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Honduras Community Vulnerability Assessment

and Identification of Adaptation Needs
in the Island Communities of

Punta Gorda, Sandy Bay, Utila, Chachahuate y East End

Submitted by: **Ian Drysdale**

Collaborators:

Nadia Bood (WWF CA)

Nanzi Duarte (WWF CA)

Robert Walle (Independent)

Jennifer Myton (CORAL Honduras)

Mirza Castro (Climate Change Office Honduras)

Photos:

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Design:

Jeffrey Muñoz

Executive Summary

A vulnerability assessment was carried out in five communities of the Bay Islands of Honduras. These communities share, to some degree, the same vulnerabilities to climate change factors, due to their geographic location, proximity to the high tide line and altitude above sea level.

It was funded by the Department for International Development (DFID) through World Wildlife Fund (WWF), and carried out by Luna Environmental Consultants. Main collaborators were World Wildlife Fund Central America Regional Office (WWF CA), the Honduran Climate Change Office (SERNA) and Honduras Coral Reef Alliance (CORAL).

Field-based methodologies and participatory tools (e.g. CVCA, CRiSTAL) were applied to collect information related to climate risk, climate hazards, impacts, vulnerability, and coping/adaptation strategies at local level. These tools were utilized at

workshops within the target communities, where active members of each community were invited to participate, as well as local community leaders, water boards and any other organized groups.

The study found that all 5 communities have noticed changes in rain patterns, stronger hurricanes, beach erosion and higher temperatures. As all 5 communities base their economy on natural resources and tourism, their suggestions for coping strategies fall mostly on these two categories. The frequency, magnitude and scale of risks and hazards were increasing due to changes in temperature and rainfall. Major climate risks in the study sites include drought (or lack of access to fresh water), landslide, flooding and beach and coastal erosion. Other hazards include sea surface temperature increase and bigger waves.

The impact of climate change was very severe on biodiversity and livelihoods of communities in the study areas. Drought, flooding and coastal erosion dis-

turbed communities by affecting staple crops, health and infrastructure. Coastal erosion had damaged potable water distribution network, eliminated coastal vegetation and destroyed existing roads. Drought has dried water sources such as wells and rainwater collection has all but disappeared. Increased sea surface temperature has had a direct effect on coral bleaching and depletion of fish stocks due to fish migration to deeper and/or cooler waters.

The impact of climate risks and hazards was very high in the communities visited. Most coping strategies based their success on acquiring seed money for implementing projects and programs that would reduce the impact of climate related hazards and risks. The presence of community based groups and NGOs allowed participants to rely on them for technical support and implementation, while stating active support from within the communities. Coping and adaptation mechanism and strategies were documented in the study sites. These strategies were based on local knowledge and practices.

Table of Contents

Executive Summary	2
Acronyms	4
Review of Climate Change Information	4
Vulnerability Assessment of Target Communities	6
Vulnerability mapping and assessment of adaptive capacity.	7
Identification of current coping strategies and sustainability assessment.	9
Institutional mapping	12
Proposed Adaptation Options	13
Conclusions	16
Recommendations	17
Annexes	18

Acronyms

BICA	Bay Islands Conservation Association
CC	Climate Change
CODEL	Comité de Emergencia Local
CRISTAL	Community based Risk Screening Tool- Adaptation and Livelihoods
CVCA	Climate Vulnerability and Capacity Assessment
DFID	Department for International Development
EIA	Environment Impact Assessment
VRA	Vulnerability Reduction Assessment
FAO	Food and Agriculture Organization
HCRF	Honduras Coral Reef Fund
IPCC	International Panel on Climate Change
msl	meters above sea level
MBRS	Meso American Barrier Reef System
MPA	Marine Protected Area
NGO	Non Governmental Organization
PMAIB	Proyecto de Manejo Ambiental de las Islas de la Bahía
RPM	Roatán Marine Park
TNC	The Nature Conservancy
USAID	United States Agency for International Development
UNDP	United Nations Development Programme
UCEM	Utila Center for Marine Ecology

Review of Climate Change Information

A review of available Climate Change (CC) information was conducted, focusing on major documents of international funding and Honduran National policy/action guidelines. Analysis of major documents shows the International Panel on Climate Change (IPCC) Report to be the central document used by major initiatives in Honduras, including the UNDP and the FAO.

This study will contribute to the overall climate change picture, helping fill gaps for including small communities whose biodiversity is particularly vulnerable to climate change, yet may be less prominent in the large scale activities proposed under current policy efforts. To offset this possible oversight, coastal marine ecosystems, specifically the coral reefs and other linked ecosystems within the Meso American Barrier Reef System (MBRS) (which includes the Honduran Bay Islands), will need special attention to problems caused by climate change, and the promotion of their role in receiving benefits from global and regional initiatives that can help preserve their unique biodiversity while maintaining and improving their adaptive capacity.

The predominant climate change literature, including the IPCC 4th Report that serves as the chief document for international based funded activities, concentrates on mitigation effects that would be more appropriate to mainland Honduras communities, where there is both greater industrial activity generating climate change gases along with larger areas available for carbon sequestration mitigation activities.

As islands belonging to a centralized mainland based government, there will be more focus on carbon sequestration strategies and projects that may be “traded” (under provisions of Cap and Trade type legislation currently under consideration in industrial nations). There is little land available in the Bay Islands for any type of plantations for local participation in this type of activity. Activities to maintain and enhance adaptive capacity will have to link to these larger activities such as commercial export agriculture and large scale forestry initiatives under the upcoming global carbon policies.

