How can Dominica and Other Islands Become More Resilient to the Negative Impacts of Climate Change?

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Introduction

Climate change refers to the change in weather patterns due to the build up of man-made gases in the atmosphere which trap the sun‟s heat. Due to climate change, there is an increase in the frequency and intensity of hurricanes over the last decade and the Caribbean has frequently experienced substantial damage from these weather events. Hurricane Maria produced an estimated US$931 million in losses on the island of Dominica, which amounts to two hundred and twenty-six percent (226%) of its gross domestic product (GDP) (Government of Dominica, 2017). The greatest losses were sustained in the agricultural sector (32%), followed by tourism (19%) (UNDP, 2017).

The Global Climate Risk Index 2009 report has also ranked at least six Caribbean islands, Dominica included, in the top forty countries experiencing extreme weather impacts due to climate change (Harmeling, 2009). A study from the Caribbean Catastrophic Risk Insurance Facility (CCRIF) showed that annual expected losses from wind, storm surge and inland flooding amount to up to six percent of GDP in some countries (Young, Iyahen, & Phillips, 2011). The Intergovernmental Panel on Climate Change (IPCC) has categorized the Caribbean region as a global “hot spot” and that these countries are expected to undergo direct and indirect adverse climatic impacts such as land loss and beach erosion, infrastructure and settlement damage, damage to coral reefs, damage to the tourism industry, agriculture and food security, water resources, and, lack of capacity to adapt (IPCC, 2007).

These impacts have not only disrupted the region‟s natural ecosystems but has also weakened the socioeconomic structures of these small island states. The Caribbean region is particularly affected by climate change, mainly due to its physical location and weaker adaptive capacity to resilient efforts, as these countries have limited resources to allocate toward

enhancing their resilience to climate change. These outcomes have a great effect on the standard of living of these islands due to their dependence on agriculture and tourism- two vulnerable sectors of their economies.

This essay identifies some of the most persistent issues and climate vulnerabilities facing Dominica and other Caribbean islands. It makes the case that climate resilience investment by both the private and public sectors is urgently needed to sustain economic and social development, and gives recommendations to some possible approaches to resilience building.

Negative Impacts of Climate Change

Agricultural Sector. Firstly, the droughts during the dry season have affected the production of agricultural produce as water sources are greatly diminished during these months. Also the destruction of mangroves by tropical storms has assisted in the reduction of freshwater availability on coastal farmlands. This increases the pressure on our interior forests as farmers are now moving further inland as coastal agricultural lands are made unusable due to the increase in salt deposits on these lands. The effect of natural disasters and human activities on coastal and inland forests has forced wildlife species to either die or migrate from this new environment created. Dominica's fresh water supply is also susceptible to major hurricane impacts as water quality is affected via landslides, slope failures and flooding. These storms also cause major damage to roads, bridges, buildings and agricultural land.

Dominica‟s major crops include bananas, coconuts and citrus fruits. Banana, Dominica‟s major export, is very sensitive to levels of rainfall. Excess rainfall increases the frequency of pest and diseases. This in turn leads to flagging productivity, as droughts lead to lower crop yield. Extreme events exact damage directly on food production through the destruction of crops and livestock and the erosion of farmlands.

Transportation networks and Infrastructure. Dominica‟s vulnerability is partly due to its physical location as well as its population distribution as over ninety per cent of the population resides in coastal villages (John, Bellot, & Parry, 2001). Most of the roads, bridges, and buildings found on the island are near the coastline. The projected gradual sea-level rise and the concentration of populations in the coastal zone is expected to cause major infrastructural damage which will be disruptive to both economic and social sustainability. Due to the topography of Dominica, the majority of coastal villages utilize hillside areas for infrastructural development. These areas are highly susceptible to the effects of torrential rains, storms and hurricanes.

Dominica‟s major airport, the Douglas-Charles airport runs adjacent to the Melville Hall river. During extreme climatic events, the area surrounding the terminal building is prone to flooding. The Roseau Ferry Terminal which is also adjacent to the Roseau river also suffers damage from floods caused by heavy rainfall. Other ports such as the Roseau Cruise Ship terminal and the Woodbridge Bay cargo port also suffered infrastructural damage during the passage of Hurricane Maria.

