REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

Enhancing the Resilience of Belize's Coastal Communities to Climate Change Impacts

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PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	Regular Project
Country:	Belize
Title of Project/Programme:	Enhancing the Resilience of Belize's Coastal Communities to Climate Change Impacts
Type of Implementing Entity:	National Implementing entity
Implementing Entity (NIE):	Protected Areas Conservation Trust (PACT)
Executing Entities:	National Climate Change Office (NCCO); Coastal Zone Management Authority and Institute (CZMAI); National Meteorological Service (NMS), National Hydrological Service (NHS), Ministry of Infrastructure Development and Housing (MIDH)
Amount of Financing Requested:	US$ 4,000,000

A. Project Background and Context:

The Problem: Highly vulnerable coastal zone (communities and eco systems) of Belize for the current and projected negative impacts of climate change

Figure 1: Map of Belize

Belize, located on the eastern coast of Central America, has a national territory that expands across 46,620 km^2. The mainland of the country comprises 95% of the total territory and the remainder, approximately 1,060 km^2, consists of small islands and offshore cayes. The country's coastline, which extends 386 km is noted for its extensive mangrove forests, seagrass beds, and the Belize Barrier Reef System. The Belize Barrier Reef Reserve System, the largest reef complex in the Atlantic-Caribbean region was inscribed as a UNESCO World Heritage Site in 1996 (UNESCO World Heritage Centre, n.d.).

Throughout Belize and the Caribbean, the effects of climate change are impacting communities and their economic sectors. Given current climate projections for the region and Belize, impacts will be exacerbated and have highly noticeable effects on Belize's society and sustainable development. Changes in the intensity, distribution, and frequency of extreme weather events, such as storms and hurricanes, sea-level rise (SLR), increased sea surface temperature, ocean acidification, coral bleaching, drought, wildfires, and changes in crop production are but some of the impacts of climate change Belize anticipates facing. These changes will have direct and indirect impacts on productive sectors in Belize and the environment, which will in turn affect Belize's sustainable economic and social development.

Belize's geographic location and low-lying coastal areas leave it highly susceptible to the impacts of climate change: rising sea level, increased temperature, and increased frequency of intense hurricanes with their associated hazards in the form of torrential rains, catastrophic winds, and destructive storm surge under warmer environmental conditions. With a vulnerability score of 2.25, Belize is ranked 9th on the Climate Change Vulnerability Index for the Latin America and Caribbean region (Figure 2. On the adaptive capacity index, Belize does not fare much better and ranks 10th (Figure 3) (CAF, 2014). Much of Belize's northern half and a large portion of the southern third of the country, as well as the coastal areas and islands, are flat and low lying, being highly vulnerable to SLR, erosion, storm surges, and flooding. A 2014 assessment categorized Belize's vulnerability index to climate change as extremely high: ranking 9th on the list of 33 countries in Latin America and the Caribbean (Mapplecroft, 2014). Climate change impacts resulting from global warming are expected to threaten the sustainability of social, economic, and ecological systems.

Country	Rank	Score	Risk category
Haiti	1	0.58	extreme
Guatemala	2	0.75	extreme
El Slavador	3	0.79	extreme
Honduras	4	0.92	extreme
Dominican Republic	5	1.01	extreme
Nicaragua	6	1.19	extreme
Jamaica	7	1.50	extreme
Paraguay	8	1.58	extreme
Belize	9	2.25	extreme
Bolivia	10	2.48	extreme
Venezuela	11	3.64	high
Ecuador	12	3.76	high
Dominica	13	3.85	high
Cuba	14	3.90	high
Guyana	15	4.23	high
Colombia	16	4.30	high
Mexico	17	4.47	high
Peru	18	4.98	high
Panama	19	5.57	medium
Antigua and Barbuda	20	5.64	medium
Brazil	21	5.77	medium
Suriname	22	5.85	medium
Saint Kitts and Nevis	23	6.24	medium
Argentina	24	6.66	medium
Trinidad and Tobago	25	7.22	medium
Costa Rica	26	7.70	low
Saint Lucia	27	8.25	low
Uruguay	28	8.33	low
Bahamas	29	8.68	low
Chile	30	9.54	low
Granada	31	9.58	low
Saint Vincent and The Grenadines	32	9.63	low
Barbados	33	9.77	low

Figure 2: Climate Change Vulnerability Index for the LAC region

Country	Rank	Score	Category
Haiti	1	0	extreme
Nicaragua	2	0.13	extreme
Honduras	3	0.5	extreme
Guatemala	4	0.54	extreme
Guyana	5	0.66	extreme
Bolivia	6	0.8	extreme
Paraguay	7	0.94	extreme
El Salvador	8	1.44	extreme
Dominican Republic	9	2.31	extreme
Belize	10	2.75	high
Suriname	11	3.31	high
Venezuela	12	3.62	high
Ecuador	13	4.44	high
Peru	14	5.32	medium
Colombia	15	5.66	medium
Argentina	16	6.07	medium
Jamaica	17	6.15	medium
Saint Lucia	18	6.31	medium
Panama	19	6.7	medium
Saint Vincent and The Grenadines	20	6.74	medium
Trinidad and Tobago	21	6.78	medium
Dominica	22	6.86	medium
Antigua and Barbuda	23	7	medium
Grenada	24	7.26	medium
Saint Kitts and Nevis	25	7.5	medium
Mexico	26	7.66	low
Brazil	27	7.88	low
Uruguay	28	8.18	low
Cuba	29	8.44	low
Costa Rica	30	9.23	low
Chile	31	9.4	low
Barbados	32	9.58	low
Bahamas	33	9.89	low

Figure 3: Adaptive Capacity Index for the LAC region

The Risk Profile Report (IDB, 2020) reiterates Belize's risk to coastal flooding and coastal erosion as a result of tropical cyclones and its projection between 2020 and 2050, further confirms the damaging impact it would have on the country's coastal ecosystems. Much of the observed and projected impact to coastal communities and habitats are coastal flooding, storm surge and coastal erosion, directly linked to sea level rise and changes in weather patterns. Due to the higher population concentration in northern Belize, the impacts and damages associated to tropical cyclones are expected to be higher than the southern half of the country's coastline (IDB, 2020). Much of the coastline of Belize has some form of vegetation, but where absent, coastal erosion has been the major cause of beach loss. The increase in storm intensity and frequency has made natural recovery and regeneration of eroded beaches less likely. Coastal erosion is expected to be more pronounce in human settlements with high coastal development, especially those that have no natural vegetation protection (IDB, 2020).

1. Socio-economic context

A significant part of the population lives in the coastal zone of Belize, 57.9%[1] of the population lives within 25km from the coastline, and is where a significant percentage of the economic activities are based (Tourism, fishing, and agricultural production). The coastal and marine ecosystem includes coral reefs, seagrasses, lagoonal reefs, and mangroves, which provide goods and services that sustain the livelihoods of coastal communities. Significant infrastructure investment has been done alone the coastline, including human settlements, transportation, industry and economic development, many of which were not designed to be climate resilience, and thus adding to their vulnerability to the various impact related to climate change. Coral reefs, mangroves, and coastal lagoons reduce the negative impacts of climate change, they provide a key service in reducing vulnerability. The impacts of climate change can be summarized in 7 categories (a) increased in air and ocean temperature; (b) sea-level rise and tidal influence on coastal and marine habitats; (c) Intensifying atmospheric pressures: stronger and more frequent hurricanes; (d) changes in native fish species migration; (e) more frequent and intense coral bleaching events; (f) ocean acidification and saline contamination of coastal freshwater resources; and (g) extensive coastal erosion significantly impacting local communities (CATIE and TNC, 2012; MCCAP, 2020).

A recent Marine Conservation and Climate Adaptation Project (MCCAP) Knowledge, Attitudes and Practices (KAP) study, using a statistically representative survey sample of the Belize population (95% confidence level, 5% error margin, 2,422 interviewed households), has revealed that in urban areas, 6% of households are poor. Of the remaining 94% however, 13% are vulnerable to poverty (lower-middle class). In the rural areas, 18.3% are poor, of which 3.1% are extremely poor (indigent) and 81.7% are non-poor; of the non-poor however, 14.5% are vulnerable to poverty (near-poor). Relative to the 2015 Baseline, these poverty estimates revealed an overall increase both in the number of households living below the national poverty line as well as in the severity of poverty, with more households now living below the indigence line (MCCAP, 2020).

The MCCAP KAP findings are likely to have been exacerbated by the Covid-19 pandemic and the significant tourism reduction. Study results from Dangriga have indicated that most local community members lack appropriate training to survive in the industry. Local business start-ups have a hard time surviving due to a lack of requisite training and capital business expansion. Therefore, many locals take up low-paying jobs that are insufficient to properly support their families (Nana Asante Appah, 2018). The Covid-19 pandemic, as well as the 2020 hurricane season have likely exacerbated the situation in Belize; unemployment rose significantly, loss in revenues by businesses, especially Micro, Small and Medium Enterprises has led to business closures in all sectors that contribute to the economy. Climate changes are already impacting coastal communities and the natural resources they depend on for their livelihoods. The degradation of coastal fresh water, beach erosion, degradation of coral reefs and decline on fish stocks, have further expose the vulnerability of coastal communities to climate change and can be used as an indication of level of adaptation and mitigation interventions that will be needed to make them climate resilient (Caribsave et al., 2014).

The main forms of livelihood in coastal areas are fisheries and tourism and due to their high reliance on natural resources and favourable climatic conditions, these sectors are highly vulnerable to the impacts of climate change.

The fisheries sector is comprised of commercial capture fisheries, commercial aquaculture, and freshwater inland fisheries. Capture fisheries operates off the coast of Belize in the Caribbean Sea and in 2020 generated BZ$18.8[2] million in export earnings, employing 2,131 licensed fishermen in that year (Fisheries Department Admin Data, 2020). The aquaculture subsector operates in the coastal plains and is comprised of ten shrimp farms and two fish farms. Shrimp farms generated BZ$62.5 million in export earnings in 2006, which placed the fisheries industry as the third largest sector in terms of foreign exchange earnings. The freshwater inland fisheries sub-sector operates throughout Belize's 16 major rivers and their tributaries; however, it is not well documented and is practiced for subsistence (Richardson, 2009).

Tourism in Belize is nature-based, and as such it is particularly vulnerable to climate change. Climate change will affect the viability of certain recreational activities, comfort and enjoyment of outdoor activities, and the ecological systems that are essential for these activities.

The total expenditure from the Tourism industry in 2019 was BZE$1,093.6 million, but drastically declined to BZE$302.6 million in 2020, the latter largely due to COVID-19. The industry is driven by overnight tourism, 90.4 % in 2019 and 91.1% in 2020, the rest if from cruise tourism (BTB, 2020). The GDP contribution of Tourism in Belize was 28% and 5.92% in 2019 and 2020 respectively. This is from direct tourism expenditure in the country and does not reflect some of the associated services to the tourism sector. The

[1] sib.org.bz

[2] Economic Statistics | Statistical Institute of Belize (sib.org.bz)

significant drop in tourism contribution to GDP is as a direct result of the impacts of COVID-19 and travel restriction during the keep of the pandemic. Tourism accounted for 11.4% of GDP in 2007, the broader travel and tourism industry, including manufacturing, construction and government activity associated with tourism, accounted for 26.0%. Nearly 13,000 jobs were provided by tourism in 2007, and the broader industry employs about 28,000. For the past few years, travel and tourism has presented the largest component of GDP in Belize, as well as the largest foreign exchange earner (Richardson, 2009). The sector has continued to grow since then, however, with the recent pandemic the tourism industry has been drastically affected and many Belizeans have become unemployed during this period. This emphasizes the vulnerable nature of this sector and the need to increase resilience. Rising sea levels pose risks of flooding, inundation, saltwater intrusion, and erosion, which threaten water supplies, property and infrastructure, and coastal areas needed for the functioning of the travel and tourism industry, warmer sea waters also threaten coral reefs, which attract tourists to Belize, and there is the increasing frequency and intensity of storms (Richardson, 2009); however with this project it is envisioned that coastal community stakeholder will be equipped with resources and capacity development to better adapt to the impending changes and be better prepared. Figure 4 below provides annual data describing the economic impact of tourism in Belize between the period 2011 – 2020.

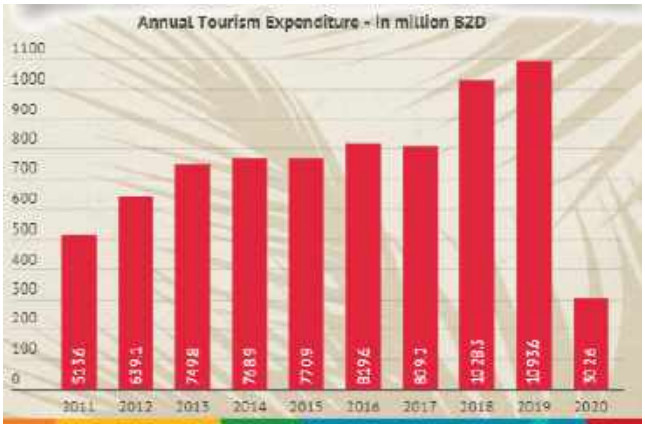


Figure 4: Economic Impact of Tourism in Belize

It is clear that there is an urgent need to address the impending impacts of climate change in these coastal communities. The activities under this proposed project will consider the impacts of climate change and help to put in place the necessary measures to increase resilience, monitoring and knowledge.

Sustainable development and addressing climate change are reliant upon a healthy environment being supported by its various cultures and ethnicities and expression of traditional practices. Thus, ensuring the active participation of indigenous groups is crucial for the success of this proposed project, these communities and sub-populations are a wealth of traditional knowledge. Several members of indigenous groups have been consulted for the formulation of this proposed project. During a meeting with the Belize National Indigenous Council held on 16 February 2021 members of the council commended the formulation of this project and stated that they are willing support the activities of the project and actively participate on its implementation. Thus, the proposed project will ensure to continue engaging the indigenous communities and groups through the Belize National Indigenous Council as the focal contact, since they represent Mayan and Garifuna groups and are in constant communication with the different communities. Indigenous groups will benefit from the capacity building initiatives, as well as trainings to be held. Members of the indigenous council have also expressed interest in providing support for monitoring initiatives.

Country gender profile

Belize's mid-year population estimate for 2020 is 209,603 males, 209,596 females, and 419,199 for the total population. The population estimates for the major administrative area and urban/rural figures are indicated in Table 1. The 2021 Labor Force Survey estimated the labor force at 161,416 or 53% of the population 14 years and above (legal working age in Belize is 14 years). Four out of every five men of working age were included in the labor force, compared to only one in two women of working age, revealing a distinctive sex-segregation in the formal labor market. Of the employed population 62.5% are males and the unemployment rate is 7% for males and 17.4% for females

According to the CDB 2016 Gender profile, Belize has a significantly sex-segregated and male-dominated labor force, demonstrated for example by male participation in the primary industries outnumbering female participation by nearly 19 to 1. The male to female employment ratio diminished from primary to secondary, to tertiary industries at 3.9 to 1 in secondary industries, and 1.2 to 1 in tertiary industries. Males earn more than females, with female (annual) average income estimated at $4,475 and male (annual) estimated average income at $10,317 (2016), at a ratio of 0.46:1. Tourism is significant to the Belizean economy, and the industry employs one in seven persons. Male to female participation in tourism was estimated at 55% to 45% (2016). Despite the effective integration of women in the tourism sector compared to the primary and secondary sectors, male and female labor is highly gender-segregated. The National Women's Commission estimated in 2016 that approximately 60% of female labor was concentrated in services, shop

sales, clerical duties, and elementary occupations, further revealing the significance of the tourism sector to their labor and underscoring the nature of female employment opportunities. Females are highly concentrated in domestic services-related jobs such as cleaning, housekeeping, and other poorly paid service jobs, including hair-braiding and souvenir selling. Male employment is most prevalent in areas including resort ownership and management; building and grounds maintenance; and tour guiding, including taxi driving (CDB, 2016).

Table 1: Midyear estimates Major Administrative Areas (SIB, 2020)

Area	Males	Females		Estimated Mid-Year Population 2020
Country Total	209,603	209,596		419,199
Urban	91,405	95,844		187,249
Rural	118,198	113,752		231,950
Corozal	*25,163*	*25,327*		*50,490*
Orange Walk	*26,683*	*26,690*		*53,373*
Belize	*63,102*	*64,581*		*127,683*
Cayo	*51,028*	*51,086*		*102,115*
Stann Creek	*23,844*	*22,170*		*46,015*
Toledo	*19,783*	*19,742*		*39,525*

2. Development context

As a country, Belize is economically dependent on its natural resources and associated ecosystem services provided, magnifying the impending vulnerabilities to be faced because of climatic changes. The country's key development sectors are particularly vulnerable to the impacts of climate change, due to their high reliance on natural resources and the direct link to the social well-being of the citizens; sectors such as agriculture, fisheries, tourism, coastal zone, water, and forest. Likely effects of climate change include loss of beaches due to erosion, degradation of ecosystems (e.g., coral reefs and littoral forests), inundation, and damages to infrastructure.

Historically, Belize's coastal zone is highly vulnerable to hurricanes due to the presence of human communities, sensitive ecosystems, and low adaptive capacity. Although hurricanes affect the entire Central American region, their effects differ. High and medium strength hurricanes converge in northern Belize and La Mosquitia (Honduras). This, together with soil quality, may explain why the predominant vegetation in these regions consists of pine savannah. Additionally, the recovery of mangrove forests from hurricane damage can take years (CATIE and TNC, 2012)

The impacts of Climate Change are felt in the productive sectors of Belize, affecting the livelihood of a large part of the population. Belize has a significant capacity to contribute to the mitigation of global climate change. due to its potential as a large carbon sink. The country contributes to the mitigation target to limit the increase of global average temperature to 1.5 °C compared to pre-industrial levels. Belize's Nationally Determined Contributions (NDCs) are guided by its commitment to purposefully transition to low carbon development while enhancing its resilience to the effects of Climate Change. An important contribution to carbon fixation is managed in Belize's REDD+ (reduce emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks) Readiness Project. Similar to other countries, Belize's REDD+ carbon accounting strategizes mangrove ecosystems like forests and is thus important for mitigation as well as adaptation (MCCAP, 2020).

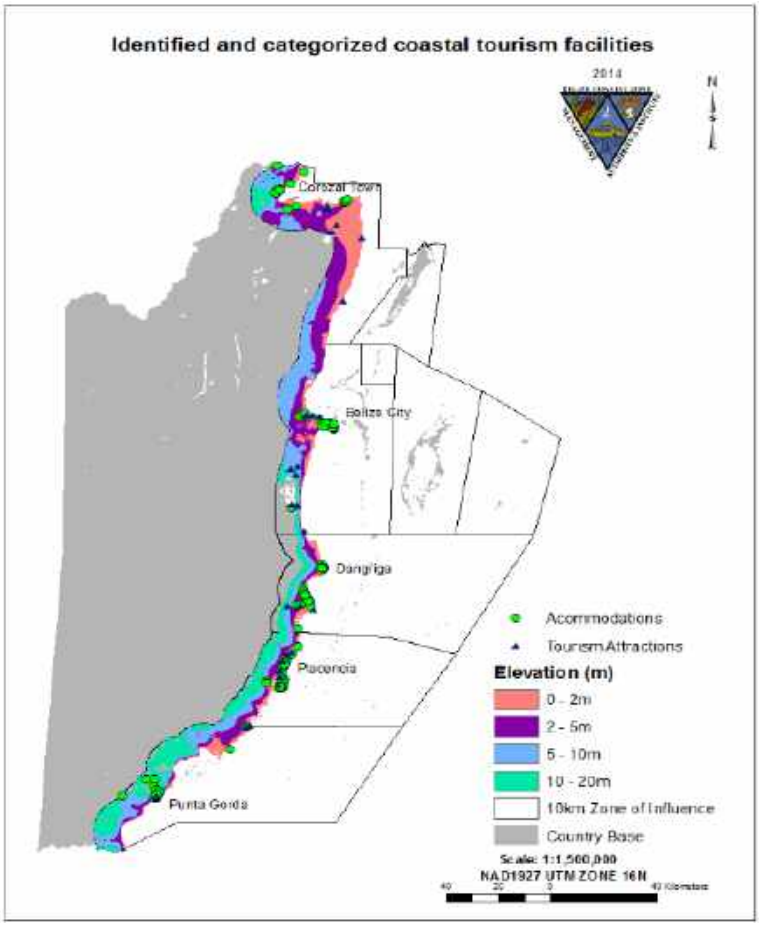


Figure 5: Locations of vulnerable tourism accommodations and attractions

As indicated in Figure 5 , the extensive coastal plain of Belize lies largely below 20m above sea level, with substantial areas below 10m and many denoted "subject to inundation" on hazard maps. Along the river valleys, notably Belize, Mopan, and Macal Rivers, there are vast areas below 10m which are also subject to inundation. Major roads are likely to be affected by inundation from sea level rise, including the New Phillip Goldson Highway and the Old Northern Highway. Additionally, much of the northern part of Belize City, the center of economic activities, is on land below 10m, and thus will potentially be affected by sea-level rise.

3. In Belize City, residential areas such as Vista del Mar, Bella Vista, Belama, and Fort George that are constructed on drained and reclaimed wetlands are extremely vulnerable to the projected sea-level rise. Similarly, the infrastructure developments in most of the other coastal communities like Dangriga, Corozal Town, the Placencia Peninsula, Ambergris Caye, and the other offshore islands are currently threatened by even a 20 cm rise in sea level. For these communities to cope with rising sea-levels, a constant supply of large volumes of sediment would be required. The sources of supply of natural and alternative sediment to these areas have been significantly reduced. Protecting these urban areas might require the construction of seawalls and dikes that could withstand the impacts of the projected sea-level rise through the new century. Impacts on GDP in Belize are also important to note. The impacts of 1m of SLR are expected to lead to just over a 2% loss in GDP (Caribsave et al., 2014).**Environmental context**

Over the past few years, Belize has experienced many effects linked to climatic changes and variation, such as drought, flooding, change in precipitation and temperature patterns, sea-level rise, and coastal erosion. The country is also seasonally affected by tropical storms and hurricanes, which on average, according to scientific reports, are becoming more intense each year due to the effects of human-induced global warming and higher sea surface temperatures. Belize is also highly exposed to other natural hazards such as flooding and drought. These can lead to infrastructure and economic losses, especially in agricultural and coastal areas during the hurricane season. There has also been evidence that the average annual temperature of Belize has been rising and is projected to rise further. Temperature projections carried out by experts from Cuba's Meteorological Institute showed that annual temperature changes from 2021 – 2080 versus 1961 – 1990 for four climate projection scenarios show a steady increase in mean temperature during the XXI century for Belize nationally (Figure 6).

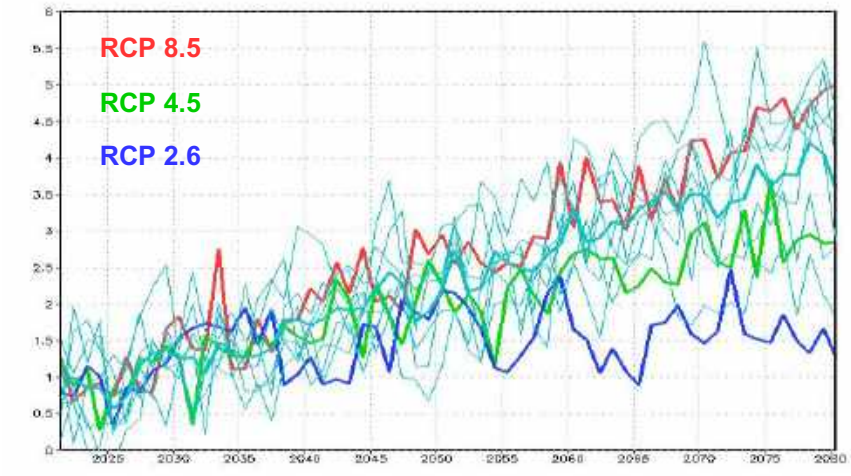


Figure 6: Interannual variations of mean temperature anomalies (°C) during the period 2021 until 2080 for four scenarios, with baseline period 1961-1990. (Centella & Benzanilla, 2019)

Climate Change projections suggest that under the worst-case scenario Belize's temperature will increase to approximately 2 °C by the 2050s and almost 4 °C by the 2080s, relative to the baseline period 1961 to 1990. Projected models for the 2050s indicate rainfall change of -20% to -30% from the reference period 1961 to 1990 under the worst-case scenario by the 2050s, and around -50% to -60% change by the 2080s. Projections of atmospheric moisture deficit/surplus (P-E) indicate that by the 2080s, dry months' deficits will decrease slightly, but the wet season months will see a decrease in moisture surpluses. This entails that the dry seasons will be slightly less intense around the 2080s, but the wet seasons will become drier (CaribSave, 2009).

Exposure to coastal hazards is defined by proximity to the coast and the topography (altitude to avoid exposure to sea-level rise). An exacerbating factor is that the population and infrastructure are concentrated within the first kilometers of the coast. Areas with greater exposure are the Districts of Corozal and Belize City (CATIE and TNC, 2012). The coastal lowlands in northern Belize will remain vulnerable to sea-level rise according to the global climate model projections. Between 2046 and 2065 the mean increase in sea levels for the different scenarios will range from 0.17 m to 0.3 m, with an extreme value of 0.38 m. During the period 2081 to 2100 this average increases and ranges between 0.4 m and 0.63 m, whereby 0.82 m is the extreme. Rising sea levels are expected to continue to threaten low-lying coastal areas, and exacerbate beach erosion, coastal flooding, inundation, and salinization of surface and groundwater resources (MCCAP, 2020).

The coastal zone of Belize is for the most part below the high tide level. As a result, the coastal zone is very vulnerable to the impacts of climate-driven sea-level rise, especially when augmented by storm surges. For example, characterization of the hydrodynamic regime of coastal areas in southern Belize (i.e., Dangriga) based on the climatological information (i.e., direction and speed records, from 2015 to 2020) provided by the National Meteorological Service of Belize (NMS)[3], shows the average wind speed recorded is 6.55 kt (12.1 km / h) and a maximum of 14.91 kt (27.6 km / h). Wind direction is primarily NE to the SE. The barrier reef lies between 18 and 22 km off its coast and, functions as an effective natural breakwater. Similarly, the swell that exceeds the reef is limited by depth.

Nevertheless, storm wave or storm surge, generates sea level increase that brings about greater waves and increases the impacts of wave action on the shoreline. The propagation of the waves towards the coast produces transformations in the wave fronts, mainly caused by the phenomena of refraction, diffraction, breakage, and dissipation by the bottom, and therefore, there are also alterations in the spatial distribution of the wave energy (Table 2).

Table 2: Scenarios and parameters for wave modelling[4]

Parameter	Scenarios (Waves)		
	Usual	Cold front	Storms
Significant height (Hs)	0.75 m	2 m	5.5 m

[3] The Dangriga Automatic Station is located at 190 m from the waterfront and 14 km from the center of Hopkins Village. The automatic station of Placencia is located in the Placencia Airstrip Terminal, 150 m from the coastline and 37 km from the center of Hopkins Village.

[4] Spectral waves were propagated, using a TMA type frequency spectrum (Texel Marsen Arsloe) (Bouws et al., 1985), which is applicable in areas near the coast where the depths are shallow, and the waves are affected by the bottom and it is defined from a JONSWAP spectrum

Peak period (Tp)	8 s	10 s	12 s
Directions	ENE, E, ESE, SE	NE, ENE, E, ESE	NE, E, SE

The usual swell scenario corresponds to the annual average conditions imposed by the prevailing winds. Under normal conditions, the swell reaches the vicinity of the coast without being affected in its propagation, which are only visible when interacting with the low depths formed by the underwater bars. From this area, and due to the processes of shoaling, refraction and diffraction, the height and direction of the wave fronts undergo the greatest transformations, producing a rapid dissipation of the wave energy in a narrow strip very close to the shore. As for cold fronts, although these do not significantly impact costal infrastructure, it influences wave regime, which contributes to increases in wave energy.

During storm events, storm surge associated with extreme meteorological events, such as tropical storms and hurricanes, the loss of sand and the total disappearance of beaches have been observed. Hurricanes are centers of low pressures and produce trains of waves that exceed the barrier. Also, the distance between the barrier and the coast is between 15 and 19 km, broken waves reorganize and rebuild, reaching waves with hurricane energy to the coast. The vulnerability of coastal environments increases the return period and associated exceedance probability for tropical cyclones affecting Belize is considered. The most probable event simulated, corresponding to a tropical storm with a return period of 1.15 years and probability of occurrence of 87% (Table 3).

