USAID/USFS CLIMATE CHANGE VULNERABILITY ASSESSMENT AND ADAPTATION PRIORITIZATION

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USAID/USFS Climate Change Vulnerability Assessment and Adaptation Prioritization

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Acronyms

AO	Assistance Objective
CARDIN	Caribbean Disaster Information Network
CAS	Country Assistance Strategy
CIAT	International Center for Tropical Agriculture
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CSGM	Climate Studies Group Mona
DGP	Development Grant P
ECLAC	Economic Commission for Latin America and the Caribbean
EGAT	Economic Growth and Trade
FAO	Food and Agriculture Organization
GCC	Global Climate Change
GDP	Gross Domestic Product
ICT	Information and Communications Technology
INC	Initial National Communication
IRI	International Research Institute for Climate and Society
MAJIC	Marketing and Agriculture for Jamaica's Improved Competitiveness
MOAF	Ministry of Agriculture and Fisheries
MOU	Memorandum of Understanding
PERSUAP	Pesticide Evaluation Report and Safe Use Action Plan
PIOJ	Planning Institute of Jamaica
RADA	Rural Agriculture Development Authority
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USFS	United States Forest Service
UWI	University of the West Indies

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Executive Summary

Jamaica is highly vulnerable to climate variability and change. Expected impacts include increased temperatures, rising sea levels, and increased rainfall variability with more intense storms and longer dry spells. These changes will have severe impacts on key economic sectors, including agriculture and tourism, which are already under pressure from non-climate stresses such as pollution, soil erosion, and natural resources degradation. Climate change impacts threaten to increase erosion and pest outbreaks, decrease crop yields and water supply, and damage beaches, coral reefs, and infrastructure. Jamaica's resiliency to these climate impacts will depend, in large part, on the Jamaican government's ability to coordinate key actors, apply climate information to decision making, disseminate information to vulnerable populations, and implement adaptive strategies.

This two-week in-country vulnerability assessment, conducted by an interdisciplinary team of USAID, USFS and a Jamaican consultant, included a literature review, a two-day stakeholder workshop, field visits and follow up meetings with key institutions. Given USAID/Jamaica's commitment to their current Marketing and Agriculture for Jamaican Improved Competitiveness (MAJIC) program, the team's immediate recommendations are focused on reducing vulnerability to climate change within the agriculture sector. The recommendations, and the assessment as a whole, should serve as a guide for USAID/Jamaica's programming of current and future Climate Adaptation funding, as well as the resiliency of related programs.

The team identified a number of gaps that inhibit Jamaica's ability to adapt to climate change. The most relevant are the following:

- A lack of clear coordination between key actors and a poor synthesis, dissemination and use of existing climate information. As a result, global climate change concepts and adaptation strategies are not consistently integrated into relevant policies and activities.

- Insufficient understanding of how climate change will impact different sectors. For example, key government personnel lack the capacity to plan and implement adaptation strategies.

- Disjointed research efforts, uncoordinated data management, and inadequate access to information by farmers. Weather forecasts and climate projections need to be improved and made actionable for farmers.

Our recommendations are structured in two phases: those that should be acted upon immediately under the current MAJIC program (Phase 1), and those that could be incorporated in the future when the Mission is prepared to broaden the scope of its country strategy and/or activities (Phase 2). Phase 1 recommendations are aimed at ensuring USAID/Jamaica's ongoing activities in agriculture increase climate change resiliency, support activities and research contributing to improved planning at the policy and project level, and bridge the gap between climate information providers and users, such as farmers. The recommendations also aim to raise awareness of climate change adaptation issues and needs, build institutional and technical capacity, and improve coordination between key actors. In Phase 2, the emphasis is on developing a replicable program that models integrated watershed management for cross-sectoral climate change adaptation in one or two sub-watersheds.

I. BACKGROUND

Jamaica, as a small island developing state, is vulnerable to a number of climate change impacts. The Climate Studies Group in Mona (CSGM) in the Physics Department at the University of West Indies (UWI) has outlined the most probable climate change impacts for Jamaica. Expected changes include shifts in precipitation patterns, with more intense storms and longer dry spells (especially between June and August), increased temperatures, an increase in hurricane intensity, and sea-level rise. These trends are already apparent in Jamaica. Additionally, deficiencies in the existing risk information framework, inadequate climate data and data management systems, unplanned settlement patterns, inadequate level of knowledge and/or awareness of the impacts of climate change, weak physical planning system and land use practices, inconsistent enforcement of planning and land use regulations, and the degradation of terrestrial and coastal and marine resources decrease Jamaica's ability to effectively respond to climate change.

Jamaica's flourishing coastal tourism business has the potential to be negatively impacted by climate change, as sea level rise and storm surge lead to loss of beach land, and sea temperature rise and increased sedimentation cause coral reef damage. In addition, more intense hurricanes will threaten tourism infrastructure, and increasingly scarce water resources will make it difficult to meet tourists' basic needs.

Although agriculture only comprises approximately 5% of Jamaica's Gross Domestic Product (GDP)[1], it is a vital sector in terms of rural livelihoods; 73% of those living below the poverty line reside in rural areas. Literature reviews and climate change projections present overwhelming evidence that the agricultural sector in Jamaica is vulnerable to the impacts of climate change. As a result of increased rainfall variability, storm intensity, and other changes, farmers will increasingly face problems with erosion, flooding, landslides, strong winds, new diseases and pests, and inadequate water supply. All of these impacts threaten to decrease yields and farmer income.

Presently, USAID/Jamaica's Adaptation programming is focused on reducing vulnerability to climate change within the agriculture sector. USAID has an approved Country Assistance Strategy[2] (2010-2014) in which Assistant Objective #2 (AO#2) responds to Country Assistance Strategy Priority Goal 2: Promoting Economic Prosperity and Sustainable Development. The primary objectives of AO#2 are to improve farm income and food security, expand small scale agro-processing and other supporting rural enterprises, and protect fragile environments. AO#2 objectives are being addressed through the Marketing and Agriculture for Jamaican Improved Competitiveness (MAJIC) project, implemented by ACDI/VOCA and the Ministry of Agriculture and Fisheries (MOAF). USAID/Jamaica received $3 million in Global Climate Change (GCC) Adaptation funding in FY 2011, which the Mission intends to commit to MAJIC.

USAID/Jamaica requested assistance from USFS International Programs and USAID/EGAT to prepare a climate change vulnerability assessment. The assessment provides the Mission with a rapid analysis of the challenges related to climate change in Jamaica and recommendations for strategic programming of Climate Change Adaptation funding. The assessment, conducted from August 9 to 19, 2011, consisted of a literature review; consultation meetings with government

[1] Planning Institute of Jamaica. 2010. Economic and Social Survey of Jamaica. Kingston, Jamaica.
[2] USAID Jamaica. 2010. Country Assistance Strategy (2010-2014). USAID. Kingston, Jamaica.

ministries, the UWI, and donor agencies; field visits to existing USAID and other donor GCC-related activities; and a two-day stakeholder workshop. Agriculture and tourism were the primary sectors analyzed during the workshop; the primary gaps and needs identified by stakeholders are described in section III. This assessment report provides recommendations for using GCC funding to support resilience-building activities in agriculture, through the MAJIC program, as well as suggestions for further GCC Adaptation activities beginning in FY 2013 under the new Country Development Cooperation Strategy.

II. Economic Drivers and Expected Climate Change Impacts

Agriculture and tourism are two key economic drivers that are highly vulnerable to climate change. Both of these sectors use natural resources such as water and forests as key inputs. In this section we outline the economic value of agriculture and tourism and then review how climate change is expected to impact these sectors.

