased **debt burden** and long-term **poverty alleviation** efforts undermined, reduced foreign direct and local investment in areas vulnerable to climate variability and change impacts.	*Economic Growth and Trade* – Diversification of livelihoods, local value addition, improved access to markets and finance (e.g., microcredit), technology transfer, use of carbon trading opportunities to increase revenue while putting in place measures that reduce emissions.
	Energy – In some areas, may reduce energy demand because of higher **temperatures,** decreased hydropower potential due to reduced **precipitation;** increased energy demand for air conditioning, damaged dams due to flooding.	*Energy* – Enhance dam structural parameters, change siting of hydropower projects, shift to small hydropower; incorporate future reduced generation capacity in design, integrated water resources and disaster management; improved energy efficiency; widen water channels and periodic draining of vulnerable lakes.
Humanitarian Assistance	Increased need for **post-disaster relief** and reconstruction, increased pressure on **disaster management** systems.	Capacity building of local communities to assist in relief actions; use of insurance, bonds, and other risk-sharing measures to finance relief and reconstruction; manage risk to reduce impact.

ADAPTATION AND THE PROJECT CYCLE

USAID's development activities proceed through a design process that is generally referred to as the "project cycle." The project cycle includes four basic steps: problem diagnosis, project design, implementation and evaluation. This sequence is viewed as a cycle owing to the dynamic nature of assistance: the completion and evaluation of one project could provide the impetus for a subsequent project to build on the previous project's accomplishments, or address issues that were absent in the previous design or emerged over the course of implementation.

The six-step approach for assessing vulnerability and identifying and implementing climate change adaptations (the V&A approach) follows a developmental path parallel to the more general project cycle. This is not surprising because the V&A approach can be utilized for a stand-alone project or incorporated into a separate project or program. Exhibit 5 illustrates the similarities between the project cycle and the 6-step V&A approach.

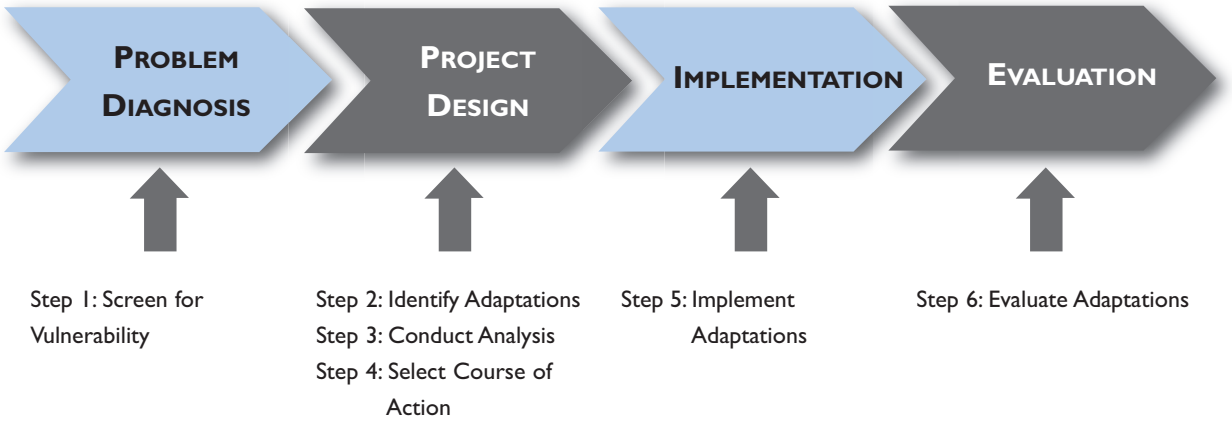
To demonstrate the flexibility of the V&A approach in supporting USAID projects and programs, a few examples are presented below. This discussion is intended only to help project designers see the potential of V&A, not make a decision on whether to add V&A elements. That latter issue is discussed in the next section.

Example 1 – Incorporating V&A steps from project inception (Problem Diagnosis to Evaluation) – Ideally, climate will be considered from the beginning. USAID project designers conduct problem diagnosis and consider climate variability and change as part of that exercise. If there are climate concerns, project modifications will be identified and analyzed as part of project design. Project modifications would be included in implementation and evaluated along with other project activities during and at the end of the project.

Example 2 – Adding adaptations to an ongoing project (Implementation) – In the course of project implementation, USAID and partners identify a flaw in the project related to climate vulnerability and impacts. USAID and implementing partners would conduct V&A Steps 1 through 4 to select modifications to incorporate into the project and then add activities related to the modifications to the implementation or work plan (Step 5).

Example 3 – Capacity building and training program (Implementation) – During project implementation, USAID's partners may request assistance to strengthen capacity to understand and manage water or natural resources in the context of climate vulnerability. This may be a case where USAID doesn't have the resources or flexibility to add adaptations to the existing project but can help partners assess climate impacts and develop

EXHIBIT 5 - THE PROJECT CYCLE AND THE V&A APPROACH



adaptations. This might help USAID's partners to better articulate future donor and multi-lateral development bank assistance needs.

Example 4 – Support for the preparation of Poverty Reduction Strategy Papers (Problem Diagnosis and Project Design) – In this case, USAID may provide advisors to assist in the preparation of a country's strategy to reduce poverty. Such a project provides an opportunity to examine climate vulnerability in the context of livelihoods and the health of impoverished populations and develop adaptations to complement economic, health, and educational policies proposed in the strategy.

Example 5 – Agricultural Competitiveness/Value Chain Analysis (Evaluation and Problem Diagnosis) – V&A might not be relevant to the evaluation of an existing market unless there have been chronic supply breaks due to climate variability; the value chain analysis could be expanded to examine whether drought or flooding risks are accounted for in the production chain and the options for insuring against such risks.

In each example above, the V&A approach is used in a different way. V&A can be incorporated at any stage of the project cycle and tailored to meet the specific needs of the project. The complete six-step V&A approach is most easily incorporated into USAID projects at the initial stage of the project cycle but is flexible enough to be applied at different stages of the project cycle and using only those V&A steps required by the project.

Thai residents walk on a flooded street in the Chon Buri province, about 81km (50 miles) east of Bangkok, September 14, 2005. The weather bureau warned that the depression from the east coast of Vietnam could cause flooding in some areas of Thailand. REUTERS/Sukree Sukplang SS/mk.

FAQS: INCORPORATING V&A INTO PROJECT DESIGNS

We have developed a list of questions and answers that might be asked by project designers and managers about climate change and adding V&A elements to new or ongoing projects.

Question: I am not a climatologist or atmospheric scientist. Do I need to understand the "science" of climate change to include V&A in my project?

Answer: You don't need to be a climate expert, but you do need the information that is available on current and future climate change, and you need to understand how it applies to your project. You should also understand some of the uncertainties surrounding climate change. Much of the analysis from regional-level climate change models has been summarized and provided by a number of international organizations. The CD-ROM provided with the Manual includes a list of reference materials. In addition, the Global Climate Change Team is developing a mapping tool that will provide easy access to information on historical climate data and future climate change scenarios for a country or region. The GCC Team can provide support and put you in touch with additional experts in the field.