Coastal and Marine Environment. There is a sizable threat presented by sea level rise to the coastal forest habitats of our wildlife. The loss of forests due to climate change will also affect the biodiversity of species on the island as animals will be forced to migrate. Sea-level rise and increase sea water temperatures can have negative impacts on accommodation, beach erosion, and the natural coastal defense of coral reefs and mangroves. These impacts on both the natural and human environment are critical as these are some of the features that are needed in other sectors such as tourism and agriculture.

Dominica‟s wildlife is very sensitive to the impacts of climate change. The increase in temperature during the months of February to May is prone spells of drought on the western side of the island. This has affected the water flow in watersheds resulting in reduced food availability for wildlife and an increase in the forest pests and diseases. The increase of pests and diseases due to a shift in weather patterns have all but caused the extinction of the crapaud, a species of frog only found in Dominica. Elevated sea temperatures can also impair the coral reefs of Dominica through bleaching which in turn will cause erosion of our beaches.

Tourism. The Caribbean has been identified as a „tourism vulnerability hotspot‟ where a collection of climate related factors combine to place the Caribbean as a tourism destination „at-risk‟ (UWNTO-UNEP-WMO, 2008). The main reason behind the move towards tourism by these small island states is that tourism utilizes natural and cultural attractions to obtain economic benefits, locally produced goods can be sold to visitors, and; goods that could not be exported due to insufficient export capability can be sold to tourists (Mihalic, 2002). It is therefore important to assess and develop potential strategies to offset any potential threats caused by climate change to this industry. Given the importance of tourism‟s contribution to employment, livelihoods and the economic well being of Dominica, there are undeniable reasons why potentially adverse impacts of climate change need to be acknowledged and adaptation measures should be developed in order to abate the effects (Moore & Cashman, 2012).

Health Sector. Water scarcity carries a range of health risks. After the events of tropical storms and hurricanes or during droughts, potable water is unavailable and people tend to use water from rivers, springs and rainwater which are all untreated. Storage of these waters provide breeding sites for vectors such as dengue. There is reduced amounts of water available for basic

hygiene due to watershed diseases, chemical and microbial contamination as a result of increased drought; and gastrointestinal diseases caused by microbes in contaminated water.

Recommendations to Mitigate Climate Change

Priority should be given to preparing and implementing a Climate Change Act and the establishment of a body to coordinate the implementation of such an Act. This act should include legislation on building codes, planning of urban and rural settlements as well as environmental management and natural resources management. There should also be legislation on the sustainability of tourism in Dominica. This act is important as it will help guide the population on what is expected of them and help in protecting both human, livestock and wildlife from the ravages of climate change. Also the revision of rural and urban planning will assist in the building of settlements in areas that are not prone to landslides, flooding and coastal degradation. The updated building codes will ensure that people are housed in buildings that will withstand intense storms, landslides and floods. Further, improved environmental and natural resources management will help in protecting wildlife from the consequences of climate change as well as help protect the population from land loss, depletion of fresh water sources and lack of food security.

Agricultural Sector. Dominica‟s major crops are susceptible to the ravages of climate change. Pests and diseases have almost wiped out citrus production. Bananas is sensitive to both excessive rainfall and drought. It also is damaged by the high winds of hurricanes. It would be in the interest of farmers to diversify their crops to those that are more resilient to extreme weather conditions. Through research, agriculturists have discovered crops such as sweet potato, yam and cassava are hardy crops that adapt well to the extreme weather conditions the Caribbean now

faces. Sweet potato is a very resilient crop as it is drought-resistant and requires little fertilizer or soil nutrients.

The persistence of droughts means that farmers need to practice water management strategies such as mechanization and irrigation to improve crop yields during these months. Farm efficiency can also be improved by mechanization but this is costly to small farmers who are the back bone of Dominica‟s agricultural sector. It is important that government grants to aid in farm mechanization be given to these small land owners as this is a method that will help curtail the losses in the agricultural sector due to climate change.

