PUSHING CLIMATE CHANGE DOWN THE DRAIN

HOW A REVAMPED DRAINAGE SYSTEM HELPED A SEASIDE COMMUNITY IN DOMINICA ADAPT TO CLIMATE CHANGE
ACKNOWLEDGEMENTS

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SYNOPSIS

This case study shows how the Climate Change Adaptation Project funded by the United States Agency for International Development (USAID) and executed by the Organization of the Eastern Caribbean States (OECS) enabled the seaside Mero community in Dominica to revamp its drainage system and avert disasters due to floods. The project responds to a surge in significant slope failures, erosion, landslides and related coastal area damages to many vulnerable communities. This initiative was part of the work of USAID within the Eastern Caribbean to enhance the region’s resilience to climate change impacts. This was achieved through the construction of roadside and hillside drains, as well as a silt trap to avert low-level flooding. Ravines and a deteriorated seawall were also rehabilitated. The benefits and lessons of the project became clear when homes and other structures remained intact and Mero residents were not displaced after the Tropical Storm Erika hit in 2015 and caused considerable destruction in other areas of the country. Participatory project development, effective planning, and funding are among the lessons the study highlights for possible replication or adaptation in other communities in the Caribbean and beyond.

BACKGROUND

Water-related Disasters Exacerbated by Climate Change

Water-related disasters are on the rise globally with accompanying fatalities and enormous economic losses. For the period 2000 to 2010, the United Nations Office for Disaster Risk Reduction recorded 1,910 flooding disasters which resulted in 62,131 fatalities; left 1,127,400 people affected and US$203.9 billion in damages. Floods also have major socio-economic impacts that have demographic, psychological, political and economic consequences. The demographic effects include the displacement of populations: people moving from affected areas to safer places or where they feel less threatened. Several psychological impacts are seen through negative psychosocial responses such as fear and post-traumatic stress disorder, while political impacts involve “community conflict resulting in social activism and political disruption during recovery periods.”
The economic impacts can be direct or indirect; the direct damages occur during or immediately after the disaster and consist of impacts on assets – infrastructure, capital, and stocks. The indirect damages are observed after the event occurs for weeks to months and include effects such as reduced production and income, and increased expenses. According to the World Disasters Report 2016, 574 disasters inclusive of flooding were reported in 2015 that had killed approximately 32,550 people, affected over 108 million and caused US$70.3 billion in damage (See Table 1 and Figure 1). Similarly, National Geographic states that floods are among the most common and most destructive natural hazards. Vulnerability, as a result of persons living in dangerous places, coupled with climate change cause an increase in disasters. In addition, displacement in the context of disasters is an increasing phenomenon.

**TABLE 1: TOTAL NUMBER OF PEOPLE KILLED AND REPORTED AFFECTED BY DISASTER, BY COUNTRY**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua and Barbuda</td>
<td>4</td>
<td>7,982</td>
<td>-</td>
<td>30,800</td>
</tr>
<tr>
<td>Dominica</td>
<td>14</td>
<td>990</td>
<td>32</td>
<td>36,364</td>
</tr>
<tr>
<td>Grenada</td>
<td>40</td>
<td>61,860</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saint Kitts and Nevis</td>
<td>5</td>
<td>11,180</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saint Lucia</td>
<td>-</td>
<td>375</td>
<td>21</td>
<td>202,984</td>
</tr>
<tr>
<td>Saint Vincent and the Grenadines</td>
<td>4</td>
<td>1,634</td>
<td>12</td>
<td>23,797</td>
</tr>
<tr>
<td>Martinique</td>
<td>0</td>
<td>600</td>
<td>3</td>
<td>106</td>
</tr>
</tbody>
</table>

*Source: Emergency Events Database, Center for Research on Epidemiology of Disasters (EM-DAT, CRED), University of Louvain, Belgium as cited in World Disasters report 2016*

