



Enabling Adaptation to Climate Change within the Mesoamerican Reef

A Case Study

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MESOAMERICAN REEF (MAR)
ECOREGION, CENTRAL AMERICA

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- ensuring that the use of renewable natural resources is sustainable
- promoting the reduction of pollution and wasteful consumption



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Contenido

Overview	1
Objectives	5
Main Results	6
Summary	16



Overview

The Mesoamerican Reef (MAR) system stretches over nearly 1,000 kilometers of coastline, spanning the Caribbean coasts of Mexico, Belize, Guatemala and Honduras. It is the largest in the Western Hemisphere and has been granted international recognition due to its unique and important variety of productive ecosystems. The MAR is a region of high conservation value, as has been proven by its inclusion in WWF's Global 200 priority ecoregions and as a top marine conservation priority in Latin America and the Caribbean (LAC). Human populations within each of its adjoining countries rely heavily on its diverse resources for much of their livelihood and sustenance. This has even led to population density escalation in vulnerable coastal areas due to increased migration by individuals seeking job opportunities and a better quality of life from growing employment opportunities in the tourism, agriculture and fisheries sectors in coastal areas. As such, coastal mangroves are being cleared at an increasing rate, thereby increasing ecosystems' and human's vulnerability to natural threat factors.

Produced by:

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2008

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The health and integrity of the MAR is under significant threat. Threats include declining or depleted fisheries stocks, habitat degradation or loss, declining water quality, among others. The Mesoamerican Reef is also subjected to increasing threat from global climate change, with more frequent coral bleaching events and potentially more frequent and violent storms projected. It has already been considerably impacted by the 1995 and 1998 mass bleaching events, which both coincided with elevated sea temperatures and calm seas; well known promoters of bleaching. Hurricanes are fueled by warm sea surface temperatures and have had devastating ecological, economic and human-health related impacts in the region.

Climate change could be the last straw that pushes many reefs and other coastal systems beyond the threshold of recovery, yet efforts to critically address this threat is lacking. Tourism and fisheries, two of the region's main economic foundations for the population, depend on maintaining the health of reef ecosystems that are directly threatened by climate change impacts. Climate change (CC) is certainly the key global environmental issue of the day as it has substantial implications for development in the MAR region. Developing climate change adaptation strategies to improve resilience to this and other combined anthropogenic threats is crucial for helping the region weather the effects of climate change.



The climate change adaptation project discussed herein is helping to enhance the long term viability of the MAR's diverse ecosystems through lobbying for the incorporation of sound management and conservation practices that consider both the potential and actual impacts of climate change in combination with other direct anthropogenic threats (pollution, over-fishing, habitat degradation, etc) on coastal ecosystem health, thereby promoting sustainable livelihoods and natural disaster protection to dependent communities and sectors. It is providing the necessary guidance to create strategies to build ecosystem and human resilience in response to climate change. It has been realized that to build resilience, however, requires a concerted and coordinated effort of government, private sector, conservation organizations as well as local communities. As such, partnerships have been bridged with various organizations, agencies and community groups.

The project focuses on (a) assessing the impacts of CC on coral reefs and associated habitats & species, (b) working with partners to identify the most resilient reefs for further protection and (c) raising awareness of key stakeholders and the broader public on CC issues and possible adaptation strategies. Maintenance of environmental health and sustainable livelihoods has strong focus since the health and well-being of the MAR populace are dependent upon the continued functionality of its complex ecosystems. For the most part, these ecosystems are undervalued until the negative effects of their overexploitation/degradation become evident. Through the ecological monitoring and public outreach work, the project have been effectively documenting and raising awareness on threats to these systems, which is hoped will set the pace for a concerted movement to effect change in how the populace use and interact with its natural resources. Efforts are being approached from both the top-down and bottom-up directions, which includes placing increasing emphasis on elevating local communities' awareness and actions to identify local based CC adaptation approaches as well as working with policy and regulatory parties to enable legal implementation of such adaptation measures as well as scaling-up to the national level.

The building of social networks for CC adaptation is as an important measure in enabling adaptation planning. This will build people's trust and ability to work together to pursue common interest, thereby setting the pace for improved management of common resources. Such networks will enable innovation, development of knowledge and the sharing of such knowledge to shape policies – essentially ensuring that the public's interests are reflected in legislations. Through this project, WWF hopes to transform current structure (e.g. influencing government and private sectors) and processes (e.g. laws, policy, culture, institutions, etc.) to enable climate change adaptation planning within the MAR.