Agriculture. The agricultural sector is important to Jamaica's development; it is a relatively small yet important contributor to GDP and foreign exchange earnings, but a significant employer. Between 2004 and 2009, agriculture (including fisheries and aquaculture) represented on average 5% of Jamaica's GDP. Although agriculture's contribution to Jamaica's GDP has steadily declined over the past two decades, this sector continues to occupy a significant proportion (20.2%) of the labor force and is the largest employer among economic sectors.[3] The agricultural sector is two-tiered, with large-scale commercial monoculture plantations producing primarily for export in one tier, and small-scale mixed subsistence farms for the domestic market in the other.

Small farms are especially vulnerable to climatic hazards and therefore must be the main target of interventions to mitigate climate change impacts and promote sustainability. Although small scale farmers account for nearly 80% of all farms in Jamaica, they have access to less than 15% of total arable area. The adaptive capacity of small farmers is further limited by their lack of "soft" assets like training, organization, market information or finance, and their reliance on intermediaries for marketing their produce.[4] Credit, certification, and alternative technologies are hard for most small farmers to access.

Tourism. Jamaica is the fifth most tourism-dependent economy in the Caribbean.[5] Tourism is Jamaica's second largest foreign exchange earner after remittance inflows, and its growth is faster than overall GDP growth for the country.[6] The direct contribution of tourism to the economy does not provide a complete picture of the sector's importance, because of the multiplier effect of the industry and its linkages to other sectors. Total direct and indirect contribution of tourism was an estimated 25.4% of GDP in 2010, when it also accounted for approximately 10% of employment.[7,8]

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[3] Planning Institute of Jamaica. 2009. Economic and Social Survey of Jamaica, PIOJ. Kingston, Jamaica.

[4] International Center for Tropical Agriculture. 2011. Draft Impact of climate change on Jamaican hotel industry supply chains and on farmer's livelihoods. CIAT/Oxfam. Cali, Columbia.

[5] Clayton, A. 2009. Climate change and tourism: implications for the Caribbean. *Worldwide Hospitality and Tourism Theme*s. Vol. 1 # 3, 212-230.

[6] Meteorological Service of Jamaica. 2009. Draft Second National Communication. Met. Services. Kingston, Jamaica.

[7] WTTC (2010), Reports Commissioned and Policy Reports and Initiatives, World Travel and Tourism Council, London, available at: http://en.wikipidia.org/wiki/world_Travel_ and_Tourism_Council

Natural resources. Natural resources are critical inputs for agriculture and tourism. Coastal vegetation, forests, and other non-farm, non-developed lands play a critical role in generating and preserving water and soil resources as well as biodiversity. An estimated 30% of Jamaica is forested; annual loss from 1990-2000 was 1.5%.[9] Natural vegetation plays a key role in culture and recreation, and is used for subsistence and commercial purposes. Forests will be increasingly important as climate change progresses; mangroves, for example, help build resiliency by protecting against storm surges.

Gender. Women, especially poor women, are particularly vulnerable to climate change because of their lower adaptive capacity: less access to credit, adaptive technologies, and information. After Hurricane Ivan, the Ministry of Labor's data indicated that female-headed households were over-represented in each category of damage reported.[10] In Jamaica, women are more involved in subsistence farming and the service sector, and therefore more likely at risk to unemployment and income loss as a result of climate change impacts on agriculture and tourism. Men who work in ecotourism or as laborers on large farms will also be impacted; however, men may be more mobile than women - who have more family and household responsibilities- and therefore able to travel in search of alternate sources of income. Adaptation strategies must also consider gender dynamics in order to be successful. In the recent stakeholder workshop, participants noted that women are more likely to attend training sessions, and they are more receptive to new technologies that could increase their productivity or resiliency. Male farmers may be reached more easily through other measures, such as demonstration plots.

Expected Climate Change Impacts on Agriculture, Tourism, and the Environment

The following specific trends observed for Jamaica will have broad impacts on tourism, agriculture, and natural resources:

- **Rising temperatures:** Hot days and nights have become more frequent, and cold nights have become less frequent (1973-2008). Meanwhile, sea surface temperatures in the waters surrounding Jamaica have increased at an annual rate of 0.7˚C per decade between 1960 and 2006. Temperature will continue to rise, by 1-4 degrees C by the end of the century.
- **More variable rainfall:** Rainfall will become increasingly variable. Some regions in Jamaica will see an increase, and others will see a decrease, but across the Caribbean there is an overall drying trend.[11]
- **More intense storms:** North Atlantic hurricanes and storms appear to have increased in intensity over the last 30 years, although there is still debate regarding whether this is a long term trend.
- **Sea level rise:** Sea level rises around 1.5 to 3.3mm per year have been observed at tidal gauging stations around the Caribbean, and the trend continues. Sea level rise will increase storm surge heights and contribute to erosion, inundation, and storm surge.[12]

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[8] Planning Institute of Jamaica. 2010. Economic and Social Survey of Jamaica. Kingston, Jamaica.

[9] Evelyn, O.B., and R. Camirand. 2003. Forest cover and deforestation in Jamaica: An analysis of forest cover estimates over time. International Forestry Review 5(4):354-363.

[10] ECLAC. 2004. Macro-Socio-Economic and Environmental Assessment of the Damage done by Hurricane Ivan Sept 10-12, 2004.

[11] UWI/CSGM presentation, August 2011

The Global Climate Risk Index identified Jamaica as one of six Caribbean Islands experiencing the most adverse extreme weather impacts.[13] Climate change could cause agricultural yields to fall by 10-25% in tropical and developing countries by 2080, although losses will be partly offset by gains in temperate countries.[14] Severe weather events in recent years, particularly the drought conditions of the 1997/1998 El Niño events, demonstrated the effects of weather shocks on water sources and water supply. As climate change continues, the impacts currently being observed can be expected to intensify.

The impacts will be widespread. A one-meter rise in sea level—possible in the next 100 years—could result in 2% loss of agricultural lands in Jamaica.[15] These losses may be due to direct erosion or contamination of the agricultural soil through increased salinization. Additionally, climate change and variability in the form of more intense rainfall, temperature rise, and drought will cause inundation, pollution of ground and surface water, the need for increased pest management, soil erosion and soil deterioration, stress on crop quality and yield, and pressure on water supply. Forests and other coastal vegetation will not be able to adequately provide ecosystem services. All of these impacts will be aggravated by non-climate stresses like deforestation from agriculture and development.

Most of the island's infrastructure is on the coastline, and 90% of Jamaica's GDP is produced within its coastal zone.[16] Sea level rise will affect coastal zones; some beaches will disappear while others are formed. Hurricanes and tropical storms are expected to become more severe, leading to increased erosion, damage to infrastructure, and discouraging tourism. Frequent damage claims on insurance companies will lead to higher premiums or reduced coverage. The death of a large number of coral reefs in 1988 and 1990 has been attributed to the increases in the temperature of coastal waters; temperatures will rise further under climate change. All of these adverse weather and climate impacts on coastal assets, infrastructure, resources and communities will result in loss of employment and income, loss of commercial viability, and overall negative impacts on the economy.[17]

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[12] CARIBSAVE Partnership. 2009c. *Caribbean climate change, tourism and livelihoods: A sectoral approach to vulnerability and resilience.* Final Report, CARIBSAVE Seed Funding Project. Bridgetown, Barbados: CARIBSAVE.

[13] Harmeling, S. 2009. *Global Climate Risk Index* – Weather related loss events and their impacts on countries in 2007 and in a long term comparison

[14] Cline, W. (2007), Global Warming and Agriculture: Impact Estimates by Country, Centre for Global Development, Washington, DC.

[15] Simpson *et al.* 2009; Niels Bohr Institute 2010

[16] Clayton, A. 2009. Climate change and tourism: implications for the Caribbean. *Worldwide Hospitality and Tourism Theme*s. Vol. 1 # 3, 212-230

[17] Meteorological Service of Jamaica. 1994. Initial National Communication of Jamaica to the UNFCCC. Kingston, Jamaica.