Question: Adapting to climate change sounds like a formidable challenge. Does USAID have experience in developing and implementing adaptations?

Answer: USAID project planners already have many of the skills necessary for adapting; what they lack is information. Planners already make decisions despite uncertainty. Agriculture projects are designed with certain assumptions about temperature, weather variability, soils, and markets for crops. Health projects are designed with assumptions about diseases, disease vectors, and human behavior. Infrastructure projects and disaster mitigation projects are designed with assumptions about the weather, population, and flood plains. In many developing countries, people already have adapted to flood-drought cycles and to extreme weather events and disasters. Much of the experience of addressing current climate variability can be applied to longer-term climate impacts. USAID's GCC Team has led four pilot studies that informed the development of this Manual. This Manual, and additional resources found on the CD-ROM, provide information about climate variability and change to development practitioners already accustomed to dealing with uncertainty.

In addition, it is important to remember that vulnerability to climate risks is in part a function of the resilience of the economy. USAID's work already helps reduce vulnerability to climate variability and change by promoting economic growth and diversification.

Question: Once I start with V&A screening at Step 1, do I have to follow all six steps?

Answer: No. The six-step process is flexible in that it can be stopped at any point. If Step 1 screening does not result in a compelling case for adding V&A elements, the process should stop. Even if climate vulnerability is important, it may not be in the manageable interests of USAID to add V&A elements because of information gaps, resource and time constraints, or a lack of commitment among implementing partners. Another logical stopping point is at the conclusion of Step 4. The consultation process on adaptations might result in a set of adaptation recommendations (e.g., investment in infrastructure) that are outside the scope of the USAID project.

There may also be situations where only one or a few steps in the V&A process are to be followed. For example, the project's focus might be to evaluate a current policy, program, or project and determine if its effectiveness is undermined by climate variability, or to hold stakeholder workshops on assessing vulnerability to current droughts and floods. Or, alternatively, a capacity building project might require USAID to provide assistance in developing skills to conduct assessments of adaptation options.

Question: What if my project is underway? Can I add V&A elements to an ongoing project?

Answer: USAID may want to consider adding new components to an ongoing project. The impetus might come from a mid-project review or arise because of an extreme weather event during which the project did not perform effectively.

Question: How much will it cost to add V&A elements?

Answer: In weighing the cost, it is important to recognize that there may be a cost to ignoring the impacts of climate change; a project may not perform as expected, reducing the return on investment and the benefit to the target community. Also, only consider the marginal cost of conducting the analysis and the cost of any modifications to project design; the core project would take place regardless of whether climate impacts are addressed.

Cost depends on a number of factors including the number of steps of the V&A approach that will be undertaken; the geographical scale of the project; how detailed the information on climate variability or change needs to be; and the availability of data and analyses. In previous V&A case studies, Step 1 and Step 2 involved minimal costs, similar to the costs of organizing and conducting an inception meeting and series of stakeholder meetings. Cost will be more variable at Steps 3, 5 and 6. For step 3, impact analysis can be quite costly if it involves original research, while costs for Steps 5 and 6 depend on the types and numbers of adaptations selected and the activities needed to support implementation. The GCC team is developing a better understanding of the cost and the level of involvement required of different partners as we conduct additional studies using this Manual. As we learn from new projects, we aim to lower the cost and simplify the process.

Question: How will adaptation help me to better promote development goals?

Answer: Attention to V&A will help avoid uncertain reductions in project effectiveness that can result from extreme weather events and changes in average conditions. By improving resilience and better contingency planning, climate-related impacts can be better absorbed by implementing partners. Furthermore, the incorporation of V&A considerations in project design can inform and potentially enhance your assessment of potential environmental consequences of USAID funded-activities, as per Title 22, CFR Part 216 (Environmental Procedures).

Question: How can I learn more?

Answer: The Global Climate Change Team in USAID/EGAT can provide resources, answer questions, help connect missions with regional experts, and in some cases, assist missions with the screening of climate-related vulnerability and impacts or the design of V&A elements in new or ongoing projects. Questions for the GCC Team should be directed to: John Furlow (jfurlow@usaid.gov); Telephone: 202-712-5274.

INTEGRATING V&A ELEMENTS INTO PROJECTS

This section describes the six-step approach for incorporating V&A elements into project designs, as illustrated previously in Exhibit 5 and Exhibit 6 (on the next page). Example 1 (Incorporating V&A Steps from Project Inception), the ideal example and the only one that involves all six steps, will be used here to help illustrate this six-step approach. As noted earlier, four V&A pilot studies[4] were undertaken to test and demonstrate the V&A methodology during the preparation of this Manual and examples are drawn from these studies to illustrate individual steps and highlight the flexibility of the V&A approach. Final reports and supplementary documents for the four pilot studies are available on the supplementary CD-ROM provided in the pocket inside the back cover of the Manual.[5]

STEP 1: SCREEN FOR VULNERABILITY

Step 1 involves screening a current or proposed project design to determine if it might be affected by climate variability or climate change. Even if climate issues are important, USAID must also determine if it is within its manageable interests, capacity, or resource constraints to invest in additional V&A steps. When making this decision, please bear in mind that there may be costs to not modifying the project, if climate change reduces project performance. In theory, such a "go/no-go" decision can be taken at any step in the V&A approach. However, the go/no-go decision is described with Step 1 as it is at this point (and at Step 4) that such a decision is most likely to be made.

SCREENING OF CLIMATE IMPACTS AND RELEVANCE TO THE PROPOSED PROJECT

The screening of climate impacts determines how climate relates to the proposed development project or program. This entails a two-part assessment – first, what do the climate data and models tell us about changes in climate variability and climate change in the geographical area covered by the project; and second, how will these potential changes in climate impact the relevant sectors in the development project. Some development sectors are more climate sensitive than others. Projects in the following areas may be particularly sensitive: agriculture, water resources, natural resources management (forestry, fisheries, land use management), construction, health, energy, and coastal development and management.

Ideally, Step 1 involves an extensive review of current climate data, recent climate trends, and climate scenarios, preferably analyzed at the same geographic scale as the proposed project. However, the time and resources that a USAID Mission can devote to the assessment of climate change are often limited. As a result, missions will likely need to rely on readily available information and expert opinion to assess

GCC TEAM SCREENING ASSISTANCE

- The CD-ROM provided with the Guidance Manual includes a number of source documents for climate information and impact analysis.
- GCC Team staff is available to assist Missions in conducting the screening step, if requested.
- The GCC Team is developing a mapping tool designed to assist Missions in screening climate impacts. The tool's start-up window will be a world map from which Missions will be able to click on their country/region on the map to access data and analysis tailored to their geographical area including:
  - Historical climate data and sources of climate data;
  - Regional climate change models and modeling scenarios for the major climate parameters;
  - Information on climate variability/climate change impacts tailored to the region and relevant development sectors.