The inclusion of Bay Island communities as recipients of mitigation funding from these larger activities, as well as increasing the visibility of this region, will be crucial in maintaining the irreplaceable biodiversity of the coral reef ecosystems. In explor-

ing adaptation possibilities, it will be ensured that efforts for the targeted Bay Island, Roatán, Utila and Cayos Cochinos, are oriented along lines closer to those identified for the category of “Small Island Nations”, rather than category of “Latin America” as a whole, where agriculture and industry dominates the information and accompanying recommendations.

The principal adaptations proposed for the five pilot Bay Island communities are based on CC precipitation and sea level rise, both identified by the IPCC, the UNDP, and the FAO as medium term effects. Both of these have also been recognized in the Honduran government documents, although the Bay Islands have not been specified as shown by the predominance of carbon sequestration and forestry initiatives in reviewed documents. Two opportunities present themselves within the current information and existing plans, which will allow an increase in the prominence of the Bay Islands: the rising of sea level and the varying of precipitation.

Estimates for the region regarding CC effects on precipitation include both lower and greater amounts of rainfall. There is however agreement that there will be increasing extremes, of both flooding and drought, making ecosystem elements

that are crucial in the hydrological cycle a primary focus for maintaining and improving the adaptive capacity to mitigate the effects of climate change in the selected communities. These communities should target ecosystems within the hydrological cycle such as mangrove forests, coastal and wetland vegetation, and other related ecosystems such as seagrass beds and coral reefs.

Any rise in sea level will negatively affect fresh water availability and greatly increase the potential for saline intrusion into the existing aquifers and subsequently into human use water wells. This will be a major impact on the local populations, as the conflicts between social/community uses will enter into greater and increasing conflict with economic use, principally from tourism. Even without the accepted effects of climate change, the loss of wetlands and associated mangrove ecosystems will increase vulnerability of water resources on the islands, and further stress the diminishing remaining ecosystem fragments.

Because much of the information on climate change is oriented to global effects rather than local actions, this study will focus on the latter. Within the reviewed documentation, only in the most general terms are mentioned the benefits to coastal areas

from forestry-based interventions, and the vulnerability assessment study offers an opportunity for linking these.

This linkage will be necessary because even though the biodiversity base for the majority of economic activity, tourism, is under threat from identified climate change factors, the ability of these irreplaceable ecosystems to adapt is currently compromised by non-climate change factors including sewage discharge and encroachment from tourist infrastructure that do not comply with existing construction and environmental norms.

This study takes into account these first research findings and future efforts will incorporate them into on-going activities and consensus building efforts.

Vulnerability Assessment of Target Communities

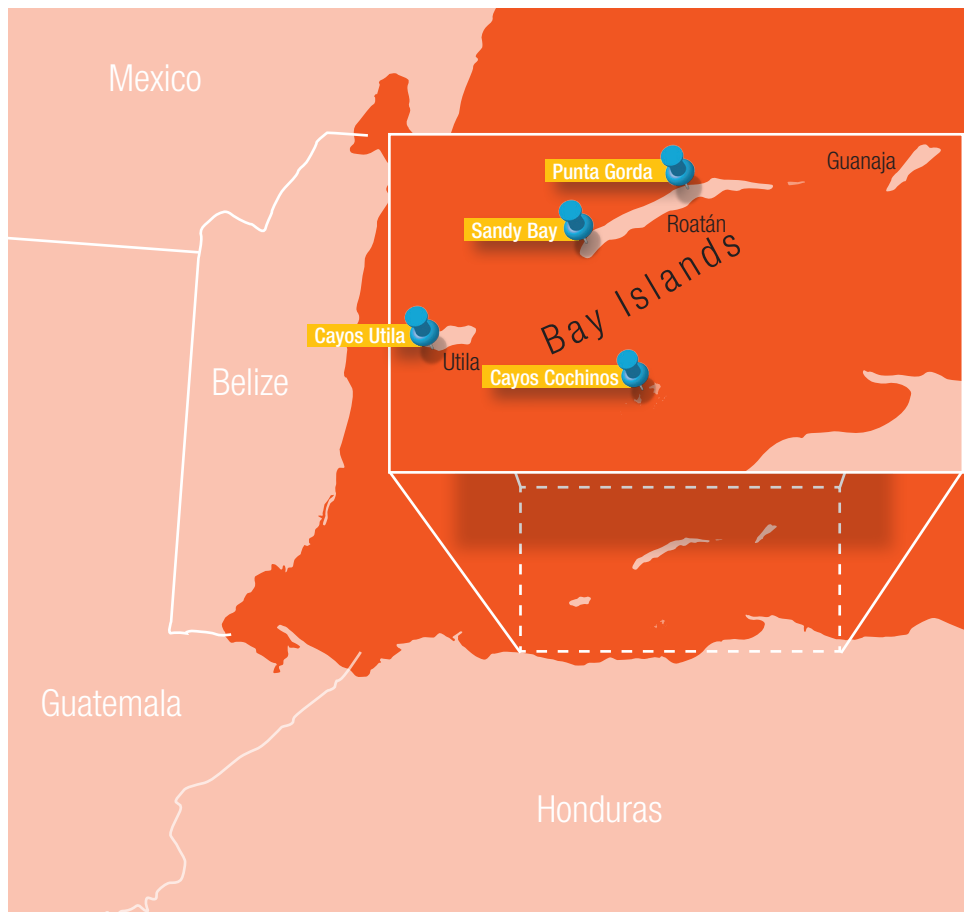
Five communities in the Bay Islands were chosen as targets in which to conduct vulnerability assessments. These four communities share, to some degree, similar vulnerabilities due to their geographical location and proximity to the high tide line: Punta Gorda, Sandy Bay, Utila Cays and Cayos Cochinos.