Also, researchers have found that crops, such as vegetables, that are watered by rainfall yield significantly less than irrigated yields. As climate change has caused a decrease in the amount and the accessibility of surface water; efficient irrigation methods, such as drip irrigation, will assist farmers in increasing their yield and improve the efficiency of their farms. Farmers must also build on-farm water storage facilities that they can use in times of drought (United Nations Economic Commission for Latin America and the Caribbean, 2011). The governmental agencies need to also promote water harvesting and conservation strategies so that farmers are educated on these practices. Also, the government needs to work with DOWASCO to effect changes in water policies to reflect climate change. The government may provide DOWASCO with fiscal incentives for water conservation practices such as the repairing and maintenance of existing dams to minimize water loss.

One of the effects of climate change is the increase in temperature. This increase has caused a shift in the growing seasons in Dominica. This change must be monitored by government agencies, such as the forestry division, to ensure that crops are grown in the most suitable areas on the island. Crops that need a specific topography should be grown in areas that

will give the best yield. Research must be done by these agencies to ensure that farmers are utilizing their lands efficiently so that they can make a sustainable income. Resilient crops such as cocoa have improved yields at higher altitudes. Such areas in Dominica are highly forested. It is important therefore to have land distribution and management policies in place that will assist in allocating farms to lands with good agricultural capabilities, introducing improved technologies such as mulching to conserve soil nutrients, and to introduce protective strategies such as greenhouse facilities to aid in land preservation.

In Dominica, droughts have led to an increase in bush fires. In 2010 there was a hundred and fifty per cent (150%) increase in the amount of bush fires reported. These bush fires increase as droughts intensify. Farmers tend to start fires during these months as the hot weather is conducive for clearing land by fire before it is replanted. These farmers need to be educated on sustainable farming practices that do not cause firefighters to use up water, a much needed resource during times of drought. Mechanical clearing of land, tillage ploughing and other beneficial practices to improve soil fertility have to be taught to farmers so that there is an increase in productivity while avoiding fire incidents.

Education will also include the use of activities that mitigate the effects of extreme weather events caused by climate change. These practices will need the injection of capital investment and the government will have to play a pivotal role in ensuring that monies are available to assist in the sustainable development of low income farmers. These activities should include reinforcing dams to protect against floods, building water retention basins to secure water for irrigation in times of drought, investing into new farming techniques such as drip irrigation and the use of resilient seeds and crops.

The governmental agencies must also do research into creating crops that are drought-resistant and resilient to new pests and diseases. Also they need to do investigations into changing the crop calendar for short term crops to match changing rainfall patterns and establish food storage facilities and seed banks that can be utilized in the aftermath of extreme weather conditions. The agencies must also provide financial and human resource investments in helping mitigate climate change. This should include the building of better designed livestock pens, and establishing an early warning system.

Agricultural micro-insurance can be adopted by small farmers as a measure to help curb the effects of extreme weather events caused by climate change. Insurance can facilitate and enhance in mitigating the effects of climate change by protecting against loss of or damage to crops or livestock. It has great potential to provide value to small farmers and their communities, both by protecting farmers when bad weather conditions occur and by providing cover against loss of investments made in climate adaptive projects. Insurance is therefore not a suitable tool to prevent climate change, but can play a useful role in wide-ranging efforts to mitigate the adverse effects of climate change.

Tourism. The increasing frequency of droughts, sea-level rise, storm surges and a rise in frequency of relatively intense storms could have damaging effects on the future sustainability of the tourism product. To curtail this effect, adaption via relatively practical solutions such as resource use efficiency, enforcement of existing regulations and innovative structural solutions should be utilized. The impacts of climate change represent a threat to the tourism industry with the potential to severely limiting its contribution to Dominica‟s economy. Through the introduction of adaptation measures, climate change presents opportunities which would secure and strengthen its place as a major player in Dominica‟s economy.

The government and tourism organizations can also provide suitable incentives such as grants and low interest loans for the accommodation sector to invest in solar and wind energy that will help in the reduction of energy costs in their buildings. Some efforts have already begun on this front. The Caribbean Alliance for Sustainable Tourism executed a twenty-four-month energy project to improve the use of energy, with the emphasis on renewable energy and micro-generation. Such projects have the potential to not only boost the sustainability of the tourism product, in light of climate change, but also to enhance the competitiveness of the product.

