



COMMUNITY LEVEL
CLIMATE CHANGE **VULNERABILITY**
ASSESSMENT

OVERVIEW

World Wildlife Fund (WWF) embarked on a mission to ascertain how climate change and other natural threats affect 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 the Mesoamerican Reef (MAR) 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.

Through this initiative, 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.

The initiative commenced with a few pilot sites in Belize, namely Placencia Village and San Pedro, Ambergris Caye and was heavily focused on not only raising awareness on climate change threats but to also work with community members in carrying out a climate change and natural disaster threat/vulnerability analysis for the said communities. Such an analysis took into consideration not only the impact from natural threats such as physical damage to properties, infrastructure and resources from storms/hurricanes, die-off of reefs due to warming seas and coral bleaching, flooding, among others but also the potential increased vulnerability owed to human activities such as clearance of mangroves that buffer against the impact from storms and prevention of erosion.

This series of vulnerability assessment took place in January (Placencia Village) and May (San Pedro, Ambergris Caye) 2008. Both were very interactive and focused on 3 main issues base on burning concerns by community members. These issues were:

1. Mangrove loss

2. Natural resource changes

3. Threat mapping

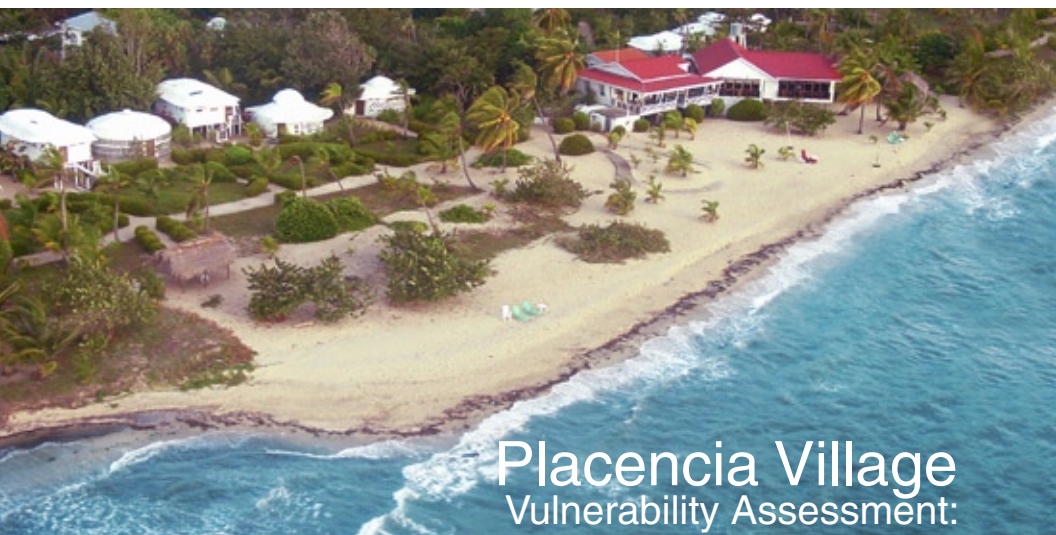
METHODOLOGY EMPLOYED



A three prong approach was used to aid community members in assessing vulnerability to climate change and other natural threats. These were:

- 1. Problem Tree** - this was used to depict a visual representation of the problems, and their causes and effects. Problem tree allowed for the identification of the existing problems within the communities, the causes and effects of those problems and the complex interlinked relationships between the causes and effects identified.
- 2. Timeline** - which looked at time records of significant historical changes within their community over time (e.g. environmental, economic, technological, social, political, etc.) that community members felt were important and how the community dealt with problems and issues. The exercise generated historical information on changes in the community, significant events and how they occurred in sequence. The information identified and discussed were use to make future projections.
- 3. Mapping** - this was used to illustrate the spatial distribution of resources, features and activities, including reef uses, within and adjacent to communities. The map developed provided a focus for discussions on patterns of resource use, users and perceptions of resources and problems and alternatives. It also identified critical locations for protection.