Table 3: Return period and associated exceedance probability, for tropical cyclones that affect Belize, from the TS category to the H5 category of the Saffir-Simpson scale

Category	Return period (Years)	Probability (%)
TS	1.15	87%
H1	2.17	46%
H2	3.92	26%
H3	6.14	16%
H4	11.66	9%
H5	27.13	4%

Longitudinal currents

Within the surf zone, the breaking of the waves generates a series of currents, which depend on the angle of arrival to the coast and the height of the wave. These currents, called longitudinal or breaking currents, are of special importance in the arrangement of the balance of a beach, due to their capacity to transport sand. Breaking currents are produced in the breaking zone of the waves, in an area where the sediment is in suspension and is easily transportable. The breaking of the waves generates a circulation pattern governed by two longitudinal currents, one in a North direction and the other in a South direction, whose bifurcation point is the bar attached to the mouth of the North Stann Creek, which is the easternmost point on the coastline. Waves coming from the East and East Northeast follows this pattern. However, for waves of the ESE and SE, a single current is generated with a north direction.

The distribution of sediments on a beach is closely linked to its current system. For there to be sediment transport, two actions are necessary: a mechanism that puts the sediment in suspension, and an element that serves as its transport. These two actions occur simultaneously within the surf zone of a beach. The breaking of the waves puts the sediment in suspension, and on the other, the currents induced by the break transports this sediment. As result, increased wave energy increases the risk of sediment transport and leading to beach erosion.

Many Belizeans that live along the coast depend on the coastal resources for fishing and (eco-)tourism, therefore, impacts to these sectors would highly affect the livelihoods of many and hinder economic and social development. Belize's Third National Communication (NCCO, 2016) states that the area most susceptible to the effects of Climate Change is the coastal ecosystem. Anticipated increases in sea surface temperatures, salinity, pH, sea level, and intensity of tropical cyclone events have direct implications on the future state of the coastal zone and the ability of Belizean people to utilize the resources it provides.

In summary, the intensifying effects of global climate change that will impact Belize's nature, people, and production include:

- Increased ambient and sea surface temperatures, with associated heatwaves and more intense droughts, impacting huma health and agriculture;
- Sea level rise and associated coastal inundation, loss of real estate, and saltwater intrusion; and
- More frequent and more intense hurricanes (category III or stronger) (MCCAP, 2020), which impacts coastal infrastructure, including roads, bridges, utility networks and buildings.

To effectively address these issues, the threat of climate change requires multilateral action from policymakers, technical experts, the private sector, and the public, to seek solutions and make changes to reduce global emissions of greenhouse gases. However, even with mitigation efforts in place, communities are going to feel the effects of climate change. Therefore, the effects currently being experienced and those expected to take place in the near future require the country to find ways to adapt to the imminent changes to reduce vulnerability and enhance resilience to future climate risks and hazards.

B. Project Objectives:

Goal & Objectives

The **goal of this project** is enhanced climate change adaptive capacities of Belize. The project will contribute to this goal by achieving its objective, which is **to decrease vulnerabilities in coastal areas by improving planning and decision-making thus ensuring that country capacity is built to address future climate change impacts**. In doing so, it encourages pro-environmental behaviors through communication and training, enhances the resilience of high-risk coastal areas, strengthens the public sector-community partnerships for data collection/monitoring, addresses issues of coastal construction, and overall makes life safer for Belizeans and visitors.

The project will achieve this objective under four main inter-related components as below

> Goal of the Project: Enhanced climate change adaptative capacities of Belize
>
> Broad Objective: To decrease vulnerabilities in coastal areas by improving planning and decision-making thus ensuring that country capacity is built to address future climate change impacts

i) Improved coastal land use for resilient habitation and sectoral activities
ii) Coastal Vulnerability Monitoring and Early Warning
iii) Coastal Protection and Adaptation response for High-Risk Areas
iv) Awareness Raising, Knowledge Dissemination and National Capacity Strengthening

While all the main components of the project are focused on Belize's coastal ecosystems, communities and their wellbeing, the sub-components have nation-wide benefits, such as the national housing policy and implementation plan, implementation of national building codes with special reference on coastal climate resilient habitation (Outcome 1.1), awareness-raising, knowledge dissemination, and capacity-strengthening (component 4). Figure 7 provides an overview of the Theory of Change of this project. The Theory of Change is elaborated throughout this project document.

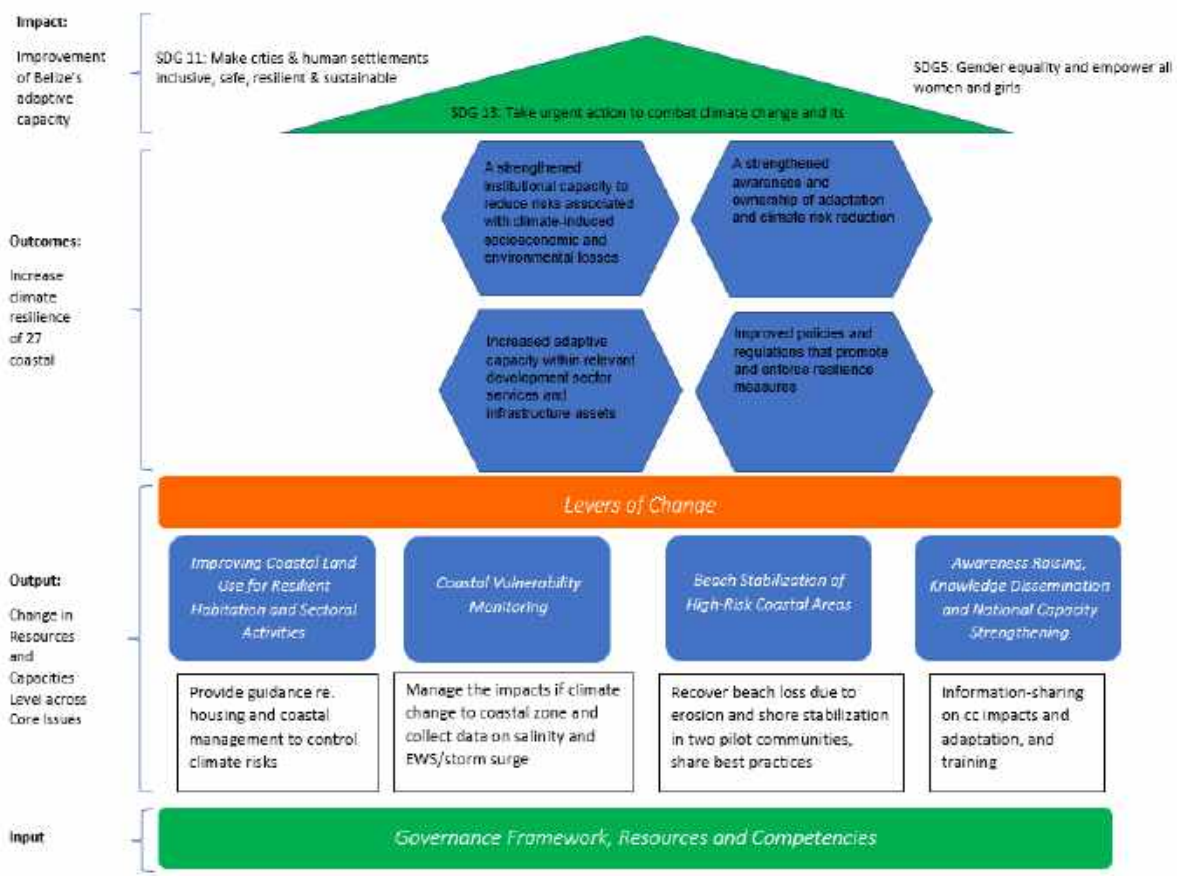


Figure 7: Theory of Change

The project will achieve this through four interconnected main components that are aligned with the Strategic Results Framework of the Adaptation Fund (Table 4).

Table 4: Alignment with the Strategic Results Framework of the Adaptation Fund

Component	AF Results Framework Linkage
1. Improved coastal land use for resilient habitation and sectoral activities	Outcome 7: Improved policies and regulations that promote and enforce resilience measures
2. Coastal vulnerability monitoring and early warning	Outcome 2: A strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses
3. Coastal Protection and Adaptation response for High-Risk Areas	Outcome 4: Increased adaptive capacity within relevant development sector services and infrastructure assets
4. Awareness Raising, Knowledge Dissemination and National Capacity Strengthening	Outcome 3: A strengthened awareness and ownership of adaptation and climate risk reduction
	Outcome 2: A strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses

The Project Area

The project is targeting the entire coastal zone of Belize which is a very vital zone of the country as far as the economy, ecosystem, infrastructure and social aspects of the country are concerned. However, the high-risk zones of Dangriga in Stann Creek district have been selected for beach stabilization processes which will demonstrate the climate change sensitive beach stabilization process for Belize. The project will have direct and indirect impacts on all coastal communities of Belize, approximately 117,825 people; see Table 5 (approximately 57,788 men and 60,036 women).

Many cross-sectoral issues exist in the coastal zone of Belize due to the impacts of climate change. Rising mean sea levels and increased intensity of storms and hurricanes have increased coastal erosion, leading to loss of beaches, coastal infrastructure and saline intrusion of estuaries and groundwater aquifers. These biophysical impacts will lead to loss of coastal habitats, property damage, flooding, and loss of life, as well as have economic consequences for rural production and urban lifestyles and displacement of 27 coastal communities in 4 districts of Belize.

Table 5: District Population based on coastal communities only, 2010 Census figures***Error! Not a valid bookmark self-reference.***

District	Total	Males	Females	Households
Corozal District, coastal communities (6)	*14,516*	*7,076*	*7,440*	*3,631*
Belize District, coastal communities (6)	*77,109*	*37,725*	*39,384*	*22,289*
Stann Creek District, coastal communities (9)	*19,748*	*9,902*	*9,846*	*5,501*
Toledo District (6)	*6,452*	*3,085*	*3,367*	*1,643*
Total	***117,825***	***57,788***	***60,036***	***33,064***

Belize's 2020 midyear population estimate is 419,199 inhabitants; this includes 209,603 males and 209,596 females. (An official updated number, disaggregated by village, is not available at the moment, as the 2020 Census was postponed commencing in mid-May 2022 due to the COVID 19 pandemic.) This project has taken into consideration gender equality and equity by pursuing activities and measures that are beneficial to both men and women and their families. The project will also be gender-responsive by ensuring that both men and women are adequately represented in employment, at all stakeholder consultations and that the opinions of all relevant stakeholders are considered during the development and implementation of project components.

Dangriga

Dangriga Town is one (1) of nine (9) municipalities in Belize in the Stann Creek District on the Caribbean Coast south of Belize City (the most populated urban area) and north of Punta Gorda Town (the least populated urban area). The 2020 mi-year population estimates indicate that it had a population of approximately 10,680 or 2.5 per cent of the total 2010 population of Belize (419,199). It is linked to the north, east and west of the country by the Hummingbird Highway, and to the south by the Southern Highway. The nearest other urban center by road transportation is the City of Belmopan. The growth and development of Dangriga Town is very important to the villages of Stann Creek District as is their growth and development to Dangriga Town as it is the administrative center of the local government for the Stann Creek District, and its financial and commercial hub. Its sphere of influence extends to 29 villages with an aggregate population of 35,335 in 2020.

The functionality of Dangriga Town as a provider of a wide array of services makes it a mecca for large transient population that travel daily to town from the surrounding villages and communities for a variety of purposes including conducting business, banking, shopping, public service (motor vehicle licenses, police), medical (Southern Regional Hospital serves Stann Creek as well as Toledo) and education (high school and six form). Dangriga also has one of two Cancer Treatment Centers in the country and has many identified neighborhoods. Some are located in the original parts of town, that is, the north-south strip of land adjacent to the Caribbean Sea. Those are Foreshore, Southern Foreshore, Bluefield, Backatown, Havana, Central Plaza, Harlem, Scotchman Town and Ghans. While others are located in the newer neighborhoods and include Lakeland, Benguche, Rivas Estate, New Site 1 and 2, the Carib Reserve North and South (where 5 acres of land were given to the Garifuna war veterans), the Monument Area, Wagierale (high farmlands), and the Sabals (Figure 8).

Figure 8: Map of Dangriga Town

Climate Impacts

The climate in the Southern part of the country is considered tropical, with rainfall reaching up to 3,800 mm (150 inches). Almost 60% of annual precipitation occurs in the rainy season, which generates favorable conditions for terrigenous sediments to be carried by rivers to coast. These fluvial discharges are mainly formed by sands detached from granitic and metamorphic rocks present in the mineralogical provinces that the rivers cross[5]. As such, the waves produced by these winds, and the presence of the barrier reef and the Cayes, determines shaping of the coastal zone (e.g., beaches). Dangriga (extension of 13 km) is located in the southern half of Belize's coast and have grown from the filling of mangrove swamp and coastal vegetation areas. Despite the presence of mangrove swamps, which provide some protection against the impacts of surges and waves produced during storms and hurricanes, climate induced erosive events continue to impact communities along the southern coast of Belize leading to loss of critical infrastructure such as schools and homes (Figure 9).

[5] The southern shelf of Belize is characterized by a carbonate-to-siliciclastic transition. Along the coast, quartz sand, that is brought into the system from the hinterland by rivers and small streams, may form small deltas and is transported along the coast by currents to form beaches, berms, and sand spits. Behind berms and sand spits, shallow coastal lagoons, mangrove swamps, marshes, and flood plains occur Gischler and Adomat (2012).

Figure 9: Image depicting erosion in Dangriga (NCCO, 2019)

During storm events, southern Belize experiences over a meter of surge. This occurs when the wind of tropical cyclones passes over shallow marine regions. As result causing extensive erosive events at an average rate of 2.61 m/year[6].The escarpments in the dune, the fall of trees, the outcrop of stumps and the foundations of facilities impacted by the waves, are clear indications of the erosive trend in the evolution of the coast. Beach scarp, dead trees, exposed roots, waves reaching building foundations, and some inefficient coastal protection structures, demonstrate the widespread characteristics of this phenomenon in the coastal community of Dangriga.

Threats to the preservation of Dangriga's cultural heritage and practices have increased over the past decades as a result of urban pressures, which impacts the physical integrity of monuments. Pressures have led to changing demographics and rural-urban migration out of the village and the urban-rural immigration into the village causing its rise as an intermediate settlement, disrupting intangible cultural practices, loss of community memory, cultural impoverishment and homogenization; and the ongoing gentrification in areas predominantly occupied by families of the original dwellers of the village, which have marginalized vulnerable families, particularly the poor and the elderly, the latter who are the historic dwellers of these areas, and the repositories of memory. A changing climate and climate variability are worsening these threats as traditional and 'ancient buildings were designed for a specific local climate. Increasing sea level rise threatens the survival of the village itself. Historically inhabitants have also built in close proximity to the beach, which has seen significant erosion throughout the years due to sand insufficiency.

Mining in the rivers and improper planning of built infrastructure have been augmenting the erosion taking place. The natural causes are also manifested in the whole region, and it may be noticed that they are related to a higher frequency and intensity of tropical storms, sea-level rise, and the deficit in the sand inputs to the coastal system (Juanes & Izquierdo, 2019). The recent experiences with Hurricanes Eta and Iota (November 2020 have depicted the extensive impact climate change has, not only on Belize's coastal communities as a direct result of the intense storms (e.g. see Hopkins and Dangriga, Figure 10), but also the severe devastation that can occur inland. Communities that were particularly affected by Eta and Iota were - along the Mopan River (e.g. Calla Creek, San Ignacio, Bullet Tree Falls, San Jose Succotz, Branch Mouth, Santa Familia), Belize River (e.g. Esperanza Village, United Ville) and villages in the Belize District (Figure 11).

[6] In the case of Belize, the algebraic expression of the sedimentary balance can be simplified with the main inputs and outputs indicated in the physical-geographical characterization.

$Q+O_b = O_s + O_{ds} + T_t + K_{red} + (L_W)^*$

(inputs) (outputs)

Figure 10: Impact of Hurricane Eta in Dangriga and Hopkins (Nov. 2020)

Figure 11: Devastation by Hurricane Eta on the inland communities Bullet Tree Falls village and San Ignacio Town

Tropical storms and hurricanes have been associated with the fastest rates of beach erosion in the area. In 2001 Hurricane Iris caused extensive damage in southern Belize, affecting several communities in the Stann Creek and Toledo Districts. The Association and Xi (2019) noted that sea-level rise is a slow factor in the area, but it will exacerbate the sand delivery problem and increase risks in the area during future hurricanes.

Thus, it is crucial to decrease the vulnerability of these communities and increase resilience against the impacts of climate change by increasing their adaptive capacity and ability to anticipate and absorb shocks and bounce back for them. Currently, residents in these areas have not been able to adapt to changes and have been drastically affected by impacts to the coast. Thus, investments need to be made in decreasing exposure, risk, building capacity, and increasing resilience to reduce the impacts of future hazards and climate change. Locally, most of the villages and municipalities do not have the financial or human capacity to identify the necessary adaptation actions or implement actions to increase their resilience.

The IPCC report (2007) stated that the global sea level rose at an average of 1.8 mm per year from 1961 to 2003. Domingues et al. (2007) estimated a rise of 1.5 ± 0.4 mm yr^{-1} for the same period. According to sea level rise projections for the Caribbean region, sea level will rise 0.18 – 0.59 m by 2099 (Cambers et al., 2007), while Rahmstorf (2007) projected that sea level could increase between 0.5 – 1.4 m above the 1990 level.

Large regional variations have been superimposed on the mean global sea-level rise rate. Table 6 demonstrates observations from tidal gauges surrounding the Caribbean basin which indicate SLR in the Caribbean is broadly consistent with the global trend (*Table 7*).

Table 6: Sea level rise rates at observation stations surrounding the Caribbean Basin (NOAA, 2009; CARIBSAVE, 2012)

Tidal Gauge Station	Observed trend (mm yr^{-1})	Observation period

Bermuda	2.04 (+/- 0.47)	1932-2006
San Juan, Puerto Rico	1.65 (+/- 0.52)	1962-2006
Guantanamo Bay, Cuba	1.64 (+/- 0.80)	1973-1971
Miami Beach, Florida	2.39 (+/1 0.43)	1931-1981
Vaca Key, Florida	2.78 (+/- 0.60)	1971-2006

Table 7: Projected increases in sea level rise from the IPCC AR4 (CARIBSAVE, 2012)

Scenario	Global Mean SLR by 2100 relative to 1980-1999 (m)	Caribbean Mean SLR by 2100 relative to 1980-1999 (+/ 0.05 m relative to the global mean) (m)
IPCC B1	0.18-0.38	0.13-0.43
IPCC A1B	0.21-0.48	0.16-0.53
IPCC A2	0.23-0.51	0.18- 0.56
Rahmstorf, 2007	Up to 1.4m	Up to 1.45m

Table 7 shows projections of sea-level rise from the IPCC's AR4 report, with projections spanning from 0.18 to 0.56 m by 2100, relative to 1980 – 1999 levels. However, these ranges were challenged by several authors as being too conservative (e.g. Rahmstorf, 2007; Rignot and Kanargaratnam, 2006; Horton et al., 2008) and have provided evidence that a larger upper limit for uncertainty should exist (CARIBSAVE, 2012).

According to a 2014 report "Analyzing Vulnerability of the Belize Coastal Tourism Sector" low lying areas in Belize, particularly those with elevations ranging from 0 – 5m, are the most vulnerable to sea-level rise. As shown in Figure 12, this accounts for a significant portion of Belize's coastal zone, especially when a 3 km inward extent along the coast is considered where most development activities occur. Figure 13 shows the location of tourism facilities (accommodations and attractions) that are in vulnerable low-lying areas. A total of 291 tourism facilities were identified along the coast, of which 263 were accommodations and 28 were attractions. Additional tourism facilities exist on the outer cayes that are not accounted for in this data analysis. Tourism facilities are located at different elevations, however, 94% of accommodations were found to be within the lower elevation (0 – 5 m) and 79% of attractions were found to be within the lower elevation (CARIBSAVE, WWF, CZMAI, ERI, BTB, BTIA, 2014). Tourism facilities and other infrastructure/ housing located within these low elevation classes are more at risk of inundation. They would also be at higher risk of erosion, soil, and aquifer contamination with salt water and other impacts of sea-level rise.

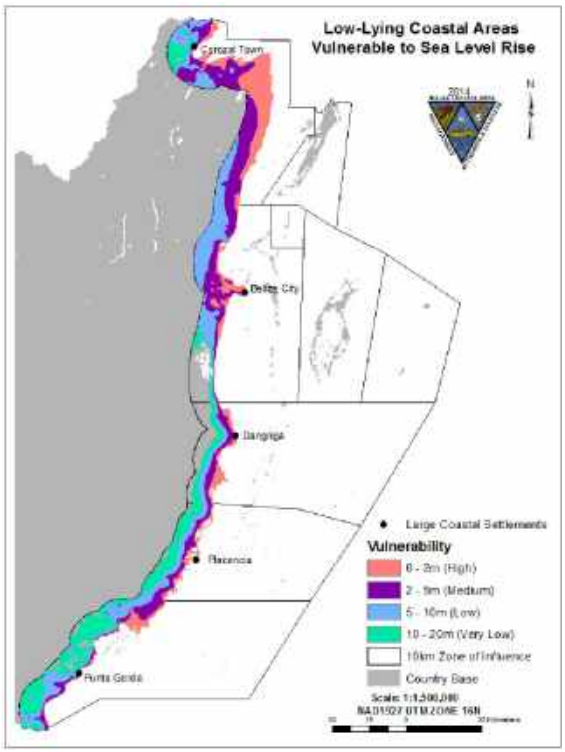


Figure 12: Vulnerability of Coastal Areas relative to sea level rise (CZMAI, 2014)

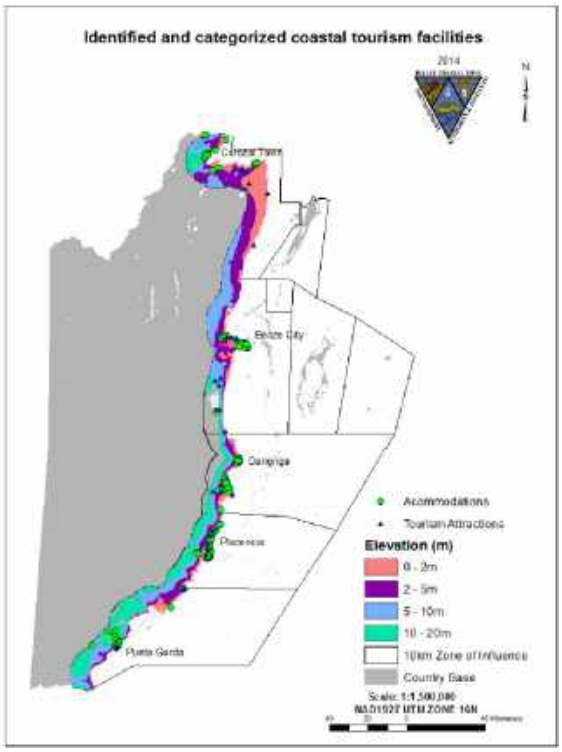


Figure 13: Location of Tourism Facilities in Vulnerable Coastal Areas (CZMAI, 2014)

It should also be noted that the coastal plain of Belize largely lies below 20m above sea level, with many areas below 10m and subject to inundation, with much of Belize City on land below 10m. The travel and tourism sector of Belize is particularly vulnerable because it depends on many of natural resources and services along the coast and is subject to climatic changes affecting activities and comfort levels of tourists. Climate change may reduce the appeal of tropical destinations, like Belize, to tourists due to heat stress, beach erosion, coral bleaching, and increased health risks. For Belize, the barrier reef and coastal areas attract the highest number of tourists; more than 70% tourists visit cayes and more than 12% visit the coastal peninsula of Placencia village, with more than 80% participating in reef-based activities (Richardson, 2009). Tourism in Belize, which mostly relies on coastal resources, ecosystems, and infrastructure will be affected by sea level rise, which can lead to flooding, inundation, saltwater intrusion, and erosion, impacting water supplies, property and infrastructure along the coast. Impacts to coral reefs will also affect the sustainability of the industry. Increased frequency and intensity of storms will also lead to storm surges, flooding, erosion, and loss of property. This is important to note due to the high level of tourism facilities and activities along the coast.

The housing infrastructure in these coastal communities are also at high risk of sea level rise and its associated impacts, just as the tourism facilities and activities are, as well as from storms, storm surge, erosion etc. Although a Building Act exists within the country, many houses are built in coastal areas that are not suitable for housing and to sustain medium to large tropical hurricanes. Thus, it is imperative do introduce a housing policy and implement appropriate climate considerate building codes, which can inform where future housing should take place and standards for their construction. It will also support a more resilient coastal zone for Belize, which will have direct economic and social benefits

As can be seen from Table 5 above, in the districts with coastal communities the male to female population does not vary greatly, therefore, both genders need to be consulted equally when carrying out adaptation activities. The project will indirectly benefit 57,788 males and 60,036 females from the total 27 coastal communities located in northern, central, and southern Belize districts. The proposed project will consider the different challenges and risks that men and woman face. Along the coast of Belize, most people rely on the fishing and tourism industries. In the fishing industry mostly males are present, facing challenges such as poor catch, decrease in fish stocks, pollution, lack of access to funds or loans, as well as others. Women are also key stakeholder in the value change of the fisheries sector, playing an integral role in the processing of marine products, both for local and export markets. For the tourism sector, both men and women are equally represented, facing challenges such as a decrease in tourist visits, changing climate, poor infrastructure, etc. Specific vulnerable groups in these sectors include fisherfolk, tour guides, hotel/resort owners, and hotel/resort workers. Other vulnerable groups include owners of residences, buildings, and other infrastructure along the coast.

Men, women, youth, and vulnerable groups in these communities are being drastically affected by changes in the climate. Residents in these communities rely heavily on the natural resources and services that the coast provides, thus ensuring that the coast is protected, and that the shoreline is not further developed in an unsustainable manner is important for a thriving future in these

communities. Ensuring protection of the coast depends heavily on the knowledge of the residents and users of the coast, thus component 4 of the project will strive to meet the needs of both men and women and will equally engage both genders in knowledge and outreach activities. Awareness-raising will be carried out in a gender-responsive manner that ensures that the attitudes, behaviors, and beliefs that reinforce inequalities between men and women are changed and that both genders are given equal opportunities.

The four project components are as follows:

Component 1, Improving coastal land use for resilient habitation and sectoral activities, focuses on strengthening governance and will provide a formal structure to address the challenges that arise due to continued growth in coastal areas. Component 1 consists of two outcomes: 'Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience' and 'Improved coordination and implementation of the Integrated Coastal Zone Management Plan '. The beneficiaries for the latter component are the coastal communities, while the National Housing Policy and building code implementation extend to the national level.

Component 2 consists of three outcomes: 'Strengthened data availability for the development of a national coastal saline intrusion program ', 'Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize' and 'Improved infrastructural capacity of the National Meteorological Service to develop a coastal early warning system and model storm surge'.

Component 3, will seek to implement adaptation measures geared towards recovery and protection of high-risk beach and coastal areas impacted by erosion in Dangriga. The proposed measures are designed to augment the adaptive capacity of residents in affected areas. The selection of protection and adaptation measures in the specific areas of Dangriga is based on a detailed analysis of the erosion causes conducted in a previous study, which informed this proposal in the selection of the most appropriate intervention measures.

Component 4 focuses on awareness raising, knowledge dissemination and national capacity strengthening. It will strengthen the capacities of local government officers, the private sector, communities, and project beneficiaries from central government. The components consist of three outcomes: 'Promotion of ecologically responsible behaviors through climate change communication', 'Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices', and 'Strengthened GIS capabilities of CZMAI and partners'.

The project components in this proposal are crucial for the proper management of vulnerable coastal areas in Belize. In the absence of proper planning, legislation, and policies, unsustainable development will continue unchecked along the coast, increasing vulnerabilities, and exacerbating the impacts of climate change. Knowledge transfer and capacity building are also necessary to ensure that relevant stakeholders can increase their adaptive and absorptive capacity and are willing to comply with the necessary adaptation actions to increase national resilience.

