REQUEST FOR PROJECT/PROGRAMME FUNDING FROM ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to

The Adaptation Fund Board Secretariat
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MSN G6-602
Washington, DC. 20433
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Email: secretariat@adaptation-fund.org

CURRENCY EQUIVALENTS
Exchange Rate Effective December 2, 2011

Currency Unit = Belize Dollar
BZD 1.96 = US$1

FISCAL YEAR
April 1 – March 31

ABBREVIATIONS AND ACRONYMS

ASO	April, September, October
BSIF	Belize Social Investment Fund
CBO	Community Based Organizations
CEO	Chief Executive Officer
CO_2	Carbon Dioxide
CPS	Country Partnership Strategy
CZM	Coastal Zone Management
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
ENSO	El Niño Southern Oscillation
EU	European Union
FAO	Food and Agriculture Organization
FMA	February, March, April
FM	Financial Management
GDP	Gross Domestic Product
GEF	Global Environment Facility
GOB	Government of Belize
IBRD	International Bank for Reconstruction and Development
IADB	Inter-American Development Bank
IMF	International Monetary Fund
IPCC	Inter-government Panel on Climate Change
ISN	Interim Strategy Note
IUCN	International Union for Conservation of Nature
MCCAI	Marine Conservation and Climate Adaptation Initiative
MCCAT	Marine Conservation and Climate Adaptation Trust
MED	Ministry of Economic Development, Commerce and Industry, and Consumer Protection
MJJ	May, June, July
MLLGRD	Ministry of Labour, Local Government and Rural Development
MNRE	Ministry of Natural Resources and the Environment
MoF	Ministry of Finance
MPA	Marine Protected Area
MTDS	Medium Term Development Strategy
M&E	Monitoring and Evaluation
NDJ	November, December, January

NGO	Non Governmental Organization
NPAS	National Protected Area System
NAPSP	National Protected Area System Plan
NPESAP	National Poverty Elimination Strategy and Action Plan
NPLG	National Policy on Local Governance
PAU	Project Administration Unit
PACT	Protected Areas Conservation Trust
PDO	Project Development Objective
PIU	Project Implementation Unit
PR	Procurement
RFP	Request for Proposal
SST	Sea Surface Temperature
TA	Technical Assistance
TAT	Turneffe Atoll Trust
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
WRI	World Resources Institute

PROJECT/PROGRAMME PROPOSAL

PART I: PROJECT/PROGRAMME INFORMATION

PROJECT/PROGRAMME CATEGORY:	REGULAR PROJECT
COUNTRY/IES:	BELIZE
TITLE OF PROJECT/PROGRAMME:	BELIZE MARINE CONSERVATION AND CLIMATE ADAPTATION PROJECT
TYPE OF IMPLEMENTING ENTITY:	MULTILATERAL IMPLEMENTING ENTITY
IMPLEMENTING ENTITY:	WORLD BANK
EXECUTING ENTITY/IES:	PROTECTED AREAS CONSERVATION TRUST
AMOUNT OF FINANCING REQUESTED:	$6 MILLION (IN U.S DOLLARS EQUIVALENT)

PROJECT / PROGRAMME BACKGROUND AND CONTEXT:

Global and regional climate change impacts

1. Belize is a small, upper-middle income country with a population of 310,000 and a per-capita GDP of US$4,115 (2009). It is situated on the Caribbean coast of Central America with Mexico to the north and Guatemala to the west and south. It lies between 15º45´ and 18º30´ north latitude and 87º30´ and 89º15´west longitude. Total national territory covers 46,620 km^2, which includes 22,960 km^2 (8,867 miles^2) of land and 1,060 cays. Belize has a typically moist tropical climate. In accordance with the United Nations Framework Convention on Climate Change (UNFCCC), Belize chose the year 1994 for its first National Inventory of Sources and Sinks of Greenhouse Gases. The results of the Inventory reveal that Belize is a net sink for greenhouse gases, i.e., it absorbs more than it emits. Yet, Belize is extremely vulnerable to adverse impacts of climate change. Therefore, the national objective is focused on identifying feasible adaptation options to address climate change. Through its membership in the Caribbean Community (CARICOM), Belize is a partner in the Alliance of Small Island States (AOSIS). Its UNFCCC negotiating position is therefore coordinated within this body. Belize is also a member of the Central American Commission on Environment and Development (CCAD). It attempts to reconcile the negotiating positions of these two groups into a larger unified voice to achieve the objectives of the Convention.

2. Global climate change remains arguably the most serious challenge to the development aspirations of the CARICOM countries. Observational data for the Caribbean already indicates an approximate increase in sea surface temperature of about 0.6°C above the global mean temperature in the 20th century. At the same time, mean sea level rose over the past century between 2 and 6 mm/year. In addition, rainfall variability that appears to be closely related to the El Niño Southern Oscillation (ENSO) has increased.[1] Due to these changes that have already taken place, climate change related events have started profoundly impacting the region's geophysical, biological and socio-economic systems and depleting national budgets. It is well-established that the countries of

[1] Intergovernmental Panel on Climate Change (IPCC 2007), "Fourth Assessment Report, Climate Change 2007: Synthesis Report, An Assessment of the Intergovernmental Panel on Climate Change http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf

the Caribbean are among the most vulnerable to global climate change (IPCC, 2007). While the severity of the impacts will vary from country to country, there is a suite of priority concerns directly linked to climate change that is virtually ubiquitous across the region. Sea level rise will combine a number of factors resulting in accelerated coastal erosion, increased flood risk and in some areas permanent loss of land. This may be exacerbated further by increases in the destructiveness of tropical storms, the impacts of which will be greater due to sea-level rise even without increases in storm intensity. The impacts of sea-level rise will be further exacerbated by the loss of protective coastal systems such as coral reefs. The Caribbean has experienced widespread coral loss in recent decades due to a variety of interacting factors including bleaching, which has become more frequent due to higher ocean surface temperatures, a trend which will continue into the future as a result of climate change (Gardner et al., 2003, 2005). Loss of coral will also affect livelihoods, for example those dependent on tourism and fisheries. Sea-level rise will also be associated with saline intrusion into coastal aquifers, affecting the availability of freshwater, which will combine with drought to increase water stress. The IPCC projections indicate a reduction in precipitation across most of the Caribbean throughout the year, with the largest reductions occurring in the boreal summer (Christensen et al., 2007). Hurricane intensity may increase as a result of anthropogenic climate change, although there is uncertainty about the future behavior of hurricanes and tropical storms in general (Vecchi et al., 2008). Belize, like most of the countries in the Caribbean, is also low-lying, with some coastal areas below mean sea-level. In all countries a high percentage of the population and much critical infrastructure are located along the coast[2]. These factors will be exacerbated by the projected adverse effects of climate change.

3. The United Nations Human Development Report (2008) and the State of the World Report (2009) of the World Watch Institute have identified a 2˚C increase in the average global temperature as the threshold beyond which irreversible and dangerous climate change impacts become unavoidable. On the basis of the vulnerabilities of the marine and coastal ecosystems, this threshold for irreversible damage is probably even lower for the Caribbean region. While most nations and natural capital assets in the region are likely to be heavily impacted, Belize presents an early case of potential negative ecosystem-wide impacts on its coral reef induced by climate change-related damages that are further exacerbated by unsustainable uses of reef resources. Belize is a country with extensive, low-lying, coastal areas vulnerable to climate-related disasters through tropical cyclones and flooding. Furthermore, the economy is small and concentrated, along with most centers of population, in these very areas that are most vulnerable. Consequently, the UNFCCC recognizes Belize as one of those countries most vulnerable to the adverse impacts of climate change due to it: (i) having a long, low-lying coastline, (ii) having over 1,060 small islands, (iii) having the second longest barrier reef in the world (and the largest reef in the Western Hemisphere and the Americas), and 17,276 km^2. of forest cover, each of which support fragile ecosystems, and, (iv) being very prone to climate-related disasters, especially hurricanes. Hence the vulnerability of the country to the foreseeable adverse physical, environmental, and economic impacts of climate change indicates that priority attention must be directed towards implementation of viable adaptation measures targeting the most vulnerable sectors and ecosystems.

4. Indeed recent climate trends and projections of future climate for Belize indicate that climate change will exert increasing pressure on the country[3]: (a) **Temperature**: Mean annual temperature has increased by 0.45°C since 1960, an average rate of 0.10°C per decade. The average rate of

[2] See the First National Communication to the UNFCCC sub mitted by CARICOM countries.
[3] McSweeney, C., M. New & G. Lizcano. 2008. Belize: UNDP Climate Change Country Profile. University of Oxford, UK.

increase is most rapid in the wet seasons (MJJ and ASO) at 0.14-0.15°C per decade and slower in the dry seasons (NDJ and FMA) at 0.08-0.09°C per decade. The frequency of particularly hot days and hot nights has increased significantly since 1960 in every season. The average number of 'hot' days per year in Belize has increased by 67 (an additional 18.3% of days) between 1960 and 2003. More importantly, the mean annual temperature is projected to increase by 0.8 to 2.9°C by the 2060s, and 1.3 to 4.6 degrees by the 2090s. The range of projections by the 2090s under any emissions scenario is 1.5-2°C; (b) **Precipitation**: Mean annual rainfall over Belize has decreased at an average rate of 3.1mm per month per decade since 1960, but this trend is not statistically significant. Whilst all seasons appear to have shown decreasing precipitation trends since 1960, only FMA has a statistically significant trend. Projections of mean annual rainfall from different models are broadly consistent in indicating decreases in rainfall for Belize. Projections vary between -64% and +20% by the 2090s with ensemble median values of -11 to -22%; (c) **Tropical cyclones**: Whilst evidence indicates that tropical cyclones are likely to become, on the whole, more intense under a warmer climate as a result of higher sea-surface temperatures, there is great uncertainty in changes in frequency, and changes to storm tracks and their interactions with other features of climate variability (such as the El Niño Southern Oscillation) which introduces uncertainty at the regional scale (Christensen *et al*., 2007); and (d) **Sea level rise**: The coastal lowlands in Belize are highly vulnerable to sea-level rise. Sea level in this region is projected by climate models to rise by the following levels by the 2090s, relative to 1980-1999 sea level: 0.18 to 0.43m under SRES B1, 0.21 to 0.53m under SRES A1B, and 0.23 to 0.56m under SRES A2.

Climate challenge to the Belize Barrier Reef

5. Belize is remarkably diverse ecologically with substantial natural capital along its coast, represented by the largest coral barrier reef and associated ecosystem in the Americas[4], as well as significant areas of mangroves, tropical forest and inland wetlands. The Belize Barrier Reef has been classified as one of the world's marine hotspots with an abundance of globally and locally significant biodiversity[5]: it consists of six UNESCO World Heritage sites and is home to a variety of endemic species, many of them endangered and under some degree of protection, including sea turtles (green, loggerhead, leatherback, and hawksbill turtles), queen conch, West Indian manatee[6], splendid toadfish, crocodiles (American and Morelet's), Nassau grouper, and black coral. Two of the most important reef-building coral species in the Caribbean─elkhorn (*Acropora palmata*) and staghorn (*Acropora cervicornis*)─are listed as critically endangered by the IUCN Red List of Threatened Species. Locally, the reef system provides livelihoods for communities and contributes to the national economy through fisheries and growing tourism revenues. It also shelters the coastal zones from intense tropical storms and high velocity winds that cause erosion and coastal damage. It has been estimated that the value of ecosystem services (fishing, tourism, shoreline protection) generated by the coral reefs and mangroves contributes between 15 and 22 percent of GDP in Belize.

6. **Belize derives very large benefits from the ecosystem services generated by the coral reefs and mangroves.** The Belize Barrier Reef not only supports vibrant tourism and fishing industries, but also shelters Belize's coast from high-velocity winds that cause erosion and coastal damage. According to the World Resources Institute (WRI 2008), about two-thirds of the mainland

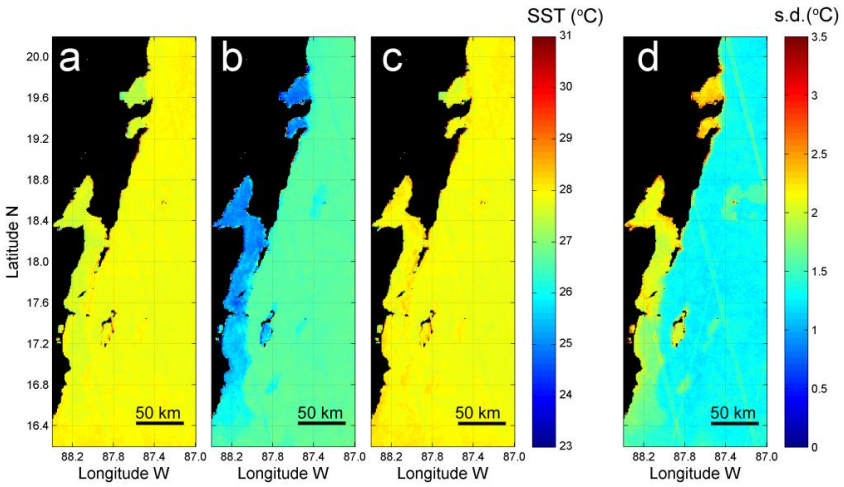
[4] A UNESCO world heritage site.
[5] The reef system is home to more than 66 stony coral species, 350 mollusk species and more than 500 fish species.
[6] The Barrier Reef is home to one of the world's largest populations of manatees with an estimated population of 1,000 to 1,500.

coast is protected by coral reefs. The degree of protection varies with reef type, depth and distance from shore, as well as with the elevation and slope of the shore, the geological origin of the area, and the wave energy along the coast. Emergent reefs, such as the Barrier Reef, can mitigate over three-quarters of wave energy. Reefs close to shore provide the most protection, because waves have less chance to regenerate. The reef off Ambergris Caye, for example, contributes about 40 percent of the coast's stability due to its close proximity to the shore. The atolls and Barrier Reef, although further offshore, also contribute to the protection of the cayes and mainland coast. Mangroves protect the immediately adjacent shoreline and mitigate the force of both the waves and the storm surge, protecting 50 percent of the mainland's coastline and 75 percent of the cayes' shoreline.

7. **Belize is highly vulnerable to natural hazards and climate change.** Belize's long low-lying coastal areas are especially vulnerable to more intense and frequent tropical storms and hurricanes, flood damage, and rising sea levels. Like the rest of the Caribbean, Belize has experienced frequent natural disasters of catastrophic proportions, and most recently suffered the impact of a Category 1 hurricane (Richard in October 2010) and widespread flooding in 2008. Tropical Storm Arthur (May 2008) caused extensive damage to infrastructure and the agriculture sector. Hurricanes Keith (2000) and Iris (2001) struck Belize each causing damages reaching 45% and 25% of GDP, respectively. In 1961, Hurricane Hattie destroyed Belize City and prompted the Government to build a new administrative capital 50 miles inland in Belmopan. Beyond economic and social losses, climate-related natural disasters have contributed to large fiscal deficits and debt accumulations that required Belize to restructure its public debt in 2007. These severe budget constraints, in turn, have limited Belize's ability to finance climate change adaptation and mitigation activities.

Figure 1. Sea surface temperature patterns in Northern Belize

(a) average, (b) minimum monthly mean, (c) maximum monthly mean, and (d) standard deviation



Source: P. J. Mumby, *et al.*, Marine Spatial Ecology Laboratory at the University of Exeter (UK)

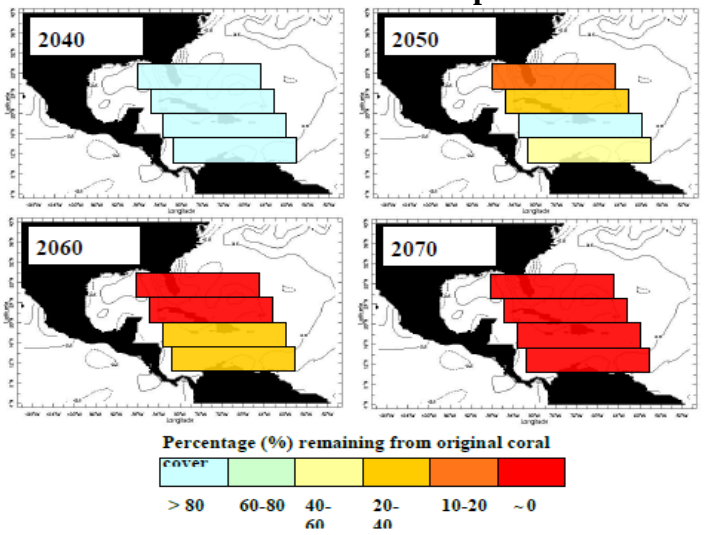
8. Of the ecosystems in Belize, the barrier reef is assessed as being highly vulnerable and identified as a "Critical Area for Conservation: [with] high species richness and potentially severe climate-induced destabilization."[7] Several indicators attest to this: severe coral mortality induced by

[7] From CATHALAC/USAID study of regional biodiversity and climate change, 2008.

warmer sea surface temperatures (Fig. 1) and increasing ocean acidification; reduction of coral cover; and reduction in fisheries annual catch.[8] While some of these indicators respond to local stressors (e.g., sedimentation, nutrient pollution from agrochemicals, overfishing, etc.), they are all exacerbated by the consequences of global warming. Gradual and consistent increases in sea surface temperatures have yielded increasingly frequent bleaching events (1993, 1998, 2003, 2005, 2008, 2009, and 2010), which cause wide-scale bleaching throughout the Caribbean Region. Recovery from such large scale coral mortality will depend on the extent to which coral reef health has been compromised and the frequency and severity of subsequent stresses to the system. More than one bleaching event over a short timeframe can be devastating (Christensen et al. 2007).

9. A recent analysis indicates that high sea surface temperature anomalies will have significant impacts on the coral reefs in the Caribbean especially if no significant large-scale adaptation measures are undertaken.[9] Figure 2 summarizes the results of this analysis that simulates the response of coral reefs in the Caribbean to continuous increases in sea surface temperature (SST), as anticipated under the A1B emission trajectory of the Inter-governmental Panel on Climate Change (IPCC). Optimal water temperatures for Caribbean corals range from 25 to 29°C, with a few important exceptions. A few individual corals of many species are able to tolerate higher temperatures for a few days or weeks, depending on the magnitude of the temperature elevation. There is strong evidence that corals have the ability to adapt to higher temperatures if given enough time and removed from other types of chronic stress (e.g., over-fishing, pollution, rapid coastal development, etc). Therefore, adaptation measures for coral reefs must include broader management measures such as controlling overfishing and associated ecological imbalances through the establishment of no-take marine reserves, as well as controlling land-based threats to reefs.

Figure 2. Evolution of relative coral covers over time for the four different latitudes under the A1B scenario with 2ºC temperature sensitivity



Source: Vergara, W. *et al*, 2009. Subjacent map obtained from www.portal.iri.columbia.edu.