Punta Gorda

Located within the Santos Guardiola Municipality on the northeastern coast of the Roatán Island, Punta Gorda is inhabited mainly by Garifunas, a local indigenous group who descend from black Africans who landed on Roatán in the 1800's. Their local economy is based on the use and extraction of natural resources such as fish, coconuts and a few crops of yucca (manioc) and corn. The community is located approximately 20 to 30 meters from the high tide line, with the main road running the complete length of the community parallel to the coast.

Sandy Bay

This target community within the Municipality of Roatán is located within the West End Sandy Bay Marine Reserve. Some beaches within Sandy Bay (SB) are used as access roads, due to the fact that Roatán's main highway runs along the middle of the island, bisecting



SB down the middle. Most of the coastline community of Sandy Bay is located approximately 15 to 30 meters from the high tide line at 1 to 2 meters above sea level (masl), while the inland community lies between 15 to 100 masl. This altitude presents an added vulnerability, which is relevant to the slopes on which the 3 colonias (neighborhoods) have been built. These dwellings began as invasions of private land, and over the course of several years, have become established as the 3 largest “shanty towns” on Roatán, where the greatest majority of low wage workers reside, followed closely by Los Fuertes, located in the middle of the island.

Utila Cays

Is part of the Municipality of Utila, and is composed of 13 cays, of which the two largest, Up and Down Cay are permanently inhabited. The Cayans, or residents of Utila Cays, base their economy wholly on fisheries, and run a fish processing plant directly on the Cays for export to the US market mostly, and to the Honduran market in smaller quantities. The two cays, at their highest natural points, are no more than 1 masl, being highly susceptible to flooding during storms and hurricanes. Most houses are built in concrete, having a few made out of wood, and the vast majority have built retaining walls around their properties to minimize damage during the rainy season. Potable water is piped from the main island, but the majority, if not all, have rain catchment and holding tanks.

Cayos Cochinos

Is a group of 13 small cays and 2 larger cays (Cayo Mayor and Cayo Menor), all within the Cayos Cochinos Marine Natural Monument Marine Protected Area (MPA). There are 3 main communities: Chachahuate, Bolaños and East End, which are directly linked to three communities on the Honduran mainland: Nueva Armenia, Sambo Creek and Balfate. Most mainland community dwellers are family related to cays dwellers, and carry out fishing and tourism activities within the MPA. Chachahuate and East End were the two target communities for this vulnerability assessment; the former being a Garifuna community inhabiting a cay, and the latter a ladino (or mainland) community located on the southern side of Cayo Mayor, with views towards the Honduran mainland. Chachahuate’s highest natural point is no more than 0.90 masl, and covered with sparsely spaced coconut trees and 45 thatch roof houses, while the school and the tourist cabins are wood houses. These two buildings are the only structures that catch and store rainwater, while the one community well, an artesian well located in the middle of the cay, has a medium to high salinity content during rainy season and is sea water during the dry season. East End, snugly fit in a small bay, offers higher ground to its residents in case of flooding and storms, while the community itself, comprised of 30 houses, is all located between 1 to 10 meters from the high tide line and no more than 1.50 masl.

Vulnerability mapping and assessment of adaptive capacity

During the workshops, vulnerability mapping and assessment of adaptive capacity was carried out for each community, using the **Vulnerability Reduction Assessment (VRA)**¹ Indicator as a survey tool. The participants were verbally asked which climate change hazard had the largest impact on their community, and to then answer a set of questions. Below, a short summary of the results is presented by community, as well as the adaptive capacity (capacities) identified. The complete VRA Indicators tool per community is located in Annex 1.

Punta Gorda

Due to the large number of participants present at this workshop, two groups were created, each working on 1 hazard.

Group 1 Hazard: Shortage of Fresh Water. The adaptive capacities mentioned were based on using own funds created through the local water board as well as accessing funds from other projects and the local municipality. These funds would be used to: 1) increase access to water by drilling more wells and capturing rain water on all roofs within the community; and 2) improving the water distribution network and the quality of the water distributed.

¹ A Guide to Vulnerability Reduction Assessment. UNDP Working Paper. Drosch, et. al. February 2008



Group 2 Hazard: Bigger waves and sea level rise.

The adaptive capacities mentioned were based on acquiring funds from international aid (such as USAID) and from church groups based outside of the country, as well as personal economic resources belonging to community members. The community would adapt to this hazard by building new houses and raising existing ones on pylons, planting mangroves to serve as natural barriers, and as a last resource, relocating the community to a safer area.

Sandy Bay

The hazard identified during the Sandy Bay workshop is Landslides due to Heavy Rains. This community did not mention economic resources as a means to adapt, but rather, mentioned the existing organized groups such as patronato, water boards, school and church groups. The adaptive means identified are more focused towards enforcing existing laws and regulations, through the organized groups, such as not allowing building on slopes, prohibiting the deforestation of the area and not allowing

the leveling of slopes. The community also mentioned the need to build a shelter for use during storms and hurricanes.