Objectives

General

Enhance the viability and health of the Mesoamerican Reef's diverse ecosystems that support the livelihoods and natural disaster protection of coastal communities through the consideration and incorporation of potential and actual impacts of climate change into ongoing marine and coastal resource management practices.

Specific

- Assess reef ecosystem health, predict climate change impacts to such systems and identify adaptation strategies to reduce impacts for decision support.
- Increase public awareness on climate change issues.
- Foster necessary networks for advocating, identification, and implementation of mitigation and adaptation strategies to build ecosystem and coastal community resilience to climate change.



Main Results

1. Increased Scientific and Technical Capacity to Monitor Reef Health within the MAR.

A total of 27 individuals representing various local organizations (Governmental, NGOs, and Community Based Organizations) were technically trained in reef assessment techniques in Belize in 2006. These individuals are now able to design their respective monitoring programs to answer important management questions and effectively contribute to management efforts within the region.

2. Execution of Comprehensive Assessment of Reefs within the MAR.

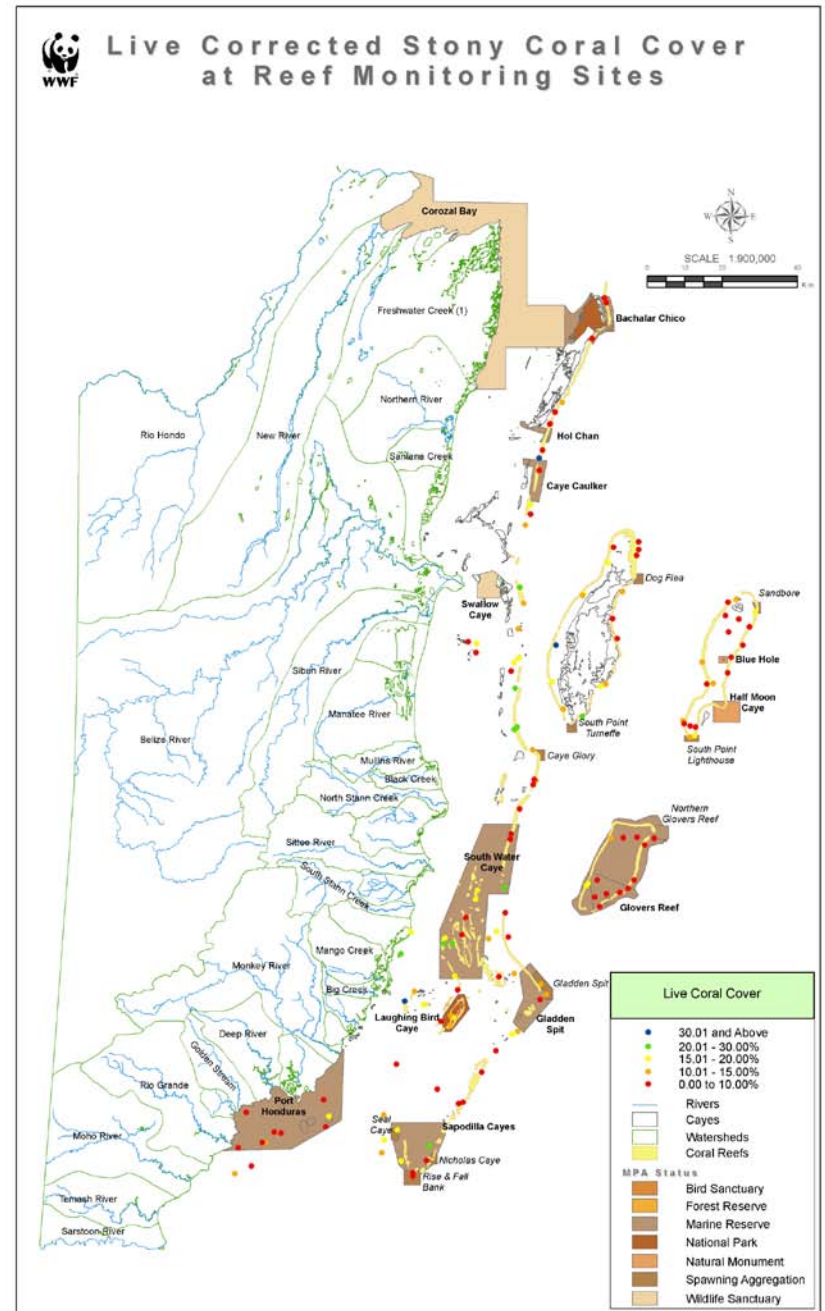
WWF in partnership with various local organizations (including community based ones) carried out a detailed rapid reef assessment in Belize during 2006. This effort was replicated in Mexico, Guatemala and Honduras through WWF's collaboration with the Nature Conservancy (TNC). The reef assessment initiative entailed the training of local counterparts in field monitoring techniques prior to the comprehensive reef study for which more than 400 sites within the MAR were investigated. 327 sites had suitable reef substrate cover that warranted thorough investigation. Of the 327 reef sites, 140 were in Belize. These sites are randomly situated throughout the Belize Barrier Reef Complex and include shallow fore reefs, patch reefs and back reefs/reef flats, ranging from the northern barrier tip (Bacalar Chico) to the southern reefs off Sapodilla Cayes, including reef areas within and outside of MPAs. Based on this assessment, live coral cover was found to be overall low within the region; a national average of 11.3% for Belize, 7.64% for Mexico, 8.5% for Guatemala and 11% for Honduras. A critical finding for Belize also is that fore reefs appear to be more susceptible to bleaching than reef flat and patch reef sites, which is contrary to the current school of thought¹.