10. The anticipated intensification and an increase in the frequency of hurricanes threaten the survival of coral reefs. The increase in major hurricanes is indicative of a broader increase in

[8] It is estimated that between 60 to 70 endemic species of corals in the Caribbean are endangered.
[9] Vergara et al., "The Potential Consequences of Climate-induced Coral Loss in the Caribbean by 2050-2080", *Assessing the Potential Consequences of Climate Destabilization in America*, LCR Sustainable Development Working Paper No. 32, World Bank, January 2009.

average tropical cyclone wind speeds as sea surface temperature rises, as well as a shift in the intensity distribution toward a greater number of Category 4 and 5 hurricanes. An analysis of the global tropical cyclone intensity data since 1970 indicates an average increase in intensity of 6 percent for a 0.6°C SST increase. High-resolution climate models indicate a 2 percent intensity increase when scaled for a 0.6°C SST increase, and potential intensity theory yields an increase between 2.7 percent and 5.3 percent.[10]

11. Hurricane events lead to disturbance and mortality of coral recruits by sediment scouring, direct mechanical breakage, and the removal of substratum. Post-hurricane events such as an ephemeral bloom of blue-green and filamentous green algae may also create further stress.[11] Hurricanes cause a devastating reduction in live coral cover when it coincides with a bleaching event. An observation reported that a mass-bleaching event coinciding with hurricane Mitch in 1998 resulted in a 48 percent reduction in live coral cover across the Belize reef system. The corals showed signs of recovery in 1999 in fore-reef habitats of the outer barrier reef and offshore platforms. In contrast, coral populations on reefs in the central shelf lagoon died off catastrophically[12].

Table 1. Value of annual losses of economic services of coral reefs (Lecon),
in 2008 US$ million

	50% Corals in Caribbean are lost		**90% Corals in Caribbean are lost**	
	Low estimates	**High estimates**	**Low estimates**	**High estimates**
Coastal protection	438	1,376	788	2,476
Tourism	541	1,313	973	2,363
Fisheries	195	319	351	574
Pharmaceutical uses	3,651	3,651	6,571	6,571
Total	4,824	6,659	8,674	11,985

Source: Vergara et al, 2009, op.cit.

12. Further reduction in the reef cover would weaken its ability to provide the associated local and global economic and environmental services. Specifically, in the wake of coral collapse, major impacts on fisheries, tourism, and coastal protection are anticipated, as well as severe loss of biodiversity in terms of species extinction and impacts on ecosystem integrity. Once the corals die, the reef structure breaks down with no easy way to regain the ecological goods and services of habitat, fisheries, tourism and storm protection.[13] The economic losses associated to 90 percent coral collapse in the Caribbean have been estimated at between 9 and 12 billion dollars per year (Vergara et al., 2009).

13. Warmer sea water threatens the coral reefs that attract thousands of tourists for snorkeling and scuba-diving activities. Loss in the percentage of coral cover with a concomitant loss in reef-

[10] J. Curry *et al*., "Potential Economic Impacts of Hurricanes in Mexico, Central America, and the Caribbean ca. 2020–2025", *Assessing the Potential Consequences of in America*, LCR Sustainable Development Working Paper No. 32, World Bank, January 2009.
[11] Mumby, P. J., "Bleaching and hurricane disturbances to populations of coral recruits in Belize", *Marine Ecology Progress Series*, Vol. 190, 27-35, December 1999.
[12] Aronson, R.B. *et al*., "The 1998 bleaching event and its aftermath on a coral reef in Belize", *Marine Biology* (2002) 141: 435–447, DOI 10.1007/s00227-002-0842-5
[13] Hoegh-Guldberg *et al.*, "Coral Reefs under Rapid Climate Change and Ocean Acidification", Science 14 December 2007: 1737-1742.

related species of invertebrates and fishes will lead to a general decline in the attractiveness of reef sites used for snorkeling and scuba diving. Presently, the majority of tourism in Belize is marine-based, with approximately 70% of hotels located in the coastal zone. Over 60% of visitors are interested in visiting the cayes. Tourism accounts for over 15% of GDP, is the largest source of foreign exchange earnings, and generates significant employment. The economic impact of climate change on Belize's tourism sector has been estimated at BZ$48.3 million, which includes the effects of reduced tourism demand and the loss of facilities (from sea level rise), beaches (from coastal erosion) and reef-based ecotourism. Thus, any decline in marine tourism will have a direct effect on the economy of the country. With a loss in coral cover there will also be a related loss in biodiversity. Coral reefs are one of the most diverse systems on earth, and the reefs of Belize comprise some of the best in terms of general reef health and diversity in the Caribbean region.

14. Belize's location and vulnerability to climate change, one effective way of adapting to climate change is through promotion of ecosystem-based adaptation measures that strengthen the resilience of the reef and associated habitats. An effective approach to protect corals is by strengthening and improving the overall health of the ecosystems associated with the coral reef. A recent study shows that bleached corals recover to normal growth rates more quickly when they have clean water and plentiful sea life at their side. The researchers found that following a major bleaching event Mountainous star coral (*Montastraea faveolata*) on various reefs in Honduras and Belize was able to recover and grow normally within two to three years when the surrounding waters and reef were relatively healthy. In comparison, those corals living with excessive local impacts, such as pollution, were not able to fully recover after eight years[14].

PROJECT / PROGRAMME OBJECTIVES:

15. The objective of the proposed Adaptation Fund Project is **to implement the priority ecosystem-based marine conservation and climate adaptation measures to strengthen the climate resilience of the Belize Barrier Reef System**. Specifically, the project will support (i) the improvement of the reef's protection regime including an expansion and enforcement of the Marine Protected Areas (MPAs) and replenishment (no-take) zones in strategically selected locations to climate resilience, (ii) promotion of sustainable alternative livelihoods for affected users of the reef, and (iii) building local capacity and raising awareness regarding the overall health of the reef ecosystem and the climate resilience of coral reefs. The activities are carefully selected based on the concept that the best chance of enhancing the resilience (resistance and recovery potential) of natural systems to climate change impacts is to reduce local stressors which undermine the innate resilience to external shocks that is characteristic of healthy, robust ecosystems and to strengthen the coral reefs thermal resilience.

16. The concept behind the Marine Conservation and Climate Adaptation Project embodies a two-track approach which combines **ecosystem-based adaptation** with national level enabling policy and legal frameworks as an effective long-term approach to help strengthen the resilience of the reef system to the adverse effects of climate change. Indeed, reef scientists recommend not only a stabilization of CO_2 and other greenhouse gas concentrations, but also a slight reduction from the current level of 388 ppm (2010) to 350 ppm, if large-scale degradation of reefs is to be avoided. Attaining this challenging target will take time, and require immense global efforts. In the

[14] Carilli JE, Norris RD, Black BA, Walsh SM, McField M (2009) Local Stressors Reduce Coral Resilience to Bleaching. PLoS ONE 4(7): e6324. doi:10.1371/journal.pone.0006324.

meantime, the best approach to adapt to climate change requires ecosystem-based approaches that strategically plan to enhance local-scale reef resilience through targeting critical areas, building networks of protected areas that include (and replicate) different parts of the reef system, as well as include areas critical for future reef replenishment. Such efforts may represent an opportunity to "buy time" for reefs, until global greenhouse gas emissions can be curbed. Thus, this Project would produce long-term economic, environmental, and social benefits by addressing the challenges posed by climate change on marine ecosystems and on the livelihoods of current and future generations in Belize.

17. **Investing in measures that protect and improve the ecological health of the natural ecosystems (such as the Belize Barrier Reef) is the best way to anticipate climate change while enhancing resilience to climate change impacts**. While globally there has previously been heavy emphasis on engineering approaches (e.g., dikes, storm shelters, building codes and storm resistant houses, drainage canals, sea walls, etc) to adapting to climate change related hazards (such as hurricanes and storms), empirical evidence is showing that the importance of natural ecosystem buffers and their role in climate change adaptation may indeed be higher than initially thought. Such ecosystem-based adaptation measures have little or no risk of mal-adaptation and may in fact be more cost effective. For example, a very rigorous data-rich analysis by Saudamini Das (2007)[15] sought to answer three key questions: (a) do mangroves provide storm protection?; (b) how do they fare vis-à-vis the other approaches like early warning, storm shelters, dikes, sea walls, etc?; and, (c) is mangrove preservation an economically viable adaptation strategy to climate change? The analysis empirically established that mangroves were highly effective in reducing casualties during the 1999 Super Cyclone in Orissa - India, whether of humans, buffaloes or cattle. Indeed mangrove conservation was found to be effective against the wind and wave surges during climate-related hazards which are frequent in the area. Specifically, the analysis found that: (i) mangroves reduced human death, livestock loss and house damages during the T-7 Super Cyclone of October 1999; (ii) human death toll would have been nearly doubled in the absence of mangroves; and, (iii) annualized storm protection benefit of mangroves for reducing the damages was found to be higher than annual return from land hence justifying mangrove conservation as a viable adaptation strategy to climate change. In the proposed Project intervention area in Belize, the Barrier Reef shelters the coastal zones from intense tropical storms and high velocity winds that cause erosion and coastal damage. Furthermore, it has been estimated that the value of ecosystem services (fishing, tourism, storm and shoreline protection) generated by the coral reefs and mangroves contributes between 15 and 22 percent of GDP in Belize. This shows that investing in measures that protect marine ecosystems such as mangroves and coral reefs is indeed a viable and cost-effective adaptation strategy in the face of limited resources and increasing climate change impacts.

18. **Reducing the fishing pressure by enforcing No-Take Zones and MPAs would immediately have a positive impact on the reef ecosystem, allowing it to maintain and strengthen its health.** One of the key local stressors is overfishing especially of big fish and sharks, which reduces fish populations and disrupts food webs on the reef. The most valuable catch for the fishers is spiny lobster (*Panulirus argus*) which is also important for the health of corals because it preys on coral predators such as snails and fire-worms. Elevated summer temperatures have been shown to strengthen coral pathogens while weakening the coral host, with optimum water temperatures for infectious agents being higher than the optimal temperatures for corals. Recent increases in the frequency and virulence of disease outbreaks on coral reefs suggest that the trend of

[15] Saudamini Das (2007) Storm Protection by Mangroves in Orissa: An Analysis of the 1999 Super Cyclone. South Asian Network of Development and Environmental Economics. Paper # 25-07.

increasing disease will continue to strengthen as global temperatures increase. Coral disease is an important aspect of climate change for coral reefs, and disease resistance in corals is an important aspect of adaptation, allowing adapted coral genotypes to survive over time. Overfished reefs tend to have overabundant *Stegastes* populations, and associated high disease rates. No-take areas tend to have fewer of these disease-spreading fish, likely because of greater abundance of *Stegastes* predators (e.g., groupers). This is yet another example of how no-take zones help coral reefs survive warmer waters and adapt to climate change. Lowering coral predator (e.g., coral eating fire-worm and snails) abundance should be possible through the implementation of no-take zones on reefs, which would then have higher levels of snail and fire worm predators (lobsters and triggerfish). Hence, the enforcement of no-take marine protected areas, as it results in better ecological balance, is considered an important climate change adaptation measure for coral reefs. The target areas would cover identified fish spawning sites, resilient coral reef sites that have survived/recovered from the bleaching events, and climate refugia to ensure the reef's capacity to recover from extreme climate events by providing a sufficiently large and resilient seed stock of critical biodiversity and sustain productivity in the long-term. (See Map 1, 2, and Annex 5)

19. In addition to the adaptation benefits, **there are direct co-benefits associated with ecosystem-based adaptation measures with regard to GHG emissions** (i.e., climate change mitigation). While further work is needed to identify the magnitude of emissions from near-shore marine ecosystems such as seagrass beds, it is clear that improved management of these ecosystems would slow or reverse current loss of carbon sequestration capacity (Crooks *et al.*, 2011). Natural coastal habitats (marshes, mangroves, seagrasses, etc) sequester and store large quantities of carbon in plants and the soils below them - termed "Blue Carbon". Currently, greenhouse gas emissions that occur as a result of the management of such coastal and marine habitats are not being accounted for in international climate change mechanisms (e.g., UNFCCC, Kyoto, CDM, etc) or in National Inventory Submissions. This represents a missed opportunity globally and for countries like Belize that are richly endowed with coastal and marine ecosystems of global importance. Over the past couple of years, scientific work has documented the carbon management potential of a number of coastal ecosystems: tidal saltmarshes, mangroves, seagrass meadows, kelp forests and coral reefs. The evidence shows that the carbon management potential of these selected marine ecosystems compares favorably with and, in some respects, may exceed the potential of carbon sinks on land. This potential can be effectively maintained and enhanced through management approaches such as marine protected areas, marine spatial planning, area-based fisheries management approaches, regulated coastal development, and ecosystem rehabilitation. Sustainable management of coastal wetlands and near-shore marine ecosystems offer a wide range of co-benefits, including shoreline protection, nutrient cycling, water quality maintenance, flood control, habitat for birds, other wildlife and harvestable resources such as fish. Together, these increase the resilience of coupled ecological and social systems to the impacts of climate change. Indeed, there are calls to identify conservation and management actions for coastal wetlands and near-shore marine ecosystems as components of developing countries' Nationally Appropriate Mitigation Actions (NAMAs).

20. This Project would specifically **mainstream climate change adaptation into the on-going activities**. The adaptation measures to be implemented would complement on-going efforts by the Government of Belize and other funding sources aimed at marine protected areas (MPAs). While the on-going measures have been crucial in protecting this critical ecosystem, they have been lacking in programmatically mainstreaming specific climate adaptation into their activities. In line with the core principles of country-drivenness and country ownership, the proposed activities would specifically address the key adaptation measures identified in Belize's First National

Communication to the UNFCCC (See Section D). In particular the First National Communication identifies enforcement of conservation and use of marine and terrestrial ecosystems, establishment and management of protected areas, inclusion of biodiversity conservation into sectoral adaptation strategies, creation of alternative livelihoods away from coastal systems, as some of the climate adaptation measures that need to be urgently undertaken. The design and implementation of these activities is meant to enhance climate resilience and also address the anthropogenic stressors (specifically overfishing, uncontrolled coastal development and marine dredging, unsustainable tourism practices on the reef, etc) impacting the reef ecosystem.

PROJECT / PROGRAMME COMPONENTS AND FINANCING (TABLE 2):

PROJECT COMPONENTS	EXPECTED CONCRETE OUTPUTS	EXPECTED OUTCOMES	AMOUNT (US$)
1. Improving the protection regime of marine and coastal ecosystems	• Expansion of the target MPAs and replenishment (no-take) zones • Enhancement of the enforcement and monitoring of MPAs • Strengthening the legal framework for MPAs • Implementation of a Coastal Zone Management Plan	1. MPAs and no-take zones expanded and secured. 2. Coastal zones effectively managed.	2 million
2. Support for viable and sustainable alternative livelihoods for affected users of the reef in the areas impacted by project activities.	• Participatory selection of alternative livelihoods activities • Development of business plan and entrepreneur training • Sub-grants for initial capital investments	Livelihoods of affected users of the reef diversified	2.45 million
3. Raising awareness, building local capacity, and disseminating information	• A Climate Change knowledge, attitude and behavioral practice (KAP) survey • Targeted local capacity building to develop climate resilience strategy • Dissemination campaigns	The value of marine conservation and impacts of climate change are understood by local people.	0.56 million
4. Project/Programme Execution cost			0.52 million
5. Total Project/Programme Cost			5.53 million
6. Project Cycle Management Fee charged by the Implementing Entity			0.47 million
Amount of Financing Requested			6 million

PROJECTED CALENDAR (TABLE 3):

MILESTONES	EXPECTED DATES
Start of Project/Programme Implementation	December 2012
Mid-term Review (if planned)	June 2015
Project/Programme Closing	December 2017
Terminal Evaluation	June 2017

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.

21. Consequently, the following five priority activities are proposed to be implemented under this component (see additional details in Annex 2):

Component 1 – Improving the Protection Regime of Marine and Coastal Ecosystems (AF resources: $2 million; in-kind contribution by MNRE and MAF)

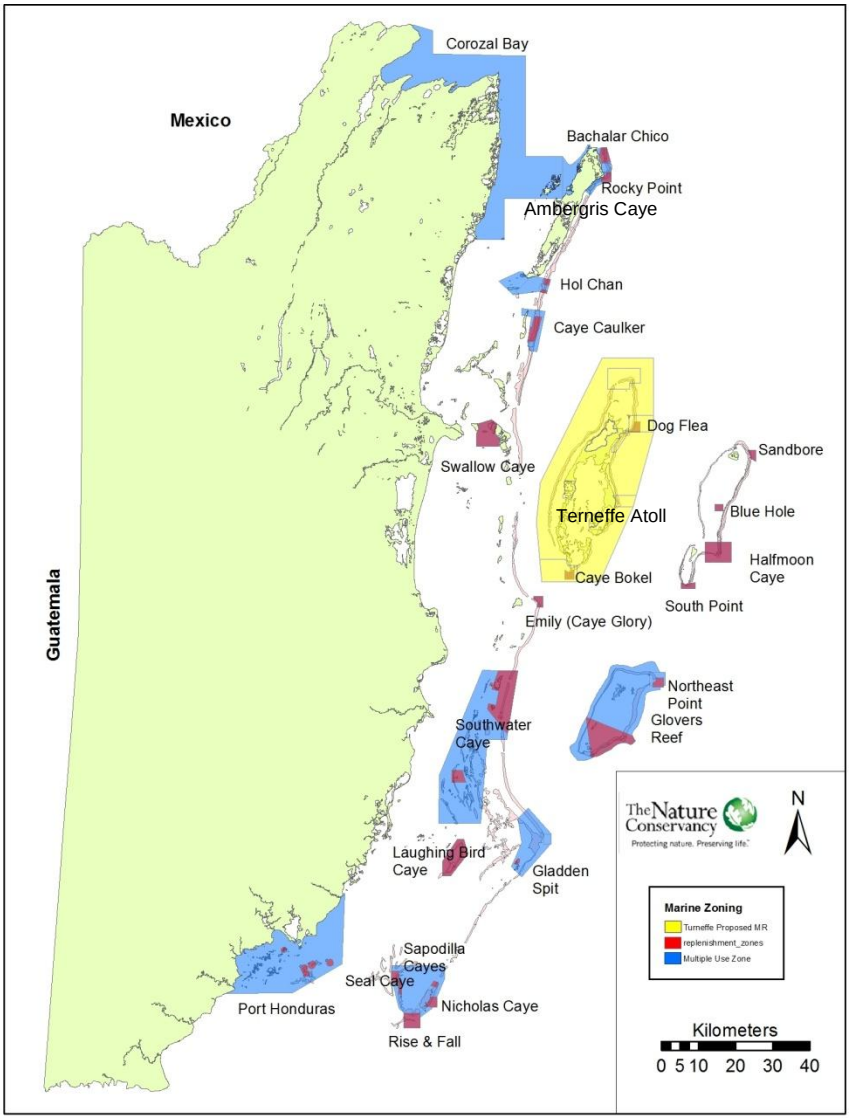
22. This component is aimed at programmatically mainstreaming specific climate change adaptation measures in the on-going efforts for the conservation of marine and coastal ecosystems by the GoB. This would be achieved through (i) expanding and securing the Marine Protected Areas (MPAs) and replenishment (no-take) zones in strategically selected locations to build climate resilience, (ii) strengthening the legal framework for the network of MPAs. The activities would include (a) creation of a network of no-take zones and MPAs, (b) enhancement of the enforcement of MPAs and no-take zones, (c) implementation of a comprehensive monitoring protocol, (d) strengthening of the legal and institutional framework for MPAs; (e) implementation of a Coastal Zone Management (CZM) Plan, and (f) providing necessary training to implement these activities. These are aligned with the key components of successful MPA management repeated in various MPA effectiveness studies (e.g., Alder et al., 1994; Neis, 1995; Sumaila et al., 2000; Christie et al., 2009). These efforts are crucial to reduction in key local stressors to the reef, which is important for enhancing the ecosystem's functionality, resilience and capacity to adapt to climate induced changes. Such stressors include: (a) overfishing and harmful fishing practices (e.g., gill nets, spear gun fishing, unregulated fish traps); (b) unplanned coastal development and marine dredging which cause nutrient, sediment and other pollution, and also lead to loss of critical nursery habitats (especially mangroves and seagrass); and, (c) uncontrolled tourism expansion (e.g., cruise-ship industry, hotel construction) and associated unsustainable practices, pollution and pressures on the reef.