Utila Cays

The members of the Utila Cays community mentioned personal funds, donations and municipal funds as means to adapt to Loss of Coastline hazard. These funds would be used to build sea walls to protect the community, as well as begin the process of raising the existing houses on pylons.

Cayos Cochinos

This workshop, which included two communities, based their means to adapt to the hazard of a Reduction of Rains, on human resources and community collaboration. They would then focus their efforts towards protecting the forests and river basin and replanting around the wellhead. An infrastructural mean to adapt would be to increase rain catchment and storage capacity within the whole community.

Identification of current coping strategies and sustainability assessment

During the different workshops, participating members were asked about how they viewed climate change hazards and how these were affecting their communities at the moment. This question was posed to the effect of identifying current coping strategies, as well as to assess the sustainability of any mentioned strategies.

The overall replies, consistent in all 4 workshops, stated that these communities were not aware of how climate change would directly and/or indirectly affect their communities. Most participants expressed not knowing about climate change before the workshops, while a few stated knowing about climate change in general, but not about how it would directly/indirectly affect them and their communities.



Utilizing the CRiSTAL 3.2 Methodology, attendees worked as a team to identify climate change hazards and impacts, focused on their communities' vulnerabilities, resources and geographic location. The use of this tool allowed communities to perceive how a hazard, agreed upon by all, would have impacts on their resources and also how these resources would and could be used to minimize these impacts.

Coping strategies varied by location, although there were similarities between all communities. Below is a table containing the hazard identified, the impacts perceived and the coping strategies proposed by the workshop participants for all sites. Annex 2 contains the CRiSTAL results per community.



Punta Gorda

Decided upon 3 hazards, and came up with impacts and coping strategies for each.

The first hazard identified was shortage of fresh water due to a reduction of rain patterns, having impacts on: 1) the local economy, due to the need to buy water; 2) salt water intrusion into the aquifer, affecting the community wells; and 3) health risks due to a reduction in personal hygiene due to the lack of water. The coping strategies are based mostly on collecting and preserving this important natural resource, through: 1) collecting more rain water, which can be done if the community members acquire more and larger holding tanks; 2) increasing fresh water infiltration into the aquifer, by planting more trees and vegetative

cover in the areas around the wells and along the creeks that run through Punta Gorda; and 3) providing the local water board with more technical information and training on how to better manage the distribution and use of water.

The second hazard identified was bigger waves due to stronger hurricanes, having impacts on: 1) destruction of homes, as they are mostly located in front of the beach; 2) road deterioration due to washing away of its surface (it is a sandy road), creating communication and evacuation difficulties; and 3) damage to pipes of the water distribution network, as well as loss of coconut trees (a basic staple) and mangrove forests. The coping strategies identified are of a more engineering and/or infrastructure improvement nature, through: 1) denying permits of new homes and infrastructure near the high tide line (the distance was not



defined); 2) construction of barrier type infrastructure, such as sea walls and other physical barriers that will ameliorate the destructive strength of these waves; and 3) replacing PVC pipes, that are part of the water distribution network, especially those located in high risk areas, with metal pipes, as well as installing them deeper in the ground.

The third hazard is stream overflow and runoff due to heavy rains, having impacts on: 1) flooding of homes from the overflow of streams; 2) overflow of septic tanks, creating high risks to health and pollution of nearby streams and the reef; and 3) sediment input and pollution of these faster running and overflowing waters from the creeks. The coping strategies for this hazard are twofold, one is engineering in nature: 1) the creation of an artificial stream way in the larger creek that runs through the community. While the second is



more oriented towards management of the water resource in a larger context: 2) pumping out of septic tanks on a permanent schedule, especially before the rainy season; and 3) creating and implementing a waste management and recycling project that will look to reduce contamination of the stream and the oceans and reefs as well.

Sandy Bay

Identified two hazards, along with their impacts and coping strategies.

The first hazard being landslides due to deforestation, having impacts on: 1) loss of households and infrastructure; 2) soil erosion and the consequent sedimentation of the adjacent reef; and 3) pollution of the river basin and, eventually, the ocean. The coping strategies identified by the community are: 1) create and implement a reforestation project in order to protect slopes; 2) denying permits of new homes and infrastructure on slopes and high-risk areas, which is closely related to 3) create a building code applicable to the area that takes into account the singularities of the site.

The second hazard identified was coral bleaching, having impacts on: 1) loss of biodiversity; 2) loss of income due to a reduction in tourism; and 3) loss of natural barriers, such as the reef. The coping strategies identified by the community are: 1) create and foster more support for local NGOs and other environmental groups;

2) application of laws and regulations; and 3) follow up on the application of these laws and regulations.

Utila Cays

Decided upon 3 hazards, and came up with impacts and coping strategies for each.

The first hazard is the reduction or shortage of fresh water, having impacts on: 1) lack of water to make ice for fish preservation and shipping, affecting the local economy which depends greatly on fishing; 2) lack of water for domestic use; and 3) a great reduction of tourists. The coping strategies are the following: 1) acquiring a machine that makes ice with sea water, which has a two-fold positive impact: firstly, it reduces pressure on the limited fresh water resource; and secondly, it prepares the fish shipping companies for any eventualities of lack of fresh water for ice. The other two strategies focus on managing the water resource in a more conservational manner: 2) creating and implementing a water management policy that must be followed by the whole community; and 3) implementing a “Blue Tourism” strategy, similar to a green seal, that looks to promote Utila Cays as a water-conservation-oriented destination.