**Figure 1:** Total Amount of Estimated Damage from Floods by Year (2006 - 2015) in Millions of US Dollars

*Source: EM-DAT, CRED, University of Louvain, Belgium as cited in World Disasters report 2016*
Flooding has been described by the Caribbean Disaster Emergency Management Agency (CDEMA) as a silent killer that has become the most common natural hazard affecting the socio-economic development of Caribbean countries. Under Article 24 of the Protocol of the Eastern Caribbean Economic Union, Member States are to implement the St. George’s Declaration of Principles for Environmental Sustainability (SGDs) in the OECS. The goal is to minimize environmental vulnerability, improve environmental management, and protect the region’s natural resource base for the optimal social and economic benefits of Member States. Member States also agree to collaborate with national, regional, and international institutions to assist the governments and their national partners to secure and maintain the technical, financial, and human resources required to achieve the goals and targets of the SGDs. One of the stated principles of the SGDs is to address the causes and impacts of climate change.

Consistent with the commitments above, in 2011, the OECS Commission implemented its first climate change adaptation project titled “Reducing the Risks to Human and Natural Assets Resulting from Climate Change” (RRACC) Project. The overall aim of the RRACC Project was to assist OECS Member States to build their resilience and adapt to climate change in the tourism and agricultural sectors, also with a focus on water and coastal resources.

The Project was implemented in the six independent Member States of Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, and St. Vincent and the Grenadines between 2011 and 2016 and it had the following five components:

1. Improving the Enabling Environment to build understanding and support for policies and laws that reduce vulnerability to climate stress

2. Interventions in Freshwater and Coastal Management to build resilience

3. Information Strengthening to build institutional capacity and address information gaps through support for key practitioners in government and related sectors affected by climate, institutions in the region such as training facilities, and entities charged with developing data

4. Public Awareness and Capacity Building for climate change adaptation

5. Project Management
The Steering Committee for the RRACC Project selected Mero from a pool of projects to serve as a study area for the preparation of a Climate Change Adaptation (Disaster Management) Action Plan (CCAP). The selection stemmed from the growing dependence of the population in the area on tourism, and the high vulnerability of the community to climate related hazards, specifically storm surge which impacted their livelihoods. The steering committee also took into account the immediate benefits to residents and their livelihoods from the alleviation of flooding.

The community of Mero lies along the west coast of Dominica in St. Joseph Parish, about 11 miles north of Roseau, the Island’s capital. The community is bordered by the Caribbean Sea to its west, the Morne Piquant Ridge to the south; the Macoucherie River to the north; and the Carholm agricultural settlement to the east. The village occupies an area of about 1,110 acres and is accessed from other parts of the Island via the Edward Oliver Leblanc Highway and the Cuba-Carholm Feeder Road. The Village Road is the principal road within the Village itself. The Mero Community relies in large measure on tourism for its livelihoods as several tour companies take tourists to the village as part of their visit to Dominica.

Rehabilitation Of Drainage System In Mero

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The purpose of the Mero Drainage Project was to alleviate flooding issues in the community caused by unpredictable rainfall, storm surge, and sea level rise that threatened the tourism sector and accompanying livelihoods. The Director General of the OECS Commission, Dr. Didacus Jules, said “the mandate of the project was to build the enabling environment in support of policies and laws to reduce vulnerabilities; to make interventions in fresh water and coastal areas management; to build resilience in tourism and agriculture sectors; to address information gaps that constrain addressing vulnerabilities; increase awareness about issues related to climate change; and improve capacities to climate change adaptation”. The main objective of the CCAP was to strengthen the capacity of Mero to mitigate and overcome the impacts of climate change and related disasters. Addressing the flooding in Mero was highest on the prioritized list of adaptation and mitigation measures based on consultation with the community. The Government, the Mero Enhancement Committee and OECS also felt that this project could be a model for other communities in Dominica and across the Caribbean that face the same flooding challenges.