[4]USAID contracted with Stratus Consulting Inc. to prepare the pilot studies in Honduras, Mali, and South Africa and with International Resources Group to prepare the pilot study in Thailand.

[5]The International Institute for Sustainable Development has developed a tool called CRiSTAL (Community-based Risk Screening Tool – Adaptation & Livelihoods) that may help you organize information about your project. The tool runs in Excel and can be downloaded at: http://www.iisd.org/security/es/resilience/climate_phase2.asp

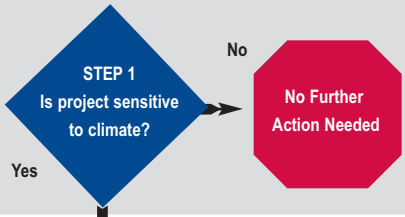
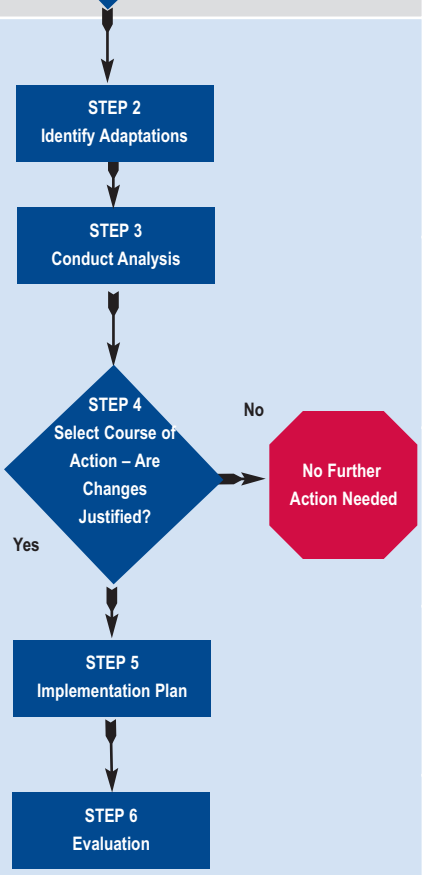
potential changes in climate parameters and climate impacts. The GCC Team offers a range of assistance options to aid USAID Missions in screening climate impacts (see box on GCC Team Screening Assistance). Historical records may serve as a proxy for projections of future change – if something has happened before, it could happen again. For example, in thinking about vulnerability to drought, you might weigh the impact of a repetition of the worst drought on record more frequently in the future. How might you alter your plans?

In screening climate impacts, two rules of thumb are useful in making the determination:

Rule 1: If a project is sensitive to climate variability, it is likely to be sensitive to climate change.

A change in climate will change climate variability. That, in turn, will affect any project that is already

EXHIBIT 6 - STEPS TO INCORPORATE CLIMATE CHANGE INTO PROJECT PLANNING

PROCESS	DEFINITIONS
Step 1: Screen for Vulnerability 	**Step 1 – Screen for Vulnerability** Vulnerability Screening is a preliminary assessment of whether climate variability or change could compromise the integrity, effectiveness, or longevity of a project within the planning horizon for the project.
Step 2 – 6 Analysis, Implementation and Evaluation 	**Step 2 – Identify adaptations** Work with stakeholders to identify alternative designs or management practices that may enable them to better cope with climate variability and change. The emphasis should be on finding measures that increase resilience to climate change, but still make sense under the current climate. **Step 3 – Conduct analysis** Examine the consequences of climate variability and change as well as the effectiveness, costs, and feasibility of adaptations that can reduce vulnerability to climate variability and change. **Step 4 – Select course of action** Meet with stakeholders to review results of the analysis. Determine if changes in a current project design are required or if a proposed project should feature new adaptations. **Step 5 – Implement adaptations** Prepare an implementation plan identifying next steps, responsible staff and organizations, timeline, and resource needs required to incorporate the climate change adaptations into the project. **Step 6 – Evaluate adaptations** Evaluate the implementation of adaptations and their effectiveness. Since many adaptations may be due to infrequent, extreme events or long-term climate change, it may be difficult to evaluate effectiveness in a relatively short time period following implementation. But, at a minimum, an evaluation can be done to see if the adaptations were put in place and whether there were problems or excessive costs associated with them.

sensitive to climate variability. But one should not stop at just examining risks from climate variability.

Rule 2: Long-term climate changes can introduce other risks to projects.

Climate change involves not only changes in extreme weather and patterns of wet and dry, hot and cool periods, but also changes to average climate. That means that systems and activities that are adapted to an average climate can be affected. Crops are grown in particular locations because the range of temperatures and precipitation is right for those crops. Natural vegetation, such as forests or grasslands, exists in certain locations because the climate is favorable for particular species. Coastal development is close to high tide because land above high tide is dry, yet close enough to the ocean to allow access. Climate change is altering average climate conditions and sea levels, meaning that certain activities may have to be moved to other locations or modified in other ways.

The screening process for assessing climate impacts might proceed as follows:

1. Characterize current climate variability including short-term events (extreme weather events) and long-term events (trends in seasonal and annual variations) in the geographical area. Sources may include historical weather records (if available), stakeholder input, and climate change projections.

2. For the relevant development sectors and planned project or program activities, determine which of these sectors or activities is or would likely be impacted by the various types of short- or long-term climate variability events (see Rules 1 and 2).

It would be useful to describe the nature of the impact and assess the magnitude, even if only in relative (e.g., high, medium, or low) or qualitative terms.

3. Identify maladaptations (project designs that create or exacerbate a problem) in the relevant development sectors and current and planned projects that increase exposure to climate-related hazards. An extreme example of a maladaptation comes from Honduras: in an effort to protect houses from flooding by the Rio-Cangrejal River, a levee was built to contain floodwaters. However, the construction of the levee created incentives for people to locate their homes in the floodplain immediately inside the levee, increasing the number of people at risk for flooding.

4. Identify current or proposed adaptation strategies and policies in the sectors of interest. Are adaptation policies and strategies in place to address current climate issues such as extreme events or variability? Is

WORKING WITH CLIMATE DATA

The most difficult part of adapting to climate change will be gathering data about climate change for a specific location and interpreting that data to understand possible impacts on your project. Climate change models, known as General Circulation Models or GCMs, are mathematical models of how the earth's climate system works. They are among the most complicated models ever made, and one of the greatest challenges for modelers is that no one fully understands how the climate system works, much less how to describe it in a model.

To test the models' accuracy, modelers run them to see how well they can "predict" the present. That is, data from the past are input into the model and it is run to represent different climate variables for the 20th century or some part of it. The model's outputs are then compared to observations from the same time period, and the way the model treats certain variables is adjusted, improving its ability to match observations. The current models are very good at predicting current temperatures, and there is almost universal consensus (among models and experts) that most of the world will get warmer in the coming decades. This is consistent with our understanding of how the atmosphere functions and how our behavior contributes to greenhouse gas concentrations in the atmosphere.