Table 1. Impact of climatic factors on priority sectors

Climate Trend	**SECTOR**				
	Water	**Agriculture**	**Tourism**	**Coastal Communities**	**Agro-forestry and biodiversity**
Sea level rise	Increased risk of saline intrusion into coastal aquifers, negatively impacting water quality	Inundation of rural farming communities. Reduction in fish population	Coastline and beaches will disappear. Infrastructure damage. Loss of livelihood activities	Loss of coastal land, infra-structure, and livelihood activities. Beaches and cays erode.	Destruction of mangrove forests. Loss of land, infrastructure, biodiversity, livelihood activities, and marine ecosystem services.
More intense rainfall (shorter duration but heavier)	Flooding and landslides that degrade watersheds and damage infrastructure and crops. Damage to water distribution infrastructure. Sedimentation leading to increased water treatment costs	Nutrients and agricultural chemicals leaking into ground and surface water. New pests and spatial redistribution of pests, higher incidence of pests and diseases. Soil erosion, flooding, landslides. Inconsistent crop quality and reduction in yields.	Flooding; Infrastructure damage. Frequent insurance claims, rising cost of insurance.	Flooding damage to road infrastructure, houses, etc. Women, children and elderly most vulnerable.	Flooding. Landslides. Loss of forest ecosystem services
Drought, increasing temperatures	Saline intrusion. Low reliable yields/reduced safe yields. Reduction in potential groundwater recharge	Crop failure. Heat stress and low moisture levels. Yield decrease due to faster crop maturation. Increased pressure on irrigation schemes. Reduced livestock productivity due to variability in pastoral and water supplies. Change in growing seasons.	Crop failure. High dependency on imports. Inadequate water supply to resort areas. Coral bleaching	Increased fire risk. Drought conditions coupled with floods during traditional dry months of July-September.	Increased risk of fires. Loss of forest ecosystem services
Increased intensity of storms and hurricanes	Loss of infrastructure and revenue, contamination of water supply	Damage to crops, livestock and fisheries equipment and gears. Loss of crops during post-harvest and marketing phases.	Visitors stay away during hurricane season. Detrimental impact on employment and economy.	Coral fisheries destroyed. Increased unemployment	Destruction of forest cover. Loss of plant and animal biodiversity, forest ecosystem services. Planting regime and income affected.

III. Outcomes of the Stakeholder Workshop

On August 10 and 11, 2011, USAID and USFS held a stakeholder workshop, with 68 participants from academia, the government, civil society organizations and donor agencies. Stakeholders were led through a process to identify Jamaica's key economic drivers and development priorities, the conditions and inputs necessary to support those priorities, climate and non-climate stresses that affect those conditions and inputs, and then possible adaptation options to build resiliency.

Agriculture and tourism emerged immediately in the plenary session as key economic drivers, and for this reason—-and because of the Mission's interest in agriculture and the high climate vulnerability of these two sectors—they became the focus of the discussions and exercises for the remainder of the workshop. Participants also identified other key economic activities that were not examined in detail here; these included bauxite mining, manufacturing, ICT, financial services and remittances, infrastructure development, small and medium enterprises, culture and entertainment, and transportation.

Participants then identified key conditions and inputs for these economic drivers:

Economic Driver	**Key Inputs/Conditions**
Agriculture	Arable land, water, suitable and predictable climate, labor, transportation, seed stock, fertilizers, market access, energy, knowledge on appropriate techniques, crop and pest information, policies, money, security, storage
Tourism	Natural and manmade attractions and coastal resources (e.g., beaches and reefs), transportation, infrastructure, investment capital, food, energy, security, policy

To inform discussions about the impacts of climate change on these key assets and conditions, Dr. Michael A. Taylor from the CSGM at UWI gave a presentation on climate trends in Jamaica and the Caribbean. Trends include rising temperatures, increasingly variable rainfall with an overall drying trend, more intense storms, and rising sea levels. Many of the key inputs/conditions listed above are sensitive to climate impacts. For example, participants noted sea level rise will damage fixed assets like buildings and certain equipment, increase salinization and contaminate water supplies, and damage infrastructure like roads that are critical for accessing markets. Similarly, more intense rainstorms will cause drainage problems and damage coastal attractions like coral reefs and beaches by increasing runoff, pollution, sedimentation and turbidity. Non-climate stressors were also considered, since a development program must consider both climate and non-climate stresses to be successful in obtaining its overall objectives (although non-climate change funding would generally need to be for activities tackling non-climate stresses). Examples of non-climate stresses include crime, pollution, deforestation, global economic conditions and trade, and government policies.

The group also discussed traditional coping strategies being used in Jamaica to deal with existing climate variability. These types of existing coping strategies (e.g., rainwater harvesting, irrigation, mixed farming practices, mulching, and livelihood diversification) may provide an initial foundation for building adaptation strategies to climate change, but in many cases would need to be expanded or complemented with additional measures.

Participants then brainstormed adaptation measures for agriculture and tourism, and evaluated them against different criteria (e.g., affordability, technical feasibility, social or political feasibility,

likely effectiveness, robustness under different climate scenarios, etc.). It was noted that although measures are often evaluated individually, the ultimate goal is to have a strategy that bundles several different measures, by considering complementary activities, long term and short term needs, different entry points (capacity, policy, information, infrastructure, best practices, etc), and budget constraints.

After hearing presentations from PIOJ, UNDP, CCRIF, and FAO on some existing adaptation programs in Jamaica, participants identified remaining gaps and needs. The time for discussion was limited, so the list was not exhaustive, but a number of useful issues were raised.

Gaps and needs identified include:

A. INFORMATION

- **Knowledge management**, potentially in the form of a clearinghouse. There are some existing platforms that could be used, such as the Caribbean Disaster Information Network (CARDIN), Climate1Stop.org, and the Adaptation Learning Mechanism, but there may be a desire to have a Jamaica-centered platform.
- **More consistent and widespread sharing of lessons learned**, including best management practices and successful adaptive strategies, so that these lessons can be used to expand or replicate successful projects, and allow agencies like RADA to update their trainings and guidance.
- **Analysis and dissemination of weather and climate information**, with a particular focus on improved communication with end users (farmers, fishermen, policymakers, etc) so that the data can be easily applied to decision making at different levels.
- **Research** on a variety of topics (e.g., climate change impacts on crops and pests). Students could be connected to agencies and organizations that have climate-related research needs; scholarships could be offered for postgraduate research in specific topics where more data is needed to inform policy and project design. Research results should be shared with stakeholders (including farmers, Ministry staff, and policymakers) in useful, accessible formats.

B. FIELD ACTIVITIES AND BEST PRACTICES

- **Improved watershed management and water use efficiency**, by promoting and/or implementing measures like revegetation of watersheds, on-farm water harvesting, more efficient irrigation systems, and mandating or incentivizing water retention systems in buildings.
- **Coastal resources management**, including protection or rehabilitation of mangroves. Coastal resources are important for the tourism industry, but also for other livelihoods (like fishing) and disaster risk reduction.
- **Measures to address higher temperatures and increased evaporation** in agriculture, such as greenhouses and the use of shade crops.
- **Expanding and scaling up** successful interventions (e.g., rainwater harvesting) to avoid getting stuck in the pilot phase.
- **Improving the resiliency of structural design and siting** to extreme weather events.
- **Promote resilient, alternative livelihoods.**
- **Measuring the impacts** of adaptation interventions.

C. CAPACITY BUILDING

- **Build the capacity of farmers and their organizations** based on needs assessments. Develop guidance and outreach materials for farmers on adaptive practices and technologies. Create demonstration plots. Use lead farmers to impart knowledge and best practices to other farmers.
- **Raise public awareness** on climate change, options for using water more efficiently, etc.
- **Train the media** to report on climate change issues.
- **Train developers and contractors** in water use efficiency technologies.

D. GOVERNANCE

- **Promote policies** (e.g., incentives or mandates) that complement on-the-ground activities.
- **Update zoning regulations and building codes** to take into account projected climate impacts.
- **Promote enforcement of existing laws and regulations** (e.g., build the capacity of ministries and agencies to draft instructions).
- **Improve coordination** between agencies, donors, the private sector, and other stakeholders.