The second hazard is sea level rise, with community-identified impacts such as: 1) population

decline due to migration away from the Cays; 2) loss of vegetation cover and soil erosion, as sea level rises and takes land away; and 3) destruction of tourism and housing infrastructure. The first coping strategy falls in with the impact, which, according to the workshop participants, would be to 1) sell households and businesses and move away from the Cays before the problem gets worse. The other two coping strategies focus more on preparing for the impacts, rather than accepting them as unchangeable: 2) to build protection infrastructure and to plant natural barriers (such as mangroves and other coastal vegetation); and 3) to prepare and enforce a climate change preparedness action plan.

The third hazard identified by the participants of the workshop is rise in ocean temperature, with impacts such as: 1) coral bleaching and die-off; 2) untimely and unnatural death of fish; and 3) fish migrating to cooler and deeper areas. The coping strategies identified are all focused on preparing for these changes in the fisheries: 1) begin managing fisheries more effectively and sustainably; 2) looking towards alternative livelihoods, so as to not depend wholly on fishing; and 3) begin investing in equipment and look towards alliances and partnerships between fishermen in order to explore new fishing grounds

Cayos Cochinos

Identified three hazards, along with their impacts and coping strategies.

The first hazard identified is a reduction in rainfall, which will have the following 3 impacts: 1) less water available for human consumption; 2) increase in poverty levels; and 3) a reduction in health levels of the local population. The coping strategies prioritized at the workshop are: 1) acquire more holding tanks in order to store more rain water during rainy season; 2) begin a reforestation project (where possible) that will allow recharging the aquifer and replenish wells; and 3) increase rain catchment infrastructure to all households and buildings within the community.

The second hazard identified is increased strength in hurricanes, which will have the following impacts identified at the workshop: 1) flooding of the smaller cays, as their elevation above sea level is less than 1 meter; 2) loss of beaches due to erosion caused by hurricane waves; and 3) higher and stronger waves. The coping strategies are as follows: 1) replant flood and hurricane resistant varieties around the cays; 2) create a plant nursery to grow these resistant varieties in order to have a stock of plants handy and not

have to buy these plants season after season; and 3) create, disseminate and manage a CODEL (Comité de Emergencia Local), local emergency committee.

The third hazard identified is sea level rise, with the following impacts: 1) destruction (erosion) of beaches and coconut trees, which are a main source of food to the local population; 2) homes becoming more vulnerable to flooding; and 3) a consequent reduction in tourism due to the risks associated with sea level rise and the two preceding impacts combined. The first two coping strategies are physical activities in order to reduce the strength of the impacts: 1) replant in order to create natural barriers and grow coconut trees in nurseries to reinstate/replace those that might be affected by the hazard; 2) build any new houses and infrastructure on pylons, while at the same time raising those existing ones onto pylons. The third coping strategy falls under management of resources: 3) regulating the number of visitors and visits to vulnerable sites within the protected area.

Institutional mapping

A series of questions were posed to the workshop attendants in order to map the actors and institutions. The answers per community are presented in the table below, while a complete list and other relevant information is contained in Annex 3.

Community	Neighborhood	NGO	Government Institution or Project	Community Institution	Other
Punta Gorda			-Health Center -PMAIB -Municipality of Santos Guardiola -Ministry de Turismo	-Water board -Patronato	-AIDS center
Sandy Bay	Balfate			-Balfate Patronato and Water Board	
	Policarpo Galindo	-BICA -RMP	-Municipality Roatán -Ministry of Education -Health volunteers	-Policarpo Galindo Patronato and Water Board	-Schools -Sport clubs
	Monte Fresco			-Monte Fresco Patronato and Water Board	
Utila Cays		-BICA Utila -UCME -Iguana Station (Bay Islands Foundation)	-Municipality of Utila	-Informal fisheries group	-Church Ecological group -Utila Dive an Safety Council -Volunteer fire fighters
Cayos Cochinos	Chachahuate			-Chachahuate Patronato	-Park rangers -School -Kinder garden -Church -Parents association (similar to PTA) -Kitchen group -Lodging at East End -Dance group -Environmental committee
	East End	-HCRF -Fisherman's Association -WWF -TNC	-Honduran Navy -Ministry of Environment -Fisheries Department	-East End Patronato and Water Board	

Proposed Adaptation Options

Based on the coping strategies identified by the community members at each workshop, a series of site based projects have been identified, and classified as short, medium and long term projects, along with their risk assessment, capacity building, institutional linkages and activities.