Energy Sector. The first is by managing carbon emissions by adopting national emission reduction practices and technologies in energy generation and transport. Although the region only accounts for zero point two per cent (0.2%) of all carbon emissions, it would be a plus to market the region as a carbon neutral zone (Dulal, Shah, & Ahmad, 2009). This would create media attention and establish a positive, environmental image for the region. Also, energy consumption is very high in the tourism and commercial sectors as fossil fuels are in greater demand as the increase in temperature means an increase in the electricity bill for purposes such as air conditioning. It would therefore be desirable that governments invest in alternate sources of energy such as solar energy, wind energy, hydroelectricity and geothermal energy. Some twenty per cent of Dominica‟s energy is derived from hydroelectricity. There is potential for an increase in hydroelectric output. Further, the government of Dominica has also done research into using geothermal energy as an alternative to fossil fuels. This will help reduce Dominica‟s dependence on fossil fuels and create much needed revenue as excess electricity products can be sold to neighbouring islands.

Energy efficient technologies found in light bulbs, refrigerators and air-conditioning units can also help in energy conservation and also help reduce energy wastage in buildings. The reduction of energy consumption and the promotion of energy efficient technologies usage that focuses on conservation and efficiency in the sector will help in long term reduction of expenses that may result due to climate change.

Transportation Sector and Infrastructure. One of the obstacles facing the adaptation of the transportation and infrastructure sector is the lack of data produced by suitable research and development. There needs to be collaboration between government organizations and private institutions at a national and regional level. In this respect funding is a key factor and for this reason the establishment of an environmental trust fund is proposed. This trust fund will be used to research solutions to mitigating climate change in a sustainable manner. These bodies must also share information on best practices to adaptation and mitigation, do research and evaluation activities on projecting current and future climate change impacts; assessing vulnerabilities and evaluating resilience and adaptive capacity; and evaluating current and future adaptation and mitigation activities. Such projects will assist governments in allocating funds to areas that are needed as Dominica and other islands in the region have limited financial resources. The data obtained from the research conducted by governmental and other agencies can be used to create policies to guide the design and planning of new infrastructural projects. These new designs will utilize information gathered such as projected temperature, precipitation, and sea level to build infrastructure such as road networks, bridges and buildings, that are resilient to these conditions.

There is also a need by governmental agencies to ensure that new infrastructure is in compliance with existing regulations and policies. The need for coastal structures to follow building codes is critical in order to reduce the damage or destruction of tourism

infrastructure during extreme weather conditions. Other structures such as airports, seaports, roads and bridges are also expected to be built using resilient materials and be designed to withstand extreme weather conditions.

Health Sector. Adaptions in the health sector is mainly via education and monitoring. The ministry of health needs to conduct education and training on how climate change affects health. Possible strategies taught will be the proper storage of rainwater to prevent vector and water borne diseases. The governmental agencies must assess and prioritize vulnerability reduction investments in their health facilities. There must also be a monitoring system of mosquito movements to help curb incidences of dengue fever and also rainfall patterns to diminish the effects of water borne diseases.

Conclusion

The negative impacts of climate change on Dominica and other small island developing states is a cause of concern as these islands are vulnerable due to their weak adaptive capacity to resilient efforts. Due the the physical location and topography of the island, many of its sectors including agriculture and tourism, which is often of considerable economic importance, are also at risk. Given the high vulnerability of Dominica and other islands in the Caribbean, it is likely that a proactive approach to adaptation planning will be especially beneficial in reducing the adverse effects of climate change.

Adaptation to the impacts of climate change should involve a wide range of actions, policy changes and research. The main recommendation is the implementation of a Climate Change Act that will include legislation on building codes, rural and urban planning, and environmental and natural resources management. In the agricultural sector, suggestions include

agricultural diversification of crops, building of food storage facilities, water management strategies, education on new agricultural technology, monitoring of rainfall patterns and agricultural micro-insurance. Recommendations for the tourism sector would include resource use efficiency, enforcement of existing regulations and innovative structural solutions.

To mitigate the effects of climate change in the energy sector, it is advocated that the islands invest in energy efficient technologies and alternative sources of energy to reduce consumption of fossil fuels. For the transportation and infrastructure sector, it is advised that the government sets up a trust fund to do research and development in mitigating climate change in a sustainable manner. Data from the research will be utilized in the planning and design of new infrastructural projects. In the health sector, recommendations include education and monitoring of vector borne and water borne diseases. Our ultimate survival as a nation and region hinges on our ability to make the islands of the region more resilient.

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