23. The major undertaking is the expansion of Marine Protected Areas (MPA) from 13% to 20.2% (indicative) of the marine ecosystem habitats and Marine Replenishment No-Take Zones from approximately 2% to 3.1% (indicative)[16] as identified in the NPASP. The Project would also support the entire MPA network of Belize to improve its management effectiveness by strengthening the legal framework for the MPA network, enhancing the enforcement, and implementing a comprehensive monitoring protocol. This will significantly enhance the ecosystems' functionality, resilience and capacity to adapt to climate induced changes. The specific emphasis would be on the area surrounding Turneffe Atoll, Southwater Caye Marine Reserve, Corozal Bay Wildlife Sanctuary and Estuary Lagoon Systems. (See Map 1 and 2) The selection is based on the Government's on-going PA rationalization exercise. These three sites are critical in terms of the integrity and connectivity of marine ecosystem and climate impacts. Warmer waters and more frequent thermal anomalies have been observed especially in areas of slow flow, as in the Southwater Caye area, and in shallow and sheltered regions on the internal side of Corozal Bay and

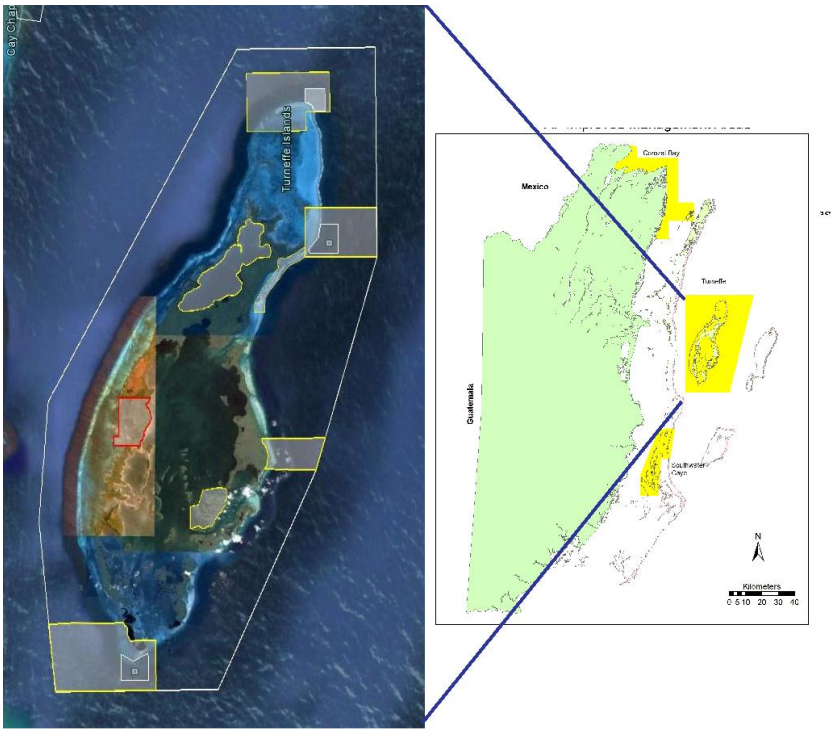
[16] The percentage represents the proposed areas surrounding Turneffe based on discussions with the local stakeholders. See Map 2.

Turneffe lagoons. Also, the Turneffe Atoll area serves as a major source of coral larvae. Transport of coral larvae is driven by the general pattern of currents in the area, with most of the connections between pairs of reefs running parallel to the coastline. The west to southwest area of Turneffe towards Southwater Caye represents the highest number of connections. (P. Mumby *et al*, 2009). In addition, the benefits of storm protection and damages avoided by safeguarding these areas are substantial. The target areas, especially Turneffe, harbor significant mangroves, littoral forests, and lagoon systems which are underrepresented in the current system. Based on a 25 year major storm event, the annualized value of storm protection and damages avoided by Turneffe Atoll is US$38 million (A. Fedler, 2011). Furthermore, by including the identified fish spawning sites, resilient coral reef sites and climate refugia, climate-resilient stocks are secured within these sites. The Turneffe area includes at least 3 identified spawning aggregations which would be buffered by the proposed marine reserve and significant reef flats which are key habitats for the valued catch and release species – bone fish, tarpon and permit. These sites would thus ensure the reef's capacity to recover from extreme climate events by providing a sufficiently large and resilient seed stock of critical biodiversity (such as fish and coral) to restock the reef and sustain productivity in the long-term.

Map 1. Priority Marine Protected Areas



Map 2. Expansion of Marine Reserve and No-take Zones in Turneffe Atoll



This is a PRELIMINARY MAP outlining the intended expansion of MPA and no-take zones in Turneffe Atoll. The Project would support the consultations and demarcation process to define the final boundary of the Marine Reserve (multiple use). The outer white line (polygon) represents the outer limits of the targeted Marine Reserve, estimated at 128,000 hectares. The yellow polygons represent what could become the no-take areas estimated at 19,218 hectares.

24. The Project would support the implementation of a Coastal Zone Management (CZM) Plan to increase protection of mangroves, seagrass, and tidal marsh areas. The CZM Authority and Institute (CZMAI) charged and with the sustainable use and planning of Belize's coastal resources is currently preparing the CZM Plan with inputs from public consultations. CZMAI is a unique multi-ministry body to coordinate the various interests in the use and management of valuable coastal marine zones of Belize. This is a unique opportunity for further and significant improvement on the coordination and governance of coastal marine resources. The Project would support the enforcement of a 66-foot buffer zone as a reserve for coastal development and prevention of erosion in the buffer zones. These are important ecosystems to protect as the buffer to storm surges, erosion, and storm wind intensified by climate change. Also destruction to its soil and biomass would cause high volume of carbon to emit into the atmosphere, increasing the concentration of CO^2 and affecting the global climate. The CZM Plan also presents critical recommendations for the long-term development of all coastal areas, including development of small, climate vulnerable cayes and of cayes found inside marine reserves. Belize faces some serious environmental problems caused by unregulated development of urban and coastal areas and the rising pollution from cruise ship tourism, increasing degradation of mangroves and coral reefs. Unlike coral reefs, which can protect wide swaths of the coast, mangroves protect the immediately adjacent shoreline. Mangroves and littoral forests, which can mitigate the force of both waves and storm surge, shelter about half of Belize's mainland coastline and about 75% of the shoreline of cayes. It is estimated that there are between 400 and 420km^2 of mangrove within 1km of the coastline of Belize (including all cayes).

Where mangroves are present, they contribute between 10–35% of the stability of the shoreline. The value of shoreline protection services provided by mangroves is estimated at US$111–167 million per year (WRI, 2009).

25. These activities would be led by the Ministry of Natural Resources and the Environment (MNRE) and the Ministry of Agriculture and Fisheries (MAF) in cooperation with the local and international NGOs (e.g., The Nature Conservancy, Oak Foundation, Belize Audubon Society, World Wildlife Fund, Southern Environmental Association, etc). The Project would also build capacity for local communities to act as stewards of the marine managed areas and of the resources they depend on. Consultations with senior Government officials have yielded a broad agreement that includes the goals outlined in this section. A policy letter issued by the MNRE, pledging to implement the regulatory and policy actions under this component is included in Annex 1b.

Component 2 – Promotion of viable and sustainable alternative livelihoods for affected users of the reef (AF resources: 2.45 million; in-kind contributions from MNRE, MAF and local cooperatives)

26. This component would support economically viable and sustainable alternative livelihoods for local populations whose economic activities are directly impacted by the adverse effects of climate change as well as by the expansion of the no-take and MPA network. Promotion of sustainable alternative livelihoods would also contribute to reducing the anthropogenic stressors on the marine resources and, in turn, increasing the health of reefs and associated marine and coastal ecosystems and its resilience to climate impacts. The preliminary targets are the coastal communities that utilize the marine and coastal resources of Turneffe Atoll, Corozal Bay, and Southwater Caye as a principal source of income (See Annex 5). The GoB has placed very high priority on directly supporting measures for those communities including at least 1,600 fishers, those who engage in tourism, and indirectly many of the 203,000 people living in the coastal areas of Belize. This component would specifically support (i) creating jobs, (ii) targeted training, and (iii) provision of financial resources for initial capital investment in viable options intended for the vulnerable areas and populations. This activity would be implemented in partnership with local communities, indigenous communities, private sector players including small and medium enterprises (SMEs), micro-lending institutions, NGOs, Government of Belize, and multi-lateral and bilateral donors.

27. With decline in fisheries stocks largely due to decline of coral cover induced by higher sea-surface temperatures and more severe and more frequent coral bleaching, it appears inevitable that coastal communities heavily engaged in "catch fishing" will continue to face key livelihood challenges. The emergence of new technologies for both traditional fisheries and aquaculture indicate the sector will continue to be an important contributor to local and national production and employment for a long time. There is, however, a need for strategies to help the sector through its transformation. This includes supporting: (i) fishers who want an alternative livelihood to explore and plan for other viable alternatives; (ii) fishers to embrace new and different fishing techniques to their advantage, add value to the final product and make use of fish parts that are currently discarded as waste; (iii) fishers to assume more of the management of the industry and encourage them to self regulate, including standards and quality control. The Project would also support people engaged in tourism, agriculture, aquaculture in vulnerable coastal areas. The intended outcomes include (i) promotion of stronger leadership within the communities and organizations, and improved management of the cooperatives and associations; (ii) access to financing and improved financial management of cooperatives through personal financial management training;

(iii) improved understanding of how marine protected areas and fisheries management works; (iv) employment for specific conservation and adaptation measures such as the enforcement and monitoring of MPA and no-take zones and sustainable management of coastal ecosystems.

28. Preliminary consultations with local fishers and NGOs involved in sustainable natural resources management have yielded a list of potential alternative livelihoods activities including **poly-culture of marine products** such as seaweed farming combined with cultivation of other marine products (e.g., conch, lobsters, sea cucumber, and crab) in an integrated cultivation system in the same area in order to maximize returns from the same unit of area. This is possible because the area is appropriate benthic habitat for all these species. This approach not only maximizes effort and returns, but also affords the communities the opportunity to reduce risk in the event one of the products does not perform well at cultivation or commercialization stages. Another innovative technique is known as 'shades' which are concrete shelters used as lobster aggregating devices. They have been shown to be successful in Mexico and trials have shown that they would work well in Belize. In addition, the 'shades' could be used as the anchors for the seaweed farms (which are just cement blocks weighing about 200lbs). Cultivation of oysters in mangroves would also be supported in the coastal areas. It is also envisaged that marine tourism-based activities such as tour-guide training, whale shark tourism, dive master, sailing, would be selectively supported by the Project based on their economic viability and sustainability.

29. In addition, the Project would support the diversification of the economic activities of the coastal communities by providing jobs and training for **the repopulation of coral reefs with thermally resilient native varieties grown in coral nurseries**. It would accelerate natural recovery from and adaptation of reef coral populations to the increasing sea surface temperature, frequent bleaching events, and intensified extreme weather events through repopulation of coral reefs with resilient native varieties grown in the coral nurseries. This would be achieved through: (i) establishment of coral nurseries throughout the Belize barrier reef system and on each of the three atolls, (ii) repopulation of coral reefs with resilient native varieties grown in the coral nurseries, and (iii) provision of training for the local people to participate in the repopulation efforts. Multiple nurseries need to be established in each section of the reef to represent the 'ecotypes' there and for greater probability of survival against bleaching events, storms or disease outbreaks. Selection of mother corals for propagation would be based on past bleaching history and mapping work (Carne 2010). The focus of the efforts would be on the *Acroporids* due to their fast growth rate, importance for reef structure and critically endangered status (IUCN Red List, 2008), but nurseries would include additional stony coral species like *Agaricia tenuifolia, Dendrogyra cylindrus, Montastrea spp.* and brain corals. Heat resilient corals grown in the nurseries would be out-planted into selected areas to increase natural sexual reproduction and restoration of the reef structure. Material used for repopulation would be representative, to the extent possible of original population diversity based on Baums' work at Gladden (2007) that revealed relatively high diversity for *Acropora palmata* and densities. Most of the repopulation effort would be undertaken on reefs that can provide an upstream source of larvae, and/or have significant tourism and fisheries value and whenever possible, are located in protected areas. This component would be led by the local marine biologists who have pioneered the coral pilot in Belize and supported by the local people who would be trained on the repopulaion techniques.

30. The design and implementation of these activities will **ensure and strengthen gender considerations and the participation of civil-society organizations**. During the design of the Project, a social assessment would be undertaken in order to determine specific activities and target communities to be supported. Project activities would consider the impacts of climate change on

men versus women in coastal communities since a large number of the households earn a living from fishing, hence the degradation of the reef/coastal areas and fishstock is likely to have differentiated gender impacts on men and women and their households. The bottom line is that in the tourism industry and coastal fishing communities' gender roles could be different, and hence the impact of climate change on them as well as their adaptation/response strategy is bound to differ; thus it is important to have targeted livelihood options that enhance socio-economic resilience to climate change. Because men and women might be affected in various ways due to their varying exposure and engagement in coastal and reef based fisheries and tourism, the definition of success in climate change adaptation in terms of human development indicators would take this gender diversity into account and come up with specific monitorable outcomes in the Project Results Framework. Non-governmental and community-based organizations will be involved in assisting the communities in the targeted areas to carry out activities aimed at enhancing their climate resilience. These would include activities related to improving livelihoods, such as building the climate resilience of aquaculture, agriculture, and tourism, empowering local communities by building their capacity to assess their own needs, training for tour guides and scuba diving, seaweed farming and processing, etc.

31. For capital investment for the vulnerable areas and populations, the Project's approach is to establish eligibility and selection criteria for viable options that specifically assist livelihoods of the people who are directly impacted by climate change and by the expansion of the no-take and MPA network. The criteria and selection process as well as a list of potential options will be further developed and detailed in the full Project proposal.

Component 3 – Raising awareness and disseminating information (AF resources: $0.56 million)

32. This component aims to (i) increase the understanding by local stakeholders of the value of marine conservation and impacts of climate change and build support among stakeholders of the importance of the National Protected Areas Policy and System Plan (NAPSP) to the long term sustainability of natural resources; and (ii) dissemination of information to promote learning and cooperation between the Project and the global marine conservation and climate adaptation community. A climate change knowledge, attitude and behavioral practice (KAP) survey would be conducted to identify needs and understand gaps in the knowledge, attitudes and behavioral practices of Belizeans (especially in coastal communities), with respect to climate change. The results of the KAP survey will be used in the design of targeted climate change knowledge and awareness raising program and a communications strategy to improve the knowledge, attitudes, and practices of targeted coastal communities, thereby increasing capacity for climate change resilient communities and economy.

B. Describe how the project / programme provides economic, social and environmental benefits, with particular reference to the most vulnerable communities.

33. The following paragraphs describe the economic, environmental, and social benefits that would result from the implementation of the proposed Project. The Project is designed to target the most vulnerable communities that depend on the use of the marine ecosystem services. These include subsistence fishermen, indigenous groups, tourism service employees and other artisans and local service providers.

34. **The value of ecosystem services generated by the coral reefs and mangroves contributes between 15 and 22 percent of GDP in Belize.** WRI conducted a valuation study of the coastal capital in Belize (2008) to assess the economic contribution of three services provided by reef and mangrove ecosystems: (i) fishing, (ii) tourism, and (iii) shoreline protection. The value of coastal tourism was calculated by estimating gross tourism expenditures in coastal areas (marine recreation, accommodation and food, and other spending). The shoreline protection services total between US$231 and US$347 million, or 9 to 13.5 percent of GDP, in avoided damages per year by buffering against storm surge and reducing erosion.[17] Of this amount, mangroves contribute US$111–167 million and coral reefs contribute a further US$120–180 million. Economic benefits (described in more detail below) from fishing add another US$14–16 million. In total, the value of the coastal ecosystem—coral reefs and mangroves—was in the range of US$395–559 million per year, or 15 to 22 percent of Belize's 2007 GDP

Environmental benefits

35. The proposed Project would generate positive impacts on the rich flora and fauna of Belize by improving the management of marine ecosystems and habitats of the Belize Barrier Reef System, from oceanic atolls outside the Barrier Reef, to extensive lagoonal and estuarine systems in the near-shore area. The expansion of MPAs and no-take replenishment zones would promote the reproduction of commercially important overexploited marine species such as the Nassau grouper (*Epinephelus striatus*), the Red Snapper (*Lutjanus campechanus*), the Silk Snapper (*Lutjanus synagris*), the Caribbean spiny lobster (*Panulirus argus*), the Queen Conch (*Strombus gigas*), and other species. Also, many endemic species like the West Indian Manatee (*Trichechus manatus*) and the American Saltwater Crocodile (*Crocodylus acutus*) would benefit from the habitat conservation measures under the proposed Project.

36. In addition, the proposed coral adaptation activities would promote repopulation of Elkhorn coral (*Acropora palmata*) and Staghorn coral (*Acropora cervicornis*) and other species to increase the resilience of reef systems and contribute to long-term sustainability of the coral biome. The named two species are listed as critically endangered by the IUCN Red List, the first reef building corals on the planet to be formally recognized as such. Until recently, *Acropora* corals dominated reefs and were the most abundant coral species on most Caribbean reefs. Because these species are the only large, open-branched corals in the Caribbean, they provide critical habitat for fish and other species like lobsters. Besides *Acropora*, other rare species such as Finger coral *Porites*, Pillar coral (*Dendrogyra cylindricus*), and Star corals (*Montastrea annularis* and *M. faveolata*) would also be targeted.

37. This ambitious Project would also allow Belize to meet its commitments under the Convention on Biological Diversity and the goals set under the Belize National Protected Areas System Plan. This means meeting protection targets for all marine ecosystems within the Belize Barrier Reef and providing stewardship for approximately 13% of highly valued coral reef ecosystems. It also provides an opportunity to expand this representation by a targeted 20.2% of

[17] This is an upper bound on the damage estimates that would be incurred in coastal areas in the absence of mangroves and coral reefs, and further analysis of scenarios of gradual degradation of reef and mangrove ecosystems are needed to provide the lower- and mid-range estimates of the value of shoreline protection services.

marine ecosystem thus significantly increasing the protection and management of this crucial ecosystem.[18]

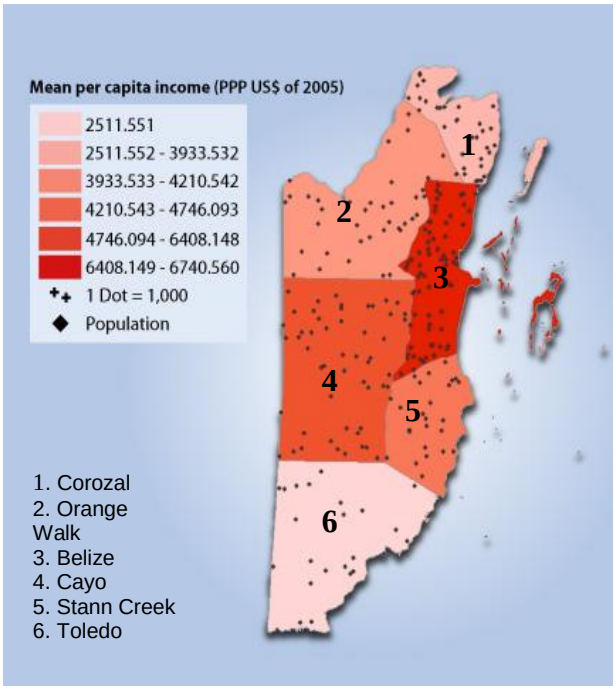
Social Benefits

38. The proposed adaptation, conservation, and restoration activities of the Belize Barrier Reef System are of immense socio-economic significance, providing an opportunity for maintaining and potentially increasing the income level and marine resources available for an estimated 203,000 people living in the coastal areas of Belize. According to the National Poverty Assessment of 2010, about 43 percent of the population (approximately 114,000 people) remains below the poverty line. The poor populations are concentrated in the Toledo and Corozal districts (see Figure 5).