The models are not as accurate at predicting current or future precipitation. While it is accepted that a warmer atmosphere will hold more moisture, models disagree on how the cycle of evaporation and precipitation will change. In general, it is expected that average precipitation will increase worldwide, but it will probably fall in fewer, more intense events. There is no consensus on how the geographic distribution of precipitation will change. For many locations around the world, one model may project an increase in rainfall, while another projects a decrease. Obviously, this makes planning more difficult.

To add to this difficulty, the GCMs provide projections at a coarse geographic scale, on the order of hundreds of square kilometers. Development projects tend to take place at much smaller scales – in a single watershed or catchment, for example. Outputs from GCMs are "downscaled" to provide projections at smaller geographic scales. The knowledge of Mission experts and development partners will be important in interpreting and applying the climate change information to a particular location or sector.

there a national/local commitment to understand climate-related risks and develop adaptation strategies?

5. Discuss the screening results with implementing partners and stakeholders to determine if there are gaps in the analysis.

6. Gauge the level of concern among implementing partners and stakeholders about the impacts of climate variability and climate change.

SHOULD VULNERABILITY & ADAPTATION BE INCORPORATED INTO THE PROJECT DESIGN?

If the analysis in Step 1 indicates that climate impacts are likely to affect the sectors and/or activities envisioned in the proposed development project or program, additional factors related to USAID's manageable interests should be considered before committing to additional steps in the V&A approach. The factors that Mission staff might consider in making this determination are organized below into a checklist (see Exhibit 7) divided into three groups of questions: 1) project/program parameters; 2) V&A content; and 3) local context for adaptation.

In addition to collecting information to assess these factors, USAID Mission staff will need to decide how to evaluate the information and rank the importance of individual factors. This determination is expected to comply with internal procedures at the mission for promoting a new program or project.

BEST PRACTICES FOR A PARTICIPATORY APPROACH

Once USAID decides to incorporate V&A elements into project design and proceed to Step 2, it is expected that USAID will work more closely with implementing partners, decisionmakers and stakeholders.

In the course of conducting the V&A pilot studies, the project teams used a highly participatory process and worked closely with local and national decision-makers and stakeholders. Some of the best practices related to the use of a participatory process in conducting V&A analyses are summarized in Exhibit 8 on the next page.

STEP 2: IDENTIFY ADAPTATION OPTIONS

Step 2 is to identify options for modifying the project in response to vulnerabilities identified in Step 1. Step 2 involves compiling an initial list of adaptation options and applying a process mutually agreed upon by USAID, implementing partners and stakeholders to review, refine and finalize the list of adaptations prior to analysis and ranking. A suggested structure for Step 2 is provided below. However, as illustrated in the exhibit below, there are a number of ways that Step 2 can be organized and conducted.

EXHIBIT 7 - CHECKLIST: SHOULD V&A BE ADDED?

USAID PROJECT/PROGRAM PARAMETERS	V&A CONTENT	CONTEXT FOR ADAPTATIONS
✓ What is the proposed length of the project?	✓ Is there experience with adaptations in the country/region?	✓ Is there support for adaptation design and implementation among decision-makers and stakeholders?
✓ What is the proposed budget of the project?	✓ Have preliminary adaptation policies and strategies already been identified?	✓ Are there known legal, political, institutional, or financial barriers to the implementation of adaptations?
	✓ Can models, tools or practices be adapted from other studies to support the vulnerability and adaptation assessments? And at what cost?	✓ Are there local resources available to sustain adaptation beyond the life of the USAID project? ✓ Is there likely to be a cost to not adapting?

COMPILE ADAPTATIONS

In developing a list of adaptation options, a number of approaches and information sources might be considered, depending on resources and availability of GCC experts for consultation. A suggested process for compiling a list of adaptations is divided into preparatory and participatory activities.

Preparatory activities:

- Review and extract information on climate impacts and project vulnerabilities developed in Step 1;
- Review previous and current programs and projects conducted by USAID and other donors to determine if adaptations were identified, assessed, or implemented;

EXHIBIT 8 - PARTICIPATORY PROCESS BEST PRACTICES

PARTICIPANTS

- Determine the types of stakeholders who should become involved in the analysis, review and decision-making process. For example, for an agricultural project, stakeholders might include local farmers, other participants in the value chain, government ministries and extension services. For a water project, stakeholders might include municipal government officials and customers. The local stakeholders chosen should have a keen interest in the project under consideration and how it will impact their livelihoods.
- Determine the types of national and international experts who have valuable expertise in the project area and in assessing climate impacts and adaptations. These could include people from local universities and agricultural colleges, local and federal governmental agencies, international research organizations and universities, etc.
- Determine if the V&A work will be coordinated with other donors – this could provide an opportunity to leverage resources and increase the potential impact of the project.

DIALOGUE

- Organize stakeholder discussions on impacts and adaptations – will these be facilitated by USAID's implementing partner; by a local educational or research institution or NGO; or by the government?
- Understand the preferred methods for making decisions on adaptation in the partner country – each country will have established procedures for making decisions, in part depending on the type(s) of adaptation to be considered. Procedures for introducing adaptation policies at the national level can be expected to differ from local adaptations.

COMMUNICATIONS

- Establish communication protocols with implementing partners and counterparts covering the dissemination of information including mechanisms (Websites, press releases to the media, reports, public meetings, workshops, etc.) and assignment of roles.

EXHIBIT 9 - IDENTIFYING ADAPTATIONS: V&A PILOT STUDY APPROACHES

La Ceiba, Honduras Municipal authorities asked the project team to identify, analyze, and recommend adaptation options in the areas of coastal development, urban drainage, and upstream land management. The climate impact analysis and the assessment of adaptation options were combined.	**Lower Songkram River Basin, Thailand** The project team developed climate scenarios and conducted inundation impact analysis in advance of stakeholder meetings. Local stakeholders elaborated and assessed adaptations at three implementation levels: farmer/fisher, community, and government. Local representatives of National Ministries also selected adaptations.
Zignasso, Mali Adaptations were identified by participants in the first Stakeholder Workshop. Stakeholders identified adaptations involving earlier planting, planting with early maturing varieties, training in soil management, and infrastructure to improve irrigation.	**Polokwane, South Africa** Adaptations were identified by participants in the first Stakeholder Workshop. They recommended adaptations in these categories: 1) Six in demand management; 2) Five in technical water resources management; and 3) Seven in policy.

- Solicit advice from and/or review recent reports and documents prepared by experts in climate change, climate adaptation and environmental science and policy that will have an intimate knowledge of the scientific underpinnings of the problem and will likely provide credible suggestions based on sound science;
- Review country strategies and policies that pertain to adaptations.