RESULTS



Placencia is a small coastal village in southern Stann Creek District, Belize. It is situated on the tip of a narrow, 16-mile peninsula that runs parallel to the mainland and bordered by the Caribbean Sea to the east and a lagoon to the west. Although Placencia is part of the mainland, its geography, tropical climate, laid-back culture and white sandy beaches give it the feel of an island. The lagoon that stretches along Placencia's west coast is fringed with mangroves and occupied by vast sea grass beds, manatees, crocodiles, birds and other wildlife. Development pressures along this Peninsula have been increasing at an alarming rate, placing the community and adjacent ecosystems at risk.

Mangroves along the eastern section of the Placencia Peninsula, the outer cayes and those buffering the lagoons are being cleared on an increasing basis. There are a number of shrimp farms along the western section of the outer lagoon that are likely polluting this lagoon. The Inner lagoon is being altered due to varied forms of developments, including reclamation for lagoonal lots (for sale) and resorts. There is currently a large mariculture farm being proposed just offshore (near adjacent outer cayes) that could result in significant adverse impact on the biodiversity within the area. WWF is trying to monitor the health of offshore reef systems.

The village is home to approximately 500 permanent residents – who all seem to know each other by name – and a steady stream of tourists. The majority of the people who live in Placencia are Creoles, descendents of European settlers and African slaves, and the main language is English. The people live modestly and the economy relies heavily on fishing and tourism. Placencia has always been a fishing village, but in the past few decades tourism has taken over as the primary income source for local residents. With increased tourism have come significant changes to Placencia's environment and way of life. Coastal development, pollution and overfishing have become central threats to

the environment and the local people who depend upon it. By its location, Placencia is a strong candidate in terms of susceptibility to impact from climate change events. Current threat factors are likely to exacerbate in the face of climate change.



Mangrove Loss: The current trend of mangrove loss was considered a major factor that could potential increase vulnerability of the community to climate change and other natural threats.

The main causes of mangroves loss identified by community members were:

1. Clearance for marina construction
2. Dredging and filling for coastal development interest
3. Urbanization
4. Tourism development
5. Chopped for fire wood
6. Aquaculture farms construction

Additionally community members felt that factors such as low penalties for clearing without permit and bribes/corruption were also significant causes for the observed increase in mangrove deforestation.

Environmental impacts that were identified as resulting from the increased mangrove losses were:

1. Erosion
2. Increased siltation
3. Loss of natural buffer (protection) from storm
4. Loss of natural filtration system (e.g. pollution from aquaculture farms)
5. Loss of nursery habitat (loss of nursery benefits to fish)
6. Loss of biodiversity (birds, insects, other wildlife that inhabits or utilize mangroves)
7. Eventual loss of adult commercial fish species

Community members felt that foreign investors and tourists are the main groups benefiting from mangrove clearance, dredging and filling...locals derived very little benefit from these. Clearance and filling-in of mangrove areas have a lot to do with the creation of lots for sale, and the sale prices are too high that locals cannot afford to purchase any. The village council and community members feel that their concerns with respect to development trends are not being taken into consideration by the relevant governmental institutions. They feel that they have very little say with respect to how development is taking place within their community.

Change in Natural Resources:



Change in natural resources (mangroves, coral reefs, etc.) were assessed according to two time scales and discussed with respect to the causes of such changes. The table on the right provides an outline of these.

Resource	10 yrs ago	Present	Causes of change
Coral reefs	Healthier and more colorful	Significant coral death (e.g. due to bleaching and other human cause stresses) re- sulting in low live coral cover on many reefs. Significant reduction in abundance of fish stocks.	Increase in water temperature
			Overfishing
	Higher productivity		Increase in pesticide run-off
	Larger fish		Increase in sewerage run-off
	Larger and more abundant conch and lobster		Sedimentation
		Physical damage due to increase in tourism and lack of environmental consciousness of tour guide.	
		Lack of awareness	
		Failure to enforce rules	
		Physical damage	Anchorage of cruise ship
	Improper solid waste disposal		
Mangrove	Lush coverage around the Peninsula	Less mangrove coverage. Developmental activities have lead to major reduction in mangroves bordering the lagoon. Approximately 35% of mangroves have already been loss and another 35% likely to be loss in the next few years.	Deforestation
	Great (or rich) fish nurseries (healthy)	Less nurseries	Increase in population and development
	More birds	Less birds	Less respect for nature
	More manatees	Less manatee sightings	
Forest	Dense green forest (evergreen)	Less wilderness	Cutting for agriculture
			Shrimp farming
Potable water	good	good	No change

