



## **A FRAMEWORK OF GOVERNANCE FOR SUSTAINABLE DEVELOPMENT FACING CLIMATE CHANGE IN THE CARIBBEAN SMALL ISLAND DEVELOPING STATES: THE CASE OF GUANAJA ISLAND IN HONDURAS**



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# **A FRAMEWORK OF GOVERNANCE FOR SUSTAINABLE DEVELOPMENT FACING CLIMATE CHANGE IN THE CARIBBEAN SMALL ISLAND DEVELOPING STATES: THE CASE OF GUANAJA ISLAND IN HONDURAS**

**TICIANO COSTA JORDÃO, WILSON JORDÃO FILHO, EBO QUARTEY**

## **Abstract**

In the current debate on climate change, the Small Island Developing States (SIDS) have gained a major concern since they contribute least to greenhouse gases but are most vulnerable to climate change, mainly when it concerns rising sea level. They comprise 52 States and Territories spread over the Pacific, Indian and Atlantic Oceans and Caribbean Sea. Generally, these States are influenced by large ocean-atmosphere interactions and are characterized by the concentration of large settlements with associated economic and social activities at or near the coast. The region with the largest number of SIDS is the Caribbean Sea where an increased frequency and intensity of storms and hurricanes due to climate change have caused many victims and considerable financial loss due to damages to infrastructure, utilities and properties. These islands are constantly under threat due to tourism and fishing sectors and depend on fragile ecosystems such as coral reefs. This paper presents a case analysis of Guanaja Island in Honduras and provides a framework for sustainable development governance facing climate change. Firstly, this framework introduces stakeholder mapping tools and a problem tree analysis. Then, it proposes mitigation and adaptation measures in a harmonized way under an objective tree analysis. Finally, authors suggest how this framework can be adapted into the decision-making process facing climate change effects in other Caribbean SIDS.

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## 1. Introduction

The Small Island Developing States (SIDS) comprise 52 states and territories located across the Indian, Pacific and Atlantic Oceans, and also in the Caribbean Sea<sup>1</sup>. They are among the most vulnerable states to the effects of climate change mainly concerning rising sea level and extreme weather events. Many of their economic activities tend to be concentrated in their coastal areas and a sea level rise may result in accelerated coastal erosion, saltwater intrusion of freshwater reservoirs and increasing reach of storm waves, in addition to the possibility of actual drowning of some low-lying islands and atolls (Olmos, 2001).

Generally, the SIDS have common characteristics, such as small size, remoteness, vulnerability to external (demand and supply-side) shocks, narrow resource base, and exposure to global environmental challenges (General Assembly of the United Nations, 2011).

The SIDS are located mainly in tropical and sub-tropical oceans. Their climate is influenced strongly by large-scale ocean-atmosphere interactions which often manifest themselves in extreme weather events such as hurricanes and cyclones. These events are associated with storm surges, coral bleaching, inundation of land, and erosion, incurring high costs of damage to socio-economic and cultural infrastructure (Sem, 2007).

The Intergovernmental Panel on Climate Change (IPCC) has pointed out that vulnerability of a region depends to a great extent on the level of economic development and institutions since poverty limits adaptive capabilities (Intergovernmental Panel on Climate Change, 1997).

The high vulnerability and low adaptive capacity of SIDS to the impacts of climate change are associated with their socio-cultural and economic context. Vulnerabilities include low availability of resources, small but rapidly growing populations, remoteness, susceptibility to natural disasters, excessive dependence on international trade, and vulnerability to global developments (United Nations Framework Convention on Climate Change, 2007).

A warming of the ocean surface around SIDS has already been detected and changes in precipitation patterns as well as extreme weather events have also been observed, which in turn may severely affect the agriculture, fishing and tourism sectors (Nurse & Sem, 2001).

Coral reefs are the world's most diverse marine ecosystems and are critical to the livelihoods of millions of people who depend on them. Increasing sea surface temperatures have been addressed as one of the factors that have been contributing to coral bleaching events and widespread mortality of numerous marine organisms (Eakin, Kleypas, & Hoegh-Guldberg, 2008). Simultaneously, the increasing concentration of CO<sub>2</sub> in the atmosphere has been pointed out as a major source of the increasing acidity of seawater that has been harmful to several forms of marine organisms (Ocean Acidification Network, 2009).