Project Components and Financing:

Table 8: Project Components and Financing

Project Components	Expected Outcomes	Expected Concrete Outputs	Amount (US$)
Component 1 *Improving coastal land use for resilient habitation and sectoral activities*	Outcome 1.1 Development of the National Housing Policy and Building Codes for resilient habitation based on vulnerabilities	Output 1.1.1 National Housing Policy and implementation plan encompassing climate resilient housing	154,174
		Output 1.1.2 Implementation of National Building Codes with special reference on coastal climate resilient habitation	45,000
		Output 1.1.3 Capacity building of stakeholders on implementing the Building Codes	41,000
	Outcome 1.2 Improved coordination and implementation of the ICZM Plan	Output 1.2.1 Updated land use inventory of three existing coastal planning regions (northern, central and southern)	164,498
		Output 1.2.2 Annual Monitoring and Evaluation of Implementation of the ICZM Plan (financed by CZMAI)	
		Output 1.2.3 Collaborative approach for strengthening the implementation of the Integrated Coastal Zone Management Plan established	22,500
Total Component 1			**427,172**
Component 2 *Coastal Vulnerability Monitoring*	Outcome 2.1 Strengthened data availability for the development of a national coastal saline intrusion program	Output 2.1.1 Enhanced evidence-based knowledge to determine best use practices for freshwater supply for the coastal areas, while reducing probability of further saline intrusion	709,000
	Outcome 2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	Output 2.2.1 Development and implementation of a National Beach Erosion Monitoring Program	250,000
	Outcome 2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	Output 2.3.1 Early Warning System (EWS) Development & Storm Surge modeling (Phase 1 of a full EWS)	140,000
		Output 2.3.2 Establishment of Weather Stations/Sensors along the coast	125,000
Total Component 2			**1,224,000**
Component 3 *Coastal Protection and Adaptation response for High-Risk Areas*	Outcome 3.1 Adaptive capacity of the coastal community of Dangriga is	Output 3.1.1 Coastal protection and recovery	1,243,734

	increased to respond to climate induce erosive events	programmed for high-risk beach and costal environments[7].	
		Output 3.1.2 Monitoring programme is established in the high-risk zones	220,000
Total Component 3			**1,463,734**
Component 4 *Awareness raising, knowledge dissemination and capacity strengthening*	Outcome 4.1 Promotion of ecologically responsible behaviors through climate change communication	Output 4.1.1 Implementation of the National Climate Change Communication Strategy and Action Plan	55,000
	Outcome 4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	Output 4.2.1 Training needs assessment for best coastal adaptation practices conducted and training modules developed	60,000
		Output 4.2.2 Implementation of training modules for best coastal adaptation practices	15,000
	Outcome 4.3 Strengthened GIS capabilities of CZMAI and partners	Output 4.3.1 Identification and procurement of infrastructure and materials including computer hardware, software and data gathering equipment	81,500
		Output 4.3.2 Implementation of GIS training for risk mapping, collection of beach profile data and susceptibility to erosion	10,000
Total Component 4			**221,500**
5. Total Components			3,336,406
6. Project/Programme Execution cost			350,230
7. Total Project/Programme Cost			3,686,636
8. Project/Programme Cycle Management Fee			313,364
Amount of Financing Requested			**4,000,000**

Table 9: Projected Calendar

Milestones	Expected Dates
Start of Project/Programme Implementation	April 2024
Mid-term Review	June 2026
Project/Programme Closing	December 2028
Terminal Evaluation	April 2029

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. The Project Components

The project is comprised of four interconnected and integrated components. Each of the components are explained below with subcomponents and details.

Component 1: Improving coastal land use for resilient habitation and sectoral activities

Outputs of Component 1:

a) National Housing Policy and implementation plan encompassing climate resilient housing
b) Housing zoning maps based on climate risks and impacts
c) Implementation guidelines for building codes in the coastal zone
d) Improved coordination and implementation of the Integrated Coastal Zone Management Plan
e) Annual monitoring, evaluation and reporting on implementation of the ICZMP

Component 1 will support the control of risks and prevention of continued infrastructure development in vulnerable coastal areas, which threatens the integrity of mangrove forests, seagrass beds, and coral ecosystems as well as native biodiversity. As infrastructure continues to be built in areas that are highly exposed and vulnerable to risks and future hazards, it is important to regulate and make recommendations for future construction in these areas to reduce of negative economic and environmental impacts and enforce national guidelines for such activities to lower vulnerabilities. The completion of this component will result in the development and implementation of a national housing policy and its accompanying implementation plan, with special focus on climate vulnerabilities in the coastal areas for coastal habitation, vulnerable groups, including women, youths and indigenous groups. To complement the building codes being developed under another project (National Adaptation Plan, funded by GCF), this project will see the preparation of building codes implementation guidelines to aid professionals, including contractors, architects, and engineers, on the use of the building codes. This component has a nationwide reach and will benefit the safety of citizens, especially vulnerable groups, and the tourism sector. The implementation of the Integrated Coastal Zone Management Plan (ICZMP) will also be strengthened. This will be achieved by acquiring the necessary software and equipment for the CZMAI to collect and process data, conducting drone mapping and ground-truthing to update an inventory of 3 planning regions (north, central, and south – identified through MCCAP, 2019), and through a participatory approach - site inspections and meetings with Community Wardens, and Coastal Advisory Committees. This strategy is in line with the recommendation to enhance cost-effectiveness and ownership through strategic partnerships (Feasibility Study Part III). This component will benefit and directly involve vulnerable groups through the implementation of plans and development on new one (plan, needs assessment, etc.), respectively.

Outcome 1.1: Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience

Rationale

Climate change is considered an important guiding factor in the development of both the national housing policy and the building codes (with focus on the coastal zone), and the Building Sector Reform, which are in line with the country's sustainable development goals (Plan Belize Medium-Term Development Strategy, 2023). The envisioned project activities will aid in reducing instances of habitation in vulnerable areas, especially the flood-prone inland communities and coastal areas, and in decreasing social and infrastructure costs due to increased resilience. It will also prevent and reduce the effects of natural hazards and of climate change on vulnerable areas, which can be exacerbated and induced by human activities. This component will have a significant impact on vulnerable populations that are at most risk from the adverse impacts of climate change. These includes marginalized and impoverished groups, such as women, youths and indigenous groups.

With the recent passing of the tropical storms, Eta and Iota, over the Central American region and Belize, the Ministry of Infrastructure Development and Housing (MIDH) recognizes that it is not only coastal communities being affected by increased frequency and intensity of tropical storms and climate change but also flood-prone inland communities. Therefore, the indirect project beneficiaries are nation-wide 419,199 persons: 209,603 males, 209,596 females (based on 2020 est., SIB), as well as 260,000 visitors (annual est.). The direct beneficiaries are the 27 coastal communities: 117,825 persons: 57,788men; 60,036 women (2010 population,

estimates for individual communities are not available, but will be at least 20% higher given the current country population estimates). Approximately 13 persons will be employed: 8 with tertiary education, 5 construction workers with secondary/primary education. Proper consideration will be provided to pursue a gender balance among staff/consultants/stakeholder beneficiaries (Gender Action Plan Annex 1 Gender and Social Assessment). The project will seek to be inclusive at all levels, including recruitment and consultations to ensure equal representation of all beneficiaries, direct and indirect.

Currently, there is a widespread expansion of communities in vulnerable areas, especially flood-prone and coastal areas, as well as tourism infrastructure such as hotels and resorts, which is leading to the unsustainable development of the coast zone. While the coast is a highly sought real estate for development, as many economic activities occur there, proper management of vulnerable and coastal areas, especially sensitive and vulnerable habitats is necessary, as they also provide high value for conservation and public enjoyment. This National Housing Policy will aid in regulating habitation in vulnerable areas, leading to more informed decision-making.

In the absence of an appropriate policy, human modification of the coastal zone for habitation and development will continue to increase, exacerbating existing threats, and future threats of a changing climate. Continued development in highly vulnerable areas increases the number of people and built infrastructure that is exposed to the impacts of climate change and natural hazards, especially impoverish populations who squat in flood prone areas. The National Housing Policy and building codes are necessary tools to guide the work of the MIDH and municipalities in addressing the housing needs of the country. The policy will address issues of land tenancy, land use planning, zoning, rentals, financial plans, subsidies, building codes, etc., and adhere to national sustainable development plans and initiatives. The National Housing Policy and codes will also serve to meet the adaptation targets of Belize's updated Nationally Determined Contribution through increased adaptive resilience. The National Housing Policy will be in line with the international conventions to which Belize is a signatory, that are related to the right to proper housing, including The Universal Declaration on Human Rights, The Habitat III Declaration, and SDG 11 Sustainable Cities and Human Settlements. At this time, when the world is facing changes like climate change, the policy and building codes will serve as a guiding tool on how to make the national housing sector resilient – while the codes are being developed under a separate project, this project will provide guidelines on the use of the building codes and capacity development of relevant stakeholders. To meet its climate change commitments, the Ministry of Infrastructure Development and Housing (MIDH) in Belize is implementing the Building Sector Reform Project that aims to contribute to the betterment of the sector through the implementation of the amendments made to the Belize Building Act in 2017.

This component will also carry climate change mitigation co-benefits. Buildings are the main energy consumers and are built using materials that emit greenhouse gasses at the production stage. Expectations are that by 2060 the global building floor area will double and, therefore the building sector stakeholders need to consider the possibilities of how to reduce the world-building sector's GHG production. Additionally, there is a demand to address the compounding needs of communities to adapt to the modified environment, which affects their way of life. Long-established construction methods and materials utilized require modification to deter the impacts of climate change being experienced in countries across the globe. Transforming the global building sector can contribute significantly to fighting climate change. Energy-efficient design of buildings can also contribute to reducing energy demand, GHG emissions, and to save money.

The building codes implementation guidelines will be one of the important tools to support the implementation of Integrated Coastal Zone Management Plan mentioned under the subcomponent 1.2 explained below.

The Lead Agency for this subcomponent is the Ministry of Infrastructure Development and Housing (MIDH).

Project Activities

This Project activity has the following outcome which is aligned with the Adaptation Fund Results Framework (Part III – Section E): *Improved National Housing Policy with a clear specification for coastal habitation.* Table 10 outlines the components, milestones, Activities, and deliverables for Outcome 1.1.

Table 10: Development of the National Housing Policy and Implementing the Building Codes

Outcomes	Milestones/ Targets	Activities	Deliverables
Development of the National Housing Policy and implementation plan encompassing climate resilient housing	National Housing Policy developed	Conduct Review of Existing Legislations, regulations and strategies related to Housing and climate change in Belize	Housing and climate change legislative and policy review report
		Consultation of stakeholders	Stakeholder consultation report
		Studying the climate change projections and vulnerabilities of Belize, with special reference to the coastal zone	Report on climate change projects and vulnerabilities for Belize's coastal zone
		Preparing a report with concrete recommendations on how to use the legislation through consolidation or amendments	Report on recommendations for legislative consolidation or amendments to enable the implementation of the National Housing Policy
		Drafting and finalizing the new Housing Policy of Belize	Belize National Housing Policy
	National Housing Policy Implementation Plan developed	Develop initial draft of implementation plan for presentation and review by lead agencies	Draft National Housing Policy Implementation Plan
		Present and share draft plan with key climate change and national housing stakeholders, including municipal bodies	Consultation report after presentation of plan to key stakeholders
		Incorporate comments and feedback and finalize implementation plan	Final Implementation Plan
Implementing the Building Codes with special reference on coastal climate resilient habitation	Implementation guidelines for building codes in the coastal zone developed and disseminated	Preparation of a discussion paper including the technical aspects of climate change sensitive building codes	Discussion paper on technical aspects of climate change sensitive building codes
		Zoning maps prepared for housing based on the climate risks and impacts in collaboration with the relevant Municipalities and authorities	Housing Zoning maps based on climate risks and impacts
		Drafting the implementation guidelines for Building Codes with special reference to climate impacts in the coastal zone	Draft Building Codes Implementation Guidelines
		Consultation of stakeholders and validation of the implementation guidelines inclusive of gender consideration and indigenous groups	Stakeholder consultation report
		Incorporate comments and feedback and building codes implementation guidelines	Final Building Codes Implementation Guidelines
Capacity building of stakeholders on implementing the building codes	Awareness raising and training for architects, engineers, contractors, designers, etc. on	Awareness creation and capacity building of the new building code implementation guidelines among the key stakeholders	Capacity Building and Communication report on use of the building codes implementation guidelines

	housing and construction using new building codes	Training for architects, engineers, contractors, designers, etc. on housing and construction using new building codes	

Outcome 1.2: Improved coordination and implementation of the ICZM Plan

Rationale
As outlined in Part I, Belize's coastal zone plays a central role in the lives and livelihoods of its citizens. It features an environment of tremendous intrinsic and extrinsic value in terms of its assets and is under pressure due to climate change and anthropogenic causes. Management of this environment is a complex task, requiring the involvement of many organizations and individuals, requiring action at the local, national, and even regional and global scales. Integrated coastal zone management (ICZM) considers the synergistic effects of all coastal activities to seek a desirable outcome. ICZM considers sustainable resource use, with environmental considerations underlying decision making in all sectors and deals holistically with the coastal environment – coastal land, the foreshore, and inshore – and being forward-looking, as well as trying to resolve problems associated with current coastal use.

The Government of Belize passed the Coastal Zone Management (CZM) Act in 1998, which provided the Coastal Zone Management Authority and Institute (CZMAI) with the mandate to develop a National Integrated Coastal Zone Management (ICZM) Plan. The Plan was endorsed by the Government in 2016; however, CZMAI is currently updating the ICZM Plan and Guidelines, and it is expected that this will be completed by the end of 2022. Under this subcomponent of the project, the CZMAI, will lead the implementation process of the updated Integrated Coastal Zone Management (ICZM) Plan and the associated management guidelines for zonation which prioritizes climate change adaptation.

Project Activities
This activity has the following outcome which is aligned with the Adaptation Fund Results Framework (Part III – Section E): Improved coordination and implementation of the Integrated Coastal Zone Management Plan and associated management guidelines for zonation to promote and enforce resilience measures. Table 11 outlines the components, milestones, activities, and deliverables for Outcome 1.2.

Outputs

- Updated coastal land use inventory
- Annual Monitoring and Evaluation of Implementation of the ICZM Plan
- ICZM plan implementation process established and initiated with stakeholder engagement

The Lead Agency for this subcomponent is The Coastal Zone Management Authority & Institute (CZMAI).

Table 11: Improved coordination and implementation of the ICZM Plan

Components	Milestones / Targets	Activities	Deliverables
Updated land use inventory of three existing coastal planning regions (northern, central and southern)	Drone mapping and ground-truthing conducted	Procure necessary software and equipment for data collection and processing Utilize software and equipment for data collection and analysis	Software and hardware for drone mapping procured and reflected in procurement plan Drone mapping and ground-truthing data uploaded to CZMAI spatial database
	Coastal Land Use Inventory updated	Updating the Coastal Land Use Inventory to update the register for three planning regions in northern, central, and southern Belize.	Updated register on coastal land use inventory data for northern, central, and southern planning regions
Annual Monitoring and Evaluation of Implementation of the ICZM plan	Annual reporting of progress made with implementation of the ICZM plan conducted by the CZMAI in accordance with Monitoring and Evaluation Framework for updated ICZM plan	Collect information on Implementation progress of the ICZM Plan in accordance with the M&E Framework Prepare annual reports on implementation progress of the ICZM plan	Annual implementation progress reports, including recommendations for improvement of ICZM plan implementation

		Share reports with national stakeholders	
ICZM plan implementation process established and initiated with stakeholder engagement	Regular site inspections and meetings conducted and recorded.	Conduct site inspections, meetings with Community Wardens, and Coastal Advisory Committees to monitor compliance with the Coastal Zone Management guidelines	Inspection reports, meeting minutes

The updated land use inventory for the northern, central, and southern coastal regions will support the updating of the Integrated Coastal Zone Management Plan and development guidelines being developed under a separate project. The updating will take into consideration the analysis of coastal alignment and trends linked to habitation and vulnerabilities. These guidelines, which will be developed in a participatory manner with community stakeholders will aim at supporting the sustainable use and management of Belize's coastal resources. The guidelines will result in protecting sensitive habitats that provide ecosystem services that communities benefit from. Successful implementation of the ICZMP will therefore have direct benefits to all community stakeholders in the coastal zone. The direct beneficiaries of this component are the 27 coastal communities which will have better management options - including 117,825 persons: 57,788 men; 60,036 women. Approximately 12 coastal wardens/advisors with secondary/primary education will be targeted to participate in the program on a volunteer basis. CZMAI already has established wardens in three communities including Hopkins, Barranco and Punta Negra. These individuals have undergone training by CZMAI staff and are providing reports on infractions and issues affecting their community via a WhatsApp group established to facilitate ease in communication and to assist in sharing photos, etc. Individuals will be invited to become wardens in other coastal communities as well. These wardens will be selected according to an established criteria to ensure committed individuals are chosen. The criteria were developed during a past project implemented and will be updated when the new wardens are onboarded through CZMAI. The volunteer program will be linked to existing environmental outreach programs from NGOs and CZMAI that work in the coastal areas. The volunteers will be trained from a cadre of high school students and capacity development will be continuous and recruiting more as others become unavailable due to continuing their education. This approach will also support the long-term sustainability of the program because it will use existing environmental education outreach programs from organizations with a long history of working in the coastal communities the project will focus its interventions. The volunteer program will also serve the purpose of increasing awareness and education on the importance of the coastal zone in building resilience to climate change, while building community stewardship and pride on the protection of our coastal zone.

CZMAI, as a key executing agency of the project will continue to use the Coastal Advisory Council (CACs) and community warden program to promote women and the involvement of youths male/female students in the implementation of project activities by promoting equal opportunities for all.

Furthermore, the CAC and community warden program will also serve as a medium to support the knowledge transfer and lessons learned from the project as is currently being done with other projects and initiatives that CZMAI is engaged in. The current Terms of Reference (ToR) for the CACs include the following objectives:

- To promote, monitor and report to the Coastal Zone Management Authority and Institute on the implementation and effectiveness of the Development Guidelines, and other policies and guidelines for coastal resource management for each coastal region
- To act as a forum for the discussion of coastal issues on a national scale

Additionally, the following is done when introducing new project/ activities:

1. Insert an agenda item to socialize the project, objectives, and activities for respective communities.
2. Insert an agenda item to obtain feedback/ lessons learnt on activities being implemented to allow for continued updates and recommendations from the local level.

Through the CACs, the implementing agencies will be able to ensure knowledge dissemination and important feedback to allow for the effective implementation of the activities.

The three planning regions selected for the updating of the coastal land use inventory are the Northern Planning Region, Central Planning Region, and Southern Planning Regions as the most relevant and with higher level of impacts for which management guidelines were developed. These planning regions were developed under the Adaptation Fund funded project 'Marine Conservation and Climate Adaptation Project.'

Past coastal alignment spatial data will be collected and analyzed to determine trends in coastal erosion, which is linked to component 2 of the project, Coastal Vulnerability Monitoring. This activity intends to build mechanisms to support informed and wise planning of Belize's coast for sustainable future development and shall propose and enforce goals and objectives to govern the use of land and water in Belize's coastal zone through the implementation of the ICZM Plan. The component will build on and support the implementation of the guidelines for zonation that already exist under the CZMAI.

Project Details

I. Procuring necessary software and equipment for data collection and processing for urban planning using remote sensing software and monitoring equipment. Data collected will be used to improve building codes to be tailored to land type.
II. Continuing drone mapping and ground-truthing exercise to update the Coastal Land Use Inventory to update the register for three planning regions in the northern, central, and southern Belize. This activity entails conducting the inventory of development sites and activities for coastal areas within three regions to gather baseline data to further analyze

development best practices and recommendations outlined within the ICZMP region-specific guidelines. The inventory included building footprints of the regions to determine the human land uses by collecting drone imagery and validation via ground-truthing. The coastal area of Belize has been targeted by local and foreign investors for the development of the public and private sectors. Most Belizean livelihoods are linked to coastal resources, which makes the task of managing and allocating its usage much more challenging. The data collected serves as the baseline data for coastal development; furthermore, this data serves as an important dataset that can be used in spatial planning regarding disaster risk management, climate change adaptation, and sustainable building practices in Belize, with the relevant regulatory agencies and stakeholders.

III. Conducting site inspections, meetings with Community Wardens, and Coastal Advisory Committees to monitor compliance with the Coastal Zone Management guidelines. This activity entails conducting meetings with community groups known as Community Wardens as well as local level groups known as Coastal Advisory Committees (CAC's). These groups have participated in sessions where the contents and recommendations in the ICZM Plan which includes the recommendations on climate change were socialized. Therefore, by conducting meetings with these groups CZMAI will be able to promote the implementation of these recommendations in the ICZM Plan and further inform communities on the impacts of climate change and the importance of following these recommendations to increase adaptive capacities. One such recommendation would be to promote ecosystem-based adaptation in these communities. Community members can help with this by protecting local habitats that are known to provide coastal protection such as mangroves and coral reefs. Also, through these meetings, new community warden groups will be established in other communities which will ensure that more coastal communities are made aware of these impacts and recommendations to increase their local adaptive capacities. As part of the sessions with the community warden, their capacity in monitoring changes in the beach profile will be enhance, as they will form an integral role in the long-term sustainability of the community warden program and the monitoring of the beach area where the project interventions are focused on. Coupling the coastal community wardens volunteer program with existing programs from stakeholder organizations who work in the coastal zone, will enhance the effectiveness of the program and its buy-in from coastal communities.

IV. Lastly, the ICZM Plan was endorsed by the Cabinet in 2016. These meetings will be a medium to monitor and report on the implementation of the ICZM Plan and guidelines. The meetings will be used to collect information on new climate change issues that may have become evident in local communities since the passing of the 2016 ICZM Plan. This information will be used to develop updated recommendations to further increasing these communities' adaptive capacities. These updated recommendations will be provided to national stakeholders to ensure these recommendations are implemented at a national level to increase the nation's adaptive capacity to climate change. Community Wardens and CAC's will be present in all the coastal planning regions. If these meetings are completed, CZMAI will be in compliance with carrying out implementation of the plan in all the coastal planning regions and therefore increased the adaptive capacity to climate change nationally.

The implementation of the ICZMP and guidelines for zonation is crucial in decreasing climate change vulnerability, as it will allow the rational and orderly development of coastal land in an environmentally sound manner to ensure the sustainable development of human settlements and infrastructure that are resilient to climatic changes and its impacts. The latter is of high importance as the ICZMP indicates that six of the ten major residential centers in Belize are located on the coast. "Despite a stated policy to relocate housing inland due to sea-level rise and hurricane vulnerability, all coastal centers are experiencing growth to varying degrees, and frequently into flood-prone areas. Development is undertaken by both the public and private sectors, with the latter involved primarily in sub-divisions in several coastal locations, often targeting foreign markets and retirees" (CZMAI, 2016). Therefore, the Plan is a crucial tool to regulate coastal construction and protect nature, people, and investments. The utilization of zonation guidelines will allow the needs of the population, in terms of housing, infrastructure, tourism development, etc., to be met within areas that are suitable for each type of activity with minimal or no negative impacts on the terrestrial and/or marine environments. It will promote those areas vulnerable to natural hazards or disasters, areas with unsuitable terrain (such as swamps), or areas that endanger the health and safety of the population are not further developed. With proper implementation and enforcement, areas identified for different activities (residential, industrial, tourism, etc.) can be divided into zones in which specific land uses will be permitted or prohibited. It may also regulate the size and placement of buildings and other conditional uses of the land.

Component 2: Coastal Vulnerability Monitoring and Early Warning

The Component 2, Coastal Vulnerability Monitoring and Early Warning, seeks to integrate the impacts of climate change to coastal zone management practices by carrying out critical assessments and monitoring. This component includes the assessment of saline intrusion and the development of a program to track its impacts. This component will also benefit the coastal communities and the agriculture and mariculture sectors. It is crucial to collect salinity data due to the implications of salinization to, amongst others, human health, agricultural production, water quality, and ecological health. A National Beach Erosion Monitoring Program will also be established to monitor coastal/beach erosion, utilizing a broad range of stakeholders including NGOs and academia which are already within the management of Belize's national protected areas system for on the ground monitoring, with the CZMAI coordinating the related activities. Beach erosion monitoring is a first step in the maintenance of the coastal system (structures, land features, and ecosystems): ensuring optimal levels of serviceability and safety and minimizing costs and environmental impact. These two outcomes in component II will aid in planning for climate-resilient infrastructure as they will examine vulnerabilities of saline intrusion and erosion, thus avoiding development in areas that may be highly impacted by these. The Monitoring component also includes strengthening the National Meteorological Service to develop a coastal early warning system (EWS) and model storm surge. This will be a first step (step 1 of 4) towards developing a fully established system for observation (monitoring) and data collection to detect disaster risks/storm surge as soon as possible. Subsequent steps – for which financing will be sought for after completion of phase 1- include wave modeling, coastal inundation and connection with a web-based management system, and EWS extension for offline analysis.

The EWS will integrate existing sea-state monitoring technology, numerical ocean forecasting models, historical database and experiences, and computer science. This component has a close interlinkage with the development and implementation of the ICZMP as it will help both CZMAI and NMS to make better informed decisions for management purposes.

Outcome 2.1 Strengthened data availability for the development of a national coastal saline intrusion program

Rationale
Sea-level rise, in combination with increased groundwater pumping, can increase saltwater intrusion in groundwater aquifers. Saltwater intrusion, through surface or groundwater aquifers, increases treatment costs for drinking water facilities (decreased quality) or renders groundwater wells unusable (decreased availability). As the sea levels rise, the "salt front" (location of the freshwater-saltwater line) can migrate upstream. This encroachment can be worsened by drought, reduced rainfall, or changes in water use and demand. Saltwater intrusion can result in the need for water utilities to increase treatment, relocate water intakes, or develop alternate sources of freshwater.

There is no national program for groundwater data collection aimed at water quality or quantity in Belize, despite the increasing demand from informal village water supply systems and agricultural activity. The proposed project will address these knowledge gaps by providing data and information that can be used to form a component of a more comprehensive program of monitoring and investigation.

The National Hydrological Service will lead this monitoring program that is crucial to determine the saline intrusion zone for the country to support a sustainable water resources development plan for Belize's groundwater resources and key aquifers. This subcomponent will also determine the risk of future soil salinization to assist the agriculture sector in identifying crop cultivation zones with high potential for impact to production yields. It will result in the identification of the best uses for the land and the spectrum of activities that are appropriate for zones with high salinity. The study will provide vital information for Water Resource Management (WRM): the development of a National Water Master Plan, Water Quality Control Plan, and Water Vulnerability Profile. WRM is a necessary condition of the Growth and Sustainable Development Strategy; that envisioned the need for a Water Master Plan, a National Groundwater and Surface Water Assessment, and a Water Vulnerability Profile. Also, Belize's updated NDC calls for the initiation of the National Integrated Water Resources Management programme, including the implementation of a national water quality monitoring programme. Apart from Hydrology and Agriculture (e.g. production of food crops), this component also links to the health sector, because amongst others water and food shortages and contamination have a negative correlation to people's health and well-being.

Project Activity
This activity has the following outcome which is aligned with the Adaptation Fund Results Framework (Part III – Section E): Strengthened institutional capacity for saline data collection. Table 12 outlines the components, milestones, activities, and deliverables for Outcome 2.1.

The Lead Agency for this subcomponent is the National Hydrological Service (NHS) within the Ministry of Natural Resources, Mining and Petroleum.