This initiative is the first for the region in terms of spatial magnitude and offers the opportunity to provide more informed inputs in terms of reef conservation. However, if we could continue tracking the status of healthier reef types, we would be in a better position to demonstrate that these reefs have significant ecological benefits, which warrants their protection.

¹ Prior to recent findings by members of the reef science community, fore reefs were thought to be less susceptible to bleaching effects – possibly due to higher flushing rate. However, even with the potential for higher flushing, bleaching is more intense due to more transparent overlying waters that allow for greater light penetration. Near-shore reefs (e.g. patch reefs), on the other hand, are overlaid by turbid waters that functions to buffer against intense light penetration.

3. Spatial Analysis, Mapping and Development of a Geographic Information System Database of Reef Health Data to Aid Exploration of Climate Change Adaptation Strategies for Reefs.

Data from the comprehensive reef study was used to conduct an analysis of habitat representation for Belize and to aid in identification of bleaching resistant and resilient reefs. GIS applications were used to generate maps to spatially highlight healthier reef types (i.e. reefs likely exhibiting bleaching resistant and resilient potential) as well as their physical location with respect to the current MPA network. This information is being utilized to contribute to critical decision support systems for conservation/management of Belize's coral reefs.

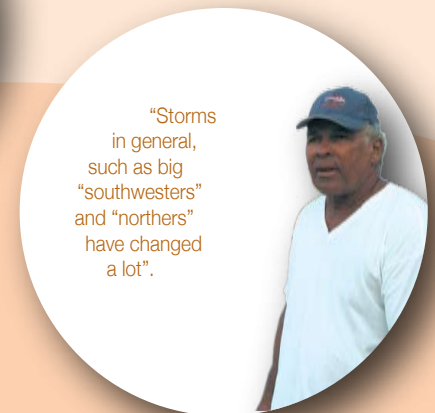


4. Building of Social Networks to Aid Identification of Key Consideration for Adaptation.

A Climate Witness Program was developed to collect information on peoples' perception about climate change and the ecological and socioeconomic implications of both climate change and anthropogenic (human-induced) stress factors. Informants in Belize have all witnessed climate change in one form or another, including rising temperatures, altered precipitation and wind patterns, and coral bleaching.

From the Mouth of Witnesses:

Climate witness surveys out to obtain personal stories from people on how climate change effects have impacted their lives and livelihoods.