IV. Recommendations for USAID/Jamaica Adaptation programming

The following findings emerged from the stakeholder workshop, as well as the follow up interviews, literature review, and field visits:

- While much climate change information is available in Jamaica, it is not easy to locate, and there is poor coordination between key actors involved in climate change adaptation efforts (at both the policy and project level).

- Global climate change concepts and adaptation strategies are not regularly integrated into relevant policies and activities.

- Technical staff at the MOAF have insufficient understanding of how climate change will impact their sector, and lack the capacity to plan and implement adaptation strategies.

- Research efforts are disjointed, data management remains uncoordinated, and transfer of information to farmers is often poor or nonexistent.

- Weather forecasts and climate projections need to be improved and made more accessible and actionable for farmers.

The recommendations that follow were based on the climate trends identified previously (e.g., sea level rise, increasing temperatures, increasingly variable rainfall, and more intense storms), as well as our findings, indicating why Jamaica is currently unprepared to respond to climate change trends through effective adaptation measures.

This section recommends priority activities that will be in compliance with Agency requirements for Adaptation funding, while also allowing the Mission to continue to promote a strong agricultural sector in line with the current Country Assistance Strategy.

A. Phase 1 (During MAJIC lifetime)

Phase 1 recommendations assume GCC Adaptation programming can be carried out under the existing MAJIC project. MAJIC is implemented by two partners: ACDI/VOCA (Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance) and the MOAF. Our recommendations take into consideration the FY11 allocations envisioned for each of these partners, and their respective capacities.

We recommend the following activities be carried out with the $1.6 Million allocated to ACDI/VOCA:

1. **Incorporate climate adaptation strategies and technologies.**
   Climate change will impact different geographic areas and crops in different ways. Based on the initial and ongoing results of a climate change vulnerability index (see Item 3 below), developed using agricultural extension coordination, geographic information system (GIS) data layers, agricultural information, and farmer interviews, MAJIC should promote appropriate interventions that address the particular weather and climate change impacts faced by farmers in the communities where the project is active. Potential interventions include: drip irrigation and other cost-effective water conservation measures, soil erosion control, rainwater harvesting, water catchments, revegetation, intercropping for crop diversification, greenhouses, shade crops, and post harvest storage facilities. All these can reduce vulnerability to weather and climate impacts that can cause crop loss. MAJIC should build these strategies into their Farmer Field School, and provide grants to farmers to implement relevant technologies where funds permit (some of this funding should come from the $1M allocated to MOAF: see point 6). The emphasis should be on proactive activities to build and maintain resilience, in order to mitigate future damage. For example, revegetating hillsides to hold water in place can be a more effective strategy than trying to repair severe soil erosion after storm events.

   Incorporate these strategies and technologies into MAJIC components 2 and 4:

   - Component 2: Strengthened Production, Processing, and Marketing Linkages of Selected Value Chains
   - Component 4: Improved Production and Marketing of Selected Specialty Crops

2. **Build the capacity of farmers and farmer organizations** based on needs assessments. Develop guidance and outreach materials on adaptive practices and technologies, including documentation and dissemination of local best practices. Create demonstration plots and update the Farmer Field School module content, as already outlined by ACDI/VOCA, to include best management practices that build resiliency and increase productivity in the context of a changing climate. Incorporate these efforts into MAJIC components 2 and 4.

3. **Support the development of a climate change vulnerability index.**
   Provide a grant to UWI Geology & Geography Department for the expansion of their vulnerability index to the MAJIC farmer communities. Properly done, a vulnerability index will have critical value in establishing a commonly-understood framework for identifying and prioritizing climate change interventions, and will also serve as a tool for monitoring

and evaluation over the lifetime of the project. The index should be developed in the context of eventually using it nationwide. In addition to UWI's technical role, RADA should be involved in informing and mobilizing farming community involvement. Mona GeoInformatics Institute (MGI) can provide a wide variety of datasets and GIS layers to inform the process. As a related item under the same grant, we recommend that USAID/Jamaica support the UWI Geology & Geography department to add cocoa and coffee to the crop suitability index that they have developed, which considers how different crops will perform under projected climate changes. We recommend requesting a new proposal from UWI based on these priorities, rather than using the DGP proposal that they submitted previously. The product branding and marketing activities under the DGP proposal would not fit the Adaptation funding requirements. This grant can fall under MAJIC component 2 or 4, because the crop suitability index will address the specific crops being targeted under these components, and the vulnerability index will provide the information necessary to identify appropriate technologies to promote as described in point 1 above.

4. **Communicating weather and climate information for better agriculture risk management**

   This activity would fall under MAJIC component 1 (Support an effective and efficient marketing information system), expanding the information system envisioned there to include weather forecasts and climate projections.

   Success in this activity will require the participation of a number of partners, who each bring specific skills and expertise to the table:

   - The Climate Studies Group in the UWI Physics Department can bring their expertise in climate projections and downscaling, and their MOU with the Met Service to incorporate shorter-term weather forecasting.
   - Mona GeoInformatics Institute (MGI) has demonstrated experience with gathering data sets on weather, climate, and crops from a wide variety of sources, layering them, and incorporating them into GIS.
   - The UWI Geology and Geography Department would contribute their field experience and ability to gather on-the-ground vulnerability data from farmer surveys, in collaboration with RADA (see item 3 above). Additionally, their research and data on crop suitability can add value to climate forecasts and to the decision-making process of planners.

   We recommend that USAID/Jamaica organize a meeting with the different departments within UWI to design a grant program where they each have clear, complementary roles. The grant should also be explicit about the need to collaborate with RADA to ensure that the products and tools that are developed provide the content that farmers need, in a format that they can easily use.

   This activity should have a phased approach:

   a. ***Dissemination of weather and climate information via cell phone under MAJIC Component 1*** (which currently focuses on market and price info). To complement this information dissemination system, MAJIC should also train farmers on what to do when the information (i.e., text message) is received. For example, ACDI/VOCA can produce crop-specific pamphlets on what farmers can do in the event of a

hurricane warning or a drought forecast, and incorporate these recommendations into Farmer Field School modules. If the text messaging system is not viable or economically sustainable, other existing communication methods that reach farmers should be explored, such as radio or television.

b. ***Consideration of additional tools, such as an interactive web-based tool*** that would provide climate and weather information for a variety of users, particularly policymakers and agricultural extension agents. This work could build on the proposal submitted by the UWI Physics Department, if a participatory design process is built in to ensure that the product responds to the information needs of specific user groups, and has an accessible, user friendly format. In this case, we would also recommend working with EGAT to bring in technical assistance and collaboration from Columbia University's International Research Institute for Climate and Society (IRI) to help build the capacity of UWI to design weather/climate info products that are driven by user needs. EGAT would aim to provide this technical assistance from IRI under an existing award, at no cost to USAID/Jamaica.

5. The mission-wide **Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP) must discuss potential GCC impacts** on pest occurrence and distribution and identify adaptation actions to minimize those impacts.

We recommend the following activities be carried out with the $1M allocated to the MOAF:

6. We strongly suggest that the majority of the **grants given to farmers for drip irrigation systems and other adaptation interventions and technologies** listed under point 1 above should come out of the resources allocated to the MOAF, as ACDI/VOCA has greater capacity to integrate adaptation into other MAJIC activities.

7. **Support MOAF in developing a strategic action plan for climate change adaptation in agriculture** linked to the corporate plan and the agricultural development plan. The MOAF strategic plan will tie into the national climate change policy and strategic action plan being completed by the Environment Management Division of the Ministry of Water, Housing and Environment and the Meteorological Service of Jamaica.