Punta Gorda

SHORT TERM	Improve management of the water resource
	Short Description
	A project that looks to improve the local water board and how it manages the water resource, by providing technical assistance as well as improving some of the existing infrastructure.
	Activities
	<ul style="list-style-type: none"> • Train water board members • Improve existing water distribution infrastructure • Buy water meters • Acquire and install rain catchment infrastructure in all houses • Acquire more holding tanks • Create and implement a transparent metering and billing program

MEDIUM TERM	Improve environmental conditions of the existing creek
	Short Description
	A project that looks to improve the conditions of the existing creek so as to reduce the risks it poses to the community as well as allowing more infiltration of fresh water into the aquifer, thus recharging wells.
	Activities
	<ul style="list-style-type: none"> • Carry out a watershed study • Train community members on how to manage a plant nursery • Improve conditions of the creek • Begin a plant nursery • Replant/reforest creek bed and community

LONG TERM	Improve environmental conditions of the community by managing liquid and solid wastes as well as creating and implementing a building code
	Short Description
	A project that looks to improve the general environmental conditions of the community by managing liquid and solid wastes, which can be directly linked to creating and implementing a building code that adapts to climate change and its direct impacts on this community.
	Activities
	<ul style="list-style-type: none"> • Rapid environmental evaluation of the community to identify needs • Train community members on how to properly manage liquid and solid waste • Improve overall environmental conditions of the community • Carry out training sessions on waste management • Create and consult with local stakeholders a set of building codes that take into account climate change risks and peculiarities of the area

Sandy Bay

SHORT & MEDIUM TERM	Improve environmental conditions of the 3 communities within Sandy Bay
	Short Description
	Improve the management of liquid and solid wastes in Balfate, Policarpo Galindo y Monte Fresco
	Activities
	<ul style="list-style-type: none"> • Carry out a rapid environmental evaluation • Train community members on how to manage liquid and solid wastes • Write project proposal in order to carry out basic sanitation of these 3 communities

LONG TERM	Creating and implementing a building code
	Short Description
	A project that looks to create and implement a building code that adapts to climate change and its direct impacts on this community
	Activities
	<ul style="list-style-type: none"> • Create and consult with local stakeholders on a set of building codes that take into account climate change risks and peculiarities of the area

Cayos Cochinos

SHORT TERM	Improve management of the water resource
	Short Description
	Improve how the water resource is managed, by providing technical assistance as well as improving some of the existing infrastructure
	Activities
	<ul style="list-style-type: none"> • Train community members on how to use water more efficiently • Improve existing rain water collection infrastructure • Acquire and install rain catchment infrastructure in all houses • Acquire more holding tanks

MEDIUM TERM	Implement a reforestation project
	Short Description
	A project that aims at creating a plant nursery and carrying out a reforestation project in both communities (Chachahuate and East End) that will improve rain water infiltration into the aquifer, replenish community wells as well as creating natural barriers that will retain sand on beaches and protect houses and other infrastructure
	Activities
	<ul style="list-style-type: none"> • Identify site for plant nursery • Acquire plants and technical info from FHIA • Begin replanting process

LONG TERM	Begin a process of erecting existing houses and other infrastructure on pylons
	Short Description
	A project that will raise existing houses and infrastructure on pylons so as to raise these above higher waves and reduce the risk of houses being washed away during storms
	Activities
	<ul style="list-style-type: none"> • Get info on how to install houses on pylons • Acquire pylons • Install pylons • Install houses on pylons

Utila Cays

SHORT TERM	Improve management of the water resource by implementing a “Blue Tourism” strategy
	Short Description
	A project that looks to improve management of the water resource, by providing technical assistance as well as improving some of the existing infrastructure, based on a “Blue Tourism” strategy, in which the whole community becomes an example on how to conserve, reduce and reuse water
	Activities

- Train community members on reduction and reuse of water
- Improve existing water distribution infrastructure
- Acquire and install rain catchment infrastructure in all houses
- Acquire more holding tanks
- Create and implement a “Blue Tourism” strategy that can be used as a selling point for tourism

MEDIUM TERM	Effective fisheries management
	Short Description
	A project that looks to effectively manage fisheries, taking into account the future effects of CC on this resource, looking towards establishing alliances between fishermen to reach unexplored fishing grounds, as well as establishing catch limits and rotating no-take zones
	Activities

- Review the fisheries info created by PMAIB
- Carry out a fisheries study (if necessary)
- Involve local NGOs in the whole process
- Link project to local NGOs who might be doing something similar or adaptable to the project
- Train community members on how to manage fisheries

LONG TERM	Begin a process of coral gardening in order to replenish fishing areas and replant coral in areas that will experience die-off due to bleaching and other CC related stressors
	Short Description
	A project that will foster coral gardening and other similar ways of reproducing (grafting) coral species in order to replenish fishing areas with farmed corals and replant areas that will experience coral die-off due to CC related stressors linked to rise in sea temperature.
	Activities

- Show community and NGOs how coral gardens have been implemented effectively in other sites
- Train community and NGOs on how to create and manage coral gardens
- Train participants that are not certify
- Inform dive centers about activity and invite those that wish to participate



Conclusions

There is limited information related to CC impacts and hazards and how these will affect small island communities.

The series of vulnerability assessment workshops were very useful, especially as they served the purpose of raising awareness among the target communities of the CC hazards and impacts, and how these are occurring and will occur more frequently and severely on their resources and livelihoods. They also strengthened the ties between community members and their local organizations, bringing both groups to a discussion table where questions could be raised. The participants also realized the importance of their natural resources, and how these help protect, to some degree, their coastal communities and livelihoods, as can be seen in the coping strategies that focus on maintaining these resources and, in some cases, improving their quality and extent.

The participation of the National Honduran CC Focal Point, Mrs. Mirza Castro, served a double purpose: it allowed the communities to find out what the central government is currently doing to mitigate and ameliorate CC risks and hazards on a country-wide level; as well as allowing Mrs. Castro to understand how vulnerable these coastal communities are.