39. Belize is a multi-racial society with ethnic groups heavily intermixed. The major ethnic groups are the Mestizos in Corozal, the Creole in the Belize district, the Mayas in Toledo, and the Garifuna in Stann Creek.[19]

40. Fishing has traditionally been a means of subsistence in coastal communities and has been the main source of protein. However, it has been transformed into a commercial activity over the years and, as a result, has affected the availability of fish for local consumption as an inexpensive source of protein. Many of the fishers in a number of coastal and rural communities, especially in the poorer districts of Corozal and Toledo, only received basic school education and are often illiterate. In some instances, youngsters are removed from school to fish commercially with their fathers and brothers to supplement the family income.[20]

Figure 5. Per Capita Income and Population in Belize



Source: Reshaping Economic Geography in Latin America and the Caribbean, World Bank, 2009.

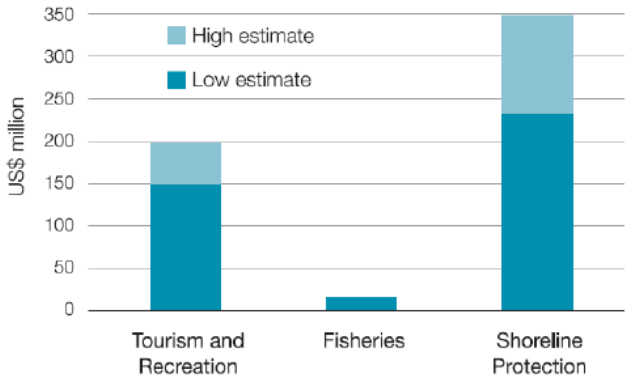
41. The fishers who operate off the Belizean shore are not only from these coastal communities. There has been an increase in Guatemalan and Honduran fishers who have obtained legal fishing licenses from the Belizean Government. The coastal population of Guatemala and Honduras is much larger than that of Belize. Therefore, the additional pressure from these fishers is high enough to threaten the local fishers. Hence proposed activities to improve the reef's protection regime and to provide alternative livelihoods to the local fishers are critical.

[18] The national MPA network currently covers approximately 254,935 hectares, or 13% of territorial waters. This initiative targets a potential expansion to up to 588,311 hectares or up to 30% representation of each coastal marine ecosystem as defined in the NPASP.
[19] 2002 Poverty Assessment Report, National Human Development Advisory Committee, the Government of Belize, June 2004.
[20] Belize National Conch Report, 2005.

Economic Benefits

42. Considering the high importance of tourism to Belize's foreign exchange receipts and the significance of fisheries to the coastal populations, the health of the marine ecosystems is critical to economic stability. The proposed Project would contribute to maintaining and potentially increasing the economic value of the reefs' environmental services in the fisheries and tourism sectors. Also the income level and marine resources available to the local population would potentially be increased through the proposed sustainable management and adaptation of marine resources, and the promotion of alternative livelihoods.

Figure 6. Annual Economic Contribution of Coral Reefs and Mangroves in Belize



Source: Cooper *et al*., Coastal Capital: Belize, WRI, 2008

43. ***Fisheries***. Belize's fisheries are threatened by overfishing and a reduction of coral cover. By expanding no-take replenishment zones and promoting complementary fisheries management and adaptation measures, the Project would provide a significant economic benefit in terms of the replenishment and stabilization of valuable marine species.

44. Fishing is an important cultural tradition, as well as a safety net and livelihood for many coastal Belizeans. In total, reef- and mangrove-associated fisheries have an estimated direct economic impact of US$14 to $16 million per year (Cooper *et al*, 2008). Over 80 percent of that total is exported, earning roughly US$11.2 million in gross revenue. The fishing industry in Belize provides direct employment for about 1,672 licensed fishers (FAO, 2004). More than 50 percent of these fishers are between the ages of 15 and 35 years and most of these fishers originate from impoverished rural and coastal communities. In addition, the fishing cooperatives employ 123 fulltime employees and the aquaculture farms employ 1,059 employees who are responsible for processing, packaging and administering the daily activities. Although fewer people are now considered 'full-time' fishers, there are many part-time fishers who also work in tourism (or tour guides who also fish). Under the Project, viable alternative livelihoods would be supported to promote the exit of part time fishers.

45. ***Tourism***. The Project would provide economic benefits to coral reef- and mangrove-associated tourism which in 2007 contributed an estimated US$150 million to $196 million to the national economy (12 to 15 percent of GDP). Tourists spent between US$30–$37 million on sport fishing and diving alone (not counting accommodation, etc.). Additional indirect economic impacts,

including locally manufactured materials that support the industry, contribute another US$26–$69 million a year. Combined, these result in a total economic contribution of US$175–$262 million from coral reef- and mangrove-associated tourism in 2007. These are "high value" industries that are especially sensitive to reef condition, and thus particularly vulnerable to degradation of the environment which they, themselves, are contributing to (Cooper *et al*, 2008).

46. ***Protection***. Reefs and mangroves also protect coastal properties from erosion and wave-induced damage, providing an estimated US$231 to US$347 million in avoided damages per year. By comparison, Belize's GDP in 2007 was US$1.3 billion.[21]

C. Describe or provide an analysis of the cost-effectiveness of the proposed project / programme.

47. The cost of Component 1 is estimated at US$2 million which would be invested in activities that would generate more benefits measured by improved fisheries, safeguarding tourism resources, and coastal protection from storms. This component would support the Belize's MPA network with specific emphasis on three priority locations for mainstreaming climate change adaptation into the on-going conservation activities. Various studies show that protecting the oceans through marine protected areas can provide higher and more sustained income through tourism and controlled fisheries than continued exploitation (IUCN, 2005). Nationally, lobster and conch rank as number one and two marine export with a contribution in 2010 of US$7.14 million and US$3.31 million respectively (Ministry of Agriculture and Fisheries 2010). However, these precious resources are under tremendous pressure and saw a 70% and 50% decline respectively from 2004 to 2009 country-wide (Fisheries Department 2009). Turneffe alone accounted for a reduced 6.2% of lobster and 2% of conch sold nationally and to cooperatives, down from an approximate 20% and 6.2% respectively of national supply (Turneffe Atoll Trust (TAT), 2011). If the Project is able to restore the fisheries to the 2004 level, the value from lobster and conch in Turneffe alone amounts to approximately US$1.62 million. Presently, tourism contributes 18% of Belize gross Domestic Product[22]. For Turneffe alone, tourism generates an estimated gross US$ 23.5 million annually from attractions such as snorkeling, diving, and sport fishing (TAT, 2011). However the Healthy Reefs Report Card for the Mesoamerican Reefs 2010 reports 65% of Belize's reefs being in poor to critical condition and of the five Turneffe sites two are in fair, two in critical and one in poor condition. As explained earlier, reefs and mangroves protect coastal properties from erosion and wave-induced damage, providing an estimated US$231 to US$347 million in avoided damages per year. Turneffe is one of the three bio-physical barriers protecting Belize City, Belize's largest urban settlement. From east to west these include Lighthouse Reef, Turneffe Atoll and the Belize Barrier Reef. Underwater, these barriers play an important role in preventing storm surge during extreme. Turneffe Atoll acts as the first line of defense against storms as history has shown that many storms reduce in category as they pass over Turneffe before approaching mainland (Wildtracks, 2011). The annual value of shoreline protection services provided by coral reefs and mangroves of Turneffe is estimated at US$38 million (TAT, 2011).

48. In order to achieve an effective use of the limited resources, the Project would focus on the key components to the success of MPA management such as (i) building local community capacity

[21] These estimates capture only three of the many services provided by coral reefs and mangroves, and should not be considered the "total" value of these resources. These numbers should be regarded as a lower bound estimate.
[22] Key Note Belize City - 15 May, 2008 - Biltmore Plaza Hotel - Address by Prime Minister, Hon. Dean Barrow to the 10th Annual Industry Presentation.

through effective outreach (e.g, Fiske, 1992; Alder et al., 1994; Neis, 1995); (ii) having effective and fair enforcement (e.g., Christie et al., 2009); and (iii) conducting research and monitoring, including local ecological knowledge (e.g., Sumaila et al., 2000). The expansion of MPAs (up to 20.2% of the marine area) and no-take replenishment zones (up to 3.1%) and the enhancement of monitoring and enforcement of these areas are major and critical undertaking aimed at filling the gap in their management and would form the bulk of the cost allocation (US$2 million).

49. Component 2 on sustainable alternative livelihoods would support innovative models of green livelihoods for local populations whose economic activities are dependent on marine resources and impacted by climate change and the expansion of the no-take and MPA network. This activity would specifically support (a) creating jobs, (b) targeted training, and (c) provision of financial resources for initial capital investments in viable options for the target populations with a resource allocation of US$2.45 million. This enables to support about at least 20 proposals, depending on the capital-intensiveness and/or viable scale of livelihoods activities. Some communities already have some potential ideas of mari-culture such the seaweed and crab farming. The indicative number of beneficiaries is 2,500 people including fishers and those who engage in the production enterprises and associated processing and marketing or in the tourism and service sector, affected by the climate change and the proposed expansion of MPAs and no-take zones. Therefore, the preliminary calculation shows that the benefit per beneficiary is below US$1,000.

50. Component 3 on awareness raising activities would support national campaigns and dissemination of information to increase understanding by local stakeholders of the value of marine conservation and impacts of climate. It would also provide training to build local capacity to participate in the program activities for knowledge sharing and exchange activities to promote learning and cooperation among different sectors and communities. This activity is anticipated to cost $0.56 million. The Project would benefit the rural communities estimated at 172,000 people whose subsistence mainly depends on natural resources and are most vulnerable to the impact of climate change.

51. The total Project cost is US$5.53 million including the Project execution cost of US$0.52 million for the five years of implementation. Compared to this modest investment, the economic benefits derived from ecosystem services provided by coral reefs and mangroves in Belize, as estimated in 2007, are calculated to be at least US$14 million per year in the fisheries sector, US$150 million per year in tourism, and US$231 million per year in coastal protection from climate-related hazards such as storms and hurricanes (see Figure 6). Thus the proposed Project approach appears to be quite cost-effective if the alternatives are considered.

52. Another alternative option was to invest the requested resources in adaptation measures for physical structures such as dikes, sand barriers, sea walls, drainage systems, and weather-proofing of buildings to address the impacts of climate change. In a country like Belize where most of the coastal areas are low lying, it would not be cost-effective nor desirable to build heavy structures such as dikes and sea walls all along the coastal areas. The amount of money needed for such investments would be astronomical (way beyond what is requested in this proposal) and it is questionable whether this would be effective against increasingly intense and frequent storms. Furthermore, the marine and coastal resources and those who depend on them would remain vulnerable to the climate change impacts. Hence, little long-term benefit may be achieved by investing in such engineered coastal storm defenses as an adaptation strategy since the entire coastal region of Belize is threatened by climate change related sea-level rise and storms/hurricanes. Thus

protecting and using natural barriers (in this case the Barrier Reef and associated coastal and mangrove systems) seems to be a better adaptation strategy in the short- and long-term.

53. More detailed cost-effectiveness analysis for each activity will be made during Project preparation as part of the programming.

D. Describe how the project / programme is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.

54. The Project is aligned with the strategic thrusts in **the National Poverty Elimination Strategy and Action Plan 2009-13 (NPESAP)**, specifically on i) effective mitigation against effects of climate change and natural disaster, and ii) reduction in citizens' vulnerabilities to catastrophic disasters, and with **the Medium Term Development Strategy**, "Building Resilience against Social, Economic and Physical Vulnerabilities" (MTDS, 2010-2013), which is closely linked to the NPESAP. A long-term development plan, **Horizon 2030**, describes the main Government priorities and challenges including (i) strengthen macroeconomic and fiscal management, and (ii) sustainable Environment and Natural Resource Management.

55. **The First National Communication to the UNFCCC** (July 2002) states that Belize has been identified as one of those countries most vulnerable to the adverse impacts of climate change. It is therefore imperative that adaptation measures be identified for the country's most vulnerable sectors and that steps be undertaken for the implementation of the more viable options. The proposed Project would address many of the adaptation measures identified in the First National Communications, for example:

- Enforce the laws regulating conservation and use of biological resources in the marine and terrestrial ecosystems
- Establish and maintain protected areas
- Include biodiversity conservation into adaptation strategies of other sectors
- Discourage construction of new townships in coastal areas
- Discourage construction of new residences within inland coastal plains
- Create alternative livelihoods away from coastal areas

56. The Project is consistent with **the National Protected Areas System Plan (NPASP)**, as it would target the completion of a comprehensive marine protected areas system in accordance with recommendations from this Plan, and fulfilling Belize's commitments to the Convention on Biological Diversity Program of Work on Protected Areas. The Project would provide a significant portion of the finance needed to sustain the marine component of the Plan, and also support the NPA authority to reach a legal entity status in order to manage and coordinate the implementation of the NPASP. The Project would also mainstream climate change considerations into the NPASP especially in areas where critical gaps exists.

57. The proposed Project is also aligned with the current World Bank's **Country Partnership Strategy** for Belize (2011-15) which is aimed at supporting the country's efforts to achieve **Inclusive and Sustainable Natural Resource-Based Growth and Enhanced Climate Resilience**.

The proposed AF Project will contribute directly to the CPS by improving the protection regime of the Belize Barrier Reef System, supporting the poor who tend to depend on the reef resources, and raising awareness and strengthening the local capacities of the agencies involved in natural resource management in Belize.

58. The CARICOM Heads of State, of which Belize is a member, participating in the First Congress for the Environmental Charter and Climatic Change (held at Ávila Mountain, Caracas, 11-13 October 2007) requested that the Caribbean Community Climate Change Centre (CCCCC) prepare a Regional Framework document that would lay the ground for achievement of the vision of a "Caribbean society and economy that is resilient to a changing climate." This strategic vision is reflected in the ***'Regional Framework for Achieving Development Resilient to a Changing Climate (2009-2015)'*** that was approved by the CARICOM Heads of Government in July 2009. The Regional Framework provides a roadmap for action by member states and regional organizations over the period 2009-2015**,** while building on the groundwork laid by the CCCCC and its precursor programs and projects in climate change adaptation[23]. It also emphatically notes that (a) CARICOM countries such as Belize have an opportunity to attract climate change finance to support their initiatives to build the resilience of their economies, and (b) developing innovative financing mechanisms to support national climate action is crucial. This Project is directly responding and contributing to these objectives.

59. The Project complements **the Caribbean Pilot Program for Climate Resilience (PPCR)** financed under the Climate Investment Fund (CIF) which finances climate resilience measures in 6 CARICOM countries (Jamaica, Haiti, Grenada, Saint Vincent and the Grenadines, St. Lucia, Dominica) and region-wide activities addressing climate risks and vulnerabilities common to all Caribbean countries. While Belize does not benefit directly from on-the-ground PPCR investments, it would be able to benefit from regional technical assistance activities (implemented through regional organizations such as CCCCC) including strengthening climate change modeling and monitoring capacity of regional organizations and strengthening monitoring capacity by increasing the number of monitoring climate change (e.g., sea level and sea surface temperature) stations in the Caribbean especially in those countries with limited resources.

60. **Sustainability/Exit Strategy.** The Project intends to mainstream regulatory and policy measures necessary to ensure the health and resilience of the marine and coastal ecosystems into the existing framework of the Government, thus adaptation measures would be sustained over the long-term. Also the Project intends to strengthen the fisher communities' ability to self-regulate their activities once productivity and managed use of resources are secured. Thus, it is expected that the objectives of the Project is sustained through the Government programs after the Project is completed. Also, alternative livelihoods activities to be supported under Component 2 would specifically be chosen to be economically viable, thus provide strong incentive for local populations to continue engaged in those alternatives. The combination of self-regulation and economic viability of local livelihoods is a key aspect of sustainability. Strong interest and support from local stakeholders in climate issues is vital for securing financial and political backing for the sustainability of adaptation measures proposed under the Project. Thus, the Project would promote awareness raising, targeted training, and dissemination of information to local stakeholders.

[23] Including the National Enabling Activities (NEAs), the First National Communications Projects, the Caribbean Planning for Adaptation to Climate Change (CPACC) project (1998-2001), the Adaptation to Climate Change in the Caribbean (ACCC) project (2001-2004), the Mainstreaming Adaptation to Climate Change (MACC) project (2003-2009), and the pilot projects being undertaken under the Special Pilot Adaptation to Climate Change (SPACC).

61. Recognizing that the world's oceans are under severe threats, the World Bank is committed to enhancing the sustainable development of the oceans and, together with many other partners, has embarked on the Global Partnership for Oceans (GPO), to be launched in February 2012. The objective of the GPO is to sustainably enhance the economic, social and ecological performance of the oceans' ecosystems and living resources, with improved benefits captured by coastal and island developing countries. The proposed Project is fully aligned with the GPO in that the Project would support practical climate resilient measures that sustainably enhance the natural capital along the Belizean coast, on which many of the vulnerable groups in Belize depend. The GPO is intended to be a long-term partnership that facilitates financing, governance, and knowledge and best practices sharing aimed at enhancing sustainability of the marine ecosystems such as those in Belize. It is expected that Belize would be a key country partner for the GPO.

62. In addition, the climate adaptation and conservation measures initiated under the proposed Adaptation Fund Project would be expanded and scaled up under the Marine Conservation and Climate Adaptation Initiative (MCCAI)—an initiative led by the Government of Belize with the support from various donors and organizations. The MCCAI would create a trust fund dedicated to finance the management of natural resources over the long-term with the emphasis on marine and coastal ecosystems in the face of increasing impacts of climate change.

E. Describe how the project / programme meets relevant national technical standards, where applicable.

63. The Environmental Impact Assessment (EIA) Regulation of the Subsidiary Laws of Belize (2003) defines the EIA requirements and contains a detailed list of the types of activities that an EIA is required. During full Project preparation, measures will be undertaken to ensure full compliance with relevant national requirements and standards as needed.

64. Not only does the proposed Project meet relevant national laws in Belize, it also supports the Government of Belize in the revision of key laws that are currently in draft form and would have an immediate impact on reducing harmful practices and activities in the coastal marine zone.