8. **Hire a full-time dedicated staff expert on climate change adaptation within the Economic Planning Unit of the MOAF**. This individual should understand the technical, economic, and social aspects of climate change adaptation and be prepared to lead on project design and implementation, although additional training may also be required. This staff person is critical to ensuring that MOAF activities funded with GCC Adaptation funding are consistently in line with Agency guidelines.

9. **Provide awareness raising and training for MOAF staff** on links between climate change and agriculture, and on adaptation options. This would include workshops and a review of relevant work plans, proposals and documents from various Ministry divisions. These activities would be led by the climate change staff expert proposed under point 8 above.

10. **Conduct climate change technical workshops** for key policy and program leaders. This could be designed as a series of quarterly workshops; they should build on each other and have a very practical focus. For example, the first workshop could offer technical training on the US Forest Service Climate Change Scorecard method for assessing progress in meeting climate change adaptation goals; this would provide participants with an example of an applied field reporting mechanism that relies on stakeholder involvement, and prepare them to develop and apply a similar tool. It would help key planning entities like PIOJ think about how they can better collect nationwide information on adaptation, as well as provide a framework for their climate change policy development. Other workshop topics could include:

    - Participatory development and review of the MOAF strategic action plan for climate change adaptation in agriculture (see point 6 &7 above).
    - Targeted topics from within the MOAF strategic action plan for climate change adaptation in agriculture (e.g., water conservation techniques).
    - Increasing stakeholder participation in the development of the National Climate Change Strategy and Action Plan.
    - A participatory design process for the web-based tool contemplated in point 4b above and in the UWI Physics proposal. The design should be driven by user needs; user groups like farmers and extension agents would attend this workshop to discuss the types of information that they need to make decisions, and what kind of format they would find accessible and useful.

    USAID/Jamaica could work with PIOJ to call together relevant organizations and jointly develop the workshop series. The series could be co-funded by other donors.

Finally, we strongly recommend that ACDI/VOCA be retained rather than pursuing an accelerated shift to the MOAF as the sole implementing partner. The MOAF does not have the capacity at this time to integrate climate change adaptation into MAJIC as necessary to ensure compliance with GCC Adaptation funding guidelines. A premature transfer to the MOAF would put the program at risk of failure. The Ministry's capacity needs to be built before they are made fully responsible for implementing the MAJIC program and all GCC Adaptation funds, and we have provided recommendations below to ensure that capacity is built. ACDI/VOCA has demonstrated a clear understanding of climate change adaptation, and has a plan for incorporating adaptation into the MAJIC activities in order to meet all Agency requirements while building on MAJIC's successful programming to date.

B. Phase 2

The second phase of GCC Adaptation programming can be envisioned as beginning under the new Country Development Cooperation Strategy, in 2013, or earlier if MAJIC is terminated or there is another reason to change the course of current programming. The recommendations for Phase 2 are therefore not constrained by a sole focus on agriculture, and consider other highly vulnerable sectors and priorities that emerged from the assessment. In Phase 2, we recommend that USAID/Jamaica support the following kinds of programs with GCC Adaptation funding, in addition to considering an extension of some of the efforts initiated under Phase 1:

1. **Support an integrated watershed and coastal management model project to increase climate change resiliency** in one or two sub-watersheds, building on lessons learned in previous projects funded by USAID and other donors. Three key pillars of the projects could be:
    - Resilient Economic Livelihoods: Farming, Fishing and Tourism
    - Building Environmental Resilience
    - Institutional Strengthening and Capacity Building

    Such a program should utilize a multi-stakeholder collaborative approach in order to build capacity and ensure sustainability from the onset. This integrated watershed management program would work with communities on the upper and lower watershed, as well as coastal communities, to address a range of climate change stresses and their impacts on livelihoods and ecosystems. Fishers, farmers and farmer associations would continue to be supported as they are under Phase 1 but with a particularly strong emphasis on adaptive measures that decrease soil erosion, reduce land-based pollution exacerbated by heavy rains and other extreme events, and increase resiliency though reforestation and revegetation. The project would raise awareness among policymakers and users about the importance of sustainably managing and preserving the upper watershed—especially in the context of climate change—and the connection between upper watershed interventions and conditions downstream.

2. **Support development and maintenance of a Climate Change Clearinghouse,** co-funded with other donors and coordinated with government agencies, universities, and other stakeholders. The Clearinghouse would provide a central web-based platform with forecasting and mapping capabilities as well as an easily-searchable database that houses relevant studies, vulnerability assessments, project reports and proposals, data sets, training modules, and other Jamaica-specific adaptation resources that have been produced by government agencies, donors, academics, and others. It could build on – or link to - the interactive web-based tool supported during Phase 1 (see point 4b above). A stakeholder meeting should be held during the early stages to discuss content and format needs, and to identify a leadership team and a technical team responsible for specific activities. The pros and cons of using existing global platforms –such as the Adaptation Learning Mechanism, SERVIR, and the ClimateOneStop should be discussed before a decision is made to invest in a new, Jamaica-only platform. A Jamaica-only platform will require some full-time dedicated staff, who could be housed at a government agency like PIOJ, or at UWI.

ANNEX A: USAID Guidance on GCC Adaptation Programming

Definition

The goal of adaptation programming is to reduce the vulnerability of people, places and livelihoods to the negative impacts of climate change by integrating effective adaptive strategies into key development sectors, including agriculture and food security, infrastructure, health, water, disaster preparedness, and conflict prevention. A GCC adaptation program funded with direct adaptation funds must meet the requirements below.

Adaptation Criteria Summary Table – Direct ("Focused") funding	
Funding Source	Focused Adaptation control level *(e.g., $3M in Adaptation funding to USAID/Jamaica in FY11)*
Objective	Explicit, primary GCC goal or objective *This does not mean that the Mission's current AO has to be formally revised; it does mean that programs being funded with Adaptation funds must articulate –in Operational Plan narratives, program workplans, reporting documents, etc.—a clear GCC Adaptation objective that is guiding the activities funded under that program. (For example, an objective could be: "Build the climate resiliency of Jamaica's agricultural sector"; or "Reduce the vulnerability of vegetable and cocoa farmers to the adverse impacts of climate change"). Other goals like increased competitiveness and profitability can also be included (especially since building climate resilience can contribute to competitiveness and sustainability of the sector), but the climate-related goals should receive primary emphasis and be used to guide the actual activities. (For example: "Build the climate resiliency of Jamaica's agricultural sector, and thereby improve its competitiveness and sustainability").*
Types of activities	• Science & analysis to inform decision making in topics sensitive to climate, including context-specific vulnerability assessments. *(The work on disseminating weather and climate information for farmers and policymakers recommended in this assessment report would fall under this category.)* • Improved governance to address climate-related risks. *(The work recommended in this report to build the capacity of the Ministry of Agriculture, through climate change adaptation trainings and a strategic climate change action plan, would fall under this category.)* • Piloting, evaluating and implementing effective adaptation methods and systems to address climate-related risks. *(The work to incorporate climate change adaptation strategies and technologies—like drip irrigation, rainwater harvesting, intercropping / crop diversification--into farming practices would fall under this category.)*
Indicators	All programs must monitor their impact on addressing climate change using one or

	more GCC indicators, at least one of which must be a standard GCC Adaptation indicator: • *Number of people with increased capacity to adapt to the impacts of climate variability and change as a result of USG assistance (disaggregate by sex)* • *Number of people receiving USG supported training in climate change (disaggregate by sex)* • *Number of institutions with improved capacity to address climate change issues as a result of USG assistance* • *Number of laws, policies, strategies, plans, agreements, or regulations addressing climate change formally proposed, adopted, or implemented as a result of USG assistance*

Making the links between climate stresses and activities

To complement the clear GCC objective, narratives should also describe the link between the climate change impacts identified in the vulnerability assessment (e.g., increased rainfall variability including heavier rainstorms and more drought periods; temperature rise; sea level rise) and how the proposed activities build resilience (e.g., of farmers) to those stresses. How will the information, technology, and capacity building provided through program activities help reduce vulnerability to flooding, drought, tropical storms, etc?