Participatory activities:

- Hold meetings with decision-makers and stakeholders to discuss climate impacts and adaptation options. These may involve workshops, smaller focus group interviews or field interviews. USAID and its implementing partners should be prepared to provide information about the project or program and share current analysis on the potential impacts of climate change and variability.
- Consult with national and international experts on climate change adaptations. The list of adaptations developed from stakeholder meetings should be compiled and shared with experts to obtain their help in reviewing stakeholder adaptations and to identify gaps in the list. Experts may also be able to share information on adaptation assessments conducted in other countries or regions that could be germane to Step 3.

HOLD STAKEHOLDER MEETINGS TO DISCUSS AND FINALIZE THE ADAPTATIONS LIST

Once the list of adaptation options has been compiled and subjected to some preliminary analysis and screening, a second set of meetings is recommended to facilitate discussions among stakeholders to finalize the list of adaptation options. It is likely that the initial list of options will be excessively long and possibly difficult to analyze in Step 3. Meetings with stakeholders and decision-makers can be useful in establishing a process for assessing the current list of options and reducing the number of options. In effect, the process of shortening the list functions as a pre-assessment of the adaptation options and will help to identify candidate criteria that can be applied in the Step 3 analysis. The process for finalizing the adaptation list might include:

- Present the full slate of adaptation options to stakeholders.
- Establish a process and criteria for screening adaptation options.
- Assist stakeholders in developing information on options to conduct the screening exercise.
- Group options by activity type and characterize them as substitutes (either/or), complements to other adaptation options, or bundle into adaptation strategies (see box below).
- Eliminate options that are not technically or technologically feasible to implement in the project or program at the present time.
- Facilitate a selection process to allow decision-makers and stakeholders to finalize the adaptations list.

Exhibit 10 on the next page summarizes the range of adaptation options that were identified in the four V&A pilot studies.

STEP 3: CONDUCT ANALYSIS

The purpose of this step is for USAID, its implementing partners, stakeholders and experts to evaluate each of the adaptation options included on the final list in Step 2. Options should be evaluated for their effectiveness at building resilience to climatic changes identified in Step 1. This analysis also must give consideration to the project's timeframe and budget as well as to the analytical requirements for implementing different adaptation options.

DEFINE BASELINE OF PERFORMANCE

The only reason to modify project plans is to improve project performance. Therefore, it is useful to assess how the original project is expected to perform under current and projected conditions, and compare that performance with the options identified in Step 2. For example, in our project in Polokwane, South Africa, the water utility was considering constructing a dam and reservoir to augment water supplies. However, some of the climate change projections suggested that rainfall will decline in the future, limiting the usefulness of a dam. Stakeholders suggested considering other options, such as demand side management, until there is better evidence that future rainfall will be adequate to fill a reservoir.

Considerations in developing this performance baseline include:

- How would the original project perform under current or expected conditions? Is it well-suited, given stakeholder experience with the local climate?

- How would the modified (climate-adapted) project options perform under current or expected conditions. Is it at least as well-suited to local conditions?
- How would the original project perform under expected future conditions? (Again, draw from the climate projections developed in Step 1 to identify future conditions.)
- How would the modified options perform under expected future conditions?

EXHIBIT 10 - ADAPTATION OPTIONS IDENTIFIED FOR THE V&A PILOT STUDIES

	HONDURAS	MALI	SOUTH AFRICA	THAILAND
Infrastructure	• Construction of groins, sea walls, breakwaters, dams, drainage systems • Sand pumping, river dredging, lining of river channel • Improved design and higher levees • Installation of collectors, storm gates and pumps	• Construction of water gate • Development of food storage facilities • Install rock lines to capture runoff	• Recycling – urban • Reuse – mining • Build dam • Expand well fields	• Water resource development • Construction of weirs
Capacity Building	• Improve environmental education • Build staff capacity and infrastructure to implement flood warning system	• Build knowledge and capacity to understand agricultural production stressors • Build capacity in weather forecasting	• Drought/risk management • Hydro-climatic network/monitoring	• Build knowledge and capacity in adaptation • Encourage conservation • Strengthen commodity value chains and find new markets
Policy	• Design and implement zoning regulations and building codes • Limit deforestation • Adoption of local policy and ordinance initiatives	• Facilitate access to credit	• Intersectoral reallocation • Reallocation of reservoir yield • Water conservation and demand management (including metering and price structure) • Conjunctive use	• Compensation for flood damages • Regulations to control unsustainable fishery practice • Develop resource management plans at the community level
New Practices	• Construction of houses on stilts • Incorporation of risk assessment and mitigation information into micro-watershed management plans	• Incorporation of crop residues into soil and ridge tillage • Use of short-rotation and heat tolerant rice and maize • Intercropping and crop rotation (to address pests) • Seed priming (e.g., soaking) prior to planting • Planting of agroforestry species	• Rainwater harvesting	• Shift to flood-tolerant crops and crop varieties • Plant eucalyptus and para rubber trees • Develop aquaculture industry • Increase livestock rearing in upper lands

CREATE ADAPTATION ASSESSMENT MATRIX

A variety of factors or criteria can be used in the analysis. An illustrative list of factors is provided below in no particular order of importance. Consultations with decision-makers and stakeholders will be useful in selecting the final set of factors and assigning "weight" or level of importance to each of them:

- **Cost** – cost to implement adaptation options; cost of not modifying the project
- **Effectiveness** – effectiveness of adaptation options as a solution to problems arising from climate variability and climate change (benefits, damages mitigated, costs avoided, and lives saved as different specifications of "effectiveness")
- **Ease of implementation** – includes issues such as barriers to implementation and the need to adjust other policies to accommodate the adaptation option
- **Acceptability to local stakeholders** – in Step 2 all adaptations would have been identified as feasible but not all will be equally attractive to all stakeholders for political, economic, social, or cultural reasons
- **Acceptability to USAID** – any options that USAID is unwilling to support should be identified so it is clear to stakeholders that those options will not be pursued in this context
- **Endorsement by experts** – in some countries, decision-makers will partly base their selection on consistency of proposed adaptation options with international best practices
- **Timeframe** for implementing the adaptation
- **Institutional capacity** – how much additional capacity building and knowledge transfer is required for the adaptation option to be implemented
- **Adequacy for current climate** – are there negative consequences of the adaptation option in the current climate? Some adaptations may be targeted at the future climate but may have costs and consequences under the current climate
- **Size of beneficiaries group** – adaptations that provide small benefits to large numbers of people will often be favored over those that provide larger benefits, but to fewer people

Exhibit 11 summarizes the main criteria that were used in the four V&A pilot studies to evaluate adaptations.