Table 12: Strengthened data availability for the development of a national coastal saline intrusion program

Components	Milestones / Targets	Activities	Deliverables
Enhanced evidence-based knowledge to determine best use practices for freshwater supply for the coastal areas, while reducing probability of further saline intrusion	Existing data on groundwater in the country evaluated and reported	Collate existing soils, geology, terrain, and groundwater information (where available) and consolidate into a common platform for visual assessment and mapping Complete preliminary groundwater flow assessment including directions, estimated rates of flow, and potential dynamics regarding the freshwater-saltwater front along with coastal areas.	Maps based on analysis of soil, geology, terrain, and groundwater data Groundwater flow assessment report
	Soil salinities determined and documented	Procurement of equipment and other tools for research on groundwater, water quality, and soil salinity Measure the electrical conductivity (EC) of the upper soil horizons	Equipment procured and reflected in the procurement plan Database on electrical conductivity data for upper soil horizons

	Water quality analyses to determine the effect of water quality on coastal influences and agricultural activity conducted	Select areas to target for field investigation	Map with GPS coordinates of selected sites
		Plan and execute a field program to assess and verify soil salinity conditions	Program for collection of soil salinity data in the field
		Correlate soil salinity results to crop productivity by review of historical records, visual inspections, and/or interviews with local farmer operators	Maps and other GIS products showing correlation of crop productivity with soil salinity
		Update GIS products to reflect newly acquired information	
		Conduct saline intrusion risk mapping considering current and future conditions under various extreme weather and climate change scenarios	Saline intrusion risk maps based on different weather and climate change scenarios
	Geophysical Surveys being used	Collate information on locations of various farming operations (crops and livestock), including information on land application of fertilizers and agricultural wastes	National map of crop and livestock farming with data on land application of fertilizers and agricultural waste
		From the maps on crop and livestock farming and fertilizer use, select potential high-risk areas and develop a field program to assess the chemical quality of groundwater in those areas	Field program to assess chemical quality of groundwater in high-risk areas
		Use the information gathered from the field program to assess the risk to groundwater	Risk assessment of groundwater report, inclusive of relevant maps and other GIS products
		Groundwater risk mapping considering current and future conditions (under various extreme weather and climate change scenarios)	Groundwater risk maps based on different weather and climate change scenarios
	Capacity Building of / Technology Transfer to stakeholders[8] process completed	Develop training tools related to capacity building of / technology transfer are being developed	Training tools for capacity building and knowledge transfer to stakeholders
		Conduct workshop/field visit for training purposes	Workshop/field visit report

Salinization of soils and water can have significant social, environmental, and financial impacts for communities because they depend on water for their sustenance, and it can also impact the viability of the primary sectors. Salinity can affect human health, agricultural production, water quality, the ecological health of streams, terrestrial biodiversity, soil erosion, flood risk and infrastructure, fixtures. Coastal communities are more susceptible to saltwater encroachments given the impacts of climate change with rising sea levels coupled with the coast being predominantly lowlands, increased drought, and changes in precipitation, be it less frequent with high intensity or the reverse. As was experienced in 2019, when there was a meteorological and hydrological drought that resulted in an agricultural drought, losses to farmers were so substantial that a State of emergency was declared.

[8] This activity is linked to component 4 'Awareness Raising, Knowledge Dissemination and National Capacity Strengthening'.

This study can assist farmers by educating them as to the state of their water and soil resources, determining which crop to cultivate, and reduce negative financial losses.

The direct beneficiaries of this component are approximately 7,944 farmers per district, rural water system operators, 27 coastal communities: 117,823 persons: 57,787 men; 60,035 women (Table 2), Belize Water Services Ltd, purified water providers. The mariculture sector will also benefit, considering that since gillnets are banned, mariculture is another alternative source fisherfolk will need to rely on. Approximately 50 persons will be trained under this component. Proper consideration will be provided to pursue a gender balance among staff/consultants/stakeholder beneficiaries.

Detail of Activities:

Evaluate existing data on groundwater in the country
Groundwater flow is driven by differences in hydraulic head across the aquifer. A review of existing groundwater level data will be used, in conjunction with hydrogeological principles, to provide an initial assessment of the groundwater flow regimes within the study area.

Determine the salinity of soils
Shallow soil salinity is determined by measuring the electrical conductivity (EC) of the upper soil horizons by preparing a soil-water mixture and assessing it using an EC probe. Large surficial areas can be assessed more broadly by the completion of terrain conductivity surveys using depth-integrated measurements of electromagnetic readings that can extend several meters to 10s of meters into the subsurface for deeper reconnaissance. The higher the salinity of the soil and associated porewater, the higher the ability of the soil to conduct an electrical current. Soil salinity negatively impacts crop yields; therefore, with limited knowledge in this subject area, it is challenging for farmers to ascertain whether soil salinity is the culprit responsible for the reduction of their crop yields. The goal of this task is to assess and map soil salinity and link this to current and future crop productivity vulnerability and risk.

Conduct water quality analyses to determine the effect of water quality on coastal influences and agricultural activity
Measuring the EC, chloride (Cl^-), and sodium (Na^+) concentrations in shallow groundwater along coastal areas provides data on the extent of seawater intrusion (including the highest risk areas) and provides the basis for future projections regarding groundwater quality under various sea-level rise and groundwater use scenarios. This is also amenable to geophysical surveys (see the following section). Concerning agricultural influences, common sources of influence include nutrients related to fertilizers, sewage effluents, and animal and food processing wastes. Implementation of this task will include the following activities:

- Select areas to target for field investigation
- Plan and execute a field program to assess and verify soil salinity conditions
    - Outline logistical considerations and program risks (health, safety, financial, schedule, etc.)
    - Identify water wells and potentially affected surface water features to sample
    - Execute sampling and comprehensive analytical program (field: pH, EC; laboratory: soluble ions)
    - Develop suitable QA/QC protocol to ensure data confidence (duplicates, blanks, spikes, etc.)
    - Complete the data evaluation process
- Correlate soil salinity results to crop productivity by review of historical records, visual inspections, and/or interviews with local farmer operators
- Update GIS products to reflect newly acquired information
- Saline intrusion risk mapping considering current and future conditions (under various extreme weather and climate change scenarios)

Use of Geophysical Surveys
Completion of geophysical surveys will provide the spatial data density necessary to resolve the extent of saline water intrusion along with the coastal areas. This will be accomplished by electromagnetic (EM) mapping or processing of multispectral satellite imagery. Implementation of this task will include the following activities:

- Collate information on locations of various farming operations (crops and livestock)
- Review land application of fertilizers and agricultural wastes
- Using the results from activities #1 and #2, develop a field program to assess the chemical quality of groundwater in high-risk areas
    - Outline logistical considerations and program risks (health, safety, financial, schedule, etc.)
    - Identify water wells and potentially affected surface water features to sample
    - Execute sampling and comprehensive analytical program (field: pH, EC, temperature, and possibly redox; laboratory: major ions, nutrients (C, N, P), metals and trace elements (e.g. As, Se)
    - Complete data evaluation process to assess groundwater quality conditions
- Use the information gathered from the field program to assess the risk to groundwater
- Groundwater risk mapping considering current and future conditions (under various extreme weather and climate change scenarios)

Capacity Building of / Technology Transfer to stakeholders.
To facilitate the transfer of knowledge and skills to in-country stakeholders a workshop/field visit will be executed to train personnel in the use of equipment, overall methodology, and results from evaluation to facilitate future assessments.

Outcome 2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize

Rationale
Next to the reef and lush tropical forests, the beaches and shoreline of Belize are some of the most iconic features that characterize Belize. They embellish the notion of life in the tropics and serve as an attraction for tourists around the world. As a result of its multiple uses and prestige, beach and shoreline properties along the coast have become highly coveted.

When erosion affects beaches, they degrade at varying pace and the beach may even disappear in several places. Erosion takes place at cliff slopes and beaches and also below the water. Water depths increase in front of existing coastal protection structures, which may lead to (extensive) damage during extreme storms.

In Belize, beach erosion is significant on the mainland, as well as (smaller offshore) outer cayes. The national beach erosion program is urgent and critical in informing a resilient coastal zone management. Localized efforts, as are currently conducted will fail to have the required impact due to the nature of coastal erosion, especially as it is exacerbated by climate change. The implementation of a national coastal Monitoring Program for Beach Erosion will be led by the Coastal Zone Management Authority and Institute (CZMAI) to monitor shoreline change and develop a baseline for coastal erosion in key areas in Belize. Available techniques will be analyzed to determine suitability, and a participatory process is envisioned with partnerships, including the Ministry of Natural Resources, Caribbean Community Climate Change Centre, Non-Government Organization's-NGOs (e.g., Southern Environmental Association (SEA), Sarteneja Alliance for Conservation and Development (SACD), Toledo Institute and Development for Environment (TIDE), Turneffe Atoll Sustainability Association (TASA)), University of Belize (Science and Technology Department), University of Belize (Environmental Research Institute), municipalities/communities, and private sector (tourism sites etc.). In addition to the technical partners for the implementation of this sub-component, local, community-based stakeholders will be engaged, which will support the sustainability of the interventions and increase the awareness of the importance of the coastal zone in building resilience to climate change.

The above local NGOs are already a part of established monitoring networks such as the National Coral Reef Monitoring Network (NCRMN) which is done on a voluntary basis to discuss monitoring data, trends etc. Each organization attracts and sustains funding for its own coral reef monitoring program, albeit there are some jointly funded national and regional programs. However, it is envisioned that the beach erosion monitoring program will be established based on key target sites to be identified during the assessment stage and as a result of these sites, the local NGOs in these areas would be identified and would become a part of the community network for on the ground monitoring. The beach erosion monitoring would become a part of the site's monitoring program and the NGOs, once capacity and equipment are provided, will be able to use this to leverage funding support for the continued implementation of the beach erosion monitoring at the sites. Close working relationships already exists with all NGOs along the coast, which are always seeking to increase their knowledge and capacity for improved management of their respective coastal areas. The resourcing with required equipment will be an incentive to stakeholders to participate and sustain the beach profiling, while capacity development will support stakeholder buy-in and institutionalization of the monitoring program.

Additionally, it is envisioned that the monitoring program would utilize cost effective methods such as beach profile monitoring apps that would not require a significant investment in equipment and training (See Figure 14). This approach also provides the opportunity for additional sites to be monitored on a voluntary basis by other beach users such as property owners and community members.

CZMAI will be responsible for coordination of the monitoring program with members of the network to analyze and report on trends as well as host the database with baseline information.

In terms of sustainability, CZMAI would take the lead in developing new projects, initiatives, and partnerships to sustain and expand the national beach monitoring program established through this project.

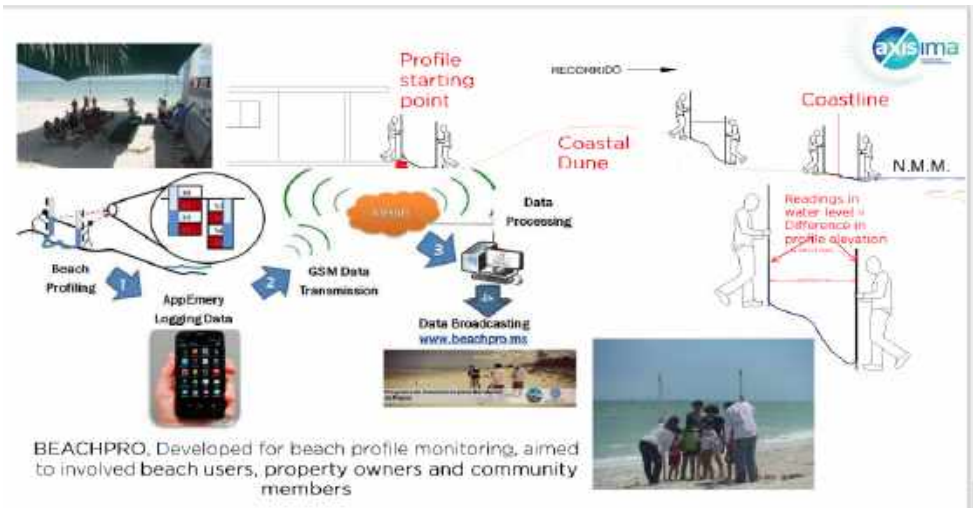


Figure 14: BeachPro Methodology

Figure 15: Sample of BeachPro Activity in Mexico

Project Activity

This activity has the following outcome which is aligned with the Adaptation Fund Results Framework (Part III – Section E): Strengthened institutional capacity to reduce beach erosion risks. Table 13 outlines the components, milestones, Activities, and deliverables for Outcome 2.2.

The Lead Agency for this subcomponent is the CZMAI.

Table 13: Develop and implement a National Beach Erosion Monitoring Program

Components	Milestones / Targets	Activities	Deliverable
Development and implementation of a coastal erosion monitoring program	Assessment of methodology/ techniques for monitoring beach erosion to determine best option for Belize	Conduct analysis on techniques available to quantify beach erosion to determine the most suitable, cost-effective option.	Report on the assessment of different options for beach erosion monitoring, including recommended option for Belize
	Network for community coastal erosion monitoring established,	In consultation with lead agency, develop ToR and member profiles for community	Terms of Reference and member profiles for coastal erosion monitoring network

	along with mechanism to ensure sustainability and funding	coastal erosion monitoring network Recruit members Assess options for sustainability of funding to maintain the network	 Minutes of inaugural session Report on recommendations for sustainability of network
	Database for the data collection and storage established	Identification of necessary equipment, hardware and software for data collection and database development Hardware and software for database procured Establish a database	List of hardware and software along with specifications Hardware and software procured and reflected in procurement plan National database on beach erosion data
	Training to the community network on protocols for monitoring and reporting provided	Develop a training program to train community network on data collection	Community network training manual
	The capacity of the CZMAI to coordinate, maintain, conduct analysis, and do outreach for the monitoring program strengthened	Development of a training program to train CZMAI staff on analysis and reporting	Training manual on data analysis and outreach for coastal erosion monitoring
	A designated Coastal monitoring officer recruited to assist with project implementation	Develop ToR, Advertise, Select and hire officer Implementation of project activities	Signed contract with selected applicant Monthly progress reports from Coastal Monitoring Officer

Detail of Activities

Coastal Research and Monitoring. Conducting coastal research at the national level requires an integrated approach, which combines diverse efforts. Benefits of research and monitoring can be summarized as follows: Improving forecasting of future uses of the coastal zone by knowing the effects of events, processes, and activities; Maintaining ecosystem functions by understanding the relationships between and among its components; Effectively planning by monitoring the changes in use and interactions by coastal communities; and providing sound data to incorporate into modeling programs, thus improving management. As a part of the implementation strategy for the Belize Integrated Coastal Zone Management Plan, CZMAI will focus its efforts on establishing a beach erosion monitoring program that will include:

i. Analyze techniques/methodologies/applications available to monitor beach erosion to determine best cost-effective option for Belize
ii. Identify necessary equipment, hardware and software for data collection and database development.
iii. Develop a database for data collection and storage.
iv. Conduct training for community network/stakeholders and CZMAI on data collection, analysis, and reporting.

Strong local presence through community partnerships. The ICZM Plan indicates the need for implementing strategies for promoting or improving community involvement in the management of the sites and promoting economic development strategies while ensuring environmental sustainability. This will result in diversified income generation options and reduce the number of people who rely on the coastal resource base to support their livelihoods. Deriving from best practices, such as improving the effectiveness of MPAs, CZMAI recognizes the importance of enlisting the support of local communities and stakeholders in research, education, and enforcement efforts, and offering incentives for them to do so. As such the analysis above under coastal research and monitoring will include the following:

i. Establishing a community network for on the ground monitoring
ii. Develop Terms of Reference and member profiles
iii. Developing a mechanism to ensure sustainability and funding for the community network after the project has been completed. The development of a mechanism and identifying funding sources is key to ensuring the sustainability of this monitoring program. By identifying these sources CZMAI and partners will be able to work towards accessing funding for continued monitoring. It is also necessary to ensure that key personnel from the CZMAI are properly trained and have the necessary equipment to continue monitoring after the completion of the project.

Develop and implement training schedules and training programs. The ICZM Plan calls for enhancing the technical and management capacity of both management and co-management agencies to ensure sound management practices. This Plan strategizes providing training for monitoring officers and partner stakeholder groups to improve performance and monitoring. In line with this intention, the following interventions will be conducted in an effort to establish the monitoring program:

i. Providing training to CZMAI and the community network on protocols for monitoring and reporting
ii. Building capacity of the CZMAI to coordinate, maintain, conduct analysis, and do outreach for the monitoring program
iii. Strengthening implementation capacity through improved monitoring and evaluation.

The direct beneficiaries of this component are the 27 coastal communities - 117,823 persons: 57,787 men; 60,035 women. Approximately 8 persons will be employed: 4 with tertiary education, 4 community members with secondary/primary education. Approximately 50 persons will be trained. Proper consideration will be provided to pursue a gender balance among staff/consultants/stakeholder beneficiaries.

Outcome 2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge

Rationale
The frequency of climate hazards is increasing in the region and Belize. Their magnitude depends on the intensity of the natural hazard and the effectiveness of prevention/mitigation actions. Natural hazard events cannot be prevented from occurring, but their impacts on people and property can be reduced if accurate information can be provided to people on time, giving them time to prepare and adapt. An early warning system is therefore critical to mitigating the loss of life and property from coastal flooding.

The purpose of this component is to take the first steps (Phase 1) towards building the infrastructural capacity of the National Meteorological Service to develop a coastal early warning system and model storm surge (EWS)[9]. The EWS will integrate existing sea-state monitoring technology, numerical ocean forecasting models, historical database and experiences, and computer science. The envisioned system will possess the capability of offering historical data current weather data, and future projections. The system will be developed for the Belizean coast due to the threat posed by weather hazards, which are exacerbated by various factors of climate change.

Development of a full EWS requires four phases:

Phase 1 – EWS development & Storm Surge modeling
This phase includes an initial set-up of the coastal EWS with Delft-FEWS. A Delft3D-FM storm surge model will be developed to run in operational mode. With the completion of phase 1, a Stand-Alone version of the EWS will be running operationally at NMS.

Phase 2 – EWS extension: Wave modeling& WES
The coastal EWS will be extended to include the effect of waves. There are various technical solutions available to introduce the effect of waves. Which solution is most appropriate depends (among others) on the position of the reef (barrier reef, fringing reef).

Phase 3 – EWS extension: Coastal inundation & connection with web-based management system
In this phase, the EWS can be extended from a stand-alone system to a client-server environment. A client-server system has several advantages regarding robustness, parallel execution of tasks, number of users, back-up and archiving facilities, etc. Whether or not the EWS will be migrated from Stand-Alone to client-Server will be discussed at the start of phase 3.

Phase 4 – EWS extension: Offline analysis & update of coastal models
During this phase, a copy of the EWS will be configured to run offline scenarios to facilitate coastal risk analysis. If needed the existing coastal models will be extended to support water quality modeling, compound flooding, etc.

The establishment of Weather Stations/Sensors is important because real-time data is required to import into the system for assimilation purposes, and for their direct function of monitoring the coastal sea conditions.

Project Activities
Recognizing that the full EWS cannot be set up with available resources, this activity is limited to the following objectives which are aligned with the Adaptation Fund Results Framework (Part III – Section E): Strengthened the institutional capacity to reduce climate related risks such as coastal flooding[10] and storm surge.

[9] An EWS is a preparedness measure that reduces the damages related to coastal flooding and storm surges. The development of a full EWS requires 4 phases. The AF proposal relates to implementation of Phase 1 – EWS development & Storm Surge modelling. This is a first step towards implementing Belize's vision for establishing a full EWS. Flooding (coastal, riverine, pluvial, etc. or any combination) is a function of Hydrological Services and the mandate of NHS. Storm surge EWS is a function of Meteorological Services and the mandate of NMS. NMS and NHS will collaborate to have a joint system where the data from the storm surge monitoring system and coastal flood warning system are incorporated.

[10] The mandate for flooding lies within the National Hydrological Service. Hence the institutional strengthening for the establishment of the system would extend to the NHS.

The Lead Agency for this subcomponent is the National Meteorological Service (NMS).

Table 14: Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge

Components	Milestones / Targets	Activities	Deliverable
Early Warning System (EWS) Development & Storm Surge modeling (Phase 1 of a full EWS)	User requirements of the EWS refined	Develop ToR and hire a consultancy firm Meet to link with existing Early Warning procedures	ToR for consultancy services Signed contract with firm Deliverables of consultancy: Report on existing early warning procedures, User Requirements Report List of software and hardware requirements with specifications
	A Delft3D-FM storm surge model for Belize coastal area developed	Purchase physical server or workstation Collect relevant geographic data sets for coastal model development (Include regional/seasonal water level variations from ocean models (HYCOM)) Collect data for model validation Storm surge model validation	Software and hardware purchased and reflected in procurement plan Database of coastal modelling data Database to include model validation data Storm surge model validation report
	A Delft-FEWS based EWS set-up	Discuss technical architecture (IT) for the importation and integration of other existing products and models Import of NWP (NOAA GFS, Local products Belize Meteorological Service) and integration of SURFACE/PLUVO Import, validation, and visualization of real-time observations of wind, air pressure, water levels, wave parameters, etc. Run storm surge model in operational mode	Verification from Lead Agency that local products and other models have been integrated into EWS, have been tested and validated, and that storm surge model is in operation mode
	Early Warning Products Designed and Developed	Develop threshold tables, maps, color-coded warnings, etc. Develop common Alerting Protocol (CAP) Meet with stakeholders	Tables, maps, field color-coded warning signs CAP Stakeholder meeting minutes
	Staff trained	Train NMS staff in Delft-FEWS, coastal processes, and modeling	Training session report

The establishment of Weather Stations/Sensors along the coast	Weather Stations/Sensors utilized for data collection	Conduct stakeholder consultations to determine the number of weather stations and sensors required	Stakeholder consultations report
		Select a site to establish weather stations	Map showing location of required weather stations and sensors
		Purchase one field vehicle	Evidence of purchase: receipt, vehicle warranty document, certificate of registration
		Purchase and installation of weather monitoring stations and water level sensors	Weather monitoring stations and water level sensors procured and reflected in procurement plan; pictures of installed products; report on number of location of installations; verification from responsible agency that installations have been tested and are operational
		Utilize assets to strengthen weather data collection	Database of data gathered from new installations

Detail of Activities

Training of NMS staff is considered an essential activity to be able to use the new technologies. Not only for the forecasters to be able to use the system, but also for experts to be able to make informed decisions about further extensions to the system in phase 2.

The technical specifications of these two project components are included in the Feasibility Study (Annex 2 – Part II, Section Research and Technologies)

The above activities will lead to an efficiently coordinated response that will protect human life and therefore ensure their wellbeing. These activities will enhance national capacities to provide early warning to residents in communities vulnerable to storm surge, coastal flooding, and wave action. The direct beneficiaries of this project component include the 27 coastal communities - 117,823 persons: 57,787 men; 60,035 women. Early warning to these vulnerable communities will help to prevent loss of lives and damage to property where possible. Residents will be able to evacuate hazardous areas promptly and be able to secure and protect some of their properties. Approximately 50 persons will be trained. Given the size of Belize, the EWS will have the potential of benefiting inland communities as well, indirectly. With the width of Belize being just over 60 miles, the impacts of storm extend throughout the entire country, especially precipitation and wind.

The above activities will lead to an efficiently coordinated response that will protect human life and therefore ensure their wellbeing. These activities will enhance national capacities to provide early warning to residents in communities vulnerable to storm surge, coastal flooding, and wave action. The direct beneficiaries of this project include all coastal communities of the country. Early warning to these vulnerable communities will help to prevent loss of lives and damage to property where possible. Residents will be able to evacuate hazardous areas promptly and be able to secure and protect some of their properties.

Phase 1 of The Belize Coastal Early Warning System will monitor and send alerts to communities along the coast of Belize which are vulnerable to storm surges. The system will monitor in real-time the conditions of coastal Belize with the use of automatic weather station equipment with either radar or pressure transducer water level sensors and will alert the targeted coastal communities to the potential hazards from Storm surges.

A physical workstation type PC or server will be purchased to run DELT FEWS and 3D model software. This activity will also be coordinated with the ERCAP project since DELT FEWS will be installed and run for the Macal River modeling portion of the ERCAP project. Under ERCAP a lower specified PC will be running FEWS however to add the 3D model capabilities a more powerful machine will be needed. The system will incorporate DELT FEWS, DELFT3D FM software applications along with leveraging the existing National Meteorological Service Climate data management System (SURFACE/PLUVO) which can import static geographic information files as well as a variety of Atmospheric and Oceanic model data to provide the necessary products and alerts to the targeted communities along the coast of Belize.

The ERCAP is providing 23 full weather stations 12 of which will be located along the coast of Belize as well as offshore. NMS will conduct consultations to determine the number of stations that would be needed, and the number of sensors needed to upgrade stations that should be received via the ERCAP project.

The beneficiaries of this component are 27 coastal communities - 117,825 persons: 57,788 men; 60,036 women. A team of approximately 4 consultants with tertiary education is needed. Approximately 8 persons will be trained.

Component 3: Beach Stabilization of High- and Medium-Risk Coastal Areas

Component 3, Beach Stabilization of High-Risk and Medium-Risk Coastal Areas, will seek to recover beach loss due to erosion and reach shore stabilization in the northern part of the southern community of Dangriga Town. This component will directly benefit the members of the selected coastal community by improving the stability of the northern coastal beach, which lines the entire eastern boundary of the town. The long-term impacts would include securing local infrastructure, increasing tourism, and recreation activities tied to beach use and intrinsic national value. Dangriga, the target community under this project component, falls under the highest category of the coastal hazard index (Blue Carbon Working Group, 2020).

Component 3 supports the rehabilitation and restoration of high-risk coastal areas in Dangriga Town. It is proposed to focus on 2,745meters of shoreline in Dangriga Town to rehabilitate, restore and strengthen the resilience of critical infrastructure. Adaptation measures will include soft engineering measures, including recovery, maintenance, and protective works. These measures will be implemented in areas that have been characterized into risk categories as outlined in Table 15. The risk categories and associated adaptation measures are informed by bathymetry studies (i.e., the topographic leveling of the beach profile and the sedimentological samplings) which verify the existence of sand bars formed because of the offshore material hauling during extreme climate events. The arrangement of two lines of bars in some stretches of coastline shows the availability of important sand reserves for the execution of beach maintenance via hydraulic pumping. Recovery and protection actions will factor the behavior of the waves and the currents that regulate the dynamics of the bars in the design. The installation of geo-tubes will ensure that the long-term sustainability of the replenished beach on the northern part of Dangriga town is maintain during subsequent extreme weather events or through natural erosion. These measures will only be taken in areas that have been categorized as high and medium risk, as can be seen in the table below. Sustainability of these measures will be increased through capacity building initiatives to be carried out with GAMMA S.A. from Cuba, where coastal engineering experts will train technical personnel within national and municipal governments on sand nourishment and the use of a sand pump to be purchased

Table 15: Reference Criteria for protection measures

Risk Category	Description of Risk
High Risk	Partial or complete destruction Facility located at <5m from the current coastline
Medium Risk	Partial or complete destruction Facility located 5-10m from the current coastline

Outcome 3.1 Adaptive capacity of coastal community of Dangriga is increased to respond to climate induce erosive events

Rationale
Dangriga, the target community under this project component, fall under the highest category of the coastal hazard index (Blue Carbon Working Group, 2020). Coastal erosion is evident in Dangriga's coastal areas. Beach scarp, dead trees, exposed roots, waves reaching building foundations, and inefficient coastal protection structures, validate the widespread character of coastal erosion in this area.

The community was chosen based on discussions between technical staff from CCCCC and NCCO, where the criteria for categorizing communities was based on natural resources, high rate of erosion occurring, presence of vulnerable groups, growing population, and sensitive ecosystems. It should be noted that risks to vulnerable groups will be avoided by ensuring that the town council is actively engaged throughout the process, ensuring adequate stakeholder consultations with indigenous groups such as the National Garifuna Council and Maya Leaders Alliance, youth groups, as well as women's groups. The town council will also play an integral role in the implementation, monitoring, and continuity of the project, in partnership with the CZMAI. From the initial consultations with stakeholders during the development of the project, the Municipal Government of Dangriga Town has been involved and its support assured. The Town Council has maintained its commitment to the project and willingness to institutionalize the project component post-project investment has been ratified.

The significant erosion process that affects Belize's coast, particularly in Dangriga, has been mentioned in numerous press articles nationally and in reports. The information has correctly shown that this is due to extreme erosive events, mainly hurricanes, tropical storms, and sea level rise.

The process of erosion observed in the profile of Dangriga is associated with sea level rise, the low island barrier becoming more and more susceptible to overtopping by storms. Increased storm surge associated with increased storms intensity have exceeded dune levels causing changes in the erosion–deposition response of the beach profile. Water flowing over the dunes causes sand to be transported and deposited away from the beach intertidal zone. The increase in the volumes of sand in the submarine bars, observed in the beach profiles and in the deposits formed by the overtopping landward, likely add up to compensate for the volume of sediment removed from the coastal strip by the erosion process, which means a redistribution of the material in the profile itself and not a net loss in the sedimentary balance of the system.