Guidance

"Adapting to Climate Variability and Change: A Guidance Manual for Development Planning" (USAID, 2007) is available at http://pdf.usaid.gov/pdf_docs/PNADJ990.pdf.

An updated guidance manual is due out this fall.

Follow-on support available from EGAT

EGAT's GCC team can provide technical assistance, updated Agency guidance on GCC, as well as preliminary reviews of Scopes of Work, Operational Plan narratives, and other documents in order to ensure alignment with GCC funding guidelines. Nora Ferm is the primary point of contact for Adaptation in the LAC region within EGAT (nferm@usaid.gov). Questions related to budget allocations should be sent to the LAC Bureau. In the LAC Bureau, the GCC lead is Christine Pendzich (cpendzich@usaid.gov); she can also provide technical assistance on all three GCC pillars.

ANNEX B: Climate Variability, Change and Adaptation in Jamaica

Stakeholders' Workshop Summary Report

August 10-11, 2011

US Agency for International Development (USAID) and US Forest Service (USFS)

USAID Adaptation programming is aimed at reducing vulnerability to climate change so that development goals can be achieved. This workshop was organized to gather stakeholder input to inform USAID/Jamaica's new Adaptation programming. It also had the dual benefit of building capacity nationally to do vulnerability assessments and prioritize adaptation needs. Stakeholders were led through a process to identify:

1) Jamaica's key economic drivers and development priorities;
2) The conditions and inputs necessary to support those priorities;
3) Climate and non-climate stresses that affect those conditions and inputs; and
4) Possible adaptation options to build resiliency (based on an understanding of ongoing efforts in order to avoid duplication).

Based on stakeholders' feedback and recommendations, USAID and USFS will identify areas of overlapping interest with USAID/Jamaica's existing Country Assistance Strategy, and help USAID/Jamaica target its future Adaptation funds accordingly. The full meeting participant list is included in the appendix.

Day 1: Wednesday, August 10, 2011

Malden Miller (USAID/Jamaica) explained that U.S. support for international climate change programs has increased dramatically in 2010, as a result of a new Presidential Initiative and "fast start" funding promises made by the U.S. as part of the 2009 Copenhagen Accord. USAID's Adaptation programs aim to support robust development despite climate variability and change. Jamaica is receiving U.S. support for climate change adaptation this year.

Part I: Development priorities and economic drivers in the country

Participants identified Jamaica's economic drivers and development priorities, the assets and inputs necessary to support those priorities, and climate and non-climate stressors that affect those assets and inputs. To begin, participants brainstormed the following key economic activities/sectors in Jamaica:

- Agriculture (and Fisheries)
- Tourism
- Bauxite Mining
- Manufacturing
- ICT, Financial Service and Remittances
- Infrastructural Development
- Small and Medium Enterprises
- Culture and Entertainment
- Transportation

Participants then identified the key conditions and inputs for several of these economic drivers:

Development Priority/ Economic Driver	**Key Inputs/Conditions**
Agriculture	Arable land, water, labour, transportation, technology, seed stock, fertilizers, access to market, energy, knowledge on appropriate techniques, suitable and predictable climate, information on crops and pests, policies, money, security, storage, support and extension services.
Tourism	Natural and manmade attractions, coastal resources, transportation, infrastructure (hotel rooms), investment capital, food, energy, security, policy
Mining	Natural resources, equipment, transportation, labour, energy, water, markets

Part II: Climate trends, recent and projected impacts

Dr. Michael A. Taylor from the Climate Studies Group (CSGM) at the University of the West Indies gave a presentation on climate trends in Jamaica and the Caribbean. Despite uncertainty about the precise magnitude and timeline for the changes, key trends can be identified. In Jamaica, trends and future projections are that:

- Temperature will continue to rise, by 1-4 degrees C by the end of the century. There will be more warm days, and fewer cool days.
- Rainfall will become increasingly variable. Some regions in Jamaica will see an increase, and others will see a decrease, but across the Caribbean there is an overall drying trend.
- Storms will be more intense, although they may not be more frequent.
- Sea levels will continue to rise, although the exact amount is uncertain. Rising sea levels will contribute to erosion, inundation, and storm surge.

Clifford Mahlung, Jamaica's Chief Climate Change negotiator from the Met. Office, then gave an overview on the contents of the Second National Communication and other studies.

Participants worked in groups to examine the impact of climate change on the inputs and assets identified earlier, with a particular focus on Agriculture and Tourism -- two particularly important and vulnerable economic sectors in the country. The tables below provide some examples from the group work that was presented.

For agriculture:

	Warmer temperatures	**Increased intensity of rainfall**	**Sea level rise**
Equipment / storage	Need for more cold storage	Damage to equipment, increased maintenance needs	Damage to fixed assets
Water	Reduced availability of water	Flooding, pollution, more	Saline intrusion

		water lost to runoff	contaminating water supply
Market access	Potential for increased spoilage in the field; increased transport costs (e.g., refrigerated transport), changes in harvest season	Flooding of roads can obstruct transport	Damage to key infrastructure including roads and ports
Land		Erosion, landslides, leaching	Loss of arable land

For tourism:

	Warmer temperatures	**Increased intensity of rainfall**	**Sea level rise**
Labor	Reduced productivity for those who work outdoors	Flooding impacting homes; Absenteeism	Damage to workers' homes
Beaches		Fewer ideal tourism days; Increased pollution from runoff	Beach erosion and beach loss
Coral reefs	Coral bleaching; Decreased native fish stock	Turbidity of freshwater and coastal attractions; sedimentation	
Transportation		Flooding leading to road blocks/ inundation and land slippages	Flooding of coastal roadways; Port facilities damaged
Water	Increased evaporation leading to water scarcity	Increased turbidity, potential drainage problems	Saline intrusion of freshwater sources

Non-climate stresses were also considered, since a development program must consider both climate and non-climate stresses to be successful in obtaining its overall objectives. Examples of non-climate stresses include deforestation, crime, pollution, global economic conditions and trade, and government policies.

Part III: Introduction to adaptation strategies and types

Tom DeMeo (USFS) gave a presentation that began by defining vulnerability in terms of **exposure** to climate/weather impacts, **sensitivity** to those impacts, and the **adaptive capacity** of communities and populations. He presented a case study from Morocco, and highlighted the importance of stakeholder participation in designing and implementing adaptation strategies.

Participants discussed how gender dynamics affect vulnerability and adaptive capacity. In Jamaican agriculture, both men and women have constraints in switching to alternative livelihoods, and face the threat of income loss due to the impacts of climate variability and change. Participants noted that unskilled laborers have lower adaptive capacity, and men are perceived to be less receptive than women adopting new technologies that could increase their productivity or resiliency. They also noted that women are more likely to attend training sessions. Men, on the other hand, may be more mobile than women (who have more family and household responsibilities), and therefore able to travel in search of alternate sources of income. In tourism, women tend to work in the hotels, while men work in ecotourism (e.g., as guides). In addition to gender considerations, it can be important to consider the vulnerability of other sensitive groups such as youth and persons with disabilities.

The group also discussed traditional coping strategies being used in Jamaica to deal with existing climate variability. In agriculture, these include rainwater harvesting and storage, livelihood diversification, more diversified or resilient crops and varieties, using wind breaks, more resilient structures, irrigation, mixed farming practices, agroforestry and reforestation, mulching, modifying cropping strategies, greenhouses, using forecasts and early warnings, stabilizing soils, and developing water catchment areas. In tourism, strategies include establishing zoning codes, purchasing insurance, diversifying livelihoods, and restoring coastal ecosystems to protect against storm surge. These types of existing coping strategies may provide an initial foundation for building adaptation strategies to climate change.