CHALLENGES

The purpose of the Mero Drainage Project was to alleviate flooding issues in the community caused by unpredictable rainfall, storm surge, and sea level rise that threatened the tourism sector and accompanying livelihoods. The Director General of the OECS Commission, Dr. Didacus Jules, said “the mandate of the project was to build the enabling environment in support of policies and laws to reduce vulnerabilities; to make interventions in fresh water and coastal areas management; to build resilience in tourism and agriculture sectors; to address information gaps that constrain addressing vulnerabilities; increase awareness about issues related to climate change; and improve capacities to climate change adaptation”. The main objective of the CCAP was to strengthen the capacity of Mero to mitigate and overcome the impacts of climate change and related disasters. Addressing the flooding in Mero was highest on the prioritized list of adaptation and mitigation measures based on consultation with the community. The Government, the Mero Enhancement Committee and OECS also felt that this project could be a model for other communities in Dominica and across the Caribbean that face the same flooding challenges.
The Mero Drainage Project was designed to respond to community preparedness/risk reduction and climate change resilience needs through 4 drainage sub-projects that were determined based on information presented in the Climate Change Disaster Management Plan. The project was implemented in Mero, Dominica, under Component 2 of the broader USAID-funded initiative “Rallying the Region to Action Against Climate Change”.

The Identification of climate-induced hazards

The drainage project began with an analysis to identify the climate-induced hazards affecting the community and the degree of vulnerability to such hazards. The analysis also highlighted results of the consultations held between the project designers and stakeholders in the community concerning hazardous weather events, consequences and recommendations for adaptation measures that should be undertaken to build the resilience and adaptive capacity within the community.

The results of a socio-economic assessment also indicated a high level of dependence on agriculture, fisheries, and tourism all of which are very vulnerable to climate induced hazards. Few social services existed in the community and most of the residents had no insurance on their properties.
The CCAP highlighted many challenges facing the Mero community along with proposed interventions to address them. These challenges and remedial interventions were identified in collaboration with the community through the Mero Enhancement Committee. The assessment revealed that buildings including the church, playing field, and tourism facilities in the area were subject to storm surge and flood waters. As such, a number of maps were developed for the community of Mero as a basis for the recommendations to solve current and future problems. They will also enable the community to make better decisions in areas such as emergency management, evacuation planning, health and safety, and tourism development.

Defining the effects of storm surge and floods

The identified hazards also impact the Edward Oliver Leblanc Highway that passes through Mero from south to north and divides the community in east and west sections. This road crosses two relatively low-lying sections that are subject to the effects of storm surge and flooding from blocked culverts. The roads on the east side of the community are also vulnerable to erosion from the overflow of water from blocked drains, minor slides and rock falls during torrential rains which can make the roads impassable during and after storm events. The main village road is also subject to storm surge; and it is therefore highly vulnerable to the effects of high seas. Additionally, the four culvert crossings under the main highway impact the residents of the community as a result of blockages that limit water flows and cause some level of flooding. Flooding did not only impact infrastructure, but also tourist visits to Mero and the livelihoods of people who rely on tourism in the community.
Plans to Build Community Resilience

The first step in addressing the challenges in Mero was the development of 3 interrelated plans:

- Community Climate Change Adaptation Plan for Mero
- Hazard Specific Plan for Mero
- Sector (Tourism) Specific Plan for Mero

Based on these plans, it was decided to address the serious issues that contributed to flooding in Mero, through the rehabilitation of the community’s drainage system. This would help build the resilience of the community and enable it to adapt to the effects of climate change.

The Hazard Specific Plans to counter flooding, storm surge and land slippage, as well as a Sector (Tourism) Plan and the topographical survey to inform the detailed design of the proposed rehabilitation were finalized in 2013. The OECS, RRACC partners, and USAID held a project site meeting with the selected contractor and engineering consultant (ECMC Ltd) in Mero during June 2014. They discussed the details of the project and examined the logistics for minimizing the adverse environmental impacts and for ensuring safety, security, and the preservation of livelihood activities. The project implementation phase commenced with a community consultation which took place on July 24, 2014, where the details of the project were presented. The consultation was chaired by Mrs. Josephine Dublin-Prince, president of the Mero Enhancement Committee and included residents, the Government of Dominica, the OECS Commission and the Consultant Engineer. The consultation also served as an official introduction of the contractor, Millennia LDC Ltd. which undertook the drainage works and the official handover of the Project site.