In Dangriga, the occupation of the coastal front by urban infrastructure has caused extreme erosive events to damage or destroy facilities in a relatively short time and the facilities also intensify the erosion process, as can be seen in Figure 16. Eight high risk areas and 17 medium risk areas have been identified along the coast in Dangriga.


Figure 16: (left) Destruction of the facility by erosion in Dangriga. (right) Type of ineffective defense structure

Dangriga, with an approximate extension of 6.3 km, has grown from the filling of mangrove areas and the occupation of coastal sectors of sandy beaches. While the native mangrove and beaches are capable of effectively buffering the impact of storm surge and waves from extreme weather events, the urban infrastructure which have replaced them are highly vulnerable and in most cases function as erosive agents.

Project Activities

Table 16: Adaptive capacity of coastal community of Dangriga is increased to respond to climate induce erosive events

Component	Milestones/Targets	Activities	Deliverable
Adaptive capacity of Dangriga is increased to respond to climate induced erosive events	Coastal protection and recovery for high-risk and medium-risk areas in Dangriga	Installation of geo-tubes Hydraulic Pumping from Sand Bards	46 geotubes installed 82,350 m^3 of material excavated to renourish beach & material for the geotubes. 2,745 m of beach recovered 2 sites reinforced with geotubes
	Monitoring and maintenance programme established	Establishment of the methodology and procedure for the development of field and office work Environmental clearance/permit and mining permit for clearance of project intervention based on existing regulations by the DOE and Mining Unit. Resourcing the Municipal Government with the necessary equipment to maintain the nourished beach during and post project investment. Topographic levelling of the beach profile Sedimentological sampling Meteorological Survey	Protocol for the monitoring of coastal erosion in Dangriga Environmental permit/clearance and Mining Permit Proof of procurement and inclusion in project financial and progress reports Annual reports with topographic records of changes in the coastline and beach profiles Annual reports with records of the spatio-temporal changes in grain size and mineralogical composition of sediment Annual reports with hourly records of wind speed and direction, and barometric pressure

Detail of activities

Coastal Protection and recovery for high-risk and medium-risk areas in Dangriga

Installation of Geotubes: In Dangriga, 'Christ the King Anglican School' and the 'George Ramírez Memorial Park' (Figure 17) were identified as two facilities prioritized by the mayor and citizens for their protection against the erosion process and, based on assessment done, as high risk. These are two critical public infrastructures, with the school being one of two primary schools along the coast in Dangriga. Both community infrastructures are in the northern part of the town, categorized as section 2 on the baseline study done to assess the vulnerability of Dangriga's coast and the most suitable interventions to stabilize the beach. Due to the nature of component 3 from sand extraction and installation of geotubes as an erosion control measure, environmental clearance/permit will be aquired from the Department of Environment. The Department of Environment will be the regulating entity that will conduct the necessary site visits prior to the issuance of the permit/clearance. The same will be done by the Mining Unit, within the Ministry of Natural Resources for the project interventions of this component. Based on the study done in Dangriga by GAMMA S.A., the project intervention will have limited environmental impacts on the shallow coastal area, as it is an area that is constantly changing due to erosion and the location from where sand will be sourced are those where eroded sand is deposited based on water currents and circulations. In essence this means that the sand from bars used to nourish the portions of the beach of Dangriga town will just be relocated from where it has been eroded to over time. The installation of the geotubes will help to reduce the incidence and frequency of erosion of the nourished beach during times of extreme weather events. Combined the beach nourishment and installation of geotubes will increase the sustainability of the impact of this project intervention, thus reducing the vulnerability of the coastal community of Dangriga and these two key infrastructures.

These high-risk public facilities will be protected in the "short term" through the beach nourishment and coupled with the geotubes, it will extend the temporal scope of protection and impact of the project interventions. Combined the beach nourishment and geo-tube installation should significantly increase the protection of the targeted area from short-term to medium/long-term protection. Furthermore, enhancing the institutional capacity of the Municipal Government and key government ministries, specifically the Ministry overseeing infrastructure development, is crucial. This will be achieved through collaborative capacity-building initiatives with GAMMA S.A. and acquiring a sand pump for beach replenishment when necessary, considering the anticipated rise in intensity and frequency of extreme weather events and storm conditions. By integrating this 'soft' technique with the activities for the CZMAI for erosion monitoring, the overall intervention will robustly strengthen its long-term sustainability.

Figure 17: (left) Christ the King Anglican School. (right) George Ramirez Memorial Park

The protection structures will be built with geo-tubes made with geotextile material specially designed to withstand extreme environmental conditions, such as salt water, high temperatures and prolonged exposure to sunlight and bad weather. Geo-tubes are filled with a mixture that combines earth, silt or sand with water, where the solid granular part is retained and the water is drained, thus the filling is compacted by its own weight and can reach a density of up to 2,200 kg/m3, depending on the type of filling material used. Due to the structures being buried in the sand in a humid, high-salt environment, which will eventually be exposed in times of storms and will suffer the impact of the waves, they must have special characteristics that guarantee their longevity. The textile that will make up the geo-tubes must have at least the properties listed in Table 17.

Table 17: General technical specifications of geo-tubes

Properties	Specification
Raw material	Polypropylene or polyester with high tenacity and high resistance to chemical degradation
Rated tensile strength (longitudinal and transverse)	> 80 kN/m
Seam strength	> 80 kN/m
Strain at nominal strength	< 10 %
Punching resistance	> 9 kN/m
UV resistance	> 80 %
Apparent opening of pores	0.12 – 0.35 mm

For the construction of the structures, it is proposed to use geo-tubes 1.00 m high, 0.75 m wide and 5 m long, with a cross-sectional area of 0.57 m^2, which individually can store a volume of 2.85 m3 of sand with a weight of 7.55 tons once they are filled, which guarantees the stability of the independent and stacked elements, allowing to counteract dragging and overturning due to the force of the waves. To ensure the comprehensive protection for both the school and the park, a total of 50 geotubes is strongly recommended. The school requires 17 geotubes, while the park needs 29, adhering precisely to the layout outlined in Figure 18. This allocation includes four (4) reserve geotubes to address potential installation failures or wear during their useful life. The geotubes will be filled by pumping the sand from the seabed next to the geotubes, for which a pump and hoses especially designed for this purpose are used and which are part of the elements to be acquired together with the geotube pieces. This strategic approach underscores the necessity for the proposed geotube quantity and the precision in utilizing purpose-designed equipment for optimal results.

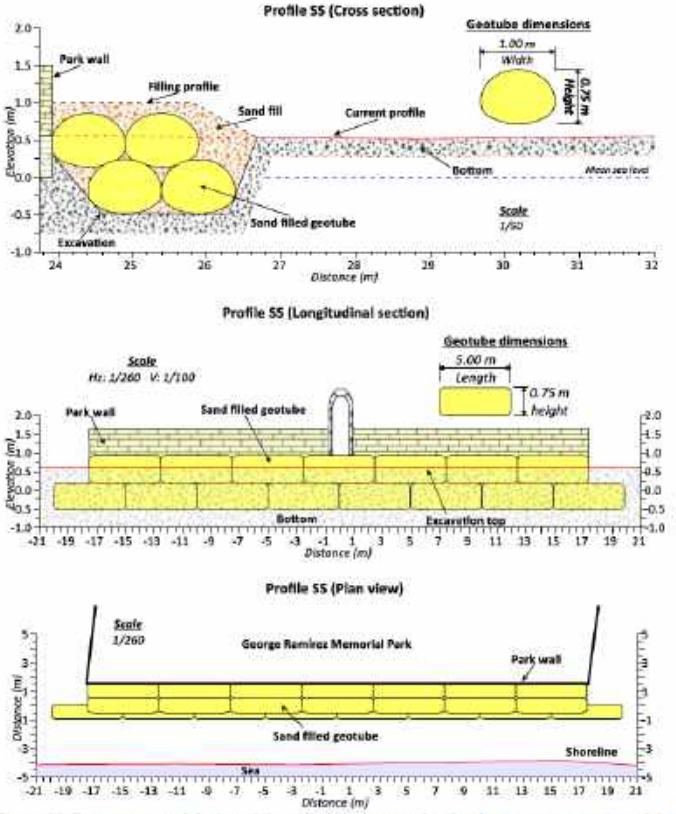


Figure 22. Parameters and design of the geotube structure for the short-term protection of the George Ramirez Memorial Park of the Social Security.

Figure 18: Typical Layout of Geo-tubes

Hydraulic Pumping from Sand Bars: The Dangriga waterfront has been divided into 5 Sectors, as shown in Figure 19. The length of beach to be recovered and the volume of sand for each sector of the Dangriga waterfront are shown in Table 18 below; the total length of beach to be nourished is 2,745 m and the total volume of material to be extracted is 82,350 m^3 (or 107,710 yd^3) for the beach nourishment component of the interventions. Hydraulic pumping will be conducted using a suction dredge, also shown in Table 18. The introduction of hydraulic pumping of sand from the bars as a recovery and protection action is more viable from a technical and

economic point of view, but unlike an artificial feeding project, it is conditioned by the behaviour of the waves and currents that regulate the dynamics of the bars, which requires their preparation to be carried out in a relatively short time with respect to the date of execution. The section where the beach nourishment will be done, Sectors 2, 3 and 4, has access to 1 or as many as 4 nearby sand bars from where the sand will be sourced. The sand that will be pumped comes from sand bars that have been created from the constant eroding of the beach along Dangriga, hence it will be replenished sand that had been eroded over time.

In addition to deploying geotubes for the school and park, this approach enhances the protection against beach erosion. The continuous monitoring by CZMAI and beach maintenance led by the municipal government and relevant ministries further contributes to extending the lifespan and ensuring sustainability of the interventions. Providing technical and financial support and capacity building to the Municipal Government and Ministry of Infrastructure Development is instrumental in fostering the long-term sustainability of the project. This assistance equips the relevant stakeholders with essential resources, capacity, and equipment, enabling them to effectively sustain nourished beaches and develop the technical expertise necessary for ongoing maintenance.

Figure 19: Sectors for the Dangriga Waterfront, from which sector 2 will be where the interventions of the project will focus on.

Recovery and Maintenance of beach with hydraulic sand pumping from the bars

"Medium term" (3-7 years)

Beach Sector	Length of Shoreline (m)	Density (m^3/m)	Estimated Volume of Sand (m^3)
Sector 2	1,400	30	42,000
Sector 3	740	30	22,200
Sector 4	605	30	18,150
Total	**2,745**	**30**	**82,350**

Table 18: Parameters of the beach recovery project with hydraulic sand pumping

Monitoring and Maintenance programme is established in the high-risk zones

The objective of a Monitoring and Maintenance Programme is to develop measurements and field studies that ensures that the magnitude, extent, and trend of the erosion process on the Dangriga coastal front are properly recorded, kept up to date, and maintained from further extensive erosion. With the results of the monitoring, the necessary information will be obtained to evaluate the effectiveness of the recovery and protection measures applied in the short and medium term, allowing the introduction of correction measures or the design of new measures for medium- and long-term planning.
Another part of the monitoring, prior to the implementation of the project interventions is creating the enabling environment for the project interventions. The activities under this outcome are not expected to have adverse effects on the natural environment, but robust and standardized documentation needs to be conducted. Prior to the implementation of the project interventions all necessary studies will be conducted with the support of the relevant regulating authorities.

The monitoring programme being proposed under this project component will provide the baseline data to assess the effective implementation of the beach nourishment and the installation of the geo-tubes and will takes advantage of the network of stations for monitoring the beach profile already established. The activities proposed under this project directly guarantee the collection of data required to evaluate the effectiveness of the measures that will be implemented, as well as appropriate data available if other protection measures are required.

To establish a robust monitoring program for Dangriga's shoreline development, sustainability and capacity building is imperative. This entails installing a high-precision tide gauge, which should be seamlessly integrated into a national or regional initiative dedicated to studying sea level rise in response to climate change. Such a comprehensive program demands a team of qualified personnel, state-of-the-art laboratory and computer equipment, boats, infrastructure, and logistical support, all of which necessitate a substantial budget. An illustrative example is the Regional Erosion Monitoring Network initiated under the project "Impact Assessment of Climate Change on the Sandy Shorelines of the Caribbean: Alternatives for its Control and Resilience" by the ACS. The baseline data gathered through this project will serve as a foundation for expanding the beach profiling monitoring program, a crucial subcomponent within our overarching initiative

Capacity development of the Municipal Government, Ministry of Infrastructure Development, and CZMAI in maintaining of the beach stabilizing interventions and monitoring of erosion processes. Ensuring the sustainability of the proposed initiative

involves assigning stakeholders the responsibility of monitoring erosion processes in the area and implementing beach nourishment activities. To equip them with the necessary expertise, GAMMA S.A. experts will provide capacity-building support and training. This crucial project component aims to empower entities tasked with maintaining the project interventions, enabling them to effectively monitor and sustain beach stabilizing activities. The initial phase of this activity focuses on enhancing the skills of human resources involved and fortifying the institutional structure, laying the groundwork for sustained post-project maintenance.

Resourcing the Ministry with responsibility for infrastructure development and the municipal government with the necessary skills and equipment to maintain the nourished beach during and post project investment. The second part of this set of activities is to provide stakeholders with the necessary technology and resources to maintain the beach stabilized. This will require providing these stakeholders with the necessary equipment to facilitate maintenance of the beach stabilized, through the acquisition of a sand pump. This activity will be supported by the capacity development the project will support for the long-term sustainability of the project interventions.

Topographic levelling of the beach profile. The objective of this activity is the spatial-temporal evaluation of the changes in the coastline and the morphology of the beach profile for the Dangriga coast. Topographic levelling of the beach profile will be repeated at the points of the established baseline with measurements at least twice a year and after the occurrence of extreme erosive events. Monitoring techniques with the use of high-resolution satellite images will also be introduced. The output will be annual reports with topographic records of changes in the coastline and beach profiles with calculations of the rate of erosion expressed in m/year and the volume of material removed from the coast.

Sedimentological sampling. Under this activity, the spatial-temporal evaluation of the variations in the composition of the sediment will be conducted. Sedimentological sampling will be repeated to know the variations in the grain size and mineralogical composition of the material in the same stations established with the baseline at least twice a year and after the occurrence of extreme erosive events. The output will be annual reports with records of the spatial-temporal changes in the grain size and mineralogical composition of the sediment.

Meteorological Survey. These surveys will evaluate spatial-temporal variations of wind and atmospheric pressure characteristics for a better understanding and interpretation of hydrodynamic and morphodynamical processes. Detailed records of hourly variations in wind direction and speed, by means of recording equipment at Dangriga and Placencia Airport, will be maintained. Under this activity, barometric pressure will also be recorded. Under this activity, annual reports with the hourly records of wind speed and direction, as well as barometric pressure will be produced. These annual reports are useful to apply mathematical modelling in the interpretation of hydrodynamic and morphodynamical processes.

Component 4: Awareness Raising, Knowledge Dissemination and National Capacity Strengthening

Component 4, Awareness Raising, Knowledge Dissemination, and National Capacity Strengthening; information on climate change impacts to the coastal zone and appropriate mechanisms for climate change adaptation will be made easily accessible to the public. The goal is to encourage and enhance pro-environmental behaviors, i.e., ecologically responsible behaviors, to minimize the negative impact or have a positive impact on the environment (or a combination thereof). This will lead to increased adaptive capacity and knowledge, thus strengthening the institutional and local capacities to address the risks associated with climate-induced impacts on the coastal zone of Belize.

A National Climate Change Communication Strategy and Action Plan (NCCCSAP) has been developed by the NCCO and will be implemented under this project. The Strategy and Action Plan will aim at facilitating effective communication on climate change information at all levels to enhance the management of climate change impacts and explore measures for adaptation and mitigation and related opportunities. Under this project, Belize seeks financing for Phase 2 – Implementation of the NCCCSAP. The indirect beneficiaries of this component are nation-wide. The remaining 2 subcomponents under component 4 aim at equipping persons with the necessary knowledge and skills to make changes that will aid them to increase their resilience to climate change, to acquire techniques and behaviors that help them, and their organizations succeed in a more sustainable manner. The justification for capacity strengthening is reiterated in various policy documents. The availability of training documentation will benefit a wider range of stakeholder and not just the trainees. Additionally, enhanced staff and community capacities to monitor, improve livelihoods, etc, will benefit the direct beneficiaries. As outlined in the Strategy, capacity building activities will also include media engagement and training for news reporters to better equip them to produce and disseminate quality, factual and impactful stories that highlight the impacts of climate change, climate change adaptation and mitigation strategies and community resilience. Communication activities also extend to multi sectoral engagement and capacity building. This ensures a unified and holistic approach to raising awareness of the country-specific climate change action needed to achieve Belize's updated NDC.

Countrywide school outreach initiatives are also important for students to become knowledgeable about climate change and be involved in climate change adaptation and mitigation solutions.

There are existing structures and mechanisms that can be used to disseminate knowledge and lessons learnt. Firstly, the NCCO and CZMAI have strong working relationships with stakeholders from the private and government sectors. Information can also be shared on websites, NCCO, CZMAI and PACT have websites and on social media. Several committees are also already in place, which will aid in sharing knowledge and lessons learnt, these include the Coastal Advisory Committees, Community Warden Program and the Belize National Climate Change Committee.

Although individual components will gather their own experiences and work with different groups of people, the overall responsibility for ensuring that experiences are well tracked, and an analysis of lessons learnt is periodically done will fall on the project management

unit's responsibilities. The PMU is responsible for overseeing all project activities; thus, they will be the best informed to keep track of all information regarding positive and negative experiences and ensuring it is documented.

Outcome 4.1 Promotion of ecologically responsible behaviors through climate change communication

Rationale

Since the consequences of a changing climate are both present and future, the solutions will not be found solely in the areas of technological innovation and improved legislation and policies. For long-term impacts, strategies also need to aim for cultural and behavioral shifts through pro-environmental behavior. Pro-environmental behaviors, i.e., ecologically responsible behaviors, will either minimize the negative impact or have a positive impact on the environment, or a combination thereof.

The purpose of this subcomponent is to promote ecologically responsible behaviors through climate change communication. This is in line with policy intentions:

- Planned adaptation is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve the desired state.
- It is necessary to develop and implement a Climate Change communications strategy and ensure it is updated every three years.
- To be effective, there must be an aggressive, innovative, and sustained Climate Change education and public awareness program that targets all sectors of Belizean society.
- Coordination of efforts in climate change communication is desired to ensure that there is a coherent national approach and avoid the duplication of efforts.

The NCCO will therefore implement an awareness program to draw attention to the impacts of climate change on the sectors and measures to adapt and mitigate those anticipated impacts through pro-environmental behaviors.

The MCCAP project (Part II – Section F), aimed at raising awareness on ecosystem-based marine conservation and climate adaptation measures, which is in line with this component. MCCAP also promoted measures to increase livelihoods through an ecosystem-based approach with benefits to the fisheries sector. Under this project, a comprehensive Knowledge, Attitudes, and Practices (KAP) study was conducted that included a survey of households and fishers in twelve coastal fishing communities. The MCCAP study recommends the engagement of relevant local community members in the dissemination of information and public education programs within their communities (e.g. veteran fishers regarding fisheries communication). It also recommends more direct communication efforts at the Primary Education level to encourage pro-environmental behaviors at an early age, which are recommendations that will be taken into consideration.

Project Activities

Under this activity, financing is sought for implementation of the National Climate Change Communication Strategy and Action Plan (NCCCSAP). The NCCO has finalized the NCCCSAP that links to the implementation of the updated National Climate Change Policy, Strategy and Master Plan, as well as Belize's updated NDC, while aiming to effectively communicate climate change adaptation and mitigation issues to the national audience. This has been financed and implemented under the UNDP – Enabling Gender-Responsive Disaster Recovery, Climate and Environmental Resilience in the Caribbean– (EnGenDER) Project. The communication strategy will facilitate effective communication on climate change information at all levels to enhance the management of climate change impacts and explore measures for adaptation and mitigation and related opportunities.

The NCCCSAP will provide proper consideration to communication and awareness on the sectors relating to this project, that is coastal zone, water, housing and land use, the risks of building in the buffer area, and alternative livelihood opportunities (e.g. sargassum use/harvesting).

By implementing the NCCCSAP, the NCCO and partners (e.g. MIDH, NMS, NHS, CZMAI, PACT) will catalyze positive behavioral changes through information-sharing and by promoting various sustainable livelihood opportunities that support building community resilience.

The Lead Agency for this subcomponent is the NCCO. However, as the NCCCSAP will address communication and awareness regarding all project components of this AF proposal and key productive sectors, implementation will be a collaborative effort among the AF proposal executing entities: NCCO, MIDH, NMS, NHS, CZMAI, and PACT.

Table 19: Implementation of the National Climate Change Communication Strategy and Action Plan

Components	Milestones / Targets	Activities	Deliverables
Implementation of the NCCCSAP	Communication activities as envisioned in the NCCCSAP successfully implemented and verified	Carry out communication activities as envisioned in the NCCCSAP	Monthly progress / implementation report from Communications Consultant

		Conduct working sessions with AF proposal executing entities Conduct monitoring, verification, and information sharing of communication activities	Minutes of working sessions Monthly reports to include level of reach and level of engagement

Detail of Activities

Public awareness and outreach will be carried out to increase knowledge on mechanisms that can be implemented and actions that can be taken for climate change adaptation, especially along the coast in regard to water, housing, coastal zone management. Based on recommendations from the communication strategy, actions and activities will be implemented to improve communication about climate change. Lessons learned from the project will also be documented and form part of knowledge products to be disseminated. The indirect beneficiaries of this component are nation-wide through the encouragement of pro-environmental behaviors. The direct beneficiaries are the 27 coastal communities: 117,823 persons: 57,788 men; 60,036 women (in 2010) as the NCCCSAP interventions will be geared towards strengthening all project components. Proper consideration will be provided to pursue a gender balance among service providers/beneficiary stakeholders (Gender Action Plan Annex 1 Gender and Social Assessment).

4.2 Improved knowledge and skills for AF proposal executing entities on the use and deployment of adaptation best practices

Rationale
While communication promotes pro-environmental behavior through ecological consciousness, capacity-building equips persons with the actual knowledge and skills to make a change. It will help stakeholders gain new techniques and behaviors that help them, and their organizations succeed.

This activity is in accordance with the ICZM Plan, which emphasizes the importance of building bridges between and among various interest groups as a mechanism to improve public education and form functional linkages for effective coastal area management. Environmental education and public awareness are among the core activities of the CZMAI.

As identified in the Feasibility Study (Part III, Strategy IV), enhancing the capacities of local people and officials through training will be cost-efficient. Livelihoods of local people will be improved through enhancing capacities on sustainable livelihoods practices (e.g. Sargassum use/farming, aquaculture farming, harvesting of fishery sources in mangrove areas) and best adaptation options for the coastal zone.

Project Activity
Under this activity, financing is sought for the development and implementation of training modules for best coastal adaptation practices.

The Lead Agency for this subcomponent is CZMAI and is supportive of the other AF Proposal executing entities staff. Several executing entities have indicated training needs, as well as through policy intentions (NDC, Horizon 2030, GSDS, NCCCPSAP, ICZMP) and a specific recommendation made as a mitigation measure for component II (Feasibility Study Part II). 'Investing in national capacities for long-term in-house and national expertise' is also a recommended strategy resulting from the feasibility study.

Table 20: Development of training modules for best coastal adaptation practices

Components	Milestones / Targets	Activities	Deliverables
Training needs assessment for best coastal adaptation practices and development of training modules	Training consultant hired	Develop ToR, Advertise, Select and hire	Signed contract with selected Training Consultant
		Conduct training needs assessment for AF proposal entities on the development and use of best coastal adaptation practices for Belize	Training needs assessment report
	Training preparation conducted	Prepared training modules	Training modules with training plan and materials

		Prepare a training plan Prepare training materials	
Implementation of training modules for best coastal adaptation practices	Training activities successfully implemented and verified	Conduct training activities according to plan, and as approved by lead agency	Stakeholder training report

Detail of Activities

A training needs assessment and training modules will be developed for the best coastal adaptation practices. These training modules will be put into practice through workshop/training sessions. The goal is to strengthen local capacity to assess the impacts of climate change on the coast and how to develop the best coastal adaptation practices. The training participants include staff members of AF Proposal executing entities (CZMAI, NMS, NHS, MIDH, PACT, NCCO), and community members, who form a part of CZMAI's Coastal Advisory Committees and/or Community Wardens Program, as well as other government and non-government stakeholders.

The indirect beneficiaries extend nation-wide as increased capacities on coastal interventions/monitoring will benefit the nation's economy and adaptation. The direct beneficiaries are government and non-government organizations and the 27 coastal communities as the training interventions will be geared towards strengthening pro-environmental behaviors. Approximately 50 professionals will be trained. Approximately 3 national consultants with a tertiary education will be employed. Proper consideration will be provided to pursue a gender balance among staff/consultants/stakeholder/trainees beneficiaries (Gender Action Plan Annex 1 Gender and Social Assessment).

This will lead to the strengthening of awareness and ownership of adaptation and climate risk reduction processes. Activities under this output include:

i) Conduct a training needs assessment and develop a training plan based on stakeholder/entity needs, and prioritization. Consideration will be given to strengthening livelihood opportunities (e.g. sargassum use/harvesting; see Figure 20) and female/persons-with-disabilities/youth/ITP education. Initial training possibilities identified by the AF Proposal executing entities relate to the areas: Early warning system, Blue economy: Livelihoods opportunities, coastal erosion modeling, sector-specific training, community-based adaptation approaches, MPAs. The training needs assessment process envisions consultations with stakeholders to determine their level of knowledge and needs.

ii) Prepare training modules
   - O development of training material for technical personnel and communities
   - O development of an inclusive community-based toolkit

iii) Training workshops carried out based on training modules for best coastal adaptation practices.

iv) Document sessions, conduct monitoring and evaluation, and disseminate lessons learned through appropriate means.

Figure 20: Seaweed Structures (Obtained from Sustainable Seaweed Cultivation Training Manual - Belize)

Outcome 4.3 Strengthened GIS capabilities of CZMAI and partners

Rationale

Under this activity, direct beneficiaries will acquire enhanced skills on GIS techniques which will enhance their performance and contributions to organizational success. Belize has over time enhanced the capacity of the CZMAI and municipal authorities to ensure developments within the coastal and urban areas of Belize are compliant with establish norms. With 57% of the country's population within 25km of the coastline (SIB, 2021), climate smart coastal development is essential in protecting human investment and lives. As such, the country's effective contribution to climate change adaptation is directly influenced by this project component. The use of GIS technologies is planned under Component 1 for Coastal Zone Management and Component 2 for saline intrusion monitoring.

Project Activity

Under this activity, financing is sought for the strengthening of GIS capacities in-country to benefit staff and the community network for coastal erosion monitoring.

Table 21: Strengthening of GIS capabilities of CZMAI and partners

Components	Milestones / Targets	Activities	Deliverables

Identification and procurement of infrastructure and materials including computer hardware, software and data gathering equipment	Equipment needs identified Equipment needs identified procured	Prepare equipment specification list Procurement of equipment	List of requisite software, hardware and data gathering equipment along with specifications Receipt of equipment
Implementation of GIS training for risk mapping, collection of beach profile data and susceptibility to erosion	Training activities successfully implemented	Carry out training interventions Conduct M&E and verification of techniques acquired Share lessors learned	Belize Coastal Erosion Monitoring Network Training Report, to include recommended tasks to be included in verification exercise Report on testing and verification of methods within a specified geographic area, including lessons learned by members of the coastal erosion monitoring network

The lead agency CZMAI's capabilities to utilize GIS will also be strengthened, building institutional capacity including partner agencies (e.g., NHS, NCCO, Forest Department, Fisheries Dept.) and local communities, especially municipalities. Learning from research experiences, an effective data collection strategy has been to employ and train local people to support data collection. The direct beneficiaries of this training include staff members of CZMAI and partner agencies, and community members. The indirect beneficiaries extend nation-wide as increased capacities on coastal interventions/monitoring will benefit the nation's economy and adaptation: 419,199 persons: 209,603 men, 209,596 women (SIB, 2020 est.).