Many diverse projects and programmes on issues relating to climate change impacts, vulnerability and adaptation have been implemented within the United Nations Framework Convention on Climate Change (UNFCCC) process in collaboration among UN agencies, multilateral financial institutions and bilateral development assistance agencies. These projects involve strengthening of institutions, policy and regulations, but also ground-level tasks such as water storage and drought-resistant crops (Scientific and Technical Advisory Panel of the Global Environment Facility, 2007) (Global Environment Facility, 2010). National adaptation programmes of action have been useful in helping the most vulnerable SIDS to identify their most urgent adaptation needs (Samoa National Climate Change Country Team, 2005) (Ministry of Rural Development, Fisheries, Handicraft and Environment at the Union of the Comoros, 2006).

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<sup>1</sup> <http://www.un.org/special-rep/ohrlls/sid/list.htm>.

The region with the largest number of SIDS and maritime boundaries in the world is the Caribbean Sea, where an increased frequency and intensity of storms and hurricanes due to climate change have been observed. Apart from many victims and considerable financial loss resulting from damage to infrastructure, utilities and properties, these islands are constantly under a threat due to their high dependence on the tourism and fishing sectors, which in turn depend on fragile ecosystems such as coral reefs.

The main organizations acting over the future of these states are the SIDS Network and the United Nations Economic Commission for Latin America and Caribbean (UN-ECLAC). Together with other SIDS, these Caribbean states have adopted in 1994 the Declaration of Barbados and the Program of Action for the Sustainable Development of Small Island Developing States (United Nations General Assembly, 1994).

This paper presents a case analysis of Guanaja Island in the Caribbean Sea, which is not listed as a SIDS since it is just a part of Honduras. The authors considered it interesting to investigate the climate change effects on the island and explore possible mitigation and adaptive measures from the same perspective of a SIDS as it shares similar socio-economic and environmental characteristics of a typical SIDS. First, the use of the Mendelow Framework for stakeholder mapping on the island is presented. Subsequently, the authors highlight within a problem tree analysis the main local climate change effects, their interrelations, and their main local contributing factors. Then, mitigation and adaptive measures are proposed in a harmonized way under an objective tree analysis. Finally, the authors suggest how this framework can be adapted to the decision-making process facing climate change effects in other Caribbean SIDS.

## **2. A sample case analysis: The Guanaja Island - Problem tree analysis and stakeholder mapping**

Guanaja is a small island in Central America, located about 70 km off the Honduran coast in the Caribbean Sea. It is one of the Bay Islands of Honduras. Bonnaca Cay, the main town, is on an islet about 300 meters off the main island. There, 10,000 people live in a very small area amid waterways that run through it. It is the most densely populated city in Honduras. What makes Guanaja Island special is its seclusion. There is only one small road on the island linking the other two minor towns of Mangrove Bight and Savannah Bight, so that nearly all transportation is done over water (Fortenberry & Fortenberry, 2007).

Guanaja has most of the typical characteristics found among SIDS and seems to be a good example for a qualitative sample analysis. The main income for the islanders is fishing. Tourism also plays an important role but is still confined to small resorts fitted to divers, snorkelers and adventure travellers. The island's warm, clear waters support an extensive coral reef that is part of the Mesoamerican Barrier Reef. The access to Guanaja is only by flights from the Honduran town of La Ceiba and by ferry from Trujillo.

Although it is in a better situation than the national average standards of living in Honduras, Guanaja still faces significant problems to solve on its social and environmental agenda (ECON, 2004).

Just like the rest of the country, Guanaja Island has been highly dependent on a thermo-based power system (Empresa Nacional de Energia Electrica [ENEE], 2010). Most of this thermal energy is generated by diesel motor with imported oil. Therefore, its energy supply system is very vulnerable to the high and volatile international oil prices and causes major concerns in terms of pollution. Another important source of energy is biomass, primarily firewood, mainly for the residential sector in rural and peri-urban areas (International Energy Association, 2010). However, a good potential

for offshore wind power around Guanaja Island and other Bay Islands of Honduras has been identified (Meisen & Krumpel, 2009). Due to the likely long-term trend of high oil prices, such resources could be developed at competitive prices (Empresa Nacional de Energía Eléctrica [ENEE], 2009).