EXHIBIT 11 - CRITERIA FOR ANALYZING ADAPTATIONS

PILOT STUDY	Effectiveness	Cost	Feasibility	Social/Cultural Feasibility	Assistance Requirements	Adequacy for Current Climate	Speed of Implementation	Consistency with State Policy
La Ceiba, Honduras	√	√					√	
Zignasso, Mali	√	√	√		√	√		
Polokwane, South Africa	√	√	√	√			√	
Songkram River, Thailand			√	√				√

In conducting the assessment of adaptations, the following issues should be given consideration:

- For each proposed adaptation to be assessed, each factor should be evaluated on a pre-determined scale that is appropriate for the factor. For example, factors such as cost, stakeholder support, and experts' endorsement can be rated for their favorability as low (1), medium (2), high (3) or very high (4). For factors such as effectiveness, a more detailed assessment scale may be required. The system for rating factors should be agreed upon in advance with decision-makers and stakeholders.
- Even if a partner requires the assessment to be organized in a particular format pursuant to agency procedures or regulations, it might be beneficial also to organize the results of the adaptation analysis in matrix form to facilitate comparison and selection of adaptations. This approach is beneficial in that it is effective without being overly complex or costly.
- GHG emission implications of the potential adaptations should be considered. In many cases, this will not be an issue, but care should be taken to ensure that emissions are not increased by the adaptation so that climate change is not exacerbated by the activity. (For example, building a reservoir could increase carbon emissions as flooded trees decay and release carbon. However, USAID is less and less involved in this type of infrastructure project.)

The output of Step 3 would be a completed matrix and/or assessment results in a form specified by decision-makers. An illustration of an assessment matrix from the Polokwane, South Africa pilot study is provided in Exhibit 12 on the next page.

EXHIBIT 12 - MATRIX FOR EVALUATING ADAPTATION OPTIONS IN POLOKWANE, SOUTH AFRICA

ADAPTION OPTION	EFFECTIVENESS	COST	TECHNICAL FEASIBILITY	SOCIAL AND CULTURAL FEASIBILITY	SPEED
Water conservation and demand management existing	High	Low	High	High	High
Level of service/future	High	Low	High	Low	Medium
Recycling - urban	Medium	High	High	Medium	High
Reuse - mining	Low	High	High	High	Medium
Reallocation of dam yield	Medium	High	High	Medium	High
Conjunctive use	Low	Low	High	High	Medium
Expand well fields	Low	Low	High	High	High
Build new dam	High	High	High	Medium	Low
Rainwater harvest	Low	Low	High	High	High

STEP 4: SELECT COURSE OF ACTION

The purpose of this step is to use the results from Step 3 to select one or more adaptations to be implemented with assistance from the project or program. This step is very important in terms of determining the ultimate success of the V&A elements in the project or program. It is also the step in the approach where local ownership of both the process and decision is essential and close coordination between USAID, its implementing partners, and decision-makers will be needed. This could involve organizing venues for discussion, facilitating those discussions, and gathering information to address gaps in the analysis identified in the deliberation on adaptation options. Consistent with USAID's commitment to transparency and accountability, the implementing partner should make an effort to ensure there is buy-in to the decision-making process in government and that all important parties, including key stakeholders, are represented in the decision-making process. Decision-makers should be encouraged to rank the relative importance of selection factors to promote transparency in the final selection. It is important to recognize that the ranking of factors must be in the context of the country's economic, environmental, and social goals – not in terms of the success of the project or program. Partly this reflects the fact that projects have limited timeframes and resources that might only allow support for a subset of adaptations under consideration.

The process of selecting a course of action is summarized for three of the four V&A pilot studies in Exhibit 13 on the next page. For La Ceiba, Honduras, Steps 4 and 5 are described in detail in Exhibit 14.

STEP 5: IMPLEMENT ADAPTATIONS

Once adaptation options are selected, the next step is implementation. If the options were selected to modify a project that was already being planned, implementation of the options will become a part of the implementation of that "parent" project. The implementation plan will typically include the following components: better definition of the specific tasks, schedule, and roles of implementing partners, decision-makers, and stakeholders; and, resource requirements. If you have been working with an implementer (i.e., under contract or cooperative agreement), they should be involved in revising the implementation plan. In addition, the implementer's work plan may have to be revised to reflect needs to build capacity, finance implementation interventions, or carry out other activities mutually agreed by assistance partners and USAID.

The implementation plan typically will include the following components:

- Strategy that describes actions and a timeline for formalizing the adaptation options, initiating activities, designing investments, and coordinating activities with other projects and programs of USAID, other donors and the government;
- Capacity building needs assessment and training plan;

EXHIBIT 13 - SELECTING A COURSE OF ACTION

PILOT STUDY	COURSE OF ACTION
MALI	• 2nd Stakeholder Workshop convened to present analysis of adaptations and prioritize adaptations • Farmers' priorities for adaptations focused on irrigation infrastructure, better equipment and storage capacity and credit to allow crop to be stored until prices are more favorable • Representatives of the regional agricultural technical services favored crop diversification, germplasm improvements, and better soil and fertilizer management
SOUTH AFRICA	• 2nd Stakeholder Workshop convened to present analysis of adaptations. • Participants applied the evaluation criteria from Step 3 to complete the analysis of options • Stakeholders favored water demand and conservation adaptations over new infrastructure – consistent with current priorities of South Africa and USAID mission (water demand only)
THAILAND	• Adaptations presented to participants in 2nd National Workshop but not selected for action • Results provided to Thai Government for consideration in the development of the National Strategic Plan on Climate Change that will include adaptation strategies in five vulnerable sectors and an adaptation capacity building strategy

- Financial/business plan covering expenditure needs and revenue generation, opportunities for co-financing;
- Outreach/communications plan;
- Exit/sustainability plan; and
- Plan for monitoring performance of the adaptations.

The implementation of adaptation options relies very heavily on the engagement of the host country as USAID projects and programs will likely be limited in duration and resources. The local government will be called on to participate and later continue performance monitoring and evaluation, and organize financing and technical support for those adaptations not included in the USAID project or program. The exit/sustainability plan will be a key document to ensure continuity of implementation activities and capacity building as well as monitoring and evaluation. Exhibit 14 on the next page illustrates how adaptations in La Ceiba are being coordinated between the local office of the USAID-funded MIRA Integrated Watershed Management Project and the University of Colorado on behalf of the La Ceiba Municipality.

STEP 6: EVALUATE THE ADAPTATIONS

After adaptation options have been implemented, the final step is to evaluate them. The purpose of the evaluation is to determine whether the project or activity 1) delivers the intended benefits and/or 2) causes adverse outcomes. Evaluating a project or activity's effectiveness in reducing risks from climate variability and change can present immediate problems for two reasons:

1. The project may be designed to reduce vulnerability to infrequent extreme events. If an extreme event occurs, then the project or activity can be evaluated. If such an event has not occurred, it may be difficult to determine if the project or activity was properly implemented. Note that even if the event does not happen following implementation, this does not mean the investment was unjustified.
2. The project may have been modified to incorporate long-term risks from climate change. This can be even more difficult to evaluate. Long-term changes in climate may not be evident when it comes time to evaluate the project. This lack of an immediate payoff should not be a factor in the decision analysis.

In cases such as this, there are other ways to evaluate a project or activity.

- **Ease of implementation.** How easy or difficult was it to implement the project? How does this compare to what was expected in the implementation plan?