In order to foster climate change adaptation at the community level, WWF has been actively trying to strengthen the voices of communities and individuals to build social networks for adaptation. WWF is working with a number of witnesses from various coastal communities in Belize, including Port Layola (Belize City), San Pedro, Placencia, Glover's Reef Atoll and Punta Gorda Town. Some of the perceptions from the local communities center on coral bleaching and reef degradation, which are viewed as major issues for dependent livelihoods and industries (i.e. fishing and tourism). Most climate witnesses believe that responsible fisheries management and sustainable development activities are necessary to reduce the stress on coral reefs and associated species. On land, development is seen as a major issue, causing significant decreases in coastal mangrove coverage, which will increase vulnerability to storms and hurricanes, since coastal mangroves function as the second-line buffer next to reefs. We are actively working with these Climate Witnesses to help bring their issues and concerns to decision-makers.

WWF is currently trying to focus more closely on community vulnerability assessment and community empowerment to identify functional adaptation strategies. The aim essentially is to obtain a more in-depth understanding of the vulnerability of these communities to climate change impacts. How has it impacted them in the past and what might it mean for them in the future. With an understanding of this, we will be in a better position to explore with them the aspects of their livelihoods (social, cultural, economic, institutional, etc.) that have helped them cope in the past, or have hindered them from coping in the past. And consequently, what they feel they may need to do in the future to be better prepared and more resilient or resistant to climate change. WWF is currently in the planning stage of gathering possible “solutions” –adaptation measures, from 5 targeted coastal communities within the MAR to produce a synthesis of these. While this is very useful –especially for decision-makers at a national/regional level, it is also important to capture– in the words of each community –their solutions, as this is something that could form the basis of community adaptation planning. This initiative will also include the development of a training methodological tool(s) that could be used by others for assessing vulnerability in natural-resource dependent communities.

WWF feels that the starting point to understanding vulnerability and possible adaptation to CC is to fully understand the communities’ interaction with the reef and coast. How they use it, what it means for their livelihoods, etc. At the same time, WWF is also building partnerships with regulatory and policy agencies, and other relevant groups working on resource conservation and climate change issues in the region, including the Caribbean Community Climate Change Center that is carrying out CC adaptation planning for the wider Caribbean region.

5. Investigation of Socioeconomic Values and Predicted Socioeconomic Impact from Climate Change

WWF has been actively working in collaboration with the World Resources Institute (WRI) to execute an economic valuation of coral reefs and mangroves goods and services to provide accurate estimates of the value of these ecosystems to the Belizean populace. The project strives to evaluate the economic value of coral reefs and mangroves under future scenarios of resource degradation or improvement resulting from economic changes or policy interventions. It is hoped that the project will contribute to improving coastal resource management by providing new, reliable information to key decision makers on the current value of goods and services associated with coral reefs, on losses likely to result from degradation, and on the long-term benefits of investment in coastal management. Information from such socio-economic studies will be synthesized with the ecological data to obtain a better understanding of the economics of coral reef degradation, with emphasis on the impacts of climate change.



6. Public Outreach and Building of Awareness on Climate Change

WWF has hosted several workshops and public meetings to share information and discuss climate change adaptation possibilities with relevant groups, the media and the public at large. A climate change public awareness campaign was launched in Belize in June 2007 to increase awareness of climate change threats and to highlight the critical need for the identification and implementation of coping mitigation and adaptation measures. The campaign is still ongoing, and has become quite mobile with presentations made within targeted coastal communities (e.g. Belize City, San Pedro and Placencia).

A number of communication and outreach materials including a brochure, comic strip, stickers, articles, a climate witness poster, and a 15 min documentary that features our climate witnesses and local climate experts have been produced. This documentary has been featured in the mobile campaign as well as aired on national TV stations. Project staff have also made several guest TV appearances to share information on the project and to discuss climate change issues.

WWF is in the process of developing another documentary featuring climate witnesses from each MAR country.



7. Addressing Climate Change at the Community Level

The World Wildlife Fund (WWF) is embarking on a mission to ascertain how climate change affects coastal inhabitants within the Mesoamerican Reef (MAR) in order to include their perspectives into conservation and management strategies to increase their coping ability. Certain locations within Belize are already prone to extreme weather events such as intense storms and hurricanes and their associated torrential rains, flooding and erosion. *Climate change would undoubtedly compound impact to these already vulnerable areas since it's forecasted that the intensity and frequency of such events would significantly increased with changing climatic conditions.*

WWF is trying to focus on determining the degree of vulnerability of coastal communities while at the same time, empowering such communities to identify functional climate change adaptation strategies. WWF hope to obtain a more in-depth understanding of the vulnerability of these communities to climate change impacts. For example, how has weather variability impacted them in the past and what might it mean for them in the future. With an understanding of this, WWF will be in a better position to explore with them the aspects of their livelihoods (social, cultural, economic, institutional, etc.) that have helped them cope in the past, or have hindered them from coping in the past - and consequently, what they feel they may need to do in the future to be better prepared to cope with climate change.