Figure 4: Completed, covered drains in Mero, Dominica
Rehabilitation works

The rehabilitation works involved the construction of drains and drainage channels, in addition to the repair of sections of the sea wall where severe spalling had been observed. The four drainage sub-projects and the sea wall repairs were as follows:

<table>
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<tr>
<th>No.</th>
<th>Component</th>
<th>Description of Works Undertaken</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Village Road Roadside Drainage</td>
<td>Covered reinforced concrete drain along Village Road</td>
</tr>
<tr>
<td>2</td>
<td>Highway Drainage</td>
<td>Diversion of drainage channels to eastern edge of the Highway to drain northward and reduce the volume of water flowing downhill into the Village</td>
</tr>
<tr>
<td>3</td>
<td>Hillside Drainage</td>
<td>Directing of surface run-off water into properly aligned and covered box drains with lateral inlet points</td>
</tr>
<tr>
<td>4</td>
<td>Drainage Solutions for the ravine</td>
<td>Construction of silt traps, ravine wall, and de-silting of ravine</td>
</tr>
<tr>
<td>5</td>
<td>Sea Wall Retrofitting</td>
<td>Removal of deteriorating concrete and replacement of a reinforced concrete skirt approximately 1.5 meters high</td>
</tr>
</tbody>
</table>

Throughout the project implementation, there was constant consultation with the Mero Enhancement Committee, the Government of Dominica, the Consultant Engineer, and the Contractor to foster stakeholder engagement and ownership so as to ensure the success of the project. The value of consulting stakeholders came to light prior to the project’s implementation. Contrary to the original design plan that required increasing the seawall by 500mm, consultations with the community and on-site inspections revealed that the solution was not a taller wall, but the rehabilitation of the drainage system. The Mero drainage project therefore resulted in the construction of roadside drains, clearing and rehabilitation of ravines, construction of a hillside network of drains, and the repair of the deteriorating seawall.

Figure 5: Mero Beach, Dominica
The project was completed in 2015, and the same year, the rehabilitated drainage system was put to a severe test. Tropical Storm Erika hit Dominica bringing torrential rains that set off massive landslides and flooding. Rivers and streams surged thus carrying borders and destroying homes, roads, bridges and land. In some cases, entire villages were engulfed and over 800 households were left homeless. Meanwhile, the rehabilitated drains in Mero achieved their purpose effectively during the storm and they reduced flooding; homes and other structures remained intact and the village residents were not displaced.

The United States Ambassador to Barbados and the East Caribbean, Linda Taglialatela lauded the project’s interventions saying “During the storm, these measures effectively diverted floodwater away from the community and dramatically reduced the scale of flooding”. In her view, the project underscores the value of community-driven efforts in reducing vulnerability to the threats posed by climate change. Mr. John Drigo, the Minister for Agriculture and Fisheries of Dominica noted that the community of Mero benefited tremendously from the project. Marina Serrant, a resident of Mero was even more exuberant as she expressed gratitude for the project that she said had saved her home from flooding during Tropical Storm Erika.

The additional project expansion works which were recommended by the consultant were completed and they addressed additional drainage issues within the project area.

The media publicized the project activities to educate the public on the impacts of climate change on the community of Mero and other coastal communities in Dominica. Such publicity included public announcements highlighting the dangers posed by climate change, project details and benefits in English and Creole as well as posters and brochures depicting the work of the RRACC Project on climate change adaptation, and a song on climate change prepared by the youth. A group of young people was exposed to the reality of climate change through educational programmes and field visits to see the impact of disasters on a number of communities in Dominica. They were also trained in the use of popular theatre; and they utilised this art form to share key concepts of climate change among the youth and the wider community through music and drama.
Photos taken after the Passage of Tropical Storm Erika

Figure 6: Photos of Mero Community taken after Tropical Strom Erika

Figure 7: Photos of Mero Community taken after Tropical Strom Erika
The community actively participated in the implementation of the Mero project, from inception right up to the completion of the project; they even provided materials for the civil works. The drainage project has improved the lives of Mero residents, and safeguarded the livelihoods they earn from the tourism industry. Also, tourist visits to the community have improved overall. Tourists who visit the community observe that it is safe to walk along the main road which has covered drains that serve as a side walk.