EXHIBIT 14 - IMPLEMENTATION OF ADAPTATIONS IN LA CEIBA, HONDURAS

STEP 4: SELECT COURSE OF ACTION

In La Ceiba, the Project Team convened the second of two Stakeholder Workshops and presented the list and analysis of 18 proposed adaptations. During the Workshop, stakeholders rejected two of the adaptations (construction of a sea wall and lining of the river channel) because they were not deemed to be feasible, and added three new adaptations. The adaptations on the final list included the following (new options identified through stakeholder observations are in italics):

Risk management – (1) Decide what level of risk is appropriate; (2) Zoning; (3) Environmental education

Coastal zone (developed areas) – (1) Building groins to protect against erosion; (2) Sand pumping; (3) Building breakwaters

Coastal Zone (less developed areas) – (1) Set-backs; (2) Zoning and building codes; (3) Construction of houses on stilts

Rio Cangrejal flooding – (1) Improved design and higher levees in most vulnerable locations; (2) *Limit deforestation and promote reforestation;* (3) Construct a flood control dam; (4) Dredging of river; (5) *Flood warning system*

Urban drainage – (1) Accommodate/adapt to flooding; (2) Install drainage systems

STEP 5: IMPLEMENT ADAPTATIONS

The Project Team, in consultations with stakeholders and the MIRA project staff in La Ceiba, recommended a set of adaptations for USAID to consider adding to the MIRA project and another set of infrastructure-related adaptations that could be financed by multi-lateral development banks or donors. Efforts to implement recommended adaptations are underway.

The MIRA Project is carrying out three follow-up activities:

1. Micro-watershed management planning and implementation. MIRA has incorporated the flooding analysis, improved land-use and watershed management recommendations in the development and implementation of micro-watershed management plans in the region. Information from the study has been used in local stakeholder workshops to help define specific land-use, forestry and protection actions within the plans.

2. Disaster preparedness and response. Identification and mitigation of vulnerability to natural disasters is a key component of the micro-watershed plans developed by the project. Risk assessment and risk mitigation information from the Stratus study has been incorporated into the vulnerability assessments and mitigation recommendations into the watershed plans, as well as community level disaster preparedness and response plans and training events.

3. Local governance and environmental policy. Risk management principles and improved land-use and land development practices were included in local policy and ordinance initiatives, especially those related to tourism development.

4. Urban floodplain modeling and design. Civil Engineering classes at the University of Colorado are using La Ceiba as a teaching tool under the direction of Professor Ken Strzepek (who was a member of the Project Team). Students have modeled 50-year floods and the 50-year flood plain and developed the pre-design for the ***urban drainage system*** for one of the poor and vulnerable neighborhoods of La Ceiba. Subsequent classes will produce designs and cost estimates for urban stormwater systems for all downtown areas of La Ceiba.

- **Costs.** Were costs of implementation as anticipated?

The evaluation should examine:

- **Adverse impacts**. Has the project or activity caused adverse impacts, e.g., environmental impacts? Were these anticipated? How can they be ameliorated? If unanticipated, do these adverse impacts outweigh the realized or potential benefits of the project? These can be difficult and challenging questions to address.
- **Creation of benefits**. Has the project produced immediate benefits? How do these compare to what was anticipated in the implementation plan?

If the evaluation has revealed that the adaptation(s) have not been successful in confronting climate variability and climate change then it would be necessary to return to Step 3 and reassess possible adaptations and select new adaptations or modify the current set of adaptations. The success of adaptations will be both in comparison to the baseline and through a direct consideration of the socioeconomic situation of the affected local population.

CONCLUSION AND NEXT STEPS

There is an additional role evaluation can play, that is, to evaluate this process itself. Users should evaluate how well these steps worked, the role stakeholders played, the usefulness of analysis in informing decision-making, how consensus on selection of options was reached, and so on. Such information can be useful in updating and improving this process for future project planning and design.

The Global Climate Change Team views this Manual as a document that will grow and change as needed. If you have any questions or comments, please contact John Furlow (jfurlow@usaid.gov).

ANNEX 1
PILOT STUDY CONTRIBUTORS

La Ceiba, Honduras Pilot Study

Joel B. Smith (Coordinator) – Stratus Consulting

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Julio Cardini (coastal analysis) - consultant

Mario Castaneda and Carlos Quiroz (flooding analysis) - consultants

Pepe Herrero, Christiane Arias and Juan Moya – MIRA Project, IRG

Zignasso, Mali Pilot Study

Dr. Kris Ebi and Joel Smith (Co-Coordinators)

Mamadou Doumbia and Alpha Kergna (analysis of adaptation options)

Tanveer Butt and Bruce McCarl (analysis of climate change impacts on agriculture) – Texas A&M University

Siaka Bagayoko (organization of stakeholder meetings)

Polokwane, South Africa Pilot Study

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Burgert Gildenhuys (baseline water demand projections) - BC Gildenhuys and Associates

Petrus Matji (organization of stakeholder meetings) – Matji and Associates

Beyers Havenga (partner) – South African Department of Water Affairs

Songkram River, Thailand Pilot Study

Pradeep Tharakan and Glen Anderson (Coordinators) – IRG

Suppakorn Chinnavano and Anond Snidvongs (climate scenarios) – START-SEA (Global Change System for Analysis, Research and Training - South East Asia Center)

Richard Friend, David Blake, Suparerk Janprasart, Tawatachai Rattanasorn and Rattaphon Pitaktapsombut (stakeholder meetings and adaptation options) – Mekong Wetland Biodiversity Program, IUCN

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ANNEX 2 – V&A RESOURCES AND LINKS