Part IV: Exploring options

Nora Ferm (USAID) highlighted some good practices in adaptation, including no regrets actions, cooperation among stakeholder groups, and avoiding maladaptation. She also noted some criteria that can be used to evaluate a list of possible adaptation options:

- Affordability
- Technical feasibility (including ease of implementation, ease of monitoring, skill levels, staffing)
- Effectiveness in reducing vulnerability
- Possible negative impacts of the project (physical, biological, economic, & social)
- Robustness: Will it work under multiple climate scenarios, or just one?
- Sensitivity to gender and youth issues
- Political will
- Community buy-in

Although measures may be evaluated individually, the ultimate goal is to have a strategy that bundles several different measures, by considering complementary activities, long term and short term needs, different entry points (capacity, policy, information, infrastructure, best practices, etc.), overall budget constraints, and other considerations.

Day 2: Thursday, August 11, 2011

The day began with an exercise on exploring adaptation options and evaluating them with criteria such as those presented at the end of the first day. The following tables provide examples of the ideas raised in the small group discussions. Ideally, when considering options, more criteria would be considered (e.g., political will, community buy-in, sensitivity to gender or youth issues). For the purpose of this small group exercise, only four criteria were used due to time constraints. Criteria could also be weighted or ranked to show their relative importance.

ECONOMIC DRIVER/SECTOR/DEVELOPMENT OBJECTIVE: _____Agriculture_____

INPUTS/KEY ASSETS	**PROBLEMS**	**ADAPTATION MEASURES TO REDUCE VULNERABILITY**	**CRITERIA**			
			Affordability	**Feasibility**	**Speed of Implemen-tation**	**Potential effectiveness**
Arable Land	Flooding	Water diversion (guttering)	MED	MED	MED	MED
		Construction of check dams	LOW	LOW	MED	HIGH

		Relocation based on hazard mapping	LOW	LOW	LOW	HIGH
		Public awareness education	MED	HIGH	MED	MED
Water	Drought	Rain water Harvesting	MED	HIGH	HIGH	HIGH
		More drought resistant crops	HIGH	MED	LOW	MED
		More efficient irrigation techniques (e.g. drip irrigation)	LOW	HIGH	HIGH	HIGH
		Dry farming (mulching)	HIGH	HIGH	HIGH	HIGH
		Rehabilitating watersheds (revegetation)	LOW	MED	LOW	HIGH

ECONOMIC DRIVER/SECTOR/DEVELOPMENT OBJECTIVE: _____Tourism_____

INPUTS/KEY ASSETS	**PROBLEMS**	**ADAPTATION MEASURES TO REDUCE VULNERABILITY**	**CRITERIA**			
			Affordability	**Feasibility**	**Speed of Implemen-tation**	**Potential effectiveness**
Marine attractions - beaches	Sea Level Rise	Sea walls, groins and other manmade beach defenses	LOW TO MED	MED - HIGH	LOW	MED (these structures could adversely affect neighbors)
		Implementation of coastline vegetation	MED -HIGH	HIGH	MED-HIGH	HIGH
		Artificial reefs	HIGH	MED	LOW	MED
		Sand transfer, transported sand	HIGH	HIGH	MED	LOW

Part V: Assessing ongoing and planned activities; Identifying remaining needs

Representatives from four organizations gave presentations on some existing climate change adaptation programs in Jamaica.

1. Planning Institute of Jamaica (PIOJ)

Vision 2030 is the Jamaican government's national development plan. In the context of this document, climate change adaptation is related to Goal 4 (Jamaica has a healthy environment), Outcome 14 (Hazard Risk Reduction and Adaptation to Climate Change). PIOJ described recent and planned initiatives, including:

- A Government of Jamaica (GOJ)/UN Environment Program (UNEP) pilot in Negril that integrates climate change and ecosystems management into planning.
- A Global Fund for Disaster Reduction and Recovery (GFDRR)-funded Coastal Multi-Hazard Mapping and Vulnerability Assessment Project which assessed the vulnerabilities of select communities.
- The Pilot Program for Climate Resilience (PPCR). Baseline studies are being conducted to inform the development of the Strategic Program for Climate Resilience.
- A GOJ/European Union/UNEP Climate Change Adaptation and Disaster Risk Reduction project is rehabilitating select watersheds through slope stabilization measures; increasing resilience of select coastal areas; and building capacity and awareness on climate change.
- A thematic working group on Climate Change Adaptation (CCA) and hazard risk reduction that can facilitate policy advances.
- Ongoing efforts to develop a National Action plan that would integrate climate change adaptation and disaster risk reduction.

2. UNDP Community Based Adaptation small grants program

The Community-Based Adaptation Project is a five-year pilot project implemented in 10 countries by United Nations Development Programme (UNDP) and funded by the Global Environment Facility (GEF). Six projects have been implemented in Jamaica; one has been completed. The focus is on priorities identified in the First and Second National Communications to the UN Framework Convention on Climate Change (UNFCCC): coral reef monitoring and agriculture. Activities in agriculture include slope stabilization and erosion control measures, and the planting of drought and saline resistant crops. A "Lessons learnt" manual will be produced.

3. Climate Risk Adaptation and Insurance in the Caribbean Project

Project partners include the Caribbean Catastrophe Risk Insurance Facility (CCRIF), MicroEnsure, Munich Re, and the Munich Climate Insurance Initiative (MCII). The aim is to provide risk management tools, particularly micro-insurance, to enable vulnerable people to adapt to weather extremes. Three different insurance products will be developed, tested, and implemented in the Caribbean, for target populations like small scale farmers and day laborers in tourism. Up to three countries will be selected from the following: Belize, Dominican Republic, Guyana, Haiti, Jamaica, and St. Lucia. Emphasis will be placed on explicitly linking these pilot insurance schemes to risk reduction efforts.

4 Food and Agricultural Organization (FAO)

In Jamaica, FAO's climate change adaptation activities include :

- Development of an Agricultural Disaster Risk Management Plan (ADRM) in collaboration with the Ministry of Agriculture.
- A rain water harvesting project for small-scale farmers in South St. Elizabeth, and publishing a Rainwater Harvesting Feasibility Study.
- A study on the likely climate change scenarios and impacts on production areas and agricultural sub-sectors, as well as policy options.

- Building the preparedness capacity and resilience of farmers, pastoralists, fishers and foresters in selected vulnerable areas.
- In cooperation with the Belgian government, supporting community-level disaster preparedness contingency plans; pre-positioning of strategic contingency stocks of agricultural inputs to be ready for use by the selected communities in case of natural disaster; development of DRR information and communication plans; documenting best practices for agricultural risk management.

Remaining gaps and needs

After hearing about these existing adaptation efforts, participants were asked to brainstorm remaining gaps and needs, particularly in the following categories: policy, capacity, information, infrastructure, best practices, geographic areas, sectors, and type of climate impact.

Gaps/needs identified included:

A. INFORMATION

- **Knowledge management**, potentially in the form of a clearinghouse. There are some existing platforms that could be used, such as the Caribbean Disaster Information Network (CARDIN), Climate1Stop.org, and the Adaptation Learning Mechanism, but there may be a desire to have a Jamaica-centered platform.
- **More consistent and widespread sharing of lessons learned**, including best management practices and successful adaptive strategies, so that these lessons can be used to expand or replicate successful projects, and allow agencies like RADA to update their trainings and guidance.
- **Analyze and disseminate weather and climate information**, with a particular focus on improved communication with end users (farmers, fishermen, policymakers, etc) so that the data can be easily applied to decision making at different levels.
- **Research** on a variety of topics (e.g., climate change impacts on crops and pests). Students could be connected to agencies and organizations that have climate-related research needs; scholarships could be offered for postgraduate research in specific where more data is needed to inform policy and project design. Research results should be shared with stakeholders (including farmers, Ministry staff, and policymakers) in useful, accessible formats.