- Revision of the Fisheries Act and the High Seas Act including a policy governing foreign fishing vessels in Belize waters in order to keep pace with current global thinking on sustainable fisheries management.
- Promotion of mangrove conservation and management practices and enforcement of the laws which have to be improved to guarantee the appropriate level of conservation.
- Protection on fish spawning aggregations through the complete closure of fishing which is still being allowed in some of these areas and two known sites remain open to fishing.
- Promotion of the banishment of harmful techniques such as gill nets, spear gun fishing, fish traps, mangrove clearing and dredging operations within the boundaries of MPAs.
- Development of comprehensive guidelines to inform offshore oil and gas exploration and production in the offshore and near shore marine environment bearing in mind the potential impacts to the Barrier Reef and its protected areas.

F. Describe if there is duplication of project / programme with other funding sources, if any.

65. The proposed Project is fully aligned with and aimed at complementing and scaling up the on-going efforts by the Government of Belize. These efforts include i) strengthening legal framework for Marine Protected Areas, ii) revisiting and implementing a Coastal Zone Management Plan for entire Belize reef, and iii) setting up legal instrument for co-management of National Protected Areas with NGOs and community based organizations.

66. Support for alternative livelihoods of impoverished communities is one of the priority issues for the Government of Belize. The Bank is supporting their efforts in exploring potential sustainable natural resource-based livelihoods in forest and coastal communities (e.g., the sustainable extraction of "*popta*" seeds from the palmetto palm; cultivation of bay leaf palm (*Sabal muritiformis*) for thatching, xate palms (*Chamaedorea sp*.) for ornamental use, palmetto palm (*Acoelorrhaphe wrightii*) for construction of fish and lobster traps, pepper for hot sauce, and *Noni* fruit; beekeeping and honey production; and nuts and fruits processing products (oil, wine, juice, etc)). The proposed Adaptation Fund project would benefit from the on-going efforts and complement them by directly financing the coastal communities vulnerable to climate change and affected by the expansion of MPAs with job creation, skills training, and provision of initial capital for alternative livelihoods.

67. The proposed repopulation of coral reefs is a natural continuation of the technical assistance from the World Bank to Belize. Adaptation measures to identify and propagate thermally resilient varieties of corals to survive in the increasing sea surface temperature have been piloted in Belize with the cooperation of international and local coral experts in 2009. Additionally, Japanese and U.S. researchers have provided scientific expertise in the genetic analysis of the thermally resilient corals. The pilot would be scaled up under the proposed Project. Important information for scaling up was collected from the pilot including the techniques for scoping and extraction of thermally resilient mother corals and the correlation between the location of nursery sites and the survival rate of second generation corals. Also, the preliminary DNA analysis provided critical information on the sample varieties from the pilot nurseries at the clade level, which will be the basis for further scientific analysis at sub-clade level in the proposed Project. The local marine biologists together with the officials from the Fisheries Department involved in the pilot will lead the repopulation efforts with the participation of the local communities in out planting of nursery-grown corals and educational activities.

68. The GOB is also implementing projects with support from the Inter-American Development Bank (IADB) including i) increased access to wastewater treatment through the development of a new sewerage collection and treatment system in the Placencia Peninsula, and ii) flood mitigation infrastructure program for Belize City through canal improvements, Street improvements, and institutional strengthening. The proposed Project would collaborate with these activities and potentially build upon their experience in order to address some of the development-related local stresses to the reef.

69. A European Union (EU) funded Global Climate Change Alliance grant (€2.9 million) for Belize is expected to disburse in 2012. The grant will be implemented by UNDP to enhance adaptive capacity and resilience to climate change in national policies, including the water sector in Belize. According to the EU, 80% of the funds will finance investments in the water sector, where a climate change strategy is already in place with support from the World Bank. The remaining funds will be dedicated to mainstreaming climate change policy, a pre-condition of which is that the Government of Belize establishes a climate change desk.

70. The proposed Project would draw lessons from the GEF-funded Conservation and Sustainable Use of the Barrier Reef Complex project managed by UNDP (1999-2004). The project purpose was to provide decision-makers and relevant stakeholders with analytical, management and technical capacities, decision making and planning tools, and financial mechanisms and economic instruments for long-term conservation of coastal and marine biodiversity. While the project contributed to the adoption of the National Integrated Coastal Zone Management (ICZM) Strategy in 2003, the worsening economic conditions facing Belize have clearly constrained the Government's ability to focus on and continue to implement this program at levels necessary to achieve project outcomes over the long-term. Hence, the proposed Project would support the Government of Belize to implement the CZM Plan as a crucial management tool that would provide a coastal and ocean zoning plan for Belize. The CZM Plan would reflect an analysis of vulnerabilities of coastal habitation, existing tourism infrastructure, and planned development to climate impacts such as storm surge, siltation, and coastal effluents.

71. The proposed Project would build upon the achievements of the Mesoamerican Barrier Reef System (MBRS) project (2001-2007). The first MBRS project facilitated the cooperation among Belize, Guatemala, Honduras, and Mexico through the adoption of a common policy framework for transboundary sustainable management of resources in the areas of fisheries, tourism, and Marine Protected Areas (MPAs).

G. If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

72. **Awareness raising campaign**: One of the key activities of the Project is that of climate change education and awareness raising as it relates the coastal and marine ecosystems. Addressing this area of need across the various priority sectors (tourism, fisheries) will be one of the activities under the Project. Information on the value of coral conservation and impacts of climate change is disseminated to the local people through consultations, educational campaigns, and direct involvement in the coral repopulation efforts. Also the sustainable alternative livelihoods activities will be carefully selected and consulted with the local communities to promote support to/participation in the activities. The target audiences are 1) fishers, 2) eco-tourism operators, 3) coastal communities, 4) private sector, and 5) youth and particularly students in target areas. These activities are quite important for Belize where the general population, including fishers and those who reside in the coastal areas, feel that they do not have enough information and knowledge about climate change and its implications to their lives. There is especially little understanding of the linkage between the anthropogenic stressors and the health of marine and coastal ecosystems, and the environmental/social/economic adaptation benefits that healthy ecosystems would bring in the face of intensifying impacts of climate change. Indeed consultations held earlier during Project Concept preparation with a wide cross section of stakeholders confirmed that there is a need for greater public awareness and education as to the current and likely impacts of climate change and appropriate adaptation strategies. In order to ensure that the proposed climate change education and awareness raising component of the Project is based on a proper understanding of the current level of knowledge, attitudes and practices of the target population, a climate change knowledge, attitude and behavioral practice (KAP) survey would be conducted to identify needs and understand gaps in the knowledge, attitudes and behavioral practices of Belizeans (especially in coastal communities), with respect to climate change. The results of the KAP survey will be used in the design of targeted climate change knowledge and awareness raising program and a communications strategy to

improve the knowledge, attitudes, and practices of targeted coastal communities, thereby increasing capacity for climate change resilient communities and economy. The KAP survey will utilize a combination of survey design methodologies, such as stratified random sampling, purposive sampling and cluster sampling. The KAP survey shall be conducted throughout all the coastal communities of Belize, with appropriate representation of the private sector, the public sector, media houses, the general public/residents, women, men, and children in rural and urban settings, across occupations, income groups and various age categories.

H. Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation.

73. A series of consultations with key stakeholders were held in Belize between February 21st and 24th, 2011 to discuss the country's efforts to achieve sustainable natural resource-based growth and greater resilience to climate change shocks. The main conclusion from the consultations was that Belize must manage its natural resources in a more sustainable manner and strengthen resilience to climate shocks in order to achieve its medium- and long-term development goals. While this conclusion is shared by Government, donors and other stakeholders, and notwithstanding other donor's strong contributions in related areas, there is a clear lack of a holistic approach to address the critical challenges posed by unsustainable natural resource use and climate change.

74. To this end, the Marine Conservation and Climate Adaptation Project was jointly conceived by the Government and non-governmental partners. The concept and its design was well received by high level Government officials, and has resulted in a request to the World Bank for further assistance in materializing this Project. Further consultations on the content and scope of the Project have been held with high level Government officials on April 15th, 2011, between May 9th and 13th, 2011, and between November 14th and 18th, 2011. The list of stakeholders and participants consulted at various times can be found in Annex 4.

75. Through the coral resilience pilot in Belize initiated with the support from the World Bank and various local institutions, consultations and dissemination of the progress were made with local stakeholders (NGOs, marine biologists, fishers, tourism business owners, and students). These stakeholders will continue to be involved in the development of nurseries of thermally resilient coral varieties for transplantation to degraded reef areas.

I. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

76. **Baseline (without Project).** While the on-going measures have been crucial in protecting the critical marine and coastal ecosystems, they have been lacking in programmatically mainstreaming specific climate adaptation into their activities. Under the business-as-usual scenario and as identified in the NPASP, the Marine Protected Areas' (MPA) share is 13% (including no-take zones) of marine ecosystem habitats, and Marine No-Take Replenishment Zones constitutes approximately 2%. While these figures are not small in terms of conservation, they would not be enough to increase the resilience of corals to face the impacts of climate change and the increasing anthropogenic stressors. In this scenario, lobster and conch production continues to decline (by 70% and 50% respectively since 2004). The current level of budget for managing these MPAs through the Government and co-management arrangements (estimated at $1.6 million per year) is not

sufficient to effectively manage the existing MPAs. The shortfall is estimated at US$5-6 million annually.[24]

77. A significant reduction of coral cover would expose the coastal areas to storm surges and coastal erosion. In addition, the local economies which rely on fisheries and tourism which in turn depend on the coral reefs and associated ecosystems would be severely affected. Once the corals are gone, there is no easy way to revive the reefs. In fact, there are no systematic actions to restore the critical reef-building corals which have been massively severed by frequent bleaching events in recent years.

78. Under the business-as-usual scenario, the pilot repopulation of corals is supported by a few local researchers without having a long-term financing. Although the pilot results have attracted the interests of the Government and the international corals communities, maintaining and scaling-up of the pilot nurseries is not likely to happen. In the meantime, bleaching events and an elevation of sea surface temperature are likely to occur more frequently and intensely, resulting in irreversible damages to the remaining corals in the area. Consequently, the coastal areas will be exposed to storm surges and coastal erosion. In addition, the local people who heavily depend on the coral reefs and associated ecosystems would be severely affected.

79. Climate change is anticipated to result in an increase in natural disasters including floods and droughts. Sea-level rise will also be associated with saline intrusion into coastal aquifers, affecting the availability of freshwater. Clean water is essential for recovery of corals from a bleaching event. A €2.9 million project funded by European Union (expected to start in 2011) will enhance adaptive capacity and resilience to climate change in the water sector in Belize. Wastewater and lack of proper sewage system not only pose a threat to the country's water resources, but also threaten the growth of corals. In response, the Government of Belize is currently implementing a US$10 million project with support from the Inter-American Development Bank (IADB) aimed at increased access to wastewater treatment through the development of a new sewerage collection and treatment system in the Placencia Peninsula.

80. **Alternative Scenario (with Project)**. The proposed Project would specifically mainstream climate change adaptation into the on-going efforts by the Government of Belize mentioned under the baseline scenario by increasing the financial resources (approximately US$2 million) in additional to Government investment, rather than replacing Government investment. The proposed activities would address many of the adaptation measures identified in the First National Communication to the UNFCCC. The Project would expand MPAs (up to 20.2%) and no-take replenishment zones (up to 3.1%) and strengthen their enforcement. These are significant and ambitious targets that far exceed what other countries around the world have set aside. Selection of the new sites would take into account the elements to increase climate resilience such as fish spawning sites, resilient coral reef sites, and climate refugia. The Project would also support (i) strengthening of the legal framework for Marine Protected Areas, (ii) implementation of a comprehensive monitoring protocol, (iii) implementation of a Coastal Zone Management Plan for improved management of the entire Belize reef. The cost of these activities is estimated at US$2 million for the five years of implementation.

81. The financing from the Adaptation Fund would be used to also ensure viable alternative livelihoods and diversification of economic activities of local populations which are dependent on

[24] An estimate provided by a Mesoamerican Reef Fund (MAR Fund) Financial Gap tool.

marine resources and are impacted by climate change as well as by the expansion of the no-take and MPA network. The estimated cost is US$2.45 million. By addressing their livelihoods, the activity would reduce the anthropogenic stresses on the marine resources. This activity would specifically support (a) creating jobs, (b) targeted training, and (c) provision of financial resources for initial capital investment in viable options for the target populations. These would include activities related to improving livelihoods, such as building the climate resilience of aquaculture, agriculture, and tourism, empowering local communities by building their capacity to assess their own needs, training for tour guides and scuba diving, seaweed farming and processing, etc.

82. In addition, the proposed Project would accelerate natural recovery from and adaptation of reef coral populations to the increasing sea surface temperature, frequent bleaching events, and intensified extreme weather events through repopulation of coral reefs with resilient native varieties grown in the coral nurseries. The Project would (i) establish coral nurseries throughout the Belize barrier reef system and on each of the three atolls, (ii) repopulate coral reefs with resilient varieties grown in the coral nurseries, and (iii) provide training for the local people to participate in the repopulation efforts. The activity would establish 9 or more coral nurseries throughout the Belize barrier reef system and on each of the three atolls to be out-planted into selected areas to increase natural sexual reproduction and restoration of the reef structure.

83. The proposed awareness raising and capacity building component aims to (a) increase understanding by local stakeholders of the value of marine conservation and impacts of climate change; b) local capacity to support/participate in the program activities; and c) knowledge sharing and exchange activities to promote learning and cooperation between the program and the global marine conservation and climate adaptation community. The cost of these activities is estimated at US$0.56 million.

84. The total funding requested from the Adaptation Fund is US$6 million, including the project execution cost (US$0.52) and the Implementing Entity fee (US$0.47 million).

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project / programme implementation.

85. **Government of Belize (GOB):** The Ministry of Natural Resources and the Environment (MNRE) is the designated authority which is charged to endorse the proposed Adaptation Fund Project.

86. **Executing Entity:** The Protected Areas Conservation Trust (PACT) would execute the Project on behalf of the GOB. PACT is a statutory body and Belize's national environmental trust fund. PACT was established to serve as Belize's long term financing mechanism for conservation and protected areas management. PACT has extensive experience in grant management, resource mobilization, and fiduciary management for the National Protected Areas Secretariat─the government unit that coordinates the implementation of the National Protected Areas Policy and Systems Plan. To date, PACT has managed grants from GEF, TNC, Oak Foundation and the United Nations Office for Project Services (UNOPS) on behalf of the Government. PACT has sufficient

financial management and institutional capacity to have been recently accredited by the Adaptation Fund Board as the National Implementing Entity for Belize. (See Annex 3)

87. **Project Implementation Unit (PIU)**: PACT, in collaboration with the Ministry of Natural Resources and the Environment and Ministry of Agriculture and Fisheries, will establish a dedicated project implementation unit (PIU) consisting of a project coordinator, key technical staff, financial management and procurement staff. Further specification of responsibilities, staffing and reporting will be detailed in the full-fledged Project document. Detailed implementation arrangements will be elaborated during Project preparation.

88. **Steering Committee**: The PIU will be overseen by the Steering Committee comprising of the key stakeholders including the relevant ministries (Ministry of Finance, Ministry of Economic Development, Ministry of Natural Resources and the Environment, Ministry of Agriculture and Fisheries, etc.). The Steering Committee will review the annual work plans and annual implementation reports, and will provide guidance to the PIU.

89. **Implementing Entity:** The World Bank has been requested (see attached letters) by the GOB to act as the implementing entity for the Project and submit the proposal to the Adaptation Fund Board. The Bank would bear the full responsibility for the overall management of the Project financed by the Adaptation Fund, and would bear all financial, monitoring, and reporting responsibilities.

B. Describe the measures for financial and project / programme risk management.

90. The following table summarises the risks and issues of the proposed Project:

Table 4: Risk Matrix

Risk Category	Risk Rating	Risk Description	Proposed Mitigation Measures
1. Project Stakeholder Risks			
1.1 Stakeholder	Low	Stakeholders (local fishermen, tourism business owners, and NGOs) do not support the proposed scheme.	An intensive awareness raising campaign would be carried out to increase the understanding and following buy-in of the local communities. The Operational Manual of the Project will mandate that it will support only activities that comply with sound environmental and social safeguard policies. A program of alternative livelihoods is envisioned under the proposed Climate adaptation measures.
2. Operating Environment Risks			
2.1 Country	Low	Future Governments may not support the goals, targets and commitments of the Project.	The proposed Project has been developed as part of the Bank's Country Partnership Strategy (FY12-15) supported by the Government of Belize.
2.2 Institutional (sector & multi-sector level)	Low	The Government does not meet certain policy commitments (e.g. restrictions on ability to de-reserve, additionality	A policy letter from Ministry of Natural Resources and the Environment has been issued to confirm the GOB commitments.

		commitment, etc.) in accordance to mutually agreed targets.	
3. Executing Entity Risks (including FM & PR Risks)			
3.1 Capacity	Medium-Low	The Executing Entity selected for the Adaptation Fund Project is not equipped with enough capacity to manage the financial transactions and to implement the climate adaptation measures in the future.	The Protected Areas Conservation Trust (PACT) has been selected as the EE for its capacity and experience in managing many donor funded projects. PACT has recently been accredited by the Adaptation Fund as the NIE for Belize and is therefore equipped with the requisite personnel and experience to execute the project. .
3.2 Governance	Low	The governance structure, operational guidelines and other institutional policies of the PACT are altered over time and do not conform to the adequate standards.	PACT is a Statutory Body established by the Protected Areas Conservation Trust Act, No. 15 of 1995 and governed by a ten member Board of Directors. Its jurisdiction is expressly set out in the Act, therefore, makes switching, sharing or evasion of responsibility more difficult.
3.3 Fraud & Corruption	Low	Fraud and corruption occur after the proposed Project is completed.	The PACT Act empowers the Minister of Finance, currently the Prime Minister of Belize, to commission audits of the PACT. Also the governance structure of the PACT, prescribed by the Act, ensures that there is adequate representation from both the government and non-government constituents. The *non-government* representation constitutes the Board majority and includes large non-government organizations and community representation as well as an independent finance expert. Despite being a public Trust, the Governance arrangements are in line with best practices in place within the Latin American and Caribbean Network of Environmental Funds (REDLAC). Additionally, the PACT Board is in the process of strengthening its anti-corruption policies in line with the assessment of the Adaptation Fund Board's accreditation panel.
4. Project Risks			
4.1 Design	Low	Program of climate adaptation measures is too ambitious.	The activities build upon or scale up on-going efforts in the country and are complemented by the programs under the Bank's Country Partnership Strategy.
4.2 Social & Environmental	Medium-Low	Downstream conservation and climate adaptation activities will create social and environmental concerns.	The operational manual of the Project will mandate that all activities supported by the Project comply with safeguard policies of the World Bank.
4.3 Program & Donor	Low	Other donor's program overlaps with the proposed activities.	Donor coordination will be led by MNRE.
4.4 Delivery Quality	Medium-Low	Alternative livelihoods activities may not be implemented or may be poorly implemented.	Alternative livelihoods are strongly supported by MED, MNRE and MAF. The Bank together with MNRE and MAF will maintain close supervision and technical assistance as necessary to ensure the quality of implementation.

C. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

91. On-the-ground monitoring and evaluation (M&E) of the Project activities would be the responsibility of the PACT. Compiling the information gathered, the PIU within PACT will report regularly to the Bank which will in turn report to the Adaptation Fund Board. The format of reporting and detailed steps will be defined in the full-fledged Project document. The M&E system would be developed during Project preparation and would be based on the Results Framework presented in the next section. The PIU would carefully review the progress of the Project activities during regular field missions and, if necessary, suggest any appropriate adjustments in the results framework for the Project, including milestones, targets and indicators. Such adjustments would require a written consent by the Bank.