Detail of Activities

1. Training of the community network carried out data collection for the operationalization of the project activities
2. Training and utilization of GIS equipment for national monitoring of erosion carried out with CZMAI and project partners -to be used for risk mapping, mapping coast susceptibility to erosion, erosion monitoring, and early warning - and examine the use of technologies: use of drone technology (images) for monitoring
3. identification and attainment of infrastructure and materials, including computer hardware and software and data gathering equipment for the CZMAI and partners

The indirect beneficiaries extend nation-wide as increased capacities on coastal interventions/monitoring will benefit the nation's economy and adaptation: 419,199 persons: 209,603 men, 209,596 women (SIB, 2020 est.). The direct beneficiaries are the 27 coastal communities: 117,823 persons: 57,787men; 60,035women as the training interventions will support coastal monitoring. Approximately 15 professionals will be trained. Approximately 1 national consultant with a tertiary education will be employed. Proper consideration will be provided to pursue a gender balance among staff/consultants/stakeholder/trainees beneficiaries (Gender Action Plan Annex 1 Gender and Social Assessment).

The Communication/Knowledge Management/Training Component (component 4) is crucial to this project. As derived from the Results Framework, building knowledge and awareness is significant for the success of each component of this project: the housing policy and building codes, the ICZMP with zonation guidelines, saline intrusion risks, coastal erosion risks, risks associated with coastal flooding, and storm surge, GIS technologies or alternative livelihood opportunities. The Project's contribution to climate change adaptation is invaluable. The housing component not only benefits the coastal communities but the nation. Citizens will be safer through the implementation of building standards, especially since they will incorporate minimizing the impacts of climate hazards. Coastal zone management guidelines will benefit all 27 coastal communities: 57,787 males and 60,035 females. This policy will discourage investments/housing in high-risk coastal areas, such as the 66-feet buffer. Monitoring storm surge, salinity risks, and beach erosion will also have a significant impact in safeguarding the coastal communities, and considering the importance of tourism in these areas, also tourists and business investments. The disaster risk reduction measures identified have been tested for their feasibility of their implementation in the identified study sites and will be achieved through component 3. The best practices and lessons learned will be shared and thus benefit the 25 other coastal communities, and possibly beyond the national borders. Thus this project will have a significant impact sharing benefits at a national level through components 1.1 and 4 (419,199 inhabitants: 209,603 males and 209,596 females & 260,000 visitors), in the coastal zone through components 1.2, 2, and 3. Lastly, the project is made feasible by several strategies related to cost-effectiveness: by building on existing structures and identified initiatives, by promoting the ownership and other long-term benefits through strategic partnerships, and long-term thinking, and building on existing interventions and further pursuing co-financing possibilities to ensure sustainability of the activities after the project closes. The project contributes to the area of climate change (SDG 13), decent employment (SDG8), safe water (SDG 6), and resilient settlements (11) (Figure 11 Theory of Change).

B. Economic, Social, and Environmental Benefits of the Project

Coastal and marine ecosystems provide substantial goods and services to Belize, and the coastal zone is an area of high economic activity. The coastal area contains abundant natural resources, supporting several productive sectors, such as tourism and fisheries. Belize's coast is also home to about 40% of the population, its ports, and developments for the industries: tourism, agriculture, and aquaculture/mariculture (CZMAI, 2016). During the 2010 housing census, there were approximately 53,234 males and 55,039 females residing in the nine coastal planning zones across 27 coastal communities in the country. However, despite the importance of coastal ecosystems and the services they provide, they are often mismanaged and lack the proper investment and policy decisions. Belize's reefs, as well as other coastal habitats, are threatened by unchecked coastal development, overfishing, tourism pressures, and climate changes (WRI, 2008).

The benefits and beneficiaries of this project are wide-ranging, distributed across institutions -inter and intra-institutional, across layers -national and community-levels, short and long-term.

As stated previously, direct beneficiaries include the 27 coastal communities. These will participate directly in the project and thus benefit from a comprehensive combination of pre-event risk management strategies: Prevention, Protection, Preparedness strategies. However, at the institutional level, direct beneficiaries of this project are the lead entities for each component and project management (PACT, NCCO, CZMAI, NMS, NHS, and MIDH) who will be strengthened to implement their mandates and policy priorities. Since collaborations/cost-effectiveness is the pursuit, the benefits extend to non-government institutions, including communities, NGOs, academia, private sector – particularly tourism and agriculture.

The second tier of direct beneficiaries are the individuals and experts – local and international – who will be employed under this project; an estimated number of 60 persons (full-time staff, consultants, wardens, trainers, workers). Approximately 175 persons will be trained. The training will have long-term benefits, considering that each trainee will use the acquired skills ranging from 5-10 years in contributing to adaptation efforts, before the knowledge becomes outdated or retired. During the recruitment/consultations/training process, consideration will be provided to maintain a gender balance and inclusion of vulnerable and marginalized groups.

Component 1.1 and 4 have an extended reach beyond the 27 coastal communities and nation-wide benefits. Considering both subcomponents, component 3 also benefits all coastal communities. (Feasibility Study Section III).

The project incorporates prevention, protection, and preparedness strategies to climate change risks. The components are important contributions in climate change preparedness and in line with government policies for effective adaptation, and there is a sufficient legislative policy base to facilitate implementation. The project has incorporated some excellent strategies to achieve cost-effectiveness:

Investing in a combination of communication and training actions for a sustainable impact. This will allow for institutional/individual beneficiaries to enhance pro-environmental behavior through ecological consciousness and crucial skills to make a change. Approximately 16 community wardens/advisors will be engaged under the project, acquire skills regarding innovative technologies that will be used to benefit monitoring activities to protect their communities against climate risks. It aims to minimize the negative impact (or even have a positive impact) on the environment and equips beneficiaries to respond rapidly to extreme weather events. The wardens will become an extension of the programmes already existent at the CZMAI for sustainability post project investment.

Investing in disaster preparedness risk reduction measures will allow for the use of innovative technologies for effective, long-term adaptation. Advancements towards various risk reduction measures have been integrated into the project (Feasibility Study – Part I) which will benefit vulnerable communities, households, individuals, groups and businesses. Approximately 7 persons from Dangriga will be employed during the project and acquire practical experience to effectively manage the risk reduction measures under component 3 and will be able to share their insights with the other 25 coastal communities.

Cost-effectiveness, ownership and other long-term benefits through strategic partnerships (Part II Section C).

Economic Benefits

The coast provides an important economic valuable service to Belize and is an area with high economic activity (esp. tourism, agriculture, fisheries), and the proper management, and protection of the coast is crucial to ensure sustainable economic development. Much of Belize's Tourism Industry is concentrated within the coastal zone, with three-quarters of hotels found along the coast and the cayes. Tourism is a fast-growing sector in Belize. In 2017, the value of exports of non-business travel services, other than health and education reached an all-time high of 409 million USD, up by 50% from 2007. In this period, the sale of tourism services to non-residents increased at an annual average rate of 4%, outperforming other services exports (3%). The tourism sector grew from 21% in 2007 to 22% in 2017. Due to the important linkages of tourism with the rest of the economy (indirect and induced effects of tourism activities), the overall economic benefits of tourism in Belize are worth up to 700 USD million, corresponding to roughly 40% of GDP. Indirect economic impacts of the Tourism sector, such as locally manufactured materials that support the industry, earn an additional 26 to 69 million USD a year. In April 2018, the tourism sector employed approximately 21,000 Belizeans, corresponding to 13% of national employment. The contribution of tourism to employment varies widely across districts, ranging from 7% in Corozal to 18% in Belize. In general, tourism absorbs a larger share of the employed population in coastal (14%) as opposed to continental (12%) districts (UNCTAD, 2018). The beach rehabilitation project will provide economic benefits by increasing tourism in Dangriga and by decreasing the probability of infrastructure loss due to erosion.

Agriculture is also important for the economy of Belize. Large-scale agriculture tends to be technically and commercially sophisticated and oriented toward both domestic and export markets to take advantage of economies of scale. While most small-scale farms are for subsistence and local markets, they also include many sugarcane and citrus producers (as well as, increasingly, producers of peppers and other non-traditional crops) that sell to processors and exporters. Primary agriculture (crops and horticulture, livestock, and forestry and logging, excluding fisheries and aquaculture) in 2014 accounted for about 10% of national GDP, and the primary sectors contributed to 18.6% of national employment. Belize is a net exporter of food products. In 2014, the country's food exports totaled 80.2% of total merchandise exports, while food imports were 11,3% of total merchandise imports. Economic performance in the agriculture sector is primarily dependent on traditional export crops such as sugar, citrus, and banana which currently account for about 60% of the earnings with citrus exports being the principal source of income followed by sugar and banana. Rice, corn, and beans are the main domestic food crops. With respect to land tenure, 32 percent of farmland is held by farmers with title, 7 percent is rented, and about 31 percent is under a long-term lease by the government; the remainder of the land is in informal and communal arrangements (IDB, 2017). Climate change is already affecting the agriculture sector: variability of yields/harvests for rainfed agriculture is already suffering from changes in the timing and amounts of rainfall and there is a widespread perturbation of the agricultural calendar. Intense rainfalls are causing problems of soil drainage and erosion and warmer temperatures are leading to the increased incidence of yield-reducing weeds, pests, and diseases (Climate Change Solutions, 2014).

The Fisheries Sector employs over 2,500 licensed fisherfolk, is similarly dependent on a healthy coastal ecosystem, and is also one of Belize's main industries. Artisanal fishing is carried out by about 500 boats operating in the shallow waters of the barrier reef and the three atolls, which provide habitats for many commercially valuable stocks of lobster, conch, and a variety of fish. There are about 2500 fishers licensed in Belize, indirectly employing 15.000 individuals and organized in four cooperatives. There were 34 vessels listed as active in 2016. This number increased to about 57 vessels in 2018 (UNCTAD, 2018). In 2016 the Fisheries sector contributed 5% of Belize's GDP. Between 2005 and 2015 lobster generated an average annual income of BZ$15.13M from export; while conch averaged an annual income of approximately BZ$8.32M from export (Belize Fisheries Department, 2015; Belize Fisheries Department, 2017). Thus, to keep this industry alive and prospering it is important to safeguard the coastal ecosystem and ensure that capacities are built so that adaptive measures can be put in place and better-informed decision-making occurs regarding the coastal communities. The project will aid in implementing necessary tools for coastal planning and management as a method to effectively protect the lives of fishers that live within vulnerable coastal areas including the Creole, Mestizo, and Garifuna people. Fishers and their families will economically benefit as future development in areas that are unsuitable for habitation will be avoided, increasing the available coastal habitat that may nurseries for important commercial fish species.

Belize has an indefinite moratorium on all new oil exploration in its offshore waters, to safeguard the marine environment and further promote dive tourism. Belize is one of the first developing countries to turn away from offshore oil and seek to embrace environmentally sustainable development pathways by protecting the ocean environment.

The project will also provide economic benefits for the tourism and fisheries sector by avoiding unsustainable clearing of mangroves, which act as nurseries, protect the shoreline, and support other wildlife. Shoreline protection from reefs and mangroves prevents erosion and wave-induced damage, which accounts for about 231 to 347 million USD in avoided damages each year. However, without the proper measures in place, unsustainable development and clearance of mangroves will continue. The project will aid in the prevention of continued development in vulnerable coastal areas and ensure that future development and land use is appropriate and leads to minimizing negative impacts. It is crucial to prevent future deterioration of vulnerable habitats such as mangroves, seagrass beds, and reefs. The implementation of coastal guidelines and the institutionalization of a national housing policy and building codes with a clear specification for coastal habitation coupled with the coastal erosion monitoring program will contribute to the minimization of infrastructure and financial loss. The latter mechanisms will serve to protect financial investments by minimizing the probability of unwarranted development in vulnerable areas that would result in loss of coastal lands and/or infrastructure. The national beach erosion monitoring program – of which the first steps are included in this proposal – will also contribute to minimizing economic loss, by enabling national and local governments to devise proactive mechanisms to minimize the impacts of erosion that can result in the loss of beach areas as well as houses and hotels built on beach areas. The coastal early warning system will provide an additional monitoring mechanism, which will enable persons living in the 27 coastal communities to prepare for the negative impacts of intensified storms, including storm surges. The pilot beach stabilization components will benefit houses under threat of collapse due to extensive erosion. Extensive erosion has resulted in a portion of some homes being inches away from the water's edge, in coastal communities such as Dangriga (Figure 6). The saline intrusion assessment is vital for the production of potable water and the determination of suitable areas for farming. As an economic benefit for farmers, the assessment of soil salinity will provide information that can be used to deter the negative impacts of increased salinity which results in lower crop yield. This will result in the avoidance of areas with high salinity and reducing financial inputs into such areas thus improving financial gain. The goal of this task is to assess and map soil salinity and link this to current and future crop productivity vulnerability and risk.

Environmental Benefits

The project will provide substantial environmental benefits to Belize's coast and communities. The project is consistent with Belize's development goals, needs, and guidelines, and the country has a sufficient legal and policy base for the implementation of this project (Feasibility Study Part II). The project will lead to the protection of vulnerable coastal areas from future unsustainable and unregulated habitation, tourism, infrastructure, and industry development. The latter will in turn result in increased environmental protection as the implementation of nationally identified guidelines and corresponding regulations will minimize the detrimental effects of improper development. The guidelines include provisions that avoid development in areas of high ecological value and those particularly vulnerable to climatic changes, by negating development in these areas the natural environment should be protected. The project will contribute to maintaining shoreline access by regulating development in the immediate seafront area. Biodiversity in coastal areas will also benefit through the improved management and proper planning of coastal areas, habitation, and land use. The prevention of

unsustainable clearance of mangrove forests will positively affect fish stocks and invertebrates as they provide nurseries for them, shoreline protection from storms, waves, floods, etc. will also be expected, which will help prevent erosion in other areas. Also, the proposed rehabilitation project component will protect the shoreline of the chosen communities from storms and erosion. Beach restoration programs will also provide learning opportunities for students and community workers and integrate them into environmental education. This will indirectly benefit other communities, as the measures can be modified and replicated in other areas in need of beach rehabilitation. The saline intrusion and groundwater assessment will better enable the country to protect its vital groundwater resources. The activity will allow for an initial assessment of the groundwater flow regimes within the study area. It will also contribute to the minimization of potential saline water encroachment into freshwater systems caused by the unregulated use and over-extraction from groundwater aquifers. The study will also assess the quality of groundwater concerning agricultural influences. Proper consideration will be given to communication and training regarding sustainable livelihood opportunities that are active or under implementation, one of which is sargassum use/harvesting for energy production and compost use, or other possible products.

Social Benefits

Social benefits from this proposed project include reducing the vulnerability of the 27 coastal communities to climate change and decreasing the chances of infrastructure investment losses by preventing future development in vulnerable areas. This will protect the lives and livelihoods of Belizeans, by adhering to national coastal development guidelines thus minimizing unwarranted development in unsuitable areas. The implementation of coastal development guidelines also ensures the maintenance of ecosystems and the associated services they provide to the coastal communities, including regulating provisioning and protection services on which the communities are heavily dependent.

Coastal protection and stabilization activities will also have a positive effect on the welfare of communities by protecting their homes from potential losses due to erosion and storm damage. This will benefit the entire population living along the coastline by improving management. The provision of the habitation policy and the building codes can be scaled up for replication through-out the remainder of inland communities. Building codes with a strong emphasis on climatic factors will improve the ability of all communities to build climate-worthy infrastructure which can withstand the impending climatic factors such as extreme heat, drought, SLR, storm intensity and frequency, flooding increased wave action, and erosion.

Groundwater assessments enhance the long-term availability of water by ensuring that water is being utilized and extracted in a manner consistent with sustainability. In the absence of such periodic assessments, water extraction could threaten groundwater aquifers leading to saline encroachment and ultimately the loss of potable water extraction for specific sources. The activities of this project will complement other initiatives currently in the pipeline, implementation or completed for enhanced water security.

Awareness and knowledge of the public will also be increased for mechanisms that can be implemented for climate change adaptation, thus decreasing their vulnerability to erosion and other negative impacts of climate change. The Early Warning System that will be enhanced will protect the essential household and community assets. It will also reduce exposure to storm surges and flooding events and increase the ability to prepare for and respond to these disasters. Reduced exposure to storm surges and flooding events will also decrease associated negative impacts on the health of the population in areas that are more vulnerable to these hazards by supporting efforts to fight outbreaks of waterborne diseases such as cholera.

Gender

Gender balanced participation is crucial to the project and its partners. This section examines the integration of female participation (Social and Gender Assessment Section II). A Gender and Social Assessment for the project is presented in Annex 1. This assessment was conducted for the preparation of this project proposal and highlighted the prominence of women in the management of natural resources and their active involvement in the social issues related to their communities. In Belize, women hold high positions. Women are in charge or are the primary contacts for several project lead agencies, stakeholder organizations, and NGOs. Of the 18 villages associated with this project, five have female chairpersons and all villages have at least two women in the village council. In the communities with women in leadership roles, the level of participation by women appeared to be in direct relationship to the position that was held. The women who were chairpersons, leaders of community-based organizations, business owners, or heads of households appeared to be more vocal. This is an indication that women in the project's target communities have an active leadership role and appear to be more assertive. It also provides a platform on which to develop gender-sensitive collaboration with the communities during and after the implementation of the project. Women in some of the communities have expressed during our consultations that they want equal standing with men when it comes to land ownership, leadership roles, and decision-making.

Ministry of Education statistics indicate that while equal numbers of males and females enter the school system at primary school, by the time they graduate from high school there is an average of 25% attrition in males and 10% in females. It also shows that increasingly women are becoming better equipped to undertake the roles that are more academically biased. This is an indication that, of necessity, women will be required to undertake tasks that were traditionally reserved for men. It was pointed out during the consultations/discussions that there is no gender-specific roles within any of the project components. In that regard, the project provides a host of opportunities for anyone with the requisite training and skill. However, proper consideration will be provided to pursuing a gender balance among staff/consultants/stakeholder beneficiaries, and in all procurement processes, in line with the NIE's commitment to Gender Equality and Equity. Additionally, remuneration will be based on the work requirements, irrespective of gender.

C. Analysis of the Project's cost-effectiveness

The direct beneficiaries[11] of this project are Belize's 27 coastal communities. These will participate directly in the project and thus benefit from a comprehensive combination of pre-event risk management strategies: Prevention, Protection, Preparedness strategies. Components 1 and 4 have nationwide benefits. When considering both subcomponents, component 3 also benefits all coastal communities (Table 22) (Feasibility Study Part III).

Table 22: Beneficiary overview

Beneficiaries	**Indirect**	**Direct**	**Human Resources**				**Cost/ Capital (In US$)**
			Staff/Consultants/workers				
			National			**Int.**	
1. Improving coastal land use for resilient habitation and sectoral activities	**Nationwide**	**Coastal Comm.**	**staff**	**tertiary**	**unskilled** [12]		
1.1. Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	419,199 & 200,000 visitors	117,823		8	5		0.35
1.2. Improved coordination and implementation of the ICZM Plan	419,199	117,823			12		1.59
2. Coastal Vulnerability Monitoring							
2.1. Strengthened data availability for the development of a national coastal saline intrusion program	419,199	117,876	50 persons trained	1		1	6.02
2.2. Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	200,000	117,883	50 persons trained	4	4		2.12
2.3. Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	419,199	117,839	10 persons trained			4	2.25
3. Coastal Protection and Adaptation response for High-Risk Areas							
3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	100,000	10,680		2	7[13]	3	12.40

[11] Please see Annex II Part III – Financial Considerations for a a breakdown of the calculation of project beneficiaries and cost per beneficiary.

[12] Unskilled labor, measured by educational attainment, refers to jobs that require a high school diploma only, or could be filled by a high school dropout who masters specific skills. Skilled labor requires additional skills or education.

[13] As the RRM under comp. 3 are to be determined during phase 1 (ongoing), these figures are an estimate. The contractor will be encouraged to hire local community members.

4. Awareness-raising, knowledge dissemination, and capacity strengthening							
4.1. Promotion of ecologically responsible behaviors through climate change communication	200,000	419,199		3			0.13
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	419,199	150	50 persons trained	3			0.18
4.3 Strengthening of GIS capabilities within the CZMAI and partners	419,199	500	15 persons trained	1			0.22
Project Management				3			
Total			**175**	**26**	**28**	**8**	

Cost-effectiveness, ownership, and other long-term benefits through strategic partnerships (Feasibility Study Part III). Throughout the project, cost efficiencies are envisioned to be realized by engaging with a local and/or external academic institution(s) by employing student partnership support in exchange for learning opportunities and professional development. This strategy requires proper supervision but will have long-term national benefits.

The integration of strategic partnerships will enhance cost-effectiveness, ownership, and other long-term benefits. It will enable 6 government/statutory agencies (PACT, NCCO, CZMAI, NMS, NHS, MIDH), local leadership in 27 coastal communities, the University of Belize, and various NGOs (including, but not limited to SEA, SACD, TIDE, TASA) to contribute to the enhancement of national adaptive capacities according to their mandates and comparative advantage.

Cost-effectiveness by building on existing structures and identified initiatives to ensure cost-effectiveness. The enhancement of systems and mechanisms already in place (amongst others the utilization of Coastal Zone Management/GIS capacities within CZMAI and partners, the existing saline intrusion/groundwater data, the NCCCSAP, the existing SURFACE/PLUVO technologies within NMS, existing weather stations, utilization of maps from the Lands Information Centre, and the beach stabilization engineering alternatives that are being identified under Belize's Fourth National Communication), decrease the time and cost associated with the formulation of these systems from an initial concept. In avoidance of duplicated efforts, synergies will be formed with other ongoing and/or planned projects to maximize efficiency. Further enhancing the technical capacity of the entities involved in project implementation also provides for the long-term sustainability of national initiatives beyond the five-year timeframe of the Project and contributes to the realization of Belize's NDC commitments.

Cost-effectiveness by building on existing interventions and further pursuing complimentary interventions under other initiatives. This project is strengthened by the lessons learned and financing already received under other initiatives which this proposed project will learn from and expand on, including the Marine Conservation and Climate Adaptation Project (MCCAP) – component 4.1, Enabling Gender-Responsive Disaster Recovery, Climate and Environmental Resilience in the Caribbean (EnGenDER) – component 4.1, Belize Social Reform Project (BSR) - component 1, Fourth National Communication & First Biennial Update Report (FNC/BUR) – component 3, Capacity Building for Climate Vulnerability Reduction (CBCVR) – component 2.2, Energy Resilience for Climate Adaptation Project **(**ERCAP) – component 2.3). The project also incorporates long-term planning and will pursue additional funding possibilities (Components 2.1 and 2.3). The project also takes into consideration other synergies with other complimentary pipeline projects, which contribute to the overall effectiveness of project interventions The National Hydrological Service (Component 2.1) is in the process of developing a National Adaptation Plan (NAPs) for the Water Sector under a GCF Readiness Project, including the completion of assessments in other parts of the country; valued at approximately USD $903,000.

The cost-effectiveness of Component One is seen in the utilization of existing institutional structures (technical groups) and identified sectoral needs to guide the development of a habitation policy and building codes implementation guidelines. The Ministry of Infrastructure Development and Housing (MIDH) has incepted the initial process for the creation of a national policy and legislation, which enable adaptation to the impending climatic factors, via the completion of preliminary consultations and assessments as well as an initial analysis (discussion paper) of building requirements based on environmental changes. These preliminary activities will be built upon under Component One. Additionally, the activities linked to the initiative will incorporate the lessons and technical findings of similar policies and building codes from the region for sound climate proofing. The cost of this activity is US$240,174. Please see Table 23 for alternative adaptation solutions to activities under Component 1.

The implementation of coastal guidelines for three planning regions based on coastal zone development guidelines, which are available, allows the country to make scientifically sound development decisions in coastal areas taking into consideration economic growth and environmental protection. As the guidelines have been developed for the sustainable development of the area in line with the principles of environmental protection and climatic changes, its implementation should improve the long-term adaptive capacity of

coastal infrastructure by avoiding development in areas susceptible to climatic changes; thereby minimizing the financing needs to address the negative impacts of unsuitable development in climate-vulnerable areas. Coastal Zone Management under this component is additionally supported by the legal requirement for a 66-feet buffer to be maintained next to all water bodies. CZMAI will use the volunteer services provided by the local Community Wardens and Coastal Advisory Committees as a cost-efficient way to collect on the ground reports. The cost of this activity is US$186,998. Please see Table 23 for alternative adaptation solutions to activities under Component 1.

This project intends to utilize existing monitoring activities of localized NGOs to carry out the national beach erosion monitoring program. Organizations within the various districts with reputable and strong working relationships with CZMAI will conduct periodic coastal monitoring assessments for analysis by the CZMAI. The utilization of existing monitoring activities of NGOs with a local presence in the areas of interest decreases costs related to transportation and human resources for conducting such activities by an outside source. Entities will be provided with training and equipment, thus enabling a smooth transition of the additional monitoring initiatives within already established protocols. Training will not need to be extensive as personnel already have experience in conducting period monitoring in the areas. The cost of this activity is US$250,000. Similarly, building the infrastructural capacity of the NMS for the early warning monitoring system improvement will incur a minimal cost as most of the equipment and monitoring mechanisms are already in place and/or are being updated under other initiatives. The cost of this activity is US$265,000. Initial capacity assessments of the National Hydrological Service have also been completed, informing the department of viable mechanisms for strengthening. The procurement of materials and equipment under the national coastal saline intrusion program will minimize the long-term cost of hiring a consultancy firm to conduct periodic assessments within the program. The cost of this activity is US$709,000. Please see Table 23 for alternative adaptation solutions to activities under Component 2.

During the initial assessments conducted for the beach nourishment under Belize's Fourth National Report to the UNFCCC, reputable coastal engineers provided viable options for shoreline stabilization and beach nourishment based on the analysis of available topographical and environmental data. The completion of preliminary assessments within the scope of the above-mentioned project, decreases project cost and improves the scientific basis for the implementation of concrete adaptation actions for stabilizing beach areas susceptible to high wave impact, erosion, and SLR; thereby protecting coastal infrastructure. Additionally, the benefit of having this assessment done under a separate but related initiative is that the funds budgeted in this project would be used primarily for execution of the preferred intervention for one of the two sites. Additionally, capacity will be strengthened within the regulatory agencies who have some knowledge of the application of coastal protection works gained through a professional development program offered in 2019 through the University of Belize and funded by the Inter-American Development Bank. Furthermore, the possibility of scaling up the project in other areas with similar topographical characteristics is high; this pilot would also serve a case study for Belize as successes, challenges and lessons learned can be documented to share in country and in the region. The cost of implementing the pilot activity is US$1,463,734. Please see Table 23 for alternative adaptation solutions to activities under Component 3 and Part II A above.

The engagement of communities and stakeholders within each of the proposed project components will significantly enhance the impact, sustainability, and cost-effectiveness of the project to achieve the desired outcomes under this project as well in the broader area of climate change. The latter will require the implementation of the communications/engagement strategy (NCCCSAP). The NCCCSAP will serve as a guidance document for improving the knowledge of all communities across the country to climate change including adaptation, mitigation, and economic growth activities. The strategy will have a long-term focus on climate change awareness, which can be applied during the implementation of other climate-related initiatives, making it sustainable. The cost of this activity is US$221,500. Please see Table 23 for alternative adaptation solutions to activities under Component 4.

The multi-sector approach to Project design enables the harmonization of activities and the pooling of resources for the implementation of a comprehensive project, which addresses a multitude of coastal resiliency adaptation needs. From the concept stage synergies between components provided a strong basis for the inclusion of activities within the proposal.