SUBJECT	ORIGINAL SOURCE	YEAR	LINK
Global Climate Change – General			
USAID Global Climate Change Team program and documents (World)	USAID	Website	http://www.usaid.gov/our_work/environment/climate/index.html
Climate Change 2007: Impacts, Adaptation and Vulnerability (World)	Intergovernmental Panel on Climate Change (IPCC)	2007	http://www.ipcc.ch/activity/wg2outlines.pdf
Climate Change Impacts, Adaptation and Vulnerability - Summary for Policy Makers of the Working Group II (World)	IPCC	2007	http://www.ipcc-wg2.org/
Climate Change 2001: Impacts, Adaptation and Vulnerability (World)	IPCC	2001	http://www.grida.no/climate/ipcc_tar/wg2/index.htm
Global Climate Change Impacts			
Climate impacts of El Niño (Latin America)	United Nations Environmental Programme (UNEP) (citing: IPCC 2001, FAO 2002, UNEP 2003)	2005	http://www.vitalgraphics.net/lac.cfm?pageID=24
Africa aridity zones (Africa)	World Meteorological Organization (WMO), UNEP, Climate Change 2001: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Third Assessment Report of the IPCC	2002	http://maps.grida.no/go/graphic/aridity_zones
Impacts of climate change on Africa (Africa)	Anna Ballance, UNEP/GRID-Arendal, 2002	2004	http://maps.grida.no/go/graphic/climate_change_vulnerability_in_africa1
Sea Level Rise Rate (World)	US Environmental and Protection Agency		http://yosemite.epa.gov/OAR/globalwarming.nsf/content/ClimateTrendsSeaLevel.html
Potential impact of sea level rise (Nile Delta)	UNEP		http://www.grida.no/climate/vital/34a.htm
Potential impact of sea level rise (Bangladesh)	UNEP/GRID Geneva: University of Dacca; JRO Munich; The World Bank; World Resources Institute, Washington D.C.	2000	http://maps.grida.no/go/graphic/potential_impact_of_sea_level_rise_on_bangladesh
Socioeconomic Data and Indicators			
Gross Domestic Product per capita in 1999 USD (World)	United Nations Office for the Coordination of Humanitarian Affairs - ReliefWeb	2001	http://www.reliefweb.int/rw/RWB.NSF/db900LargeMaps/SKAR-64GDHA?OpenDocument
World Human Development Index 2001 (World)	United Nations Office for the Coordination of Humanitarian Affairs - ReliefWeb	2001	http://www.reliefweb.int/rw/RWB.NSF/db900LargeMaps/SKAR-64GBEW?OpenDocument
Population density (South Asia)	Food and Agriculture Organization of the United Nations (FAO)	2005	http://www.reliefweb.int/rw/RWB.NSF/db900LargeMaps/LDOK-697TZF?OpenDocument

SUBJECT	ORIGINAL SOURCE	YEAR	LINK
Poverty by GDP (Africa)	World Resources Institute	2005	http://www.reliefweb.int/rw/fullMaps_Af.nsf/luFullMap/A82EDDCCA545615A852570FA0065CFAB/$File/wri_EDU_afr310805.pdf?OpenElement
Projected population density (World)	CIESIN, FAO and CIAT	2005	http://www.povertymap.net/mapsgraphics/index.cfm?data_id=26428&theme=
CIESIN 2025 GDP projections SRESB2 (World)	CIESIN	2002	www.ciesin.org/datasets/downscaled/htmls/Guidance_Paper.pdf
CIESIN 2025 population projections SRESB2 (World)	CIESIN	2002	http://ciesin.columbia.edu/datasets/downscaled/
Health Impacts and Indicators			
Malaria: baseline climate vs. climate change scenario (World)	UNEP	2006	http://www.grida.no/climate/vital/41.htm
Spread of major tropical vector-borne diseases (Tropics)	UNEP	2006	http://www.grida.no/climate/vital/39.htm
Malaria grip in Africa (Africa)	A. Plarr McGinn, Malaria, Mosquitoes, and DDT, World Watch, Vol. 15. No.3, May-June 2002	2006	http://www.grida.no/climate/vitalafrica/english/18.htm
Lack of access to safe water as of 2001 (World)	UNEP	2005	http://www.reliefweb.int/rw/rwb.nsf/db900SID/AHAA-6HAJUR?OpenDocument
Natural Resources and Water			
Fresh water stresses: water withdrawal as percentage of total available (World)	UNEP		http://www.grida.no/climate/vital/37.htm
Level of water stress for the global population in 1990 and 2025; Population living in countries with water stress under different emissions scenarios in the 2080's (World)	UNEP		http://www.grida.no/climate/vital/38.htm
Global Freshwater Withdrawal: Country Profiles Based on Agricultural, Industrial and Domestic Use (World)	Based on data from Table FW1 in 'World Resources 2000-2001, People and Ecosystems: the Fraying Web of Life', World Resources Institute (WRI), Washington DC, 2000	2002	http://maps.grida.no/go/graphic/global_freshwater_withdrawal_country_profiles_based_on_agricultural_industrial_and_domestic_use
World's Freshwater Supplies: Annual Renewable Supplies per Capita per River Basin (World)	Revenga et al., 2000, from 'Pilot Analysis of Global Ecosystems: Freshwater Systems'	2002	http://maps.grida.no/go/graphic/world_s_freshwater_supplies_annual_renewable_supplies_per_capita_per_river_basin
Black sea water indicators (Black Sea Region)	WRI, Washington DC	2001	http://maps.grida.no/go/graphic/black_sea_water_indicators_giwa
Water availability and scarcity 1990 vs. 2025 (Africa broken down by country)	UNECA, Addis Ababa; Global Environment Outlook 2000 (GEO), UNEP, Earthscan, London, 1999	2002	http://www.grida.no/climate/vitalafrica/english/15.htm

SUBJECT	ORIGINAL SOURCE	YEAR	LINK
Fresh water stress and scarcity in Africa by 2025 (Africa)	United Nations Economic Commission for Africa (UNECA), Addis Ababa; Global Environment Outlook (GEO) 2000, UNEO, Earthscan, London, 1999, Population Action International	2002	http://maps.grida.no/go/graphic/freshwater_stress_and_scarcity_in_africa_by_2025
Global cultivation intensity (World)	Arctic Monitoring and Assessment Programme (AMAP)	1997	http://www.povertymap.net/mapsgraphics/index.cfm?data_id=10153&theme=
Soil degradation (World)	Atlas of desertification in the world, Second edition, Arnold Publishers, London, 1997	1997	http://www.povertymap.net/mapsgraphics/index.cfm?data_id=23360&theme=
Changes in cereal production under three different GCM equilibrium scenarios (World/developed vs. developing countries)	UNEP		http://www.grida.no/climate/vital/35.htm
Impact of temperature rise on robusta coffee in Uganda (Uganda)	UNEP		http://www.grida.no/climate/vital/36.htm
Impact of temperature rise on tea in Kenya (Kenya)	Otto Simonett, Potential impacts of global warming, GRID-Geneva, case studies on climate change. Geneva, 1989		http://www.grida.no/climate/vitalafrica/english/22.htm
Natural Disasters			
Natural hazards (World)	UN World Food Programme	2006	http://www.reliefweb.int/rw/fullMaps_Wd.nsf/luFullMap/3C91EAD07F9BD367852571 1B0055739C/$File/wfp_ND_wrl200206.pdf?OpenElement
Distribution of People Affected by Natural Disasters 1975-2000 (World)	Centre for Research on the Epidemiology of Disasters (CRED)	2001	http://www.reliefweb.int/rw/RWB.NSF/db900LargeMaps/SKAR-64GE97?OpenDocument
People affected by natural disasters 1971-2000 (Africa)	UNEP	2002	http://www.grida.no/climate/vitalafrica/english/08.htm
Agriculture Impacts and Indicators			
Global Climate Change and Agricultural Production, (World)	FAO	1996	http://www.fao.org/docrep/W5183E/W5183E00.htm
Screening Tools			
Community-based Risk Screening Tool-Adaptation & Livelihoods (CRiSTAL)	The International Institute for Sustainable Development	2004-2006	http://www.iisd.org/security/es/resilience/climate_phase2.asp

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