92. In addition to the regular monitoring, PACT will carry out a Mid-Term Evaluation at the end of the second year of implementation. At the end of the final year of the Project, the GOB will carry out a Final Evaluation which will be the basis of the GOB's Completion Report. Both evaluations will integrate findings from the existing M&E system and will also conduct overall assessments of Project implementation to determine if the intended Project outcomes and results are being achieved.

93. The indicative budget for monitoring and evaluation is $40,000 per year which will be financed out of the Project execution cost.

D. Include a results framework for the project proposal, including milestones, targets and indicators.

Table 5. Results Framework

EXPECTED OUTCOMES	BASELINE	TARGETS AND INDICATORS	DATA SOURCE/ METHODOLOGY
1.1 MPAs and no-take zones expanded and secured. 1.2 Coastal zones effectively managed	1.1 Marine Protected Areas (MPA) share 13% of marine ecosystem habitats as identified in the NPASP and Marine No-Take Replenishment Zones approximately 2%. 1.2 Baseline to be obtained during the preparation	1.1 Marine protected areas (20.2%) and no-take replenishment zones (3.1%) expanded and secured 1.2 Reduction (20%) in loss of mangroves	Annual report of the Executing Entity, supervision missions

2. Livelihoods of affected users of the reef diversified	2. Local unsustainable livelihoods are dependent on the reef.	2.1 At least 2,500 people benefitted from alternative livelihoods activities, of which 30% are women 2.2 At least 6 coral sites repopulated with resilient varieties grown in coral nurseries	Annual report of the Executing Entity, supervision missions
3. The value of marine conservation and impacts of climate change are understood by local people.	3. The value of marine conservation and impacts of climate change are not understood well among local people.	3. Awareness raising campaigns and dissemination reach 100% of target audiences including decision makers and local communities	KAP

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

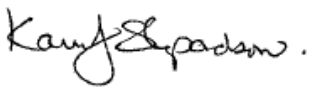
A. RECORD OF ENDORSEMENT ON BEHALF OF THE GOVERNMENT

Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

Ms. Beverly Castillo Chief Executive Officer Ministry of Natural Resources and the Environment Government of Belize Belmopan City, Belize Email: ceo@mnrei.gov.bz Phone: 501- 802-2630	Date: January 3, 2012

B. IMPLEMENTING ENTITY CERTIFICATION

Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (the National Poverty Elimination Strategy and Action Plan 2009-13, the Medium Term Development Strategy, Horizon 2030, and the First National Communication to UNFCCC) and subject to the approval by the Adaptation Fund Board, understands that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
 *Karin Shepardson* Implementing Entity Coordinator	
Date: February 8, 2012	Tel. and email: 202-458-1398; kshepardson@worldbank.org
Project Contact Person: Enos E. Esikuri	
Tel. And Email: 202-458-7225; eesikuri@worldbank.org	

Annex 1. Endorsement Letter

a. Endorsement Letter from Ms. Beverly Castillo, Chief Executive Officer of Ministry of Natural Resources and the Environment

Letter of Endorsement by the Government of Belize

Ministry of Natural Resources and the Environment
Belmopan, Belize, C.A. ph: (501) 822-2711, (501) 822-2249;
Fax: (501) 822-2333

Please Quote
Ref: CEO/MNR/93/12(3)

January 3, 2012

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Dear Sir/Madam:

Subject: Endorsement for Belize Marine Conservation and Climate Adaptation Project

In my capacity as designated authority for the Adaptation Fund in Belize, I confirm that the above national project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the Belize.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the World Bank and executed by the national Protected Areas Conservation Trust (PACT).

Sincerely,

(BEVERLY D. CASTILLO) (MS.)
Chief Executive Officer
Ministry of Natural Resources & Environment

cc: Mr. Joseph Waight, Finical Secretary, Ministry of Finance
Ms. Yvonne Hyde, Ministry of Economic Development

b. Policy letter from Hon. Gaspar Vega, Minister of Natural Resources and the Environment

Ministry of Natural Resources, and the Environment
Belmopan, Belize, C.A. ph: (501) 822-2711, (501) 822-2249;
Fax: (501) 822-2333, (501) 822-2083
Email: minister@mnrei.gov.bz, ceo@mnrei.gov.bz, info@mnrei.gov.bz

Please Quote
Ref: PS/MNR/184/10(5)

September 3, 2010

NPAPSP Barrier Reef System Adaptation Policy

Background

The National Protected Areas Policy (NPAP) is the key statement on the role and management of protected areas in Belize since 2005. The primary goal of the NPAP is to create a National Protected Area System in which all important sites are included in one coherent framework and that meets all obligations under international agreements to which Belize is a signatory. The NPAP aims for the PA system to: a) be comprehensive, with representative examples of all ecosystems in the country and including areas providing important environmental services, possessing exceptional scenic values and providing critical habitat for species of conservation concern or economic importance; b) be integrated with regional and national approaches promoting biological connectedness (such as the Mesoamerican Biological Corridors Project) and with other national and regional development plans; c) be economically, socially and ecologically sustainable in order to optimize socio-economic benefits derived from the system as far as these are compatible with maintaining biodiversity values and sustainable resource management and ensure the equitable distribution of these benefits and public awareness of their importance; and d) have transparent management geared towards delivery of measurable benefits and emphasize public participation at all levels. This applies to the establishment, management, modification or de-reservation of all the protected areas included in the national network.

The National Protected Area System Plan (NPAPSP) is designed to implement the policy. The design of the NPASP resulted from a series of consultative processes, implemented as part of the two-year national planning initiative that included widespread consultation and participation of relevant government entities (namely, the Forest Department and Fisheries Department), local and international conservation NGO's, community-based organizations, local communities, indigenous communities, academia, and industry. The plan emphasizes the following strategic actions: a) establish a National Protected Areas Authority and National Protected Areas Commission to ensure coordinated action in protected areas (PA) system development; b) revise and consolidate protected area legislation in order to give legislative underpinning to the plan; c) provide support services to protected area managers across the PA system, to enhance management capacity; d) secure comprehensive coverage by concentrating

attention on gaps in the present network of protected areas; and e) simplify the existing PA system by consolidating adjacent protected areas into single, multi-zoned, management units. This creates a smaller number of sites that are individually more important – indeed some will be of exceptional importance on a regional, even global, scale. Overall the NPAPSP aims to create a more effective protected area system that delivers and is seen to deliver tangible benefits yet is more cost-effective and simpler to administer.

Actions necessary to implement the National Protected Policy and System Plan are grouped under four objectives. Each objective has an underlying strategy and the actions are arranged following a critical path to be undertaken over a six-year period. Among them, the actions cover all the issues covered by the National Protected Area Policy and System Plan. Thus, the NPAPSP sets out an overall strategy to make the existing protected area network function effectively. As such, the objectives and actions identified in this policy note are fully consistent with the NPAPSP and will significantly advance the implementation and realization of the Plan.

Activities under Objective 1:. Improve the Reef's protection framework:

1.1. **Strengthening the legal foundations for Protected Areas in order to protect against the removal of PA status of either all or part of the designated area, and to strengthen the definition and clarity of permissible activities in these areas.** Support the Government in the revision and adoption of key laws and processes that would significantly strengthen and further secure the legal status of protected areas.

1.2. **Institutionalizing a National Protected Areas (NPA) authority and National Protected Areas Commission (NPAC).** Support the operations of the existing National Protected Areas Secretariat (NPAS) that will advance the establishment of the NPA authority and the National Protected Areas Commission to reach a legal entity status in order to mange and coordinate the implementation of the National Protected Areas System Plan (NPASP).

1.3. Formalizing a legal framework for co-management agreements of NPAs in coordination with non-governmental organizations (NGOs) and community based organizations (CBOs).

1.4. **Detailed survey and incorporation of marine areas within the Belize Barrier Reef System required to complete the National Protected Areas Plan.** Incorporation of these sites will fill important system gaps identified within the NPAPSP and will significantly enhance the functionality and resilience of the Barrier Reef System to climate induced changes.

1.4.1. Incorporation of system level gaps in the current MPAs system will lead to a net increase size of the MPA system. Based on the findings of 1.4, No-Take Zones will be designated as needed to increase functionality at the ecosystem level.

1.4.2. Increase ecosystem level representation within the Belize Barrier Reef System to include 30%, where feasible, of the marine ecosystems habitats identified within the NPASP (coral reef, sea grass, sparse algae, sandy beaches, mangrove and littoral forests, wetlands, and open sea) to ensure effective conservation and management of marine resources.

1.4.3. Implementation of a comprehensive biodiversity monitoring protocol in order to enable managers to practice well-informed adaptive management of these reserves. This program targets the formalization of a system-level, bi-annual monitoring and reporting program for the MPA Management Effectiveness and bio-physical status of the reef.

1.4.4. Strengthen enforcement and patrolling of No-Take Zones inclusive of those indentified in 1.4.1 to reduce illegal fishing and other illegal activities. This action also targets the establishment of well trained and equipped rapid response mechanisms for marine resource protection as recommended by the NPAPSP; this rapid response mechanism will require inter-agency coordination with relevant resource managers and enforcement agencies to increase resource protection.

1.5. **Utilize integrated management techniques to build capacity for local communities to act as stewards of the marine managed areas and of the resources they depend on, thus creating complementary sources of employment and alternative livelihood opportunities through stewardship**. This action is a necessity considering that that the net increase in MPAs and No-Take Zones resulting from 1.4 will have resource use implications for the communities that use marine resources. Indentifying and increasing alternative livelihood opportunities for communities that rely on marine resources will garner support for the NPASP among these communities.

1.6. Enhance the knowledge base of local communities via a comprehensive public awareness programme to recognize climate induced threats and to manage and address these in order to mitigate negative impacts. This action will be geared to garner broad public support for the implementation of the NPAPSP.

1.7. **Consolidate and simplify the Belize Barrier Reef System of MPAs by amalgamating adjacent sites into single multi-zone management units to allow a more coherent ecosystem level management approach.** This component is consistent with the Objective 4 of the NPAPSP and would allow increase in system functionality and resiliency at the seascape level.

The government of Belize stands ready to implement the activities outlined in this policy document in an effort to reinforce its commitment to environmental conservation and sustainable development. The selected objective considered in this policy documents is intended to assist the government in preserving, monitoring, and enhancing the environmental value of Belize's Barrier Reef System and the surrounding flora and fauna that it supports. This policy position is but a sub-section of the overall National Protected Areas Systems Plan which was designed and developed to ensure that Belize's environmental assets are protected and accessed in a sustainable manner that takes into consideration its local, regional and international responsibilities.

Hon. Gaspar Vega
Deputy Prime Minister and
Minister of Natural Resources and the Environment
Government of Belize

Annex 2. Proposed Marine Conservation and Climate Adaptation Measures

1. The proposed Adaptation Fund Project would support the priority marine conservation and climate adaptation measures to strengthen the climate resilience of the Belize Barrier Reef System. The priority measures are divided into four components as described below:

(1) Improving the reef's protection regime including an expansion and enforcement of Marine Protected Areas and no-take zones,
(2) Support for viable and sustainable alternative livelihoods for affected users of the reef,
(3) Raising awareness, building local capacity, and disseminating information.

Component 1 – Improving the Protection Regime of Marine and Coastal Ecosystems (AF resources: $2 million; in-kind contribution by MNRE and MAF)

2. This component is aimed at programmatically mainstreaming specific climate change adaptation measures in the on-going efforts for the conservation of marine and coastal ecosystems by the Government of Belize (GoB). This would be achieved through (i) expanding and securing the Marine Protected Areas (MPAs) and replenishment (no-take) zones in strategically selected locations to build climate resilience, and (ii) improving policy and regulatory regime for the protection of the reef. The activities would include (a) creation of a network of no-take zones and marine protected areas, (b) enhancement of the enforcement of no-take zones and MPAs; (c) implementation of a comprehensive monitoring protocol, (d) strengthening of the legal and institutional framework for Marine Protected Areas (MPAs); (e) implementation of a Coastal Zone Management (CZM) Plan, and (f) providing necessary training to implement these activities. These are aligned with the key components of successful MPA management repeated in various MPA effectiveness studies (e.g., Alder et al., 1994; Neis, 1995; Sumaila et al., 2000; Christie et al., 2009). The intended impact is a reduction in key local stressors to the reef, which is important for enhancing the ecosystem's functionality, resilience and capacity to adapt to climate induced changes. Such stressors include: (a) overfishing and harmful fishing practices (e.g., gill nets, spear gun fishing, fish traps); (b) unplanned coastal development and marine dredging which cause nutrient, sediment and other pollution, and also lead to loss of critical nursery habitats (especially mangroves and seagrass); and, (c) uncontrolled tourism expansion (e.g., cruise-ship industry, hotel construction) and associated unsustainable practices, pollution and pressures on the reef. These activities will be led by the Ministry of Natural Resources and the Environment and the Ministry of Agriculture and Fisheries in cooperation with local and international NGOs. Consultations with senior Government officials have yielded a broad agreement that includes the goals outlined in this section. A policy letter issued by the Government of Belize, pledging to implement the regulatory and policy actions in support of Component 1 is included in Annex 1b.

3. The Project will support the Government in order to assure that the Project increases the financial resources allocated to the reef, i.e., in additional to Government investment, rather than replaces Government investment. This will be done through (a) **securing commitment** from the GOB to sustain, and potentially increase, national budget allocations at 2009 levels to the ministerial departments with jurisdiction over PAs (e.g., Forest Department, Fisheries Department, and the Archeology Department); (b) **providing training** for government and non-government

personnel to install in the management authorities of the reef the knowledge to be able to interpret relevant climate change impacts and assume approaches for adaptive management.

Sub-component 1.1 Expansion and securing Marine Protected Areas and Replenishment (No-Take) Zones

4. This sub-component aims to support the Government of Belize in the expansion of Marine Replenishment (No-Take) Zones from approximately 2% to 3.1%, and Marine Protected Areas (MPA) from 13% to 20.2% (both preliminary) of the marine ecosystem habitats as identified in the NPASP. The Project would also support the entire MPA network of Belize to improve its management effectiveness by strengthening the legal framework for the MPA network, enhancing the enforcement, and implementing a comprehensive monitoring protocol. This will significantly enhance the ecosystems' functionality, resilience and capacity to adapt to climate induced changes. The specific emphasis would be on the area surrounding Turneffe Atoll, Southwater Caye Marine Reserve, Corozal Bay Wildlife Sanctuary and Estuary Lagoon Systems (See Annex 5). The selection is based on the Government's on-going PA rationalization exercise. These three sites are critical in terms of the integrity and connectivity of marine ecosystem and climate impacts. The target areas, especially Turneffe, harbor significant mangroves, litoral forests, and lagoon systems which are underrepresented in the current system. Warmer waters and more frequent thermal anomalies have been observed especially in areas of slow flow, as in the Southwater Caye area, and in shallow and sheltered regions on the internal side of Corozal Bay and Turneffe lagoons. Also, the Turneffe Atoll area serves as a major source of coral larvae. Transport of coral larvae is driven by the general pattern of currents in the area, with most of the connections between pairs of reefs running parallel to the coastline. The west to southwest area of Turneffe towards Southwater Caye represents the highest number of connections (P. Mumby *et al*, 2009). In addition, the benefits of storm protection and damages avoided by safeguarding these areas are substantial. For example, based on a 25 year major storm event, the annualized value of storm protection and damages avoided by Turneffe Atoll is US$38 million (A. Fedler, 2011). By including the identified fish spawning sites, resilient coral reef sites and climate refugia, climate-resilient stocks are secured within these sites. The Turneffe area includes at least 3 identified spawning aggregations which would be buffered by the proposed marine reserve and significant reef flats which are key habitats for the valued catch and release species – bone fish, tarpon and permit. These sites would thus ensure the reef's capacity to recover from extreme climate events by providing a sufficiently large and resilient seed stock of critical biodiversity (such as fish and coral) to restock the reef and sustain productivity in the long-term.

Activity 1.1.1 Creation of a network of Marine Replenishment Zones through the gradual enactment and enforcement of No-Take-Zones covering by 2015, approximately 3.1% of territorial waters. (See Annex 5) In the face of climate-driven and other anthropogenic threats, V IUCN World Parks Congress 2003 recommendations target up to 20-30% of all coastal marine habitats to be managed as no-take-zones in order to ensure economically productive marine systems. These would sustain vital stocks of marine species and eventually boost the supply of fish for important economic sectors of reef systems such as the fishing and tourism industries.

Activity 1.1.2 Creation of new MPAs and Managed Marine Areas to reach 20.2% representation of all marine ecosystems. Marine scientists recommend that to ensure

sustainability of marine resources and functional ecosystem services, 30% of all coastal marine habitats should be set aside as managed protected areas. Through the Belize National Protected Areas System Plan, Central Belize-Marine has been identified as the area of least representation, including the Turneffe and Southwater Caye. The expansion of managed marine areas will serve to buffer the source populations of the no-take replenishment zones, and establish the minimum level of connectivity required for recruitment and replenishment of species to occur throughout the reef.

Activity 1.1.3 Enhancement of the enforcement of no-take replenishment zones and MPAs: The Project would strengthen the enforcement of no-take zones and MPAs to reduce illegal fishing and other illegal activities, especially in the identified fish spawning sites, resilient coral reef sites and climate refugia to ensure that climate-resilient stocks are secured within these sites. It would also build capacity for local communities to act as stewards of the marine managed areas and of the resources they depend on, thus creating complementary sources of employment through stewardship. As part of the capacity building, the Project would enhance the knowledge base of local communities to recognize climate induced threats and to manage and address these in order to minimize negative impacts.

Activity 1.1.4 Implementation of a comprehensive monitoring protocol: The Project would support the implementation of a system-level, bi-yearly monitoring and reporting program for MPA Management Effectiveness (such as WWF-World Bank MPA Score Card) and bio-physical status of the reef (such as the Meso-American Barrier Reef System Synoptic Monitoring Program). This would enable managers to practice well-informed adaptive management of these reserves. This program targets the formalization of a system-level, bi-yearly monitoring and reporting program for MPA Management Effectiveness and bio-physical status of the reef.

Sub-component 1.2 Improving Policy and Regulatory Regime for the Protection of the Reef

5. The Project would support the on-going efforts of the Government of Belize in the definition of a clear policy vision for managing marine and coastal natural resources. The intended support includes (a) strengthen the legal and institutional framework for Marine Protected Areas and (b) implement the Coastal Zone Management (CZM) Plan for improved management of the entire Belize reef and the coastal areas. This activity would be led by the Ministry of Natural Resources and the Environment and the Ministry of Agriculture and Fisheries in cooperation with local and international NGOs. Consultations with senior Government officials have yielded a broad agreement that includes all of the goals outlined in this section. A policy letter issued by the Government of Belize, pledging to implement the regulatory and policy actions in support of Component 1 is included in Annex 1.

Activity 1.2.1 Strengthening the Legal and Institutional Framework for Marine Protected Areas

This sub-component would support the Government in the revision and adoption of key laws and processes that would significantly strengthen and further secure the legal status of marine protected areas and co-management agreements with non-governmental organizations (NGOs) and community-based organizations (CBOs). This would be achieved through (a) protection against the removal of PA status of either all or part of the designated

area, (b) definition and clarity of permissible activities in these areas, and (c) adoption of a formal co-management policy by the government, and (d) strengthening a National Protected Areas (NPA) authority. It is essential that the protection of the MPAs is legally founded in order to further strengthen its management and enforcement. In Belize, co-management agreements between the Fisheries Department and NGOs are an established vehicle for maritime conservation and have proven to be an important complement to the protections afforded under the marine reserve system. The co-management framework is based on a non-binding agreement and needs to be legalized in order to maintain or enhance its contribution to the effective management of MPAs. The NPA authority also needs to reach a legal entity status in order to manage and coordinate the implementation of the National Protected Areas System Plan (NPASP).