The addition of Cayos Cochinos as sites 4 and 5 allowed the inclusion of another MPA managing NGO, Honduras Coral Reef Fund. This NGO has been working closely with all communities contained within its boundaries on best practices and sustainable management of marine resources. Continental Honduras has a more direct impact over these communities, compared to the Bay Islands, due to their proximity to the North Coast, as well as shallower reefs due to their positioning on the continental platform or shelf.

Recommendations

- Follow-up with the local NGOs and other organized groups as well as community members with the results of these workshops.
- Funding should be acquired in order to carry out at least one coping strategy within each community, so as to maintain the level of commitment from the participants, which will have a multiplying effect on neighboring communities.
- Approach the local governments (municipalities) so as to inform them of the workshop results and entice them into participating in at least one coping strategy per community.
- Provide the communities on the Bay Islands with printed material, in English and Spanish; describing the possible future CC related hazards and effects.
- Distribute this project report to the target communities.
- Activities must be designed to increase community awareness.

- More in-depth study is needed to determine which coral species are lost and why, as well as how temperature changes are affecting fish populations.
- Establish mechanisms to conserve threatened species such as mangroves, corals and conch.
- Expand existing protected areas, and strengthen those established.
- Ridge to reef integrated management should be expanded in the current protected areas of the Bay Islands.
- Apply the local laws and regulations that apply to protection of key species such as mangroves and coral reefs, in order to enhance their protection.
- Acquire funding to follow-up on the coping strategies related to creating building codes and regulations that take into account climate change hazards.
- Implement carbon credit programs in smaller scales, so as to allow small island communities to apply to these funds.



Annexes

ANNEX 1A VRA Indicator Punta Gorda

APF Step	VRA Indicator	VRA Question HAZARD: shortage of fresh water	Logic
Assessing current vulnerability	1. Vulnerability of livelihood/welfare to existing climate change and/or climate variability.	<ul style="list-style-type: none"> • <u>Example</u>: What happens when there is <u>shortage of fresh water</u>? 	<ul style="list-style-type: none"> • Salt water intrusion into wells • Fresh water gully that runs through town becomes salty
		<ul style="list-style-type: none"> • How does this affect you and your community? 	<ul style="list-style-type: none"> • Economically, as then there is a need to buy water from another source • Salt water enters the community's distribution network
Assessing future climate risks	2. Vulnerability of livelihood/welfare to developing climate change risks.	<ul style="list-style-type: none"> • <u>Example</u>: What would happen if <u>shortage of fresh water</u> were twice as frequent? 	<ul style="list-style-type: none"> • Would need larger containers to fill with water from well and from rain catchment
		<ul style="list-style-type: none"> • How would this affect you and your community? 	<ul style="list-style-type: none"> • Economically • Discontent as there would be 2 water bills: one for the monthly fee charged by water board and another to buy water from another source
Formulating an adaptation strategy	3. Magnitude of barriers (institutional, policy, technological, financial, etc) barriers to adaptation.	<ul style="list-style-type: none"> • What means do you or your community have to manage events occurring more frequently? 	<ul style="list-style-type: none"> • Water board funds • Funds from other projects • Municipal funds (very difficult)
Continuing the adaptation process	4. Ability and willingness of the community to continue to manage climate change risks	<ul style="list-style-type: none"> • What means would you use to adapt to <u>shortage of fresh water</u>? 	<ul style="list-style-type: none"> • Drill more wells • Improve water distribution network • Improve water quality • Collect more rain water in larger containers • Make sure ALL roofs are collecting rainwater

ANNEX 1B VRA Indicator Punta Gorda

APF Step	VRA Indicator	VRA Question HAZARD: bigger waves and sea level rise	Logic
Assessing current vulnerability	1. Vulnerability of livelihood/welfare to existing climate change and/or climate variability.	<ul style="list-style-type: none"> Example: What happens when there is bigger waves and sea level rise? 	<ul style="list-style-type: none"> Destruction of homes Destruction of the main road Destruction of docks Hazard to the local population Loss of plants and crops
		<ul style="list-style-type: none"> How does this affect you and your community? 	<ul style="list-style-type: none"> No fishing No potable water No electricity Damage to the main road
Assessing future climate risks	2. Vulnerability of livelihood/welfare to developing climate change risks.	<ul style="list-style-type: none"> Example: What would happen if bigger waves and sea level rise were twice as frequent? 	<ul style="list-style-type: none"> Loss of tourism Loss of work Food shortage No access to community Death Pollution of fresh water Pollution of the ocean and adjacent reefs
		<ul style="list-style-type: none"> How would this affect you and your community? 	<ul style="list-style-type: none"> Migration to safer areas Repositioning of the community
Formulating an adaptation strategy	3. Magnitude of barriers (institutional, policy, technological, financial, etc) barriers to adaptation.	<ul style="list-style-type: none"> What means do you or your community have to manage events occurring more frequently? 	<ul style="list-style-type: none"> International aid Aid from church groups Personal economic resources
Continuing the adaptation process	4. Ability and willingness of the community to continue to manage climate change risks	<ul style="list-style-type: none"> What means would you use to adapt to bigger waves and sea level rise? 	<ul style="list-style-type: none"> Change in architecture (build houses on pylons) Repositioning of the community Reforestation of mangrove forests as barriers