Community Mapping:

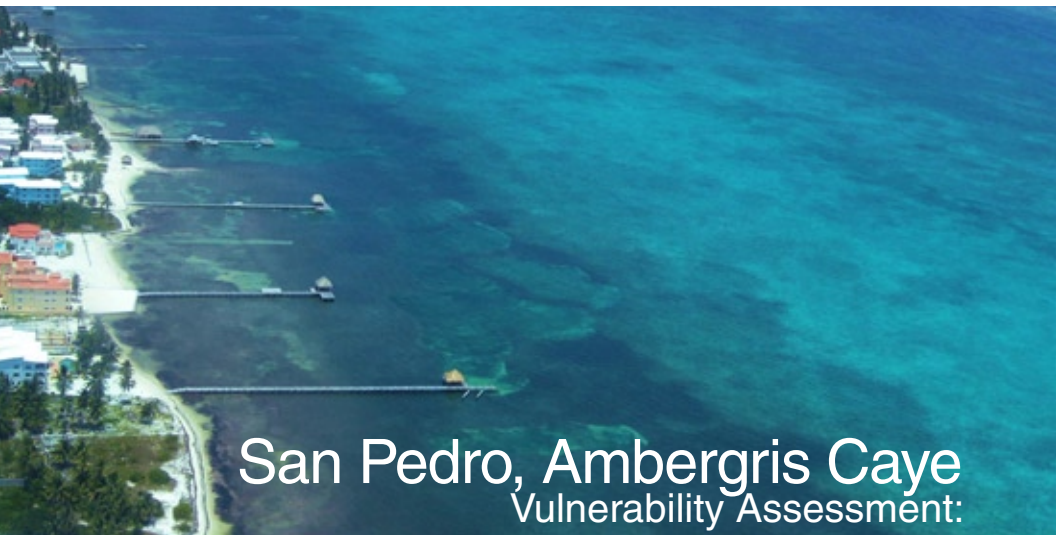


*Mapping by Placencia
Village community
members*

Community members identified developmental activities as the leading cause of mangrove reduction along the Peninsula. Members estimated an approximate 35% loss of mangroves along the Peninsula and another 35% likely to be loss in the next few years.

Proposed response solutions mentioned by Placencia Village community members:

- 1.** More lobbying for politicians to pay more attention to community concerns.
- 2.** A local committee should be developed to deal with some of the pressing local environmental problems (Community Advisory Committee).
- 3.** A comprehensive plan that addresses proper infrastructure.
- 4.** Better land use planning (update existing community plan and enforce it)
- 5.** Proper educational facilities.
- 6.** Implement some mangrove restoration projects
- 7.** More public education concerning the problems.
- 8.** Replant and maintain the remaining mangrove buffer system
- 9.** Developers should be approached by WWF to embark on some restoration projects.
- 10.** Try to maintain at least 30% of the remaining mangroves.
- 11.** Embark on some seagrass ecosystems restoration. Dredging associated with developments has destroyed a significant number of seagrass ecosystems since 2002.
- 12.** Lobby for the enforcement of sediment traps during any dredging activities to ensure that sediments are retained within the operational area, and not impact surrounding marine ecosystems.