Table 23: Identification of Alternative Adaptation Solutions

Project Activities	**Identification of alternative adaptation scenarios**	**Project's Cost/Capita (In US$)**
Component 1: Improving coastal land use for resilient habitation and sectoral activities		
Outcome 1.1 Development of the National Housing Policy and Building Codes for resilient habitation based on vulnerability	The alternative is to retain the status quo, that would result in citizens continuously suffering from climate hazards. Infrastructural development would also proceed in the absence of building codes, resulting in periodic economic losses, linked to intense storm events.	0.35
Outcome 1.2 Improved coordination and implementation of the ICZM Plan	There are no alternative scenarios. The absence of implementation of the ICZM Plan will result in unwarranted development on climate vulnerable areas resulting in loss of infrastructure and lives.	1.59

Component 2: Coastal Vulnerability Monitoring		
Outcome 2.1 Strengthened data availability for the development of a national coastal saline intrusion program	Alternative adaptation scenarios are the enhancement of rainwater harvesting. However, this is not feasible because of the variability of rainfall, leading to insufficient rainfall to meet the needs of Belize's agriculture sector. Rainfall is unpredictable due to climate change patterns and projections for the region is a decrease in average annual precipitation	6.02
Outcome 2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	The alternative to beach erosion monitoring would be to invest in adopting a robust early warning system that monitors weather events that would impact coastal beaches These would require more capital-intensive on measures not yet tested.	2.12
Outcome 2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	The alternative to coastal early warning systems and model storm surge would be to use the existing remote sensing measures that provide information on the parameters with a high level of variability.	2.25
Component 3. Coastal Protection and Adaptation response for High-Risk Areas		
Outcome 3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	Alternative adaptation scenarios can include other beach stabilizing technologies tested during the GAMMA study, which were not identified as feasible for Dangriga or the resettlement or the construction of larger drainage channels, which are not feasible due to the high cost and environmental and social risk impacts.	12.40
Component 4. Awareness raising, knowledge dissemination and capacity strengthening		
Outcome 4.1 Promotion of ecologically responsible behaviors through climate change communication	An alternative adaptation scenario is to focus more on regulating behaviors. This will, however, cause undesirable conflicts with citizens. Additionally, the Government of Belize does not have adequate resources for policing destructive practices. Communication and education, on the other hand, will encourage pro-environmental behaviors.	0.13
Outcome 4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	An alternative adaptation scenario is to focus more on regulating behaviors. This will, however, cause undesirable conflicts with citizens. Additionally, the Government of Belize does not have adequate resources for policing destructive practices. Communication and education, on the other hand, will encourage pro-environmental behaviors.	0.18
Outcome 4.3 Strengthened GIS capabilities of CZMAI and partners	There is no alternative to GIS technologies training. This modern-day effective tool needs to be professionally and efficiently utilized in safeguarding the community.	0.22

D. Project's Consistency with National or Sub-National Sustainable Development Strategies

The project integrates strategic alignment with national and sectoral development strategies as well as an obligation under international conventions to which the country is a Party (Table 24 and Feasibility Study Part II Section Policy and Legislation). In line with national priorities for development, the Project has been aligned to the **Growth and Sustainable Development Strategy** (GSDS) 2016 – 2019, which is the overarching strategy aimed to comprehensively guide national development. The GSDS utilizes an integrated, systemic approach for medium-term economic development, poverty reduction, and long-term climate-compatible sustainable development. The Growth and Sustainable Development Strategy utilize an integrated, systemic approach for medium-term economic development, poverty reduction, and long-term sustainable development. This planning document is in line with Horizon 2030. **The Horizon 2030 Vision (2010-2030)** is organized into seven thematic areas under four main pillars, amongst others responsible for environmental stewardship. A core value of this policy document is respect for the rule of law and human rights. It envisions Healthy Citizens and a Healthy Environment and emphasizes the need to put in place effective laws and regulations,

information, and communication systems to protect the environment while promoting sustainable social and economic development. It strategizes that environmental protection laws will be enforced in a fair and just manner and, where needed, the legislation will be reformed (e.g. petroleum policy, mangrove legislation, and solid waste). The pillar also emphasized the need to strengthen national capacities, e.g. engineers, urban and regional planners, architects, social scientists, environmental scientists, environmental lawyers, marine biologists, and those trained in integrated coastal zone management (MED, n.d.)

This project is centered on the implementation of Belize's **National Climate Change Policy, Strategy and Action Plan** (NCCPSAP) which aims to guide the short, medium, and long-term processes of adaptation and mitigation of Climate Change and to ensure the mainstreaming and integration of Climate Change considerations at all levels of the development planning and operational processes of governance. The Vision outlined in the NCCPSAP stipulates: Leadership and commitment to fully address the challenges of Climate Change and sea-level rise and harness the necessary resources in support of the development of special programs that are effective, resilient, and sustainable (NCCPSAP, 2015). Necessary adaptive mechanisms identified in Belize's Third National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) and eight of Belize's adaptation targets from its **Updated Nationally Determined Contribution (NDC)** to UNFCCC have been incorporated within the Project thereby to improve the country's resiliency. The NDC contains the following priority sectors: Coastal and Marine Resources, Agriculture, Water Resources, Tourism, Fisheries and Aquaculture, Human health, Land Use, Human Settlements, and Infrastructure and Forestry and Biodiversity.

Belize's NDC indicates the need to enhance the capacity of the CZMAI and municipal authorities to ensure developments within the coastal and urban areas of Belize; implementing an adaptation strategy through mangrove restoration, sea, and river defense structures to prevent coastal and riverine erosion and ecosystem disruption; manage and regulate further development of the coastline, especially in vulnerable areas; inclusion of adaptation strategies in management and development planning in all coastal and marine sectors; review and strengthen planning legislation and building codes, especially as it relates to coastal development; revise and streamline the current legislation and policies that relate to the management and regulation of development in the coastal zone to eliminate overlaps and close existing gaps (MFFESD, 2017). **The Integrated Coastal Zone Management Plan (ICZMP) (2016)** outlines a vision and implementation plan for sustainable use of coastal resources and supports an integrated approach to development planning and adapting to Climate Change. The goal of coastal area management in Belize is as follows: 'To support the allocation, sustainable use and planned development of Belize's coastal resources through increased knowledge and building of alliances, for the benefit of all Belizeans and the global community' (CZMAI, 2016).

The Constitution of Belize does not mention or explicitly refer to Climate Change. Apart from the Environmental Protection Act, there is no specific Climate Change legislation in Belize. There is however a wide range of environmental, planning, and natural resource legislation that are relevant to the effective mainstreaming of Climate Change in Belize. Impact assessments are specifically dealt with by the Environmental Protection Act and EIA Regulations. Another important area for Climate Change mainstreaming is land use planning, which is regulated through statutes such as the Land Utilization Act, the National Lands Act, the Housing and Town Planning Act (MFFESD, 2014), Belize Fisheries Resources Act, and an indefinite moratorium on all new oil exploration (UNCTAD, 2019). Table 25 lists the lead institutions of the AF project and the relevant environment-related legislation.

Table 24: Activity Direct Linkage to National Policies and Plans

Project Outcomes	**Policy / Plan**	**Description**
Component 1. Improving coastal land use for resilient habitation and sectoral activities		
1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	NDC	Review and strengthen planning legislation and building codes, especially as it relates to coastal development
	NCCPSAP	Integrating Climate Change adaptation and mitigation into key national developmental plans, strategies, and budgets.
1.2 Improved coordination and implementation of the ICZM Plan	NDC	Adaptation strategies in management and development planning in all coastal and marine sectors / Revise and streamline the current legislation and policies that relate to the management and regulation of development in the coastal zone to eliminate overlaps and close existing gaps /
	ICZMP	Support the allocation, sustainable use, and planned development of Belize's coastal resources through increased knowledge and building of alliances, for the benefit of all Belizeans and the global community / Recommends several areas in the Informed Management Zoning Scheme for Conservation (conservation, informed management, development), some of which include privately held lands.
Component 2. Coastal Vulnerability Monitoring		

2.1 Strengthened data availability for the development of a national coastal saline intrusion program	GSDS	Completing a Water Master Plan, a National Groundwater and Surface Water Assessment, and a Water Vulnerability Profile, including salt intrusion risk assessment
2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	NDC	Manage and regulate further development of the coastline, especially in vulnerable areas
2. Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	NCCPSAP	Strengthen Climate Change resilience to prevent, reduce, or adapt to the negative impacts of Climate Change on key sectors, economic activity, society, and the environment through policies and strategic processes.
Component 3. Coastal Protection and Adaptation response for High-Risk Areas		
3. Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	NDC	Implement an adaptation strategy through mangrove restoration, sea, and river defense structures to prevent coastal and riverine erosion and ecosystem disruption
	NCCPSAP	Strengthening Climate Change resilience to prevent, reduce, or adapt to the negative impacts of Climate Change on key sectors, economic activity, society, and the environment through policies and strategic processes.
	ICZMP	Takes into consideration Blue Carbon sinks (mangroves and seagrass beds) initiatives / Mangrove restoration projects to mitigate the effects of climate change, and to ensure the delivery of coastal protection services especially in areas, such as the Central and Southern regions of Belize, which are highly prone to erosion and inundation.
Component 4. Awareness Raising, Knowledge Dissemination and National Capacity Strengthening		
4.1 Promotion of ecologically responsible behaviors through climate change communication	Horizon 2030	Put in place effective communication systems to protect the environment while promoting sustainable social and economic development.
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	NDC	Enhance the capacity of the CZMAI and municipal authorities to ensure developments within the coastal and urban areas of Belize.
	Horizon 2030	Need to strengthen national capacities, e.g. engineers, urban and regional planners, architects, social scientists, environmental scientists, environmental lawyers, marine biologists, and those trained in integrated coastal zone management.
	NCCPSAP	Capacity building and networking across all implementing agencies
4.3 Strengthening of GIS capabilities of CZMAI and partners	ICZMP	Increase the technical and management capacity of both management and co-management agencies to ensure sound management practices
Other relevant aspects	Horizon 2030	Respect for the rule of law and human rights. Environmental protection laws will be enforced in a fair and just manner and, where needed, the legislation will be reformed (e.g. petroleum policy, mangrove legislation, and solid waste).
	GSDS	Eradicate poverty by 2030 and achieve more equitable income distribution / Tourism and agriculture, crucial sectors for the Belizean economy, dependent for their sustainability on the care of the environment and the integrity of Belize's ecosystems.

	ICZMP	Research to better capture the biomass, coverage, spatial distribution, and rates of change for mangroves in Belize and make this information available to support decisions on the issuing of mangrove alteration permits

Table 25: The lead institutions for the AF Project and Legislative Framework

Agencies	Portfolio Responsibility	Legislation
National Climate Change Office (NCCO)	Climate Change	National Climate Change Policy, Strategy and Action Plan
Coastal Zone Management Authority and Institute (CZMAI)	*Integrated* Coastal Zone Management	Coastal Zone Management Act Cap 329
Protected Areas Conservation Trust (PACT)	Protected Areas Conservation financing	Protected Areas Conservation Trust Act Cap 218
National Hydrological Service (NHS)	Management of Water resources	National Integrated Water Resources Act No. 19, 2010
National Meteorological Service (NMS)	Meteorological and climate-based products and services	Support implementation of Disaster Preparedness and Response Act Chapter 145 and the Civil Aviation Act Chapter 239
Ministry of Infrastructure Development and Housing (MIDH)	Regulation of land use, housing, and infrastructural development Approve building plans Issue building permits	Housing and Town Planning Act

The Project also contributes to the achievement of Sustainable Development Goals (SDGs):

- SDG 13 Take urgent action to combat climate change and its impacts
- SDG 11 Make cities and human settlements inclusive, safe, resilient and sustainable
- SDG 6 - Ensure availability and sustainable management of water and sanitation for all
- SDG 5 Achieve gender equality and empower all women and girls
- SDG 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all

E. Project's Compliance with Relevant National Technical Standards

The project meets the standards of environmental assessments, which will be enforced by the Department of Environment via Environmental Impact Assessments (EIA). The criteria and procedure under the EIA Regulations of the Environmental Protection Act Cap 328 (2003) state that these Regulations and any procedures approved by the Minister shall be used to determine whether an activity is likely to significantly affect the environment and will therefore subject to an environmental impact assessment. All persons, agencies, institutions (whether public or private), unless exempted pursuant to these Regulations, shall, before embarking on a proposed project or activity, apply to the Department for a determination whether such project or activity would require an environmental impact assessment (article 3).

The assessment of this project's activities against the list of activities for which an EIA is required (ref. Schedule 1-regulation 7, Schedule II-regulation 8 - CAP. 328, ENVIRONMENTAL PROTECTION ACT - SUBSIDIARY LAW (doe.gov.bz)) has indicated that this project does not require an EIA. Component III – based on the scope and nature of the interventions of this component and guidance from the DOE, an EIA will not be required. The GAMMA study produced much of the groundwork and data for the justification of the scope of the interventions, and the source of material for the beach nourishment activities. As required by national laws, the comprehensive project proposal, which details all possible interventions, will be submitted to the Department of Environment for screening by the National Environmental Advisory Council (NEAC). After careful consideration the by NEAC the Department of Environment will advise on the conditions of the Environmental Clearance. The DOE has been involved throughout the design, and development of this project and are aware of the scope, design and impacts of the proposed interventions. It has been determined that the project will not require an EIA based on assessment of the project by DOE. It is important to note that beach nourishment and land reclamation activities within the coastal zone have been conducted in-country, in compliance with national regulations and technical standards. The beach stabilizing interventions, which would require the construction and active disruption of parts of the coastal area of Dangriga, were selected based on the GAMMA study completed in 2022, which considered the alternatives with the least impact on the environment, community, and population; hence the reason it would not require an EIA. Under the EIA Act, 2003, an EIA is required depending on

the scale and nature of the project and the impact. The Department of the Environment (DoE) has established a robust and comprehensive structure to assess projects, including a multidisciplinary committee that will review in detail the proposed interventions.

The project will also obtain all necessary permits for specific activities requested by the different sector authorities for the development and execution of the proposed activities (table 25.b)(e.g. Mining License from the Mining Unit for hydraulic pumping under Component 3). All project activities will have high standards of environmental management to avoid negative impacts on coastal ecosystems, biodiversity, and people's health that the project design and development misses. The project adheres to the Environmental and Social Policy and devises mechanisms to be in full compliance with all human rights including those of marginalized and vulnerable groups and indigenous peoples. The training needs assessment and development of a training plan under component 4.2 will provide sufficient consideration to female/persons-with-disabilities/youth/ITP education. During consultations with stakeholders of indigenous communities the full implementation of the Free Prior and Informed Consent (FPIC) will be considered.

Table 25-b: Project components compliance with national policies/strategies/standards.

Project Component	**Policy/Standard**	**Compliance effort**
Component 1: Improving coastal land use for resilient habitation and sectoral activities		
1.1. Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	Integrated Coastal Zone Management Plan (ICZMP)	The project interventions will use the ICZMP, which is the national plan to guide coastal development. It will also align all project interventions with any other revised or update policies and plan, including building codes and coastal human settlement plans, the latter being developed under a GCF Readiness and Preparatory Grant currently being implemented.
1.2. Improved coordination and implementation of the ICZM Plan	Integrated Coastal Zone Management Plan (ICZMP)	This plan has clear activities that focus on improving the national coordination to successfully implement the ICZMP
Component 2: Coastal Vulnerability Monitoring		
2.1. Strengthened data availability for the development of a national coastal saline intrusion program	Environmental Protection Act Effluent Limitation Regulation Pollution Regulations ICZMP	The assessments and project interventions for this component will be guided by the relevant policies, regulations and strategies that govern water resource management, taiolored to the project needs regarding saltwater intrusion into ground water in the coastal zone.
2.2. Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	Beach profiling protocol and standards (Coral Network)	CZMAI, along with other partners, have established beach profiling protocols and standards which the project will follow and expand within the project's study sites.
Component 3: Coastal Protection and Adaptation response for High-Risk Areas		

3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate change induced erosive events	Environmental Policies & Legislation EIA Act ICZMP Mining Regulations (Dredging)	The activities under this component will be executed in-line with all relevant environmental protection laws, policies and premits when stabilizing the beach off Dangriga Town. The project will not require an EIA given the nature and scope of the project intervention, but relevant clearance from DOE, Mining Unit will be secured. There will also be onsite technical support and presence during the execution of activities by the relevant regulating entities.
Component 4: Awareness-raising, knowledge dissemination, and capacity strengthening		
4.1. Promotion of ecologically responsible behaviors through climate change communication	Belize Spatial Ocean Plan Communication Strategy and Work Plan National Climate Change Communication Strategy and Action Plan	Both documents have specific communication targets at the national level that will be used to guide the implementation of this sub-component.
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	Belize Spatial Ocean Plan Communication Strategy and Work Plan National Climate Change Communication Strategy and Action Plan	Both documents have specific communication targets at the national level that will be used to guide the implementation of this sub-component. The sub-component activities will also be aligned to the Coastal Zone and Fisheries National Adaptation Plan with its associated communication interventions
4.3 Strengthening of GIS capabilities within the CZMAI and partners	ICZMP Belize Spatial Ocean Plan (BSOP)	As per the needs and requirements of the ICZMP and the BSOP

Lack of and contested land rights are often a critical cause of conflicts. The project will ensure that the project activities - Under Component Two – weather monitoring stations, and Component Three - Beach renourishment – have been secured before any investments are made. Involuntary resettlements will not be pursued. However, if grievances do arise, national stakeholders have 15 grievance redress mechanisms available for conflict resolution lined to various areas of conflict (Part III Implementation Arrangements).

The project has also been prepared following some of the stated sectorial intentions to adapt to climate change from the Nationally Determined Contributions, Belize's Third National Communication, the Integrated Coastal Zone Management Plan, and the National Climate Change Policy, Strategy and Action Plan, as stated previously in Part II D.

F. Potential Duplication with Other Funding Sources

There is no duplication of efforts from other funding sources at the time of proposal development. Rather the project creates synergies with other projects and implements actions that will complement and enhance other projects further contributing to Belize's resiliency. Relevant projects include:

The baseline for coastal inventory will utilize the insights and experiences accumulated during the **'Marine Conservation and Climate Adaptation Project' (MCCAP).** The Adaptation Fund-funded MCCAP, which was concluded in September 2020, aided the CZMAI to implement components of the Integrated Coastal Zone Management Plan (ICZMP) to increase the protection of coastal ecosystems: mangroves, seagrasses, and tidal marshes. The MCCAP supported the implementation of mechanisms to improve the adaptive capacity of communities dependent on fragile marine resources by reducing the local community's dependence on fishing stocks via alternative livelihoods and educational campaigns. This Project also enhanced the execution of the Plan via the implementation of newly developed regulations and coastal development guidelines for zonation outlined within the Plan and to enhance education and awareness on climate change adaptation.

Technical assistance has been provided for the development of a climate change communications strategy and action plan which takes into consideration gender equality for the development of behavioral change in relation to national climate change. This support has been provided under the Enabling Gender-Responsive Disaster Recovery, Climate and Environmental Resilience in the Caribbean **(EnGenDER) project,** funded by Global Affairs Canada (GAC), the Department of International Development (DFID), and co-financing from UN Women, Caribbean Disaster Emergency Management Agency (CDEMA) and UNDP and implementation by UNDP, that aims at supporting improved climate resilience for women and girls and key vulnerable populations and future generations in the nine Caribbean countries. The project envisions achieving the integration of gender equality and human-rights based approaches into disaster risk-reduction (DDR), climate change adaptation and environmental management frameworks to address current gaps. Total financial allocation for Belize is approximately USD $851,000. Via sustainable action embedded in national and regional decision-making processes, the project intends strengthening capacities for gender-responsive climate change action and disaster recovery and ensuring that governance and decision-making are accessible to women, and address gender equality. There are various entry points currently being identified under the project for Belize.

The **Building Sector Reform Project** within the Ministry of Infrastructure Development and Housing financed by the Government of Belize, with an approximated financing of BZD $96,000, has as its main objective the implementation of the amendments made to the Belize Building Act in 2017. This Act mandates the development of national housing policy and building codes. The reform project complements the development of the National Housing Policy. Climate change is considered an important guiding factor in the development of both codes and policy, for the reform to be in line with the Country's sustainable development goals and initiatives. The human capacities established under the Building Sector Reform project were utilized for developing component 1 Outcome1.

The **Fourth National Communication and First Biennial Update Report Project valued** at USD $500,000, funded by the Global Environment Facility (GEF) and implemented by UNDP, aims at assisting the country in deepening the integration and mainstreaming of climate change into national development goals, coordinating efforts among different actors and sectors to address climate change. The project will enable Belize to respond to international environmental obligations by strengthening the institutional and technical capacity of government agencies, NGOs, and the private sector. The project is supporting the availability of quality information on topics that are in line with UNFCCC decisions included in the National Communications by Non-Annex I Parties: (a) national inventory of anthropogenic emissions by sources and removal by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies promoted and agreed upon by the COP; (b) a general description of steps taken or envisaged by the Non-Annex I Party to implement the Convention; and (c) any other information that the Non-Annex I Party considers relevant to the achievement of the objective of the Convention and suitable for inclusion in its communication, including, if feasible, materials relevant for calculations of global emission trends. In addition to producing the Fourth National Communication report, the project along with the EnGENder (USD 79,870) financed Phase 1 under Component 3 – Research on the coastal system functioning and design of recovery and stabilization project and planning actions for the identification of engineering alternatives for erosion control and shore protection and establishing the technical and design parameters of the proposed solutions; valued at USD $50,000 in support.

Another initiative with which the project can create synergies is the **'Capacity Building for Climate Vulnerability Reduction'** in Belize being funded by the Inter-American Development Bank (IADB). Through this project, studies were carried out to develop a coastal risk profile for erosion and flooding and to recommend risk management actions for Belize's coastal zone. The project, which commenced in July 2019, was completed in early 2020 covering assessments of hazards, exposures, vulnerabilities, and identification of high-risk-hotspots as well as recommendations of mainly nature-based solutions to address natural hazards. Results from components under the IDB project will be directly linked to this Project and aid in the provision of necessary baseline data and mechanisms for improvement. Outputs will directly complement this project and aid in informing decisions.

The Water NAPs for Belize is being implemented by CCCCC, executed by NHS and funded by GCF is seeking to increase the available data on water resources in Belize for better decision making and national adaptive planning for this vital resource. This Readiness grant, already being implemented, will focus on increase knowledge on water security that directly impacts food security in country. Although the Water NAPs is at the national level, the focus regarding mapping of available water resource is on inland areas that directly impact food production/agriculture. This project will complement the Water NAPs by focusing on coastal water resources, which are most prone to saltwater intrusion.

The **Energy Resilience for Climate Adaptation Project (ERCAP),** funded by the Global Environment Facility via The World Bank, will strengthen the National Meteorological Service for 1: Long Term Planning and Capacity Building for Adaptation in the Energy Sector: the NMS will receive six hydro-meteorological automatic stations and six automatic rain gauges to be placed in the Macal

River basin for the monitoring of rainfall and water inputs to the Chalillo dam; 2: Measures to Enhance Resilience of the Energy Sector: the NMS has requested fourteen automatic weather stations, (ii) two field vehicles, (iii) a lightning detection system, (iv) training in radar image interpretation, (v) calibration of the radar to provide more accurate data and (f) updated software for the manipulation and display of radar data. The ERCAP is providing 23 full weather stations 12 of which will be located along the coast of Belize as well as offshore. Under component 2.2, a physical workstation type PC or server will be purchased to run DELT FEWS and 3D model software. This activity will also be coordinated with the ERCAP project since DELT FEWS will be installed and run for the Macal River modeling portion of the ERCAP project. Under ERCAP a lower specified PC will be running FEWS however to add the 3D model capabilities a more powerful machine will be needed. The ERCAP Project is funded by the World Bank and Global Environment Facility's Special Climate Change Fund and is implemented by the Belize Electricity Limited and the Ministry of Public Service, Energy and Public Utilities. The project has approximately USD $836,000, with USD $200,000 allocated for support to the National Meteorological Service. Another complementary project with the NMS involvement is the **Climate Risk Vulnerability Reduction Program financed by the Inter-American Development Bank (IDB).** This project will strengthen data collection mechanisms to feed into its system; i.e. enhance the operation of the climate risk information system.

There is also the possibility of creating synergies between the concept note that was submitted to the Green Climate Fund (GCF), **"Mainstreaming Coral Reef Resilience and Restoration as an Ecosystem-based Adaptation Strategy to Climate Change in the Caribbean Region" (MaCREAS).** This is a regional concept, which includes Belize, Dominican Republic, Jamaica, Saint Vincent and the Grenadines, Saint Lucia, and Barbados. The project will focus on rehabilitation through reef restoration activities in areas of ecological significance in the region. Strengthening of the reef system will directly benefit this AF project concept as reef systems provide substantial shoreline protection, which ties in directly to resilient habitation and decreasing vulnerability of the coast. While both projects are focusing on decreasing the impacts of climate change there is no duplication of efforts.

Another concept note, **"Enhancing Coastal Resilience Against Climate Change"** is also in the pipeline with GCF, to be implemented in Antigua and Barbuda, Barbados, Belize, Grenada, Jamaica, Saint Lucia, and Saint Vincent and the Grenadines. This concept focuses on three main areas for adaptation; it will focus on enhancing livelihoods of the most vulnerable people and communities, increase the resilience of health and well-being, and food and water security, and enhance coastal protection, and improve the resilience of ecosystems. Synergies with this pipeline project can be created in their objective to enhance coastal protection. This may be achieved by coastal stabilization through mangrove rehabilitation, coral reef restoration, and integrated coastal stabilization, and integrated watershed management and coastal area management. These will be achieved by identifying and selecting initiatives and subprojects that are consistent with the criteria that they will set. Although the initiatives are not in place yet, it is possible to note that synergies can be established to increase resilience in vulnerable coastal communities and duplication can be avoided through the communication of efforts. The proposal for this concept is now being developed for submission.

G. Project's Learning and Knowledge Management Component to Capture and Disseminate Lessons Learned.

The project will follow AF standards for Knowledge Management (KM) and advocacy. The strategic framework for the KM, Advocacy & Communication Strategy (KMAS) for this project - based on aims, objectives, and best practices regarding knowledge management (KM), advocacy, and communications – will be integrated into the implementation of the National Climate Change Communication Strategy and Action Plan (NCCCSAP). Throughout this project, a wealth of data, information, and valuable knowledge concerning community vulnerabilities, and especially those of women, youth, and indigenous peoples (in line with the AF gender policy) and resilience to climate change will be generated at the community and national levels. To ensure that useful lessons and experiences gained are successfully captured, retained, utilized, and shared throughout the project, a clear KM, Advocacy & Communication Strategy (KMAS) accompanying actionable work plan will be formulated as a point of reference for all project staff and implementing partners. The use of this strategic framework and work plan will facilitate the effective coordination of resources and efforts at all implementation stages, monitoring, and evaluation. Knowledge Management at the project level will be achieved through the development of appropriate actions (gathering data; analyzing processes, results, and personal experiences; generating and disseminating knowledge products and lessons learned, etc.) so that the knowledge captured is shared to reach the largest number of stakeholders swiftly. A strong and actionable work plan allows effective knowledge sharing, advocacy, and communications. Once knowledge products and lessons learned have been generated and developed, they will be effectively communicated and shared with specific target groups and audiences as well as the public.

The core benefits of a successful KMAS/NCCCSAP are: a) Improves visibility of project activities and results to raise awareness on climate change impacts and adaptation at multiple levels and especially for women and youth; b) Enhances capacity for knowledge retention and reuse (at community, national and international level, including specific focus on women and youth); c) Enhances knowledge sharing and increases collaboration (within and across communities, relevant institutions, and organizations, including specific focus on women and youth); d) Improves learning (organizationally, locally, and globally); e) Strengthens accountability vis-à-vis project delivery and compliance with environmental, social, gender, youth, and human rights standards; f) Increases project impact through learning and access to information, including specific focus on women and youth; g) Avoids duplication; h) Facilitates modification of current and future projects based on lessons learned; i) Strengthens stakeholder/knowledge networks, including specific focus on women and youth J) Contributes to normative work of the national-level Government agencies, local government (e.g. NAVCO/DAVCO/town councils/village councils), and other stakeholders.

Implementation of KMAS/NCCCSAP will support the component and activities of this project to capture and share lessons and promote pro-environmental behaviors. Project results and lessons learned can be, depending on the strategy set out in the NCCCSAP, disseminated at national and international levels through conferences, symposia, meetings, workshops, various publications in peer-reviewed journals. Furthermore, other means such as radio, TV, newspapers, YouTube, Facebook, and video documentaries will be used as well to share and communicate project results, outcomes, and lessons learned. Learning and knowledge management will

also be an integral part of the M& E framework. Therefore, the Project Management Unit (PMU) will be required to collect, document, and facilitate the dissemination of the project results and lessons learned.

Component 4 focuses on awareness-raising and knowledge dissemination. The NCCCSAP/KMAS will be implemented under this component. This will be a key part of ensuring the sustainability of the project by building local capacity. Before implementation, lessons learned from similar projects/activities will be integrated. All lessons learned during the project development and implementation phases will be documented and shared to ensure wide dissemination of results, best practices, and lessons. The KMAS/NCCCSAP will boost climate change awareness within sectors and all coastal communities for improved coastal planning, habitation, and monitoring. As the effects of climate change are visible in some communities and sectors, but the linkage to climate change and its future effects are not clearly understood, awareness-raising initiatives are important to build the resilience of local communities to adapt to imminent threats and promote ownership of initiatives.