ANNEX 1C VRA Indicator Cayos Cochinos

APF Step	VRA Indicator	VRA Question HAZARD: reduction of rains	Logic
Assessing current vulnerability	1. Vulnerability of livelihood/welfare to existing climate change and/or climate variability.	<ul style="list-style-type: none"> Example: What happens when there is reduction of rains? 	<ul style="list-style-type: none"> Less water for human use Sad looking forests Unbearable heat Rationing of water People begin to smell
		<ul style="list-style-type: none"> How does this affect you and your community? 	<ul style="list-style-type: none"> People cannot bathe Consume (drink) less water Affects all daily activities
Assessing future climate risks	2. Vulnerability of livelihood/welfare to developing climate change risks.	<ul style="list-style-type: none"> Example: What would happen if reduction of rains was twice as frequent? 	<ul style="list-style-type: none"> Droughts Mal nutrition Death Illnesses Have to migrate to different area
		<ul style="list-style-type: none"> How would this affect you and your community? 	<ul style="list-style-type: none"> Reduction in the size of the community Poverty People become weaker Misery Lack of energy to gather food stuff
Formulating an adaptation strategy	3. Magnitude of barriers (institutional, policy, technological, financial, etc) barriers to adaptation.	<ul style="list-style-type: none"> What means do you or your community have to manage events occurring more frequently? 	<ul style="list-style-type: none"> Human resources Coconut trees Donations Community collaboration Increase awareness about the risk
Continuing the adaptation process	4. Ability and willingness of the community to continue to manage climate change risks	<ul style="list-style-type: none"> What means would you use to adapt to reduction of rains? 	<ul style="list-style-type: none"> Begin to protect forests and river basins Replant trees around the well head Begin to store more rain water

ANNEX 1D VRA Indicator Sandy Bay

APF Step	VRA Indicator	VRA Question HAZARD: landslides due to heavy rains	Logic
Assessing current vulnerability	1. Vulnerability of livelihood/welfare to existing climate change and/or climate variability.	<ul style="list-style-type: none"> Example: What happens when there are <u>landslides due to heavy rains</u>? 	<ul style="list-style-type: none"> Accidents Loss of homes Pollution Lack of access to certain areas Sedimentation of the reef Loss of human lives
		<ul style="list-style-type: none"> How does this affect you and your community? 	<ul style="list-style-type: none"> Emotional turmoil Economic downfall Physically if impacted Contaminates sources of potable water Mental turmoil Destruction of potable water distribution network Destruction of septic tanks Leaks from ruptured septic tanks cause pollution
Assessing future climate risks	2. Vulnerability of livelihood/welfare to developing climate change risks.	<ul style="list-style-type: none"> Example: What would happen if <u>landslides due to heavy rains</u> were twice as frequent? 	<ul style="list-style-type: none"> It would affect more people Migrate to other areas
		<ul style="list-style-type: none"> How would this affect you and your community? 	<ul style="list-style-type: none"> Reduction of health standard Reduction of the family and local economy
Formulating an adaptation strategy	3. Magnitude of barriers (institutional, policy, technological, financial, etc) barriers to adaptation.	<ul style="list-style-type: none"> What means do you or your community have to manage events occurring more frequently? 	<ul style="list-style-type: none"> Human resources Organized patronatos Organized water boards Church groups and School groups
Continuing the adaptation process	4. Ability and willingness of the community to continue to manage climate change risks	<ul style="list-style-type: none"> What means would you use to adapt to <u>landslides due to heavy rains</u>? 	<ul style="list-style-type: none"> Reduce deforesting of areas in the community Stop building houses on slopes Stop leveling off terrain Enforce building codes and regulations Prohibit houses on high risk areas Build a shelter

ANNEX 1E VRA Indicator Utila Cays

APF Step	VRA Indicator	VRA Question HAZARD: loss of coastline	Logic
Assessing current vulnerability	1. Vulnerability of livelihood/welfare to existing climate change and/or climate variability.	<ul style="list-style-type: none"> Example: What happens when there is loss of coastline? 	<ul style="list-style-type: none"> Loss of houses Flooding of the cays Evacuation to higher ground Impact on livelihood
		<ul style="list-style-type: none"> How does this affect you and your community? 	<ul style="list-style-type: none"> Loss of source of livelihood Migration from Cay in search of alternate livelihood Loss of monetary funds due to investment into physical structures built as buffers
Assessing future climate risks	2. Vulnerability of livelihood/welfare to developing climate change risks.	<ul style="list-style-type: none"> Example: What would happen if loss of coastline were twice as frequent? 	<ul style="list-style-type: none"> More loss of private and public infrastructure More incidences of flooding Increase migration from Cay
		<ul style="list-style-type: none"> How would this affect you and your community? 	<ul style="list-style-type: none"> Loss of more houses Complete flooding of the cays Higher impact on livelihood
Formulating an adaptation strategy	3. Magnitude of barriers (institutional, policy, technological, financial, etc) barriers to adaptation.	<ul style="list-style-type: none"> What means do you or your community have to manage events occurring more frequently? 	<ul style="list-style-type: none"> Personal funds Municipal funds Donations
Continuing the adaptation process	4. Ability and willingness of the community to continue to manage climate change risks	<ul style="list-style-type: none"> What means would you use to adapt to loss of coastline? 	<ul style="list-style-type: none"> Build sea walls Build houses on pylons