Sanitation problems have been identified as a prime concern on the Bay Islands, and have implications for the health of the surrounding ocean and coral reefs. Only 11 per cent of households on Guanaja Island have sanitation services (ECON, 2004). Additionally, waste disposal is also an issue of concern since the final disposal sites can be characterized as open dumps (Gonzalez, 2005).

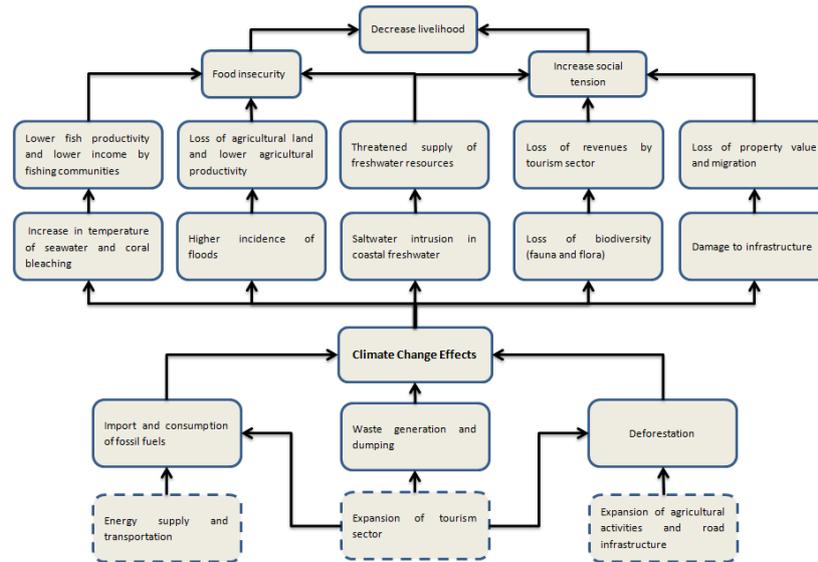
In 1998, Guanaja was one of the areas hardest hit by the hurricane Mitch and its marine and terrestrial resources suffered major changes. The storm damaged the reefs, killed whole stretches of coral and left the always vulnerable marine ecosystem even more susceptible to manmade degradation. The persistently strong winds of hurricane Mitch stripped the island of much of its vegetation cover, which caused severe erosion and landslides on steeper slopes. High winds levelled the pine forests, which have only recently begun to recover, and crushing waves wiped out the estuary-based mangrove swamps. Several of the main resorts on the island were severely damaged and ultimately forced to close (Krausse & Dyer, 2000).

Due to fears of another hurricane Mitch, investors are not financing as much as expected, which in turn is holding back tourism development. Waste problems are contained, not because of a conscious effort on behalf of the authorities to solve them, but because there is less pressure on the system.

Figure 1 provides the result of a problem tree analysis conducted by the study authors considering the cause-effect relationships associated with climate change on Guanaja Island. As observed, climate change can be evidenced in three main forms: increasing seawater temperature, rising sea level, and increasing frequency and intensity of extreme weather events. This map helps identify the linkages between the most important consequences of climate change to the island and provides an initial step for setting objectives and initiatives oriented to climate change mitigation and adaptation. It is also important to note that this map only highlights the local contributions to climate change through import and consumption of fossil fuels, waste generation and dumping, and local deforestation. These local contributions belong to the three main dimensions of activities on the island: energy supply and transportation, expansion of the tourism sector, and expansion of agricultural activities and road infrastructure. The global contributions to climate change are beyond the sphere of influence of local authorities and therefore are not specified in this map.

Figure 2 illustrates the main stakeholder groups on Guanaja Island, and the levels of their respective powers and interests according to the Mendelow framework. The Mendelow framework has been widely used in strategic analysis and its conventional purpose is to attempt to understand the influence that each stakeholder has over an organisation's objectives and/or strategy. This analysis can be easily adopted in this case study by establishing which stakeholders have the most interest in climate change issues and which ones have higher influence on local climate change adaptive measures.