San Pedro, Ambergris Caye

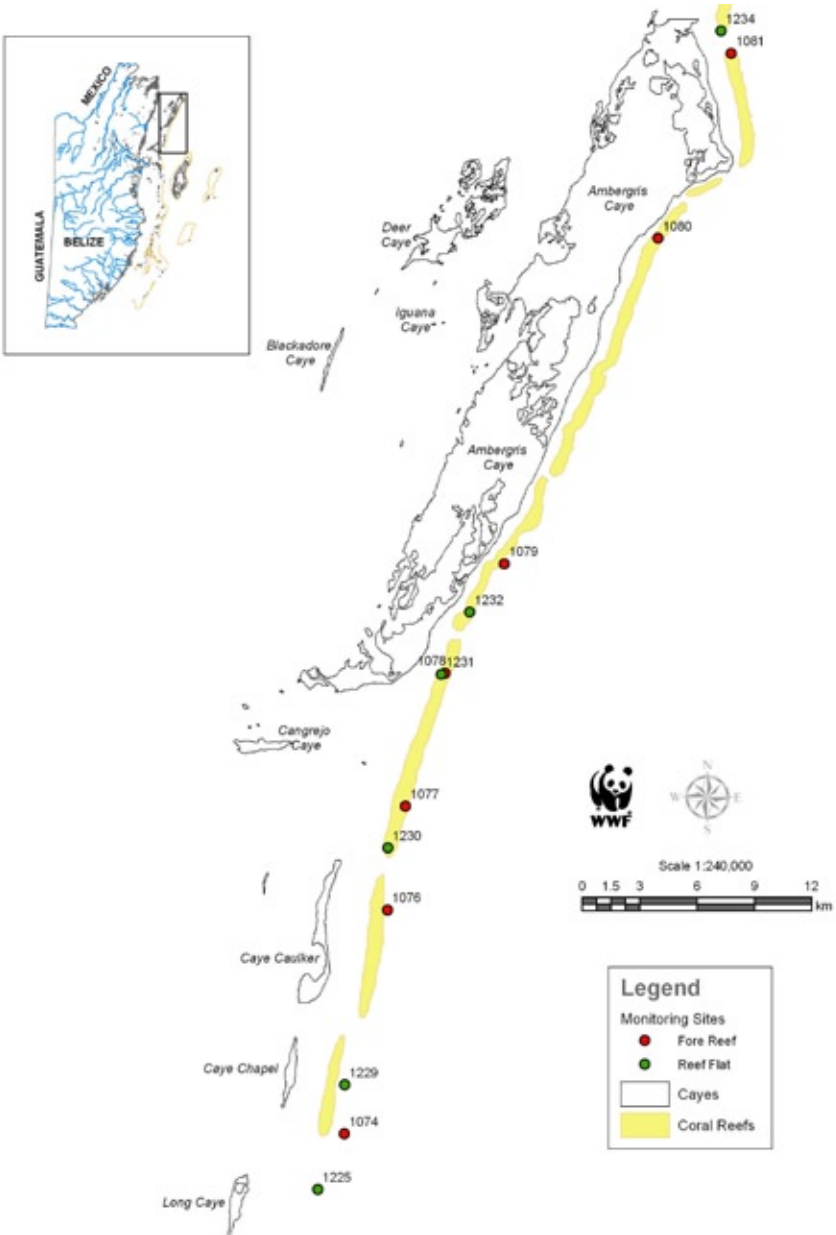
Vulnerability Assessment:

San Pedro Town is the urban region of Ambergris Caye; Belize's largest and northernmost offshore island. Ambergris Caye is a prime tourism locations and San Pedro Town is a 'hot spot' for visiting tourists. San Pedro is home to approximately 4,000 residents and is constantly faced with pressure of migrations from mainland Belize owed to the perceived notion that it's a place of lucrative source of income. Its residents are mainly of Mexican descent who speaks both Spanish and English. San Pedro was once a fishing village but tourism has now taken over forming the number one economic foundation of the populace. Some fishing still occurs today but to a much lesser degree.

The barrier reef exist a short distance from Ambergris Caye and nearly touches the land along the northernmost point of the island. Similar to Placencia, San Pedro, Ambergris Caye has seen an increased in mangroves depletion over the years and a high demand for tourism related developments may place the few remaining forested areas at risks. The area has also been impact by a number of storm events over the years that have resulted in significant erosion and damage to mangroves and other marine ecosystems, including reefs.

The drive for development has resulted in a lot of unsound activities, including dredging and land reclamation and filling-in of critical wetlands. There has also been a lack of adherence to development setbacks, with some resorts and hotels existing on the immediate waterfront. On the lagoon side (western section) of the island, there are less resorts and hotels – mainly the lower class portion of the community, who depends significantly on wages from hotels/resorts and other non-resource based employment opportunities as well as fishing.

There exist two marine protected areas (MPA) within the area, Hol Chan Marine Reserve and Bacalar Chico Marine Reserve and National Park. The existence of these two MPA allows for some degree of protection and management of the natural resources of the area but threats from both natural and human factors continue to be a problem.