Project Beneficiaries:
- Residents of Mero
- Users of Mero Beach
- Tourists
- General public

The project implemented in Mero shows the value of the lessons the community drew from similar initiatives in the region. Such peer-to-peer leaning was primarily seen in the implementation of the CCAP based on work conducted earlier as the CDEMA/OECS implemented its Comprehensive Disaster Management Harmonized Implementation Program (CDMHIP). The Mero project therefore found acceptance as it built upon this groundwork and led to more detailed investigations and recommendations for specific climate change adaptation measures.
LESSONS LEARNED

Lessons learned include the following:

- Comprehensive, integrated analysis and planning helps ensure effective solutions and implementation.
- In implementing further projects in OECS Member States, a financial allocation should be made for the provision of additional manpower or government focal points to avoid the overburdening of staff who already have their regular duties.
- The active involvement of the Mero community in the implementation of this drainage project from inception to completion played a significant role in creating a sense of ownership that ensured the project’s successful completion.
- Publicizing project work and success can contribute to replicability.
- The involvement of all key stakeholders also made the physical implementation of the project effective but demanding on the part of local government staff.
- Hosting a closing ceremony involving the participation of all project stakeholders creates motivation for sustainability and replicability.
- Identifying a major external source of financing can ensure and speed up implementation.
The Mero Drainage Project was financed under Component 2 of the RRACC Project with a total budget of US$332,426.00. The project was implemented from July 2014 to July 2015. At the time the RRACC Project was signed onto, the United States was focused on addressing global climate change. USAID recognized the particular vulnerabilities of Small Island Developing States (SIDS), including flooding and the many repercussions that these can have on regional economic growth and sustainability, food security, public health, fresh water availability, and infrastructure. USAID also recognized that reduced incomes from tourism threaten the long-term economic sustainability and the development capacity of the region. The poorest and most marginalized communities are therefore mainly vulnerable and often live in areas mostly affected by flooding. Consequently, to reduce these vulnerabilities, USAID supported sustainable adaptation approaches that strengthened the resilience and adaptive capacity of its partner States to avoid further devastation from climate-related events in the Eastern and Southern Caribbean region.
The demonstration project in Mero provides a good opportunity for replication and scaling up in other communities throughout Dominica, the wider OECS, and in SIDS in other regions. The work undertaken through the CCAP serves as a blueprint for future climate change adaptation projects in Mero. The assessment and proposed interventions include detailed recommendations for addressing the myriad climate-related challenges facing the community. The recommendations could be further developed and implemented by other climate change adaptation and disaster mitigation projects in the community.

Because of the successes and lessons learnt during Tropical Storm Erika, the project could also serve as a blueprint for implementing similar drainage projects around the world. Its replication or adaptation would not only help create similar successes but also serve as a starting point for the widespread building of drainage systems and for the leveraging of financing from global and regional donors to address water-related disasters that are dreadfully exacerbated by climate change.

The mode of implementation which included all stakeholders such as the Mero Enhancement Committee are key lessons to be taken further in the implementation of similar projects. Involving key stakeholders from inception to completion creates local ownership where the project is seen as belonging to “us” rather than “them.” The community of Mero and other stakeholders including tourists are very satisfied with the project especially as it demonstrated its purpose of building resilience and helping the community adapt to the impacts of climate change as was evident during the passage of Tropical Storm Erika. This community involvement will also be critical in the maintenance and sustainability of the project. The Government of Dominica, because of this success, has hinted that it will attempt to replicate the project concept to address similar challenges in other areas in Dominica. This illustrates the Government’s commitment to averting the impacts of climate change in Dominica and to serve as a catalyst for OECS Member States and other SIDS to do the same.
ENDNOTES

- Collymore, J. as cited by Barbados Nation News. 2010. “Flooding, the Silent Killer for Caribbean Countries”.

Contacts for follow-up

Contacts for follow up on this case study include the president of the Mero Enhancement Committee, Mrs. Josephine Dublin-Prince at email address josephine.prince@gmail.com or telephone number 1-(767)-449-1800 and Mr. Harold Guiste, Permanent Secretary with responsibility for the project at the time, from the Government of Dominica at email address agriculture@dominica.gov.dm, psagriculture@dominica.gov.dm or telephone number 1-767-266-3282/3211.