Figure 1: Problem tree analysis of climate change effects on Guanaja Island



Source: own work

The agricultural sector is very small in comparison with the fishing industry and is solely destined for local consumption on the island. It is mainly based on crops like coffee, coconuts, bananas, citrus and timber. Their low contribution to the local economy gives the farmers little power to enforce decisions on climate change adaptive measures. Most agricultural goods are imported. Therefore, they might not be as highly affected by climate change as the fishing industry, and for this reason their level of interest in such measures is supposed to be low. The communities around the island also have no power to change the scenario and demonstrate their low interest in climate change adaptive measures due to their low level of education and insufficient information provided in this respect by local and national authorities.

Figure 2: The Mendelow framework applied to Guanaja Island

	Low	Interest	High
Low	<ul style="list-style-type: none"> <li>Agricultural sector</li> <li>Community</li> </ul>		<ul style="list-style-type: none"> <li>Fishing Community</li> <li>Fisheries Department</li> <li>Fish Processing Company</li> </ul>
Power	<ul style="list-style-type: none"> <li>Transport sector</li> <li>Energy sector</li> </ul>		<ul style="list-style-type: none"> <li>Local government</li> <li>Tourism Industry</li> <li>FEMA</li> <li>Food Retailers</li> </ul>
High			

Source: own work

Over the years, fishing has been the primary industry on the island, mainly consisting of lobster and shrimp fishing. Apart from the fishing community, fish processing companies and associated transportation services have also been playing an important role in the local economy. However, the hurricane Mitch has severely impacted on this sector, which has since been in a state of profound and

irreversible decline. Therefore, the fishing community and the fish processing companies are expected to show a high level of interest in climate change adaptive measures but have little power to deal with this problematic issue. The Honduran Fisheries Department named DIGIPESCA has been struggling to establish Marine Protected Areas in the Bay Islands. Overfishing had been a common practice around all the three Bay Islands even before the hurricane Mitch, which has intensified its impacts. Their level of interest can be considered high but their power to change things has been shown at a low level.

The tourism sector, on the other hand, has been seen as the only means available to replace the lost income from the decline in fishing and packaging. An increase in private investment in the tourism industry has been observed in the past few years with the construction of new hotels and expansion of existing resort capacities. However, due to lack of sufficient public investment in infrastructure to attract or accommodate larger numbers of tourists, the sector cannot be developed at its full potential. Although incapable of handling the local economic recession, followed by increasing unemployment rates, criminality and emigration, the local government is the main stakeholder that can provide immediate assistance with infrastructure and public services.

The Regional Office of Environment Protection (FEMA) has the goal to investigate, document and present to the courts of the Republic in criminal matters, the corresponding criminal proceedings for damage caused to the environment, ecosystem, natural resources and the health of the Honduran population. Therefore, it was also assigned high levels of interest and power.

Food retailers, while highly interested in the recovery of the local fish industry, do not rely solely on the local suppliers and most of their food products are imported. Therefore, they also have some power to take adaptive measures.