San Pedro community members identified mangroves loss as a major problem owed to the following:

1. Clearance for resorts construction
2. Dredging and filling for coastal development interest

3. Urbanization
4. Beach expansion
5. Aquaculture farm construction



Mangrove Loss: The great extent of mangrove loss is considered a major factor that could potential increase vulnerability of the community to climate change and other natural threats.

Environmental impacts identified as resulting from the increased mangrove losses:

1. Erosion
2. Increased siltation
3. Loss of natural buffer (protection) from storm
4. Loss of nursery habitat (loss of nursery benefits to fish)
5. Loss of habitat for terrestrial wildlife that inhabit or utilize mangroves as forage grounds or for refuge.
6. Loss of natural filtration system (e.g. pollutants originating from land)



Community members also identified storms and hurricanes occurrence as a major natural threat. The environmental impacts on the island associated with such threats include:

1. Coral reef destruction (physical impacts associated with wave swells as well as siltation associated with storm wave generated erosion)
2. Major flooding on the island (resulting in damage to properties and infrastructure)
3. Evacuation and the personal finances needed to enable it.
4. Economic losses
5. Paralysis of the economy



Change in Natural Resources:

Changes in natural resources on San Pedro and Ambergris Caye on a whole were mapped in a similar manner to that carried out for Placencia. The table to the right provides an outline of the identified changes and their causes.



Resource	10 yrs ago	Present	Explanation
Fish Population	Threatened	Declined	Higher demand
			Migration and lowered reproduction
Coral reef	Healthy with some bleaching	Increased evidence of bleaching	Warmer sea surface temperatures
Mangroves	Plenty	Deforested	Development
Birds	More species	Less species noted	Migration changes
Land	Plenty more natural beach	Narrower beach	Mangrove cutting and erosion
Air	Cleaner	Dusty	More wind and climate variability
Infrastructure	Less infrastructure	Big developments and more settlement	House demand and lower availability of highland
Freshwater	Well water and/or rainwater	100% bottled water	Air pollution and loss of aquifer
Human economy	Lower population and stable economy	Nearly overpopulated	Labor supply
Fuel	Cheap (\$5/gal)	Sky rocket (\$10.40/gal)	High demand and less supply

Community Mapping

San Pedro community members also identified mangrove clearance as a major factor. Other worrisome changes mentioned by the members include:

1. Filling-in of mangrove wetlands that have resulted in loss of natural drainage areas that otherwise minimizes impact from flooding
2. Loss of highland due to population expansion
3. Impact to reef due to coral bleaching
4. More areas being affected by tide due to the changing landscape of the island
5. Massive and continuous deforestation driven by tourism related developments



Proposed response solutions mentioned by San Pedro community members:

Community members all agreed that due to the fact that Ambergris Caye is an off-shore island, it would undoubtedly be impacted by climate change related events. They proposed, however, some concrete initiatives that could still be carried out to reduce the degree of vulnerability.

1. A major factor identified as being critically needed for the island is proper planning...proper planning for future developments as well as the identification and enforcement of critical areas for species protection and recreation.
2. An updating (to include climate change variables) and enforcement of the San Pedro master plan.
3. A moratorium on mangrove clearance on the island
4. Protection of the few remaining wetland areas
5. Mangrove restoration where possible
6. Proper zoning for marine recreational activities.

SUMMARY

Assessment of vulnerability to climate change and other natural threats was completed within two pilot locations in Belize (Placencia Village, Stann Creek District and San Pedro Town, Ambergris Caye). These two communities identified a range of potential measures to increase their coping capacity in the face of such threats; ranging from minimizing mangrove clearance and mangrove restoration projects to the updating and enforcement of community development/zoning plans. Community members believe that such measures would help to reduce their vulnerability and build their resilience to changing environmental conditions. WWF will be providing these communities with the necessary capacity to enable implementation of the identified local based adaptation measures, and will be bringing to the attention of upper levels of governance the concerns and proposals of the communities. Adaptation measures will be promoted at both local and national levels through field-based implementation and lobbying for their inclusion in policy agendas.