B. FIELD ACTIVITIES AND BEST PRACTICES

- **Improved watershed management and water use efficiency**, by promoting and/or implementing measures like revegetation of watersheds, on-farm water harvesting, more efficient irrigation systems, and mandating or incentivizing water retention systems in buildings.
- **Coastal resources management**, including protection or rehabilitation of mangroves. Coastal resources are important for the tourism industry, but also for other livelihoods (like fishing) and disaster risk reduction.
- **Measures to address higher temperatures and increased evaporation** in agriculture, such as greenhouses and the use of shade crops.
- **Expanding and scaling up** successful interventions (e.g., rainwater harvesting) to avoid getting stuck in the pilot phase.
- **Improving the resiliency of structural design and siting** to extreme weather events.
- **Promote resilient, alternative livelihoods.**
- **Measuring the impacts** of adaptation interventions.

C. CAPACITY BUILDING

- **Build the capacity of farmers and their organizations** based on needs assessments. Develop guidance and outreach materials for farmers on adaptive practices and technologies. Create demonstration plots. Use lead farmers to impart knowledge and best practices to other farmers.
- **Raise public awareness** on climate change, options for using water more efficiently, etc.
- **Train the media** to report on climate change issues.
- **Train developers and contractors** in water use efficiency technologies.

D. GOVERNANCE

- **Promote policies** (e.g., incentives or mandates) that complement on-the-ground activities.
- **Update zoning regulations and building codes** to take into account projected climate impacts.
- **Promote enforcement of existing laws and regulations** (e.g., build the capacity of ministries and agencies to draft instructions).
- **Improve coordination** between agencies, donors, the private sector, and other stakeholders.

With only a couple of hours available for the discussion, it was not exhaustive, but it resulted in a very useful initial set of needs and recommendations for consideration by USAID and other donors.

Next steps

The stakeholder feedback gathered through this workshop will be critical as the foundation for recommendations provided to USAID/Jamaica for future Adaptation programming. The USAID-USFS assessment team will continue gathering information through field visits and follow-up meetings with a number of ministries and organizations.

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ANNEX C: Agenda for Field Visits and Stakeholders' Meetings - 8/12 – 8/17

CLIMATE CHANGE ASSESSMENT TEAM

SITE/FIELD VISIT SCHEDULE

DATE	TIME	LOCATION DETAILS
August 12	7:00	Depart Kingston
	8:30	Arrive Glengoffe – meet with CBA and visit sites Contact & other details to be confirmed by Holly-Rose Robinson)
	11:30	Depart Site
	12:00 – 1:00	Lunch – Get recommendations from CBA
	1:00 – 2:30	Travel to Paggee, St. Mary
	2:30 – 5:30	Visit DFID Fishing projects (Contact & other details to be confirmed)
	5:30 – 7:30	Travel from St. Mary to Discovery Bay Marine Lab

DATE	TIME	LOCATION DETAILS
August 13	7:00	Depart Discovery Bay
	10:00	Arrive in **Flagaman, Pedro Cross, St. Elizabeth** Contact: Mr. Felton Brown, Tele # 889-4937 Mr. Carlos Williams, Tele # 581-0094
	10:00 – 12:00	Tour NIC site
	12:00 – 1:00	Lunch at Bruceyfield – Mr. Felton Brown to give directions
	1:00 – 2:30	Travel to **Greenhouse in Kingsland, Manchester** Contact: Mr. Jervis Rowe, 476-0687
	2:30 – 4:00	Tour of Greenhouse site
	4:00	Travel to Kingston

USAID/USFS Climate Vulnerability Assessment
Trip Agenda August 15 – August 19

	Monday, August 15	Tuesday, August 16	Wednesday, August 17	Thursday, August 18	Friday, August 19
8:00			8:30 NEPA		
9:00	Ministry of Agriculture and Fisheries, Planning Division (Mrs. Zuleikha Budhan, Mrs. Georgia Marks-Doman) (Conf)**accompanied by Malden*	Climate Change Studies, UWI, Dr. Taylor and Dale Rankin (Conf) **accompanied by Raina*	Ministry of Water, Housing and Environment, Leonie Barnaby (Conf) **accompanied by Raina*	Preparation for Out-brief meetings	Depart Kingston
10:00		Office of the Prime Minister Planning Institute of Jamaica (PIOJ), Hope Peterson, Claire Bernand, LeAnn Roper			
11:00	Ministry of Agriculture and Fisheries, RADA (Harold Spaulding, Phillip Chung Shaun Baugh) **accompanied by Malden*		Mona Geoinformatic Institute Parris Lyew-Ayee (Conf)		
2:00	MAGIC, Karyll Aitcheson	ODPEM (Mr. Ronald Jackson) (Conf) **accompanied by Raina*	Meteorological Service, Clifford Mahlung and Jeffory Spooner (Conf) **accompanied by Malden* Port Royal Marine Lab (Tentative)	2:30 p.m. Out brief Mission Director (Acting) (Conf)	
3:00			3:30 EU Pierre Luc		
4:00				Out-brief Meeting with Mission	
6:00			Prepare for Out-brief meeting		

ANNEX D: List of project reports and Documents reviewed and Generated

USAID/Jamaica Climate Change Vulnerability Assessment
Project Documents
Updated - 8/3/11

Stakeholder Workshop – Technical

- USAID/USFS Vulnerability Assessment Workshop Agenda (long and short version)
- Workshop Agenda Worksheets
- Database of Jamaica CC projects
- Briefing presentation for USAID/Jamaica
- USAID Adaptation Slides for Workshop
- Suggested Stakeholder List
- Barbados and St. Lucia stakeholder workshops: Adaptation Stakeholder Summary
- USAID-State Consolidated FY2011 GCC Supplemental Guidance

Stakeholder Workshop – Logistical

- Room Arrangement for assessment
- Workshop Material List

Vulnerability Assessment Report

- Scope of Work
- Summary paper on climate change in Jamaica
- Notes from Meetings

Background Documents

- Journal Articles: Geography Dept. UWI.
  - Dealing with drought: Small farmers and environmental hazards in southern St. Elizabeth, Jamaica
  - Sustainable Food Production Systems and Food Security: Economic and Environmental Imperatives in Yam Cultivation in Trelawny, Jamaica
  - Negotiating Uncertainty: Jamaican Small Farmers' Adaptation and Coping Strategies, Before and After Hurricanes—A Case Study of Hurricane Dean
  - Climate Change, Drought, and Jamaican Agriculture: Local Knowledge and the Climate Record
- Oxfam/CIAT Impact of climate change on Jamaican hotel industry supply chains and on farmer's livelihoods
- IIED / OXFAM Project the Impact of Climate Change on Agriculture and National Economic Growth in Jamaica: Data and Literature Review Component

- DFID Pro Poor Tourism Pilots: Tourism-agricultural linkages: Boosting inputs from local farmers
- (Re)defining the Link? Globalization, Tourism and the Jamaican Food Network
- FAO
    - Draft Agricultural Sector Disaster Risk Management Plan
    - Assistance to improve local agricultural emergency preparedness in Caribbean countries highly prone to hydro-meteorological hazards/disasters – Jamaica **(**See pages 50-62: Practices already being used by small farmers in Jamaica to reduce risks of weather disasters)
- Vision 2030 Jamaica
    - Final Draft Agriculture Sector Plan
    - Natural Resources and Environmental Management & Hazard Risk Reduction and Climate Change 2009 – 2030
- Jamaica Second National Communication
- Briefing Note of the ECLAC Expert Group Meeting on the Economic Impacts of Climate Change in Latin America and the Caribbean
- CCRIF Economics of Climate Change Adaptation
- UNDP
    - UNDP/CaribSave – Modeling sea level rise in the Caribbean
    - UNDP Community Based Adaptation Strategy for Jamaica
- Ministry of Agriculture and Fisheries: Introducing Innovative Agriculture Weather Risk Management Mechanisms for Small Farmers Pre-Feasibility Assessment for St. Elizabeth and Portland Parishes
- MCII - MicroEnsure – CCRIF: Climate Risk Adaptation and Insurance in the Caribbean