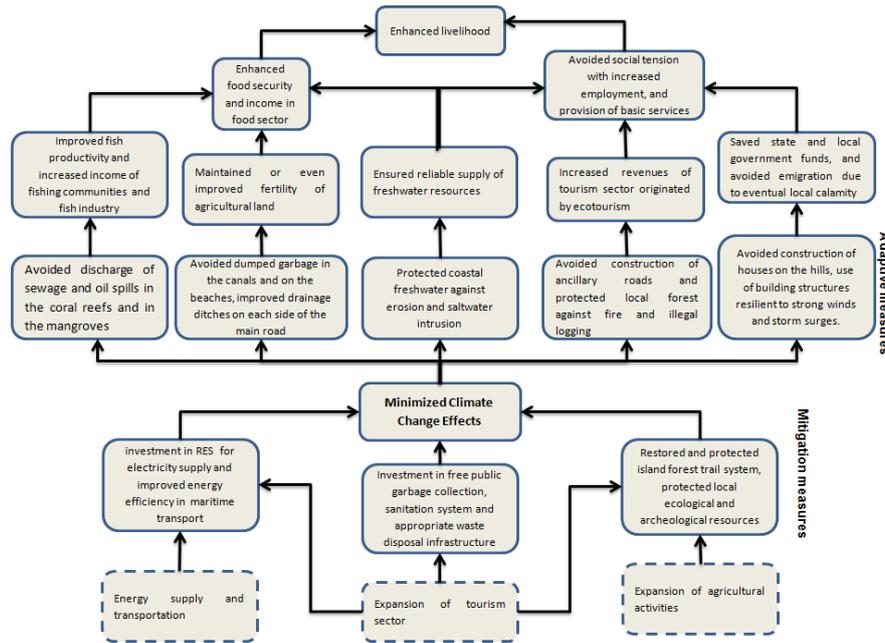
Energy and transport services are essential for the development of every community. For this reason, both the sectors are assigned high powers of influence on strategic decisions on the island. Electricity is supplied by a major thermo-based power station and numerous private generators that operate on diesel motors with imported oil. Electricity supply can be interrupted under certain extreme weather conditions but the situation would be the same with other sources of energy. Since there are currently no national or local policies and incentives to invest in renewable energy sources, the power station management does not show much concern about climate change issues. Local transport is provided by outboard-engine motorboats, a diesel ferry service and a bus service along the only road available on the main island. The local transport operators do not show much concern about climate change effects on their services as they have no other alternatives.

### **3. Mitigation and adaptive measures facing climate change**

The problem tree analysis presented in the preceding session only illustrated the local contributions to climate change since those were the only factors that could be partially controlled by the local government in cooperation with other stakeholders. Figure 3 shows an objective tree analysis, which consists of rephrasing each of the problems into positive desirable conditions. Some objectives were described in more detail since they depend on two or three sub-objectives. These were the cases of all the direct climate change effects highlighted in the problem tree.

The objectives highlighted just below the focal problem “Climate Change Effects” are considered mitigation measures since they aim at reducing the sources or enhance the sinks of greenhouse gases. On the other hand, the objectives specified just above the focal problem are considered adaptive measures facing climate change effects as they address possible ways to moderate potential damage to climate variability and extreme weather events and to take advantage of opportunities from tourism expansion.

Figure 3: Objective tree analysis facing climate change effects on Guanaja Island.



Source: own work

#### 4. Conclusions and recommendations

Climate change has emerged as an urgent issue to be addressed by governmental authorities, mainly among the Small Island Developing States (SIDS) due to the high level of vulnerability of their natural, economic and social systems associated with rising sea level and extreme weather events. Usually, these nations depend on only one or a few economic sectors. Therefore, future changes in weather patterns and sea level predicted by climate change models will further affect virtually all the areas of their economies and societies (Lal, Harasawa, & Takahashi, 2002). Moreover, most of these countries are net importers of food and fuel, which in turn yet intensifies their intrinsic vulnerabilities.

The authors have adopted strategic management tools to present the preliminary steps for the investigation of the climate change effects on Guanaja and to explore possible mitigation and adaptive measures.

It has been shown that the island's economy depends mainly on the fishing and tourism sectors. The fishing sector has collapsed after the hurricane Mitch in 1998. The tourism sector, on the other hand, is found in a growth trend boosted by private investment but is also threatened by climate change evidence and lack of sufficient public investment in adaptive measures.

The mitigation and adaptive measures presented in the study require the participation of different stakeholder groups. Therefore, it is important to understand how each stakeholder group can be affected by climate change and how they can collaborate to improve the resilience of the island to these effects. For this purpose, environmental education campaigns are highly recommended, mainly when addressing waste management, sanitation, energy efficiency, and land use. Local surveys aimed at identifying the perception of stakeholder groups concerning climate change issues can provide a valuable input for the development of these awareness-raising campaigns. Then, concrete measures can be implemented in cooperation between two or more stakeholder groups. The authors intend to establish a closer cooperation with the local government and the FEMA in order to develop these awareness raising campaigns among the local population

and define a strategic management plan for improving the island's adaptive capacity and reduce its vulnerability to climate change effects.

Mechanisms to foster diversification of the local economy should also be established, mainly by improving the agricultural activities towards meeting most of the local needs. The SIDS network and UN-ECLAC may provide a valuable exchange of knowledge and experience concerning these issues.

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