Activity 1.2.2 Implementation of a Coastal Zone Management (CZM) Plan for improved management of the entire Belize reef. This activity seeks to provide support to the Government of Belize in implementing a regulatory framework to guarantee adequate long-term, holistic management of the coastal marine environment. A coastal and ocean zoning plan for Belize is supported through implementation of the CZM Plan as a crucial management tool. This process would be informed by an analysis of vulnerabilities of coastal habitation, existing tourism infrastructure, and planned development to climate-induced changes in factors such as storm surge, siltation, and coastal effluents. The plan would help to ensure that development and resource use occur in the most climate appropriate locations, and in an appropriate balance with development needs of the Belize economy; a critical consideration in the fragile coral reef environment and one which balances the needs of all stakeholders. In the process the preservation and restoration of valuable natural infrastructure is targeted, such as mangroves and littoral forest which provide coastal protection to vulnerable human populations and coastal infrastructure in the country (e.g., Belize City). Protection of these ecosystems are important in terms of carbon stored in its soil and biomass. Once destroyed, high volume of carbon will be emitted into the atmosphere. The CZM Act will be cross referenced, and if necessary revised to ensure mainstreaming of critical climate change adaptation needs and greater alignment of this Act with present day priorities and geographic jurisdictions.

Component 2 –Promotion of viable and sustainable alternative livelihoods for affected users of the reef (AF resources: $2.45 million; in-kind contribution by MNRE and MAF)

6. This component would support economically viable and sustainable alternative livelihoods for local populations whose economic activities are dependent on marine and coastal resources which are impacted by the adverse effects of climate change as well as by the expansion of the no-take and MPA network. It is vital to provide support and diversify their natural resource-based economic activities in order to reduce the anthropogenic stressors on the marine resources and its resilience to climate impacts, in turn, increase the health of reefs and associated marine and coastal ecosystems. The number of those affected includes at least 1,600 fishers, those who engage in tourism, including private sector, and indirectly many of the 203,000 people living in the coastal areas of Belize. The GoB has placed very high priority on supporting measures that would provide viable livelihood opportunities for those communities that are heavily reliant on reef areas that would be targeted for enhanced protection. This component's specific objectives are to (a) create jobs, (b) provide targeted training, and (c) provide financial resources for initial capital investment

in viable options targeted to the vulnerable areas and populations. To this end, the Project would mobilize communities through (i) social assessments, (ii) community workshops, (iii) training, and (iv) support for community-based decision making mechanism. The preliminary target areas are Turneffe Atoll, Corozal Bay, and Southwater Caye. This activity would be implemented in partnership with local communities, indigenous communities, private sector players including small and medium enterprises (SMEs), micro-lending institutions, NGOs, Government of Belize, and multi-lateral and bilateral donors. Specifically, the communities in the targeted areas will be assisted to carry out activities aimed at enhancing their climate resilience. These would include activities related to improving livelihoods, such as building the climate resilience of aquaculture, agriculture, and tourism, empowering local communities by building their capacity to assess their own needs, training for tour guides and scuba diving, sustainable mari-culture such as seaweed farming and processing, etc.

7. With decline in fisheries stocks largely due to decline of coral cover induced by higher sea-surface temperatures and more severe and frequent coral bleaching, it appears inevitable that coastal communities heavily engaged in "catch fishing" will continue to face key livelihood challenges. The emergence of new technologies for both traditional fisheries and aquaculture indicate the sector will continue to be an important contributor to local and national production and employment for a long time. There is, however, a need for strategies to help the sector through its transformation. This includes supporting: (i) fishers who want an alternative livelihood to explore and plan for other viable alternatives; (ii) fishers to embrace new and different fishing techniques to their advantage, add value to the final product and make use of fish parts that are currently discarded as waste; (iii) fishers to assume more of the management of the industry and encourage them to self regulate, including standards and quality control. The Project would also support people engaged in tourism, agriculture, aquaculture in vulnerable coastal areas. The intended outcomes include (i) promotion of stronger leadership within the communities and organizations, and improved management of the cooperatives and associations; (ii) access to financing and improved financial management of cooperatives through personal financial management training; and (iii) training to improve understanding of how marine protected areas and fisheries management works; (iv) employment for specific conservation and adaptation measures such as the enforcement of MPA and no-take zones and restoration of degraded coastal ecosystems.

8. The design and implementation of these activities will ensure and strengthen gender considerations and the participation of civil-society organizations. During the design of the Project, a social assessment would be undertaken in order to determine specific activities to address the impacts of climate change on men versus women in coastal communities since a large number of the households earn a living from fishing, hence the degradation of the reef/coastal areas and fishstock is likely to have differentiated gender impacts on men and women and their households. The bottom line is that in the tourism industry and coastal fishing communities gender roles could be different, and hence the impact of climate change on them as well as their adaptation/response strategy is bound to differ; thus it is important to have targeted livelihood options that enhance socio-economic resilience to climate change. Because men and women might be affected in various ways due to their varying exposure and engagement in coastal and reef based fisheries and tourism, the definition of success in climate change adaptation in terms of human development indicators would take this gender diversity into account and come up with specific monitorable outcomes in the Project Results Framework. Non-governmental and community-based organizations will be involved in assisting the communities in the targeted areas to carry out activities aimed at enhancing

their climate resilience. These would include activities related to improving livelihoods, such as building the climate resilience of aquaculture, agriculture, and tourism, empowering local communities by building their capacity to assess their own needs, training for tour guides and scuba diving, seaweed farming and processing, etc.

Sub-component 2.1 Job Creation

9. The Project would assist those affected by climate impacts and the increased protection of the reef's resources, exploring activities that support the management of the reef, and guarantee sufficient income. The goal is to provide for 100 percent job creation to fishermen and those who engage in reef-based business that are displaced from the expansion and enforcement of no-take zones and MAPs. The participants would be supported in the development of business plans for viable and sustainable alternative livelihoods. Included in this process would be the product and resource base information, marketing plan, organizational plan, operating plan, and financial plan. The business plan is essential in various aspects: to commercialize the production; to rationalize the management structure; to develop an efficient operation; to understand the risks and have a plan to deal with them; to identify their niche and explore new markets; to inform investors and attract investment into the production. Where necessary, an expert would assist in the marketing including the identification of the potential markets, development of the marketing plan and marketing materials, identification of potential business partners and distributors where possible. Alternative livelihoods activities would be undertaken at scale in order to ensure maximum returns and benefits for the communities and the environment.

Sub-component 2.2 Training

10. A targeted training program will be designed and delivered in options for custodianship and to facilitate the transition to the alternative livelihoods pointed out by a job creation strategy for resilience in human populations and their livelihoods as they depend on the reef. Sustainable reef management activities led by local populations will allow the poorest members of the communities to realize benefits from their efforts in conserving these resources. Exposure and dialogue with communities to arrive at appropriate community interventions will depend partly on encouraging peer to peer technology transfer from experienced groups and technical training to be provided under the Project.

Sub-component 2.3 Provision of financial resources for initial capital investment

11. This activity aims to make resources available, including micro-financing schemes, in vulnerable areas and to the impacted populations, in order to provide the initial capital for new ventures. Investing in livelihood enhancing community sub-projects is a key pillar for reducing pressure on the reef system. Using participatory approaches, proposals would be sought from communities in the targeted areas to invest in livelihood enhancing microprojects which support the functional integrity of the reef. The approach would bring different actors from different communities/sectors under a steering committee to vet and prioritize proposals. This component would make resources available for micro-financing schemes for the impacted poor people in vulnerable areas in order to provide the initial capital for their alternative livelihoods. Access to financial system is an important aspect of supporting livelihoods of poor populations, especially empowering women and vulnerable groups. The Project's approach is to establish eligibility and

selection criteria for viable options that specifically assist livelihoods of the people who are directly impacted by climate change and by the expansion of the no-take and MPA network. The Project would establish a standing Technical Advisory Committee made up of a multi-sector public-private partnership of marine conservation and social development stakeholders to review proposals. The criteria and selection process as well as a list of potential options will be further developed and detailed in the full Project proposal.

12. Once proposals are selected, targeted engagement with communities, employing capacity building techniques and technical training would be used to support the communities in implementation of their microprojects. Arrangements would maximize synergies for capacity building, building on existing Community Based Organizations (CBOs) to support community microprojects. This would provide an efficient, multisectoral delivery mechanism for community based interventions in the management of the reef.

13. **Potential alternative livelihoods activities** include poly-culture of marine products such as seaweed farming combined with cultivation of other marine products (e.g., conch, lobsters, sea cucumber, and crab) in an integrated cultivation system in the same area in order to maximize returns from the same unit of area. This is possible because the area is appropriate benthic habitat for all these species. This approach not only maximizes effort and returns, but also affords the communities the opportunity to reduce risk in the event one of the products does not perform well at cultivation or commercialization stages. Another innovative technique is known as 'shades' which are concrete shelters used as lobster aggregating devices. They have been shown to be successful in Mexico and trials have shown that they would work well in Belize. In addition, the ‘shades’ could be used as the anchors for the seaweed farms (which are just cement blocks weighing about 200lbs). Cultivation of oysters in mangroves would also be supported in the coastal areas. Cultivation of oysters in mangroves would also be considered in the coastal areas. Based on consultations with communities and experts in Belize, farming of the species proposed has potential to be viable both technically and economically. The coastal fishing communities in Placencia, Punta Gorda and Serteneja have some basic building facilities to house seaweed storage and processing. It is also envisaged that marine tourism-based activities such as tour-guide training, whale shark tourism, dive master, sailing, would be selectively supported by the Project based on their economic viability and sustainability.

14. *Why seaweed?* Seaweed is a fairly versatile product that has been traditionally used in the production of beverages in Belize and has become quite popular over the last decade. The proposed seaweed production is intended to cover large coastal areas involving a significant number (at least 100) of fishermen. Typical seaweeds harvested on the Belizean coast are *Eucheuma isiforme* and *Gracilaria spp*, which offer numerous commercial uses including local consumption as food and drink, production of *carrageenan* for food ingredients, dietary supplement, fertilizer, bioplastics, dyes and colorants, pharmaceuticals, and potentially biofuel. With the rise in the tourism industry, the demand for seaweed for therapeutic purposes, as part of spa treatment regimens, has boosted its use significantly. There are some resorts that import their seaweed since the local supply is largely inconsistent. It is this void that the seaweed production through this Project seeks to fill. Internationally, there are several industrial uses for seaweed. It is used in the manufacture of fertilizers, soil conditioners, animal feed and fish feed. It is also used as biomass for fuel, in integrated aquaculture and wastewater treatment. So there is a market locally and internationally. During the preparation of this Project proposal, consultations undertaken with local communities,

Government of Belize, NGOs, and marine experts, have confirmed that seaweed cultivation is a viable and high priority alternative livelihood option that needs support.

15. Seaweed farming has generally been a lucrative form of livelihood for coastal communities in other countries but is yet to be in Belize. For example, it is currently the largest and most productive form of livelihood for the coastal population of the Philippines. Information from the Seaweed Industry Association of the Philippines for 2004 indicated that more than 116,000 families consisting of more than one million individuals were farming more than 58,000 hectares of seaweed. In 2000-2004, the average annual production of dried seaweed in the Philippines was nearly 125,000 tons, with a value averaging about US$ 139 million. World demand for seaweed and seaweed products is projected to remain at ten (10 %) percent annual growth rate. This implies that if implemented at scale and successfully in Belize, the targeted communities and the country as a whole stand to benefit significantly in terms of job creation (e.g., seaweed cultivation and harvesting for fishermen; seaweed drying and processing for women in the communities) and economic empowerment. Furthermore, seaweed systems are known to reduce carbon dioxide (CO_2) in the atmosphere by fixing CO_2 for their growth. Some seaweed can absorb five times more CO_2 than plants on land. Seaweeds also help to reduce water pollution from farm waste and agriculture run-off and wastewater by absorbing nutrients. Such pollution control and alternative livelihoods are critical in improving the overall health of coral reefs, in turn, increasing resilience of coral reefs to the impacts of climate change (increased sea surface temperature, intensification of hurricanes, and ocean acidification).

16. Other potential marine-based activities for Project support include:

- **Harvesting crab claws**: Wild harvest of crab claws of the Florida Stone Crab (*Menippe mercenaria*) which is distributed in northern Belize would be considered. There is open market and high demand for crab claws in Mexico. The claws are sold in the US for the price range between US$ 16/pound and US$ 33/pound depending on the claw size. This activity would provide immediate economic benefits to the local fishermen. The initial investment is simple; participants would be provided with 40-50 traps each. The harvesting of crab claw would begin two to three weeks after the traps have been deployed in the sea. The natural capacity to regenerate claws and the non-killing method of the crabs makes this livelihood environmentally friendly, sustainable, and economically viable within a short period of time (2-3 weeks);
- **Crab farming**: Channel Clinging Crab known as Caribbean King Crab (*Mithrax spinosissimus*) or Emerald crab (*Mithrax sculptusd*) have a potential for commercialization based on the knowledge and experiences in the Caribbean (Grenada). Caribbean King Crab is sold to local restaurant and Emerald crab for aquarium owners. The farming scheme consists of (i) one onshore hatchery-nursery allowing a control of the rearing parameters, (ii) various large grow-out facilities such as floating cages or pens. During that phase the animals are only fed with algae which would be sourced from the seaweed farms; and,
- **Tourism**: It is also envisaged that marine tourism-based activities such as tour-guide training, whale shark tourism, dive master, sailing, would be selectively supported by the Project based on their economic viability and sustainability.

17. In addition, the Project would support the diversification of the economic activities of the coastal communities by providing jobs and training for **the repopulation of coral reefs with thermally resilient native varieties grown in coral nurseries**. It would accelerate natural recovery from and adaptation of reef coral populations to the increasing sea surface temperature, frequent bleaching events, and intensified extreme weather events through repopulation of coral reefs with resilient native varieties grown in the coral nurseries. This would be achieved through: (i) establishment of coral nurseries throughout the Belize barrier reef system and on each of the three atolls with resilient native varieties, and (ii) outplanting of these resilient varieties in selected reefs which are critical for restoration of the reef structure. Multiple nurseries need to be established in each section of the reef to represent the 'ecotypes' there and for greater probability of survival against bleaching events, storms or disease outbreaks. Selection of mother corals for propagation would be based on past bleaching history and mapping work (Carne 2010). The focus of the efforts would be on the *Acroporids* due to their fast growth rate, importance for reef structure and critically endangered status (IUCN Red List). Nurseries would also include stony coral species like *Agaricia tenuifolia, Dendrogyra cylindrus, Montastrea spp.* and brain corals. Heat resilient corals grown in the nurseries would be out-planted into selected areas to increase natural sexual reproduction and restoration of the reef structure. Material used for repopulation would be representative, to the extent possible of original population diversity based on Baums' work at Gladden (2007) that revealed relatively high diversity for *Acropora palmata* and densities. Most of the repopulation effort would be undertaken on reefs that can provide an upstream source of larvae, and/or have significant tourism and fisheries value and whenever possible, are located in protected areas. This component would be led by the local marine biologists and NGOs who have pioneered the coral pilot in Belize and supported by the local people who have been trained on the repopulaion techniques.

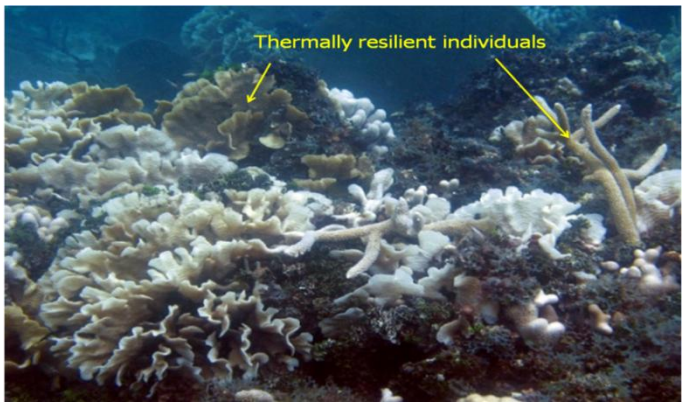
18. *Scientific Basis of Selection for Thermal Resilience as a Key Strategy for Climate Adaptation in Coral Restoration Programs*: Much applied research in coral reef conservation these days is focused on understanding thermal resilience. It has been proposed that deliberate selection, bioengineering, and biomanipulation be seriously considered as a means of enhancing the capacity of reef-building corals to survive the several decades that will be required to slow the pace of global climate change by greatly reducing anthropogenic CO_2 emissions. The basic idea is that by increasing the proportion of corals on the reef that are resistant and/or resilient in the face of frequent bleaching events, tropical hard bottoms will have a better chance of remaining coral reefs and delivering the desired services, instead of metamorphosing into seaweed meadows or bare rock of lower value to society, and greater recalcitrance to restoration efforts.

19. When corals are suffering from so many stressors at once, dealing with only one of these does not make a difference. The reason that thermal resilience is so important is that if this is not also addressed, the insurance on ecosystem services gained from other local interventions will be greatly reduced. Thermal resilience is the card that has to be played, on a local level, against climate change, a problem of global proportions and import. Elevating mean thermal resilience in reef-building corals at a restoration site ensures that mortality from anything but the most severe bleaching events will be minimized, giving natural recovery of coral colonies and populations its best shot. All the best local conservation efforts may in some places be for naught, without this extra edge against global climate impacts.

20. There is little that local efforts can hope to accomplish specifically against the most severe bleaching events, in which coral mortality approaches 100%. Such an event hit the nearly pristine coral reefs of the Phoenix Islands, central Pacific Ocean (Kiribati) during 2002-2003, and the damage was astounding. The real challenge, however, lies in the ability of coral reef communities to withstand multiple, frequent events of moderate or mild severity.

21. What can work, at a minimum, is to promote identifying resistant corals, propagating these strains and species, and restoring them in critical areas on a small scale, to maintain some of the values of a normal, healthy coral reef in places where it matters most. Such efforts, combined with an all-out reduction of local human impacts to make the environment maximally favorable to natural regenerative processes, constitutes a prudent and conservative approach to coral reef restoration on a local scale, in an age of extreme climate events. In the Phoenix Islands, where local impacts are nearly nill, a few oddly resistant and resilient corals survived the most severe bleaching event yet observed, and rose from the reef's ashes like the islands' namesake to bring large tracts of reef back to health in a mere 7 years. The combination of thermally resilient corals and all-out local efforts, are a winning combination.