There are provisions for knowledge management within each component. Under Component 1 the development of a habitation policy and the formulation of regulations for Belize's coastal guidelines will be heavily reliant on active stakeholder consultations in coastal communities. The entities undertaking the activities will provide the public with information via national media houses and social media platforms. Information obtained from the implementation of Component 2 will be linked to existing web-based platforms as well. Data collected from tidal gauges and the National Meteorological Service's automated stations will be linked to the Service's web-based data management system providing real-time data for Belize. The web-based system will inform other initiatives of the Service such as the common alert protocol and the early warning system alerting protocols thereby protecting the lives of Belizeans. Similarly, the Beach Erosion Monitoring Program, which will be spearheaded by the CZMAI, will provide data for analysis at periodic intervals for the proactive formulation of mitigation and adaptation mechanisms to coastal erosion. Lines of communication will be open during the implementation of Component 3 in the two selected coastal communities. This will keep communities abreast of activities and ensure active participation, transparency, and knowledge sharing.

The gender action plan of the project (Annex 1: Gender and Social Assessment) aims to ensure equal participation of men and women and to integrate the gender-related needs of the local communities into the technical design and the way the project is implemented. The Gender Action Plan describes the proposed measures to be included in the project design and implementation to promote gender equality and mainstreaming in the activities and consequently the outputs of the project. In particular, it focuses on the gender concerns relating to equal access to opportunities, participation in decision-making, women's access to training and practical skills, and how the plans/strategies developed will ensure equal opportunities for women. Overall, the main approaches were undertaken so far, or to be undertaken, are 1) Conducting consultations with both genders to ensure the equal consideration of the perspectives of women and men, 2) Gender sensitivity in the project's implementation, and 3) Encouraging women to take staff and consultancy positions in the project. Proper consideration will be provided to pursuing a gender balance among staff/consultants/stakeholder beneficiaries, and in all procurement processes, in line with the NIE's commitment to Gender Equality and Equity. Remuneration will be based on the work requirements, irrespective of gender.

H. The Consultation Process

The project has been designed based on the outcomes of consultations at the national and community level. Consultations with government institutions, community members, NGOs, researchers, etc. took place to inform the communities of the project development, develop a mechanism for stakeholder involvement in the process, and receive feedback on proposed activities (Table 26). Consultations with community representatives, including women, took place to identify their specific views on the project and to ensure equal distribution of benefits (Annex 1 Social and Gender Assessment). Selected findings of the Social and Gender Assessment indicate: (i) Women leaders in the communities and NGO/Government/Statutory agencies ensure female participation in the project, (ii) Belizean women are increasingly becoming better equipped to undertake the roles that used to be reserved for men, however, some women in the beneficiary communities prefer to adhere to the culturally/traditionally assigned gender-specific roles and decision-making by elders, (iii) During natural disasters, women are disproportionately affected, especially in female-headed households, (iv) Stakeholders were supportive of the project and felt that the proposed activities were beneficial to Belize's coastal communities.

The consultative process was conducted to ensure the equitable participation of men, women, youths, vulnerable groups, indigenous communities and all cultural ethnicities within Belize. The dynamics of cultural rules and norms were taken into consideration in planning for and during the engagement process. Given the Covid-19 pandemic a variety of engagement methodologies were used to effectively involve communities and attain feedback for incorporation from all stakeholders on the proposed activities within the project. Close consideration was given to environmental and social safeguards to remove or reduce any adverse impacts the project interventions may have on the targeted populations. Members of communities included, but were not limited to, the following cultural ethnicities: Creole, Mestizo, Maya, Garinagu and East Indian. Traditional communities known for their customary fishing practices such as Sarteneja, Chunox, Punta Negra and Hopkins were also consulted.

Both Indigenous Groups in Belize were consulted during the session in the Belize, Stann Creek and Toledo Districts. Members of the Garifuna community were consulted as part of the consultations in the southern part of the country (Gales Point, Hopkins, Dangriga), as many of the communities are along the coast in that area. The Maya communities, which are mostly located inland in the Southern District of Toledo, were consulted during the state level consultations. The traditional rights of the Garinagu and the Mayas are integral to the successful implementation of the project, including Component 1.1. Key Partner Agencies have also conducted sector specific consultations with traditional and indigenous communities during the development of their project components. In addition to the

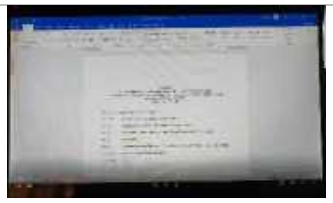
individual engagement via community stakeholder consultations, the Belize National Indigenous Council (BENIC) was also consulted, which represented all indigenous groups in Belize and has their active participation. The Free Prior Informed Consent Protocols will be observed during the project implementation. The protocols were recently endorsed by Cabinet (2022) and the relevant regulating and stakeholder agencies were consulted during the revision of this proposal.

The Implementing Entities and Key Partner Agencies are cognizant of the need to continuously engage and involve all communities during project implementation. To ensure this continued involvement, project components were developed to utilize the functional capacities of the communities to actively assist in the implementation of project components. The functioning of the Coastal Advisory Councils will also ensure the continuous flow of information to and from communities for decision making by the Implementing Entities. The latter will be accompanied by the periodic community consultations that are planned under the projects M&E and which have been incorporated into individual project components by Key Partner Agencies. Furthermore, training under Component 4 will be extended to all coastal communities to monitor and report real time data/updates for decision making to the relevant agencies.

Table 26: Initial consultation outcomes and conclusions

Stakeholder/Community	Objective of Session	Outcome	Evidence
Stakeholder Consultation Dangriga and Hopkins Village March 13th and 14th 2019	Field visit to the coastal town of Dangriga and coastal community of Hopkins with the objective to identify the various natural and human factors affecting coastal erosion.	Identification of prospective sites for erosion control interventions and the identification of potential assessments required to devise effective erosion adaptation solution.	
Javier Sabido – NAVCO Virtual, 11 Sept. 20	Inform the national village council and request support to organize community consultations.	NAVCO is positive about the project and supports to organize community consultations in villages received.	
IHCANTIABRIA/IDB Virtual, 16 Sept. 20	Map lessons learned from other projects/ assess synergies	Relevant aspects of Belize's Disaster Risk Profile research integrated into feasibility analysis (Annex 2)	
Stakeholder Session (Corozal) Chunox, Sarteneja Copper Bank Chunox, 3 October 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Recommendations: GoB needs to monitor and ensure compliance. housing codes need to enforce the mangrove regulations; coastal zone management. Indicate the need for communications.	

Stakeholder Session (Corozal) Corozal Town/Altamira, Consejo, Corozal Town, 3 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Recommendation: Consider alternative energy sources that are less expensive. Worried about groundwater contamination. Indicate the need for communications.	
Stakeholder Session (Toledo) Forest Home Punta Gorda, 10 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Highlight: Want more consultations with council chair present.	Please refer to the stakeholder consultation report for the registration list.
Stakeholder Session (Belize District) St. George's Caye, Belize City, Ladyville, Belize City, 17 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Recommendations: Need for protection and management of mangrove areas; development of a management plan for the cayes; development plans and land use laws, zoning regulations; improved governance structures at the central and local levels; monitoring and compliance; Legislation that includes building codes; a minimum standard for building construction in the city for people who don't have the resources; Awareness and education. Need flood/shoreline protection.	
Stakeholder Session (Belize District) Gales Point, Mullins River Gales Point, 17 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Worried about water due to droughts affecting supply. Want erosion controlled.	
Stakeholder Session (Belize District) San Pedro Town, Belize City Virtual, 22 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Recommendations: Proper development planning, zoning; collaboration, and communication with local authorities. Worried about flooding and advocate EWS& mangroves. Positive about beach nourishment. Indicate the need for communications. Useful to have the GIS capabilities in the CZMAI.	Please refer to the stakeholder consultation report for the registration list.

Stakeholder Session (Stann Creek) Riversdale, Maya Beach Maya Beach, 23 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Highlights: Suffering from Climate Change impacts& saltwater intrusion; no zoning regulation.	Please refer to the stakeholder consultation report for the registration list.
Stakeholder Session (Stann Creek) Placencia Placencia, 24 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Highlights: Want to collaborate.	Please refer to the stakeholder consultation report for the registration list.
Stakeholder Session (Stann Creek) Dangriga Dangriga, 24 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Highlight: Advocate for decentralization and collaboration. Suffer from saltwater intrusion. Happy that the town was chosen as a pilot. Advocate for control of man-made causes. Indicate the need for communication.	Please refer to the stakeholder consultation report for the registration list.
NGOs & Independence, Virtual, 28 Oct. 20	Inform about the project concept and receive feedback on relevant aspects, including their interventions.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. NGOs collaborative support for implementation obtained.	
Timothy Hawthorne (UCF) Virtual, 10 Dec. 20	Learn about UCF's PGIS research at Hopkins	Relevant aspects of UCF PGIS research were considered, and UCF was identified as a potential partner.	
Executing Entities and Lead Agencies 20 Nov., 17 Nov., 5 Nov., 29 Oct., 27 Oct. 20	Understand each project component, related aspects, and synergies	Detailed discussions with entities about each project component, synergies, and related climate change and policy issues, beneficiaries, financial, gender, and social aspects (Annex 3 Consultation Report).	
Media Appearance (Love FM) 24 Nov 20	Sensitize national stakeholders on the objectives of the project	Discussion of the projects objective and intended outputs on national television to increase stakeholder knowledge of the project components.	

Stakeholder Consultation (Hopkins Village) 15th February 2021	Inform about project activities and receive feedback on relevant aspects, vulnerability, social, gender.	Community expressed the need to address erosion as well as other environmental factors in the communities that have resulted in major flooding over the past 2 years during storm events. Highlights: Want to collaborate and be actively involved in the long-term monitoring program and to receive training that will better enable them to safeguard their community and way of life	 Please refer to stakeholder consultation report for registration list
Stakeholder Consultation (Belize National Indigenous Council - BENIC) 16th February 2021	Inform about project activities and receive feedback on relevant aspects, vulnerability, social, gender.	Belize National Indigenous Council (BENIC) expressed gratitude for being consulted as a group during the development of the project. They requested to be continuously engaged during project implementation and indicated that the project has no negative impact on the traditional rights of their member communities and are in support of the project.	

I. Justification for Funding Requested, Focusing on the Full Cost of Adaptation Reasoning.

Ongoing measures to address national needs for adaptation and habitation have produced some results and increased the country's resilience. However, these initiatives need to be built on further to fully ensure climate resilient coastal communities, thereby protecting the lives of flora, fauna, and man. The effects of improper planning void of climate variability considerations, poor infrastructural development, and coastal erosion compounded by sea-level rise are already visible within heavily populated coastal areas of the country. These have resulted in the loss of cultural assets in some communities, housing, community infrastructure, and beaches. As such, there is a need to devise concrete long-term solutions to address the safety of these coastal communities.

The proposed project components, outcomes, and outputs fully align with 1) national, community, and institutional priorities and gaps, with 2) identified community/vulnerable groups' needs and 3) with the Adaptation Fund outcomes. This alignment has resulted in the design of a comprehensive approach in which the different components strengthen each other and in which outputs and activities are expected to complement Belize's current climate change responses and corresponding institutional capacities.

The cost per beneficiary ranges from US$0.13 per person (component 4) to US$12.40 per person (component 3). The average cost for the project is US$2.83 which is low considering its significant contribution to Belize's climate change adaptation efforts and the project's contribution to strengthening professional, academic, and local capacities. Table 27 provides a justification for funding requested, focusing on the full cost of adaptation reasoning.

Table 27: Funding Justification

Expected Result	Baseline Data	Additional with AF	Adaptation Reasoning
Component 1: Improving coastal land use for resilient habitation and sectoral activities			
Outcome 1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	Zero National Housing Policies with clear a specification for coastal habitation	One National Housing Policy with clear a specification for coastal habitation developed	In retaining the status quo, the citizens will continue to suffer from climate hazards. Without a proper housing policy and implementation of building codes, as recent experiences with tropical storms, Eta and Iota have once again indicated, housing in Belize NOT climate resilient. A national housing policy, a crucial guidance tool, will address issues of land tenancy, land use planning, zoning, rentals, financial plans, subsidies, building codes, etc., and adhere to national sustainable development plans and initiatives. Building codes

			are urgently needed and are being developed; they will establish the minimum requirements to be considered when building, to adequately safeguard the health, safety, and welfare of building occupants. Rolling out/implementation of these codes are significant in ensuring reliance of our coastal infrastructure.
Outcome 1.2 Improved coordination and implementation of the ICZM Plan	One Integrated Coastal Zone Management Plan without associated management guidelines for zonation	Drone mapping and ground-truthing conducted and Coastal Land Use Inventory updated Annual monitoring of ICZMP implementation progress tracked and reported on	The mandate to create legal instruments for the implementation of national development guidelines contained within the ICZMP due to Belize's central government system. Currently, the guidelines have no legal power and are being used merely as a suggestive recommendation for coastal development. The absence of a legal framework for their implementation has resulted in the unwarranted development in climate-vulnerable areas of the country. This proposed project will further aid the CZMAI to implement and enforce the provision of the coastal planning guidelines within three of the national planning regions, North, Central, and Southern. There are no complementary activities (co-financing) that would affect the successful implementation of this project activity.
Component 2: Coastal Vulnerability Monitoring			
Outcome 2.1 Strengthened data availability for the development of a national coastal saline intrusion program	NHS (national level) has limited capacity to conduct saline intrusion research	Qualitative and quantitative research data on soil salinity conducted to reduce the saline intrusion risk available. Enhanced evidence-based knowledge to determine best use practices for freshwater supply for the coastal areas, while reducing probability of further saline intrusion	The continued extraction of water from underground aquifers and rivers, in the absence of scientific data to regulate extraction may result in the limited availability of water resources for the country. As the country currently relies heavily of underground aquifers and rivers for the supply of potable water to communities and for sectoral activities. It is crucial that we understand the dynamics of water utilization in country and the characteristics of water sources, especially given the predicted changes to rainfall which would affect water availability. There are no complementary activities that would affect the successful implementation of this project activity. Assessments and other water sector interventions will enable a comprehensive understanding on the availability of the country's water resources.
Outcome 2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	CZMAI (national level) has limited capacity to conduct beach erosion research	Qualitative and quantitative research data outlining coastal beach erosion available National beach erosion monitoring protocol and program developed, including establishment of a community beach erosion monitoring network	There is limited financing in country to effectively monitor erosion sites via government agencies. Additionally, erosion along coastal communities are not monitored on a regular basis in order to determine the characteristics of the event or determine possible immediate solutions. The establishment of a national program will enable the relevant entities such as the CZMAI, to determine periodically the state of the coastal zone in an effort to proactively devise solutions that would result from significant erosion in vulnerable areas.

			There are no complementary activities (co-financing) that would affect the successful implementation of this project activity.
Outcome 2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	NMS has limited capacity to model storm surge	Modeling of storm surge via research data obtained and an Early Warning System established	This activity will enable the real-time attainment of weather data to be used within the coastal early warning system. In the absence of this data, there are gaps that inhibit the National Meteorlogical Service from providing optimal information to national and community disaster response agencies. In anticipation of climatic impacts such as increase in storm intensity and frequency, this information and the establishment of the system for early warning will enable proactive responses. There are no complementary activities (co-financing) that would affect the successful implementation of this project activity. The complementary activity identified, the ERCAP Project, will further expand the national network.
Component 3. Coastal Protection and Adaptation response for High-Risk Areas			
Outcome 3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	Dangriga is under threat due to climate change	The identified beach stabilizing solutions for the northern part of Dangriga are successfully executed Beach monitoring programme established for Dangriga	In the absence of this intervention homeowners may be forced to migrate and resettle in other portions of the country. Some sections of the community may be lost completely to the Caribbean Sea, resulting in loss of traditional ways of life, physical infrastructure and public assets. Such pilot interventions enable the community to reclaim land/beaches loss and safeguard physical infrastructure. As majority of the communities along the coast are fishing communities, the resettlement of persons in other parts of the country would alter many persons traditional way of life. Co-financing activities have been completed under the FNC and the FBUR and EnGENder. These are baselines for this project that other initiative have developed or under development that will be built upon by this project. Some of the activities are the Building Code, identification of aquifers by the Water NAPs, the Gender Action Plan under EnGender, national commitment under the FNC, among others.
Component 4. Awareness raising, knowledge dissemination and capacity strengthening			
Outcome 4.1 Promotion of ecologically responsible behaviors through climate change communication	Limited awareness of predicted adverse impacts of climate change, and appropriate responses among the national population	NCCCSAP activities related to this project successfully implemented using written, audio, and visual materials	The Government of Belize does not have adequate resources for policing destructive practices. Hence communication and education, will encourage pro-environmental behaviors and enable adaptation practices that will safeguard communities in a changing climate.

Outcome 4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	Limited awareness of predicted adverse impacts of climate change, and appropriate responses among the national population	Training needs on the use and deployment of climate change best practices will be assessed and appropriate training will be delivered to relevant participants.	There is the need to build the capacity of entities, government agencies, sectors, and communities in order to facilitate the effective adaptation to climate change. Capacity building enables all entities the opportunity to function independently of continued technical support to build the climate resiliency of sectors and communities over a longer period. The co-financed activity, the development of the NCCCSAP, is already underway.
Outcome 4.3 Strengthened GIS capabilities of CZMAI and partners	Limited national level capacities to use GIS technologies	Officials trained and equipped with useful knowledge to use GIS technologies	This modern-day effective tool has many applications. Its professional and efficient utilization can safeguard communities via the monitoring and recording of climate change impacts. This tool will also enable the collection of data, which can be utilized by the CZMAI and other agencies in the decision-making processes and the long-term monitoring of climate change impacts. There are no complementary activities (co-financing) that would affect the successful implementation of this project activity.

J. Sustainability of the Project

The proposed project intends to maintain the sustainability of all components via the integration of components within the institutional functioning of executing entities (NCCO, CZMAI, NMS, NHS and MIDH) and key partners (PACT and the Municipal Governments). The components of the project are embedded as national adaptation priorities and the priorities of partner institutions. Long term implementation and monitoring will be managed by the key partners with the aid of participating community groups, which will be strengthened under the capacity building activities of this project.

The project aims to sustain adaptation benefits achieved and replicate best practices after the end of the project through a combination of anchoring activities into existing government programmes, strategies, and projects, including for policies and maintenance by sharing lessons and best practices. The projects have been described in Section F. The institutionalization of activities within the programmes of the executing entities will ensure continuity and partnership with communities will be enhance to ensure long-term sustainability.

Institutional/Policy sustainability: The project strengthens national policies and mandates. The Housing Policy and Building code implementation guidelines (Component 1.1), Coastal Zone Management (Component 1.2), Saline intrusion monitoring (Component 2.1), Beach Erosion Monitoring (Component 2.2) are vital contributions of this project to Belize's preventive climate actions. The Housing Policy and Building codes implementation benefit the nation, not just coastal communities. The improved resourcing and capacity of relevant stakeholder to component 3 will support the long-term sustainability of the project. Moreover, under component 4 awareness and training will be conducted to strengthen relevant government capacities and best practices and lessons learned from all component outputs and outcomes will be shared at the national and sub-national level.

Social sustainability: By organizing and fully engaging community members and vulnerable groups in project activities, including assessments during project preparation and the development of plans/strategies and monitoring, the project aims to achieve long-lasting awareness and capacities of community members. Moreover, community members will be trained to support pro-environmental behaviors. By bringing in positive behavior changes, the risk of flooding will be reduced. By adopting this strategy, the project will also promote ownership.

Economic sustainability: Investing in increasing resilience is a sustainable economic approach. It will reduce future costs related to erosion and flood impacts. The project will ensure that workers are used from the local communities and the investments under component 3 will result in enhanced capital liquidity in the Dangriga. Additionally, safe housing will benefit the tourism sector and soil salinity monitoring will benefit the agriculture sector as well.

Financial sustainability: The average cost for the project is US$2.83 which is low considering its significant contribution to Belize's climate change adaptation efforts and the project's contribution to strengthening professional, academic, and local capacities. The project builds on cost-effectiveness strategies to enhance the project's impact: strategic partnerships with academic institutions, communities, and NGOs, enhancing youth professional capacities (student partnership).

Technical sustainability: Belize's institutional framework is backed up by knowledgeable and dedicated professionals. Various policy documents emphasize the need for stronger capacities. As State institutions have limited funding, and technologies progress over time, there's an urgent need for capacities to be strengthened to promote adaptation efforts and the effective implementation of technical solutions. Successful pilots exist and, through this project, these will be scaled up and strengthened; opportunities for

complementarity are utilized to increase the impacts in the different areas of this AF proposal. Table 28 provides an overview of project outputs and arrangements envisioned to maintain and build on the efforts.

Environmental sustainability will be ensured through a combination of active and passive interventions. Active interventions will ensure that all material and techniques used are of the highest quality and have proven environmentally friendly raw materials. This will ensure that no adverse long-term impacts are imposed on the environment, during and post-project investment. The passive interventions include increasing knowledge, lessons learnt and awareness to building stewardship of stakeholder on the benefits and impacts of building resilience to climate change through adaptive management of coastal resources.

Table 28: Overview of arrangements for sustainability

Expected Concrete Outcome	Arrangements to sustain / maintain activities / interventions
Outcome 1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	The developed tools for long-term development National Housing Policy and building codes and ICZM zonation guidelines are crucial to climate change adaptation efforts as they will consider climate change/disaster risks developed using internationally accepted tools and guidelines such as International Guidelines on Urban and Territorial Planning. They will be used beyond the lifespan of the project as well.
Outcome 1.2 Improved coordination and implementation of the ICZM Plan	
Outcome 2.1 Strengthened data availability for the development of a national coastal saline intrusion program	The development of public-community-NGO partnerships will enhance monitoring efforts and act as a catalyzer to enhance dialogue and partnerships for future interventions. NGOs active in the areas of this component, and possible partners, include Toledo Institute for Environment and Conservation (TIDE), Southern Environmental Association (SEA), and Sarteneja Alliance for Conservation and Development (SACD). The University of Belize is also interested in collaborating in the adaptation efforts of the project. The data resulting from the research/monitoring interventions under this project will enable the detection of climate hazards sooner and provide government and partners with more time to adopt responses.
Outcome 2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	
Outcome 2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	
Outcome 3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	Essential to the long-term sustainability of this activity is hinged on the lessons learnt and knowledge shared throughout the process of implementation. This component will share the knowledge and insights gained during this intervention to enhance dialogue with other coastal communities. The availability of the report on the beach stabilization activities (beach nourishment and geo-tubes) will facilitate dialogue to identify appropriate solutions for other coastal communities and the technical and financial support of the project to the Municipal Government and CZMAI will support the long-term sustainability of the project.
Outcome 4.1 Promotion of ecologically responsible behaviors through climate change communication	Community awareness-raising is included regarding all the project components. By capitalizing upon the policy provisions, by building partnerships with and inclusion of community groups, local civil society organizations, and local government institutions and service providers, it is expected that the project will provide the necessary platform among these groups for having direct stakes and benefits (ownership) to reduce the risks of flooding and contamination levels. Pro-environmental behaviors will continue beyond the duration of this project.
Outcome 4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	This component contributes to equipping stakeholders with the tools to realize pro-environmental behaviors. Training guides, capacities, and technologies envisioned will be widely used tools available to facilitate future training programs.

Outcome 4.3 Strengthened institutional capacity of CZMAI and partners	

K. Overview of the Environmental and Social Impacts and Risks Identified

The project is in full alignment with the Environmental and Social Policy (ESP) and the Gender Policy of the Adaptation Fund (Annex 4: Demonstrating Compliance). The summary screening overview below addresses the safeguard areas of the ESP, identifying any potential environmental and social risks and impact that proposed project components may pose.

The design and implementation of all components of this project will ensure adherence to all environmental, social, and gender requirements of the Fund and will ensure the representation and consultation of all beneficiary groups including indigenous peoples, marginalized and vulnerable groups. This project will produce positive economic, social, and environmental impacts to the 27 coastal communities and the key economic sectors, tourism, in the coastal zone of the country, and in doing so – under component 1 extends its reach to the national level.

This project has been categorized as Category B concerning the potential environmental and social impacts that can be generated during the implementation of Component 3. Activities under this component for beach stabilization may result in some changes to the natural environment within the selected site of Dangriga. However, these impacts are minimal and will be easily mitigated taking into consideration the natural dynamics of the beach profile. Additionally, the beach stabilizing measures were selected based on the GAMMA study, which identified possible alternatives, but the Geo-tubes were considered to have the least negative impacts on the environment, but the more efficient given the characteristics of the intervention site.

Table 29: Environmental and Social Assessment

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law	X	No Risk The project document and the implementation of activities under this project will ensure compliance with all relevant national legislation and international laws (Feasibility Study Part II, Section Policy, and Legislation).
Access and Equity	X	No Risk This project will enhance the availability of basic human services such as housing, water, and quality of life through the implementation of project components. This project in no way compromises access of communities to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. A participatory approach has been integrated into the project's design (e.g. coastal advisory committees, community wardens, beach erosion monitoring network, knowledge transfer, data availability) and will be applied throughout the project. By sharing the lessons learned in Dangriga, component 3 will also benefit communities that could not be included in the pilot under this component.
Marginalized and Vulnerable Groups	X	No Risk Marginalized and vulnerable groups will benefit from the project adaptation efforts by being protected against pending climate hazards. If infrastructure and monitoring are improved, man/woman/child/person with disability/ elderly in the community benefits. This project will not impose any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. This project is expected to improve the ability of all groups including marginalized and vulnerable groups to adapt to the adverse effects of climate change by building the

		resilience of communities to address issues such as sea-level rise, coastal erosion, storm intensity, and frequency.
Human Rights	X	No Risk This project will respect and adhere to all relevant national legislation and international conventions on human rights. The project supports among others: the right to shelter: Component 1 addresses the right to safe housing; right to participation: local communities and other stakeholders will be fully engaged, right to use law: apart from the grievance redress mechanism the stakeholders have access to more than 10 other grievance redress mechanisms which Belize has, including but not limited to the judicial system, right to work: the project will employ under just and favorable conditions, not limited to equal pay of genders, rest and holiday, cultural rights: The project will adhere to good practices and engagement including the guidance provided by national Free Prior and Informed Consent protocols. It encompasses and enhances climate change actions (SDG 13), decent employment (SDG8), safe water (SDG 6), gender equality (SDG 5), and resilient settlements (SDG 11)
Gender Equity and Women's Empowerment	X	No Risk All participatory and consultative processes will ensure the representation of women and vulnerable groups from all communities, gender experts, and NGOs. The project partners will deliberately seek Gender Equity in consultation and project activities, e.g. through quota systems and /or the organization of separate working groups during the implementation. The stakeholders indicated that the project has no gender-specific activities (Consultation report Section II). Proper gender balance will be considered and where needed actively pursued, for example in project staffing. Female community members will be actively engaged. Gender-disaggregated data will be monitored.
Core Labor Rights	X	No Risk This project will adhere to the core labor laws and rights of all parties.
Involuntary Resettlement	X	No Risk The components for this project do not include involuntary resettlement. It is the aim of Component 3 to restore coastal beach areas to avoid the displacement of local communities such as Dangriga. The design during phase 1 of component 3 (financed under FNC) includes proper assessment of the context-appropriateness regarding the recommended risk reduction measures.
Indigenous Peoples	X	No Risk All components within this project ensure that local communities and indigenous peoples benefit. Extensive stakeholder consultations have been conducted for all project components; particularly those relying on the participation of local communities for implementation and long-term sustainability. These consultations will improve the involvement of indigenous people in the project development phase respecting their needs and rights (e.g. FPIC).
Protection of Natural Habitats		Low/Moderate Risk The implementation of the coastal guidelines under Component 1 and the national assessments for coastal salinity and beach erosion monitoring program under Component 2 and the beach stabilization under Component3, serve dual purposes of protecting the lives and livelihoods of coastal communities and their members as well as improving the protection of natural coastal habitats by regulating development based on sound scientific principles. The coastal guidelines, for instance, provides for sustainable development which takes into consideration environmental protection. The latter limits development in areas with highly vulnerable ecosystems and those where development would have a high negative impact on the natural environment. Component 3 is expected to have the most disruption to natural habitats