Summary

The project has come a far way in trying to balance the focus of climate change efforts on both biodiversity conservation and livelihoods sustenance, and have been quite successful in raising awareness and initiating actions from individuals and participatory groups. Efforts have been placed on both bottom-up and top-down adaptation planning to alleviate impacts from climate change.

It is recognized that climate change has the potential to exacerbate underlying environmental problems and increase current conflict(s) over access to increasingly scarce, shared and open-access natural resources, including reef resources. It is also realized that there is a critical need for effective governance over the use and exploitation of these resources. Wise resource use and sustainable development practices are in shortfall due to inadequate conservation and development planning. Technically sound conservation and development planning is critically required and must be factored into the mitigating and adapting climate change approach being explored. It is important that such planning efforts be carried out

through a participatory approach with various groups (policy, decision-makers, regulatory, conservation/management, civil society and local communities). By this means, WWF and partners will be in a better position to explore climate proof economic measures in how to use and interact with the natural resources.

Through the years, hurricanes have had measurable impacts on the MAR and are continuing to have devastating effects. Aside from the terrible loss of human life due to the extended flooding, and the devastating economic impacts on infrastructure, housing and agriculture, the coastal and marine environment also suffered significant impacts. The extraordinary volume of rainfall flooded the coastal plains, carrying enormous amounts of mud, forest debris and urban wastes directly into the coastal areas and onto the fragile coral reef system. The 1998, 2005 and this year's hurricane seasons provide strong proof of these adverse effects.

A key take-home message from the work thus far, is the importance of protecting and restoring mangroves not only to maintain the health of the reef system, but also to protect coastal habitats, and maintain vital nurseries for a variety of marine species. Storms and hurricanes have shown people that mangroves are a second line of defense (after reefs) to protect their own homes and properties from beach erosion, saline intrusion and physical devastation. We are stressing this point in our outreach work and CC is giving us a good additional argument to continue convincing coastal dwellers/communities, developers and decision-makers about the importance of maintaining and restoring mangroves. We are even lobbying for at least 20% of these habitats to be formally included within the coastal and marine protected areas system in the MAR ecoregion, since these habitats in particular are very under-represented in the Protected Area Network.

By promoting the protection and conservation of coral reefs and mangroves, and working with communities to identify local climate change adaptation strategies, the maintenance of those economies

(e.g. fisheries and tourism) and environmental benefits (e.g. protection of properties, infrastructure and lives) directly and indirectly dependent upon these resources will be fostered. A significant portion of the MAR populace depends on these economies as a source of food or livelihood. Essentially, the health and well-being of the populace are dependent upon the continued functionality of these complex ecosystems. Through our ecological monitoring and public outreach work, we have been effectively documenting and raising awareness on threats to these systems, which we hope will set the pace for a concerted movement to effect change in how we use and interact with our natural resources. In Belize, for example, the public is already becoming more vocal, advocating changes in how resources are utilized and demanding transparency in how coastal development projects are given clearance by regulatory agencies.

Belize currently has a very draft climate change adaptation policy that has not been given much focus in the past. The government is currently planning on updating this document, which somewhat demonstrate the country's commitment to try to adapt to climate change. Our open collaboration with both the Government of Belize (GoB) and the Caribbean Climate Change Center (CCCC) offers a great opportunity for the CC adaptation recommendations, identified under this project, to be incorporated in the overall CC strategy for Belize. Both the GoB and CCCC are very receptive to the idea of getting WWF's adaptation recommendations incorporated in the revised policy.

Although the work associated with the identification of adaptation strategies is still in the early stages, we hope to have some concrete community adaptation options by the end of this fiscal year as well as scale out initiatives to work on strategies identified as key to improving resilience and resistance.





WWF, at international level, also continues to advocate for reduced emissions as this will be the only hope for reef survival in the long-term (given that we may lose all reefs if average global temperatures increase much over 2 degrees).