Figure 1. Bleaching in Belize, October 2008



Source: A. W. Bowden-Kerby and L. Carne

Figure 2. Pilot Nursery in Laughing Bird Caye National Park, March 2009

Source: A. W. Bowden-Kerby and L. Carne

Component 3 – Raising awareness and disseminating information (AF resources: $0.56 million; in-kind contribution by MNRE and MAF)

22. This component aims to (i) increase the understanding by local stakeholders of the value of marine conservation and impacts of climate change to build support among them of the importance of the National Protected Areas Policy and System Plan (NAPSP) to the long term sustainability of natural resources and (ii) support knowledge sharing and exchanges to promote learning and cooperation between the Project and the global marine conservation and climate adaptation community. A climate change knowledge, attitude and behavioral practice (KAP) survey would be conducted to identify needs and understand gaps in the knowledge, attitudes and behavioral practices of Belizeans (especially in coastal communities), with respect to climate change. The results of the KAP survey will be used in the design of targeted climate change knowledge and awareness raising program and a communications strategy to improve the knowledge, attitudes, and practices of targeted coastal communities, thereby increasing capacity for climate change resilient communities and economy.

Sub-component 3.1 Raise awareness and promote community-based adaptation and conservation measures

23. The objectives are (i) to increase the understanding of the local people of the value of marine conservation and impacts of climate change through awareness raising campaign; and (ii) to promote understanding on the importance of the National Protected Areas Policy and System Plan and community-based adaptation and conservation measures in vulnerable terrestrial communities. The target audiences are (a) fishermen, (b) eco-tourism operators, (c) coastal communities, (d) private sector, and (e) youth and school students.

Sub-component 3.2 Dissemination of information

24. The Project would support dissemination of information to promote learning and cooperation between the program and the global marine conservation and climate adaptation community. Specifically, the Project would disseminate periodically (i) the updates of the Project activities (newsletter), (ii) comments and blogs of the project participants, and (iii) lessons learned from the Project activities.

Annex 3: Implementation Arrangements

1. **Government of Belize (GOB):** The Ministry of Natural Resources and the Environment (MNRE) is the designated authority which is charged to endorse the proposed Adaptation Fund Project.

2. **Executing Entity:** The Protected Areas Conservation Trust (PACT) will execute the Project on behalf of the Government of Belize. PACT is a statutory body and Belize's national environmental trust fund. PACT was established to serve as Belize's long term financing mechanism for conservation and protected areas management. PACT's core competencies include:

- **Grant Management –**PACT's grants program was established in 1997 and currently the portfolio of grants include small grants ranging from US$5,000 to large grants of US$200,000. To date the PACT has invested over US$10 million in grants throughout Belize to support the management of Belize's protected areas. PACT also manages the grants program of PACT Foundation (a private foundation established under the Tropical Forest Conservation Agreement with the United States Government. PACT is also a founding member of the Meso-American Reef (MAR) Fund─a regional non-government environmental fund for which PACT manages the grants awarded by the MAR Fund in Belize.

- **Resource Mobilization-** As Belize's national environmental trust fund, PACT serves a brokering role for funding by assisting the government and non-government organizations to prepare project application to various international agencies including the Global Environment Facility (GEF), Conservation International, The Nature Conservancy and the Oak Foundation among others. PACT has been able to leverage over US$5 million dollars in co-financing and serve as the major local financier of national projects supported by the Global Environment Facility for implementation of Belize's program of Work on Protected Areas.

- **Fiduciary management:** PACT serves as the fiduciary for the National Protected Areas Secretariat─the government unit that coordinates the implementation of the National Protected Areas Policy and Systems Plan. Grants awarded to the Government of Belize for the work of the Secretariat and the system plan is managed by PACT. To date, PACT has managed grants from GEF, TNC, Oak Foundation and the United Nations Office for Project Services (UNOPS) on behalf of the Government. The PACT has sufficient financial management and institutional capacity to have been recently accredited by the Adaption Fund as the National Implementing Entity for Belize.

3. **Project Implementation Unit (PIU)**: PACT, in collaboration with the Ministry of Natural Resources and the Environment and Ministry of Agriculture and Fisheries, will establish a dedicated project implementation unit (PIU) consisting of a project coordinator, key technical staff, financial management and procurement staff. The PIU will assume key administrative and operational functions, including: (a) development of annual work plans; (b) management and supervision of microprojects for alternative livelihoods; (c) procurement, disbursement, and financial management; and (d) monitoring and evaluation (e.g., preparation of financial reports and

annual implementation reports). It will also ensure that the PIU will apply the World Bank Fiduciary and Safeguards Provisions for governance and program implementation.

4. **Steering Committee**: The PIU will be overseen by the Steering Committee comprising of the key stakeholders including the relevant ministries (Ministry of Finance, Ministry of Economic Development, Ministry of Natural Resources and the Environment, Ministry of Agriculture and Fisheries, etc.). The Steering Committee will review the annual work plans and annual implementation reports, and will provide guidance to the PIU.

5. **Implementing Entity:** The World Bank has been requested (see attached letters) by the GOB to act as the implementing entity and submit the proposal to the Adaptation Fund Board. The Bank would bear the full responsibility for the overall management of the Project financed by the Adaptation Fund, and would bear all financial, monitoring, and reporting responsibilities.

6. Further specification of responsibilities, staffing and reporting will be detailed in the full-fledged Project document. Detailed implementation arrangements will be elaborated during Project preparation.

Annex 4. Local Consultations List of Participants

Consultations between February 21st and 24th, 2011

Non-state Stakeholders:

1. Albert Reimer, BAS Group
2. Alex Martinez, The Nature Conservancy
3. Amanda Burgos Acosta, Belize Audubon Society
4. Dareece Chuc, Belize Audubon Society
5. Dudley Heredia, Belize Audubon Society
6. Andre Cho, Geology and Petroleum Department (GPD)
7. Audrey Matura-Shepherd, Oceana
8. Colin Gillett, Coastal Zone Management Institute (CZMAI)
9. E. Irving, Galen University
10. Ernest N. Raymond, Social Investment Fund (SIF), Belize Municipal Development Project
11. Imani Fairweather Morrison, Oak Foundation
12. Jose Alpuche, Belize Agro-Productive Sector Group
13. Joseph Hendrilex, UNICEF
14. Kerry Beliste, Protected Area Conservation Trust (PACT)
15. Sharon Ramclam, PACT
16. Leandra Cho-Ricketts, University of Belize
17. Vincent Palacio, University of Belize
18. Marilyn Gentle-Garvin, Belize Family Life Association
19. Melanie McField, Healthy Reefs/Smithsonian
20. Mike Heusner, National Environmental Appraisal Committee (NTIA NEAC)
21. Nadia D. Bood, WWF Central America
22. Nellie Catzim, Southern Environmental Association (SEA)
23. Olivia Rhaburn, National Association of Village Councils of Belize (NAVCO)
24. Orlando Dawson, NAVCO
25. Seleni Matus, Belize Tourism Board
26. Tracey Hutchinson, Belize Social Security Board
27. Yvette Alonzo, Association of Protected Areas Management Organizations (APAMO)
28. Evita Quiroz, APAMO
29. Caroline Clarke, Representative, Belize Country Office, Inter-American Development Bank
30. Harold Arzu, Operations Advisor, Belize Country Office, IADB

Government of Belize:

1. Mary Vasquez, RESTORE Belize, Office of the Prime Minister
2. Yvonne Hyde, Chief Executive Officer, Ministry of Economic Development
3. Emily Waight-Aldana, Economist, Ministry of Economic Development
4. Yvette Alvarez, Senior Advisor, Ministry of Finance
5. Martin Alegria, Chief Environmental Officer, Department of Environment, Ministry of Natural Resources
6. Colin Young, National Protected Areas Secretariat (NPAS) Director, Ministry of Natural Resources

7. Arlene Maheiaa, NPAS, Ministry of Natural Resources
8. Paul Flowers, Strategic Planning and Policy Advisor, Ministry of Natural Resources
9. Tanya Marsden, Policy Unit (PCPU), Ministry of Natural Resources
10. Marlen Westby, PCPU, Ministry of Natural Resources
11. Marcelo Windsor, Forestry Department, Ministry of Natural Resources
12. Safira Vasquez, Strategic Approach to International Chemicals Management (SAICM), Department of Environment, Ministry of Natural Resources
13. Edgar Ek, Agriculture Dep. Chief Environmental Officer, Ministry of Natural Resources
14. Jeavon Hulse, Department of Environment, Ministry of Natural Resources
15. Gilroy Lewis, Solid Waste Management Authority (SWAMA), Ministry of Natural Resources
16. Lumen Cayetano, SWAMA, Ministry of Natural Resources
17. Beverly Wade, Fisheries Department, Ministry of Agriculture and Fisheries
18. Eugene Waight, Chief Agriculture Officer, Department of Agriculture, Ministry of Agriculture and Fisheries
19. George Myvett, Sr. Fisheries Officer, Fisheries Department, Ministry of Agriculture and Fisheries
20. David Leacock, Chief Executive Officer for the Ministry of Education and Youth
21. Christopher Aird, Chief Education Officer, Ministry of Education and Youth
22. Ellajean Gillett, Ministry of Education and Youth
23. John Bodden, Ministry of Health
24. Judith Alpuche, Chief Executive Officer for the Ministry of Human Development and Social Transformation
25. John Flowers, Ministry of Human Development and Social Transformation
26. Lawrence Sylvester, Chief Executive Officer for the Ministry of Housing and Urban Development
27. Nigel Vasquez, Ministry of Tourism, Civil Aviation & Culture
28. Nonatis Canta, Pesticides Control Board (PCB)

Consultation on April 15th, 2011

1. Colin Young, National Protected Areas Secretariat (NPAS) Director, Ministry of Natural Resources and Environment, Belize
2. Paul Flowers, Strategic Planning and Policy Advisor, Ministry of Natural Resources and Environment, Belize
3. Alex Martinez, The Nature Conservancy
4. Alex Quintero, The Nature Conservancy
5. Jonathan Rotter, The Nature Conservancy
6. Randy Curtis, The Nature Conservancy
7. Robert Weary, The Nature Conservancy
8. Imani Fairweather Morrison, Oak Foundation

Consultations between May 9th and 13th, 2011

1. Hon. Dean Barrow, Prime Minister of Belize
2. Mr. Joseph Waight, Financial Secretary, Ministry of Finance, Belize
3. Ms. Yvette Alvarez, Senior Advisor, Ministry of Finance

4. Ms. Yvonne Hyde, Chief Executive Officer, Ministry of Economic Development
5. Ms. Emily Waight-Aldana, Economist, Ministry of Economic Development
6. Ms. Beverly Castillo, Chief Executive Officer, Ministry of Natural Resources and Environment, Belize
7. Mr. Martin Alegria, Chief Environmental Officer, Department of Environment, Ministry of Natural Resources and Environment, Belize
8. Dr. Colin Young, National Protected Areas Secretariat (NPAS) Director, Ministry of Natural Resources and Environment, Belize
9. Dr. Paul Flowers, Strategic Planning and Policy Advisor, Ministry of Natural Resources and Environment, Belize
10. Mr. George Myvett, Sr. Fisheries Officer, Fisheries Department, Ministry of Agriculture and Fisheries
11. Mr. James Azueta, Fisheries Officer, Fisheries Department, Ministry of Agriculture and Fisheries
12. Ms. Lisa Carne, Marine Biologist, Placencia, Stann Creek District
13. Ms. Nadia D. Bood, WWF Central America
14. Mr. Brian Young, Tour Guide and Co-Chairman of Friends of Laughing Bird Caye, Stann Creek District
15. Dr. Kenrick Leslie, Executive Director, Caribbean Community Climate Change Centre
16. Dr. Ulric Trotz, Science Adviser, Caribbean Community Climate Change Centre
17. Mr. Mark Bynoe, Environmental/Resource Economist, Caribbean Community Climate Change Centre
18. Mr. Winston Bennett, Project Manager, Caribbean Community Climate Change Centre

Consultations between November 14th and 18th, 2011

1. Yvonne Hyde, Chief Executive Officer, Ministry of Economic Development
2. Beverly Castillo, Chief Executive Officer, Ministry of Natural Resources and the Environment (MNRE)
3. Colin Young, Program Director, Ministry of Natural Resources and the Environment (MNRE)
4. Paul Flowers, Strategic Planning and Policy Advisor, Ministry of Natural Resources and the Environment (MNRE)
5. Wilbur Sabido, Chief Forest Officer, Ministry of Natural Resources and the Environment (MNRE)
6. Arlene Maheia , Program Assistant, Ministry of Natural Resources and the Environment (MNRE)
7. Tanya Marsden, Public Sector Liaison Officer, Ministry of Natural Resources and the Environment (MNRE)
8. Ramon Carcamo, Assistant Fisheries Officer, Ministry of Agriculture and Fisheries
9. Dennis N. Jones, Managing Director, Belize Enterprise for Sustainable Technology (BEST)
10. Elvis Requena, Project Coordinator, Belize Enterprise for Sustainable Technology (BEST)
11. Shunsuke Nakamura, Resident Representative, Japan International Cooperation Agency (JICA)- Belize Office
12. Alex Martinez, Program Director, The Nature Conservancy
13. Imani Fairweather Morrison, Programme Officer, Oak Foundation
14. Nellie Catzim, SEA/Executive Director, Southern Environmental Association (SEA)

15. Lisa Carne, SEA Consultant, Southern Environmental Association (SEA)
16. Sydney Lopez, Jr., Member, Placencia Fishermen's Co-operative
17. Leon Small, Member, Placencia Fishermen's Co-operative
18. LoullYodfrey, Member, Placencia Fishermen's Co-operative
19. Celia Mahung, Executive Director, Toledo Institute for Development and Environment (TIDE)
20. Virginia Fuhs, Member, Toledo Institute for Development and Environment (TIDE)
21. Seleem Chan, Member, Toledo Institute for Development and Environment (TIDE)
22. Joe Villafranco, Member, Toledo Institute for Development and Environment (TIDE)
23. Mario Muschamp, Member, Toledo Institute for Development and Environment (TIDE)
24. Lana Cannon, Member, TIDE/Brandeis University
25. Martin Reyes, Member, Toledo Fisherman Co-operative
26. Armando Ramirez, Member, Rio Grande Fisherman Co-operative
27. Dana Rhamdas, Program Coordinator, Community Baboon Sanctuary (CBS)
28. Conway Young, Administrator, Community Baboon Sanctuary (CBS)
29. Shannon White, Peace Corps Volunteer, Community Baboon Sanctuary (CBS)
30. Dorla Rhaburn, Board member (Flowers Bank), Community Baboon Sanctuary (CBS)
31. Sharon Robinson, Board member (Flowers Bank), Community Baboon Sanctuary (CBS)
32. Faye Thompson, Board member (St. Paul's Bank), Community Baboon Sanctuary (CBS)
33. Denise Fermin, Board member (St. Paul's Bank), Community Baboon Sanctuary (CBS)
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37. Joyola Joseph, Board member (Bermudian Landing) , Community Baboon Sanctuary (CBS)
38. Carolyn August, Board member (Willows Bank), Community Baboon Sanctuary (CBS)
39. Rosean Myvette, Board member (Double Head), Community Baboon Sanctuary (CBS)
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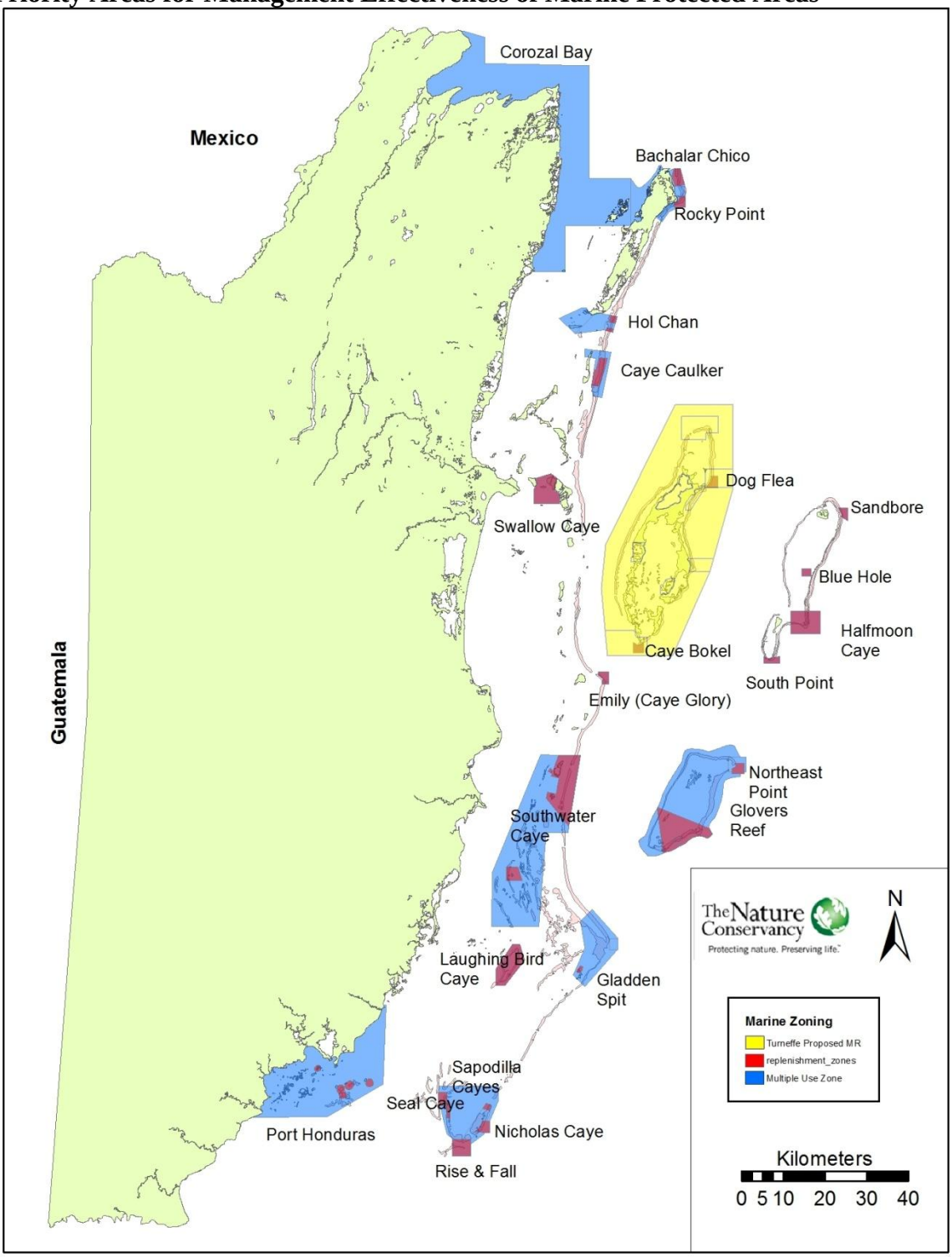
41. Rosamond Perez, Board member, Rancho Dolores Environment and Development Group
42. Carol Sutherland, Board member, Rancho Dolores Environment and Development Group
43. Edlene Smith, Board member, Rancho Dolores Environment and Development Group
44. Violet Jeffordsd, Board member, Rancho Dolores Environment and Development Group
45. Grace Pook, Board member, Rancho Dolores Environment and Development Group

Annex 5. Map of Reef Area in Belize

a. Preliminary Map of the Proposed Turneffe Atoll Marine Reserve

This is a PRELIMINARY MAP outlining the intended expansion of MPA and no-take zones in Turneffe Atoll. The Project would support the consultations and demarcation process to define the final boundary of the Marine Reserve (multiple use). The outer white line (polygon) represents the outer limits of the targeted Marine Reserve, estimated at 128,000 hectares. The yellow polygons represent what could become the no-take areas (est. 19,218 hectares).

b. Priority Areas for Management Effectiveness of Marine Protected Areas



Annex 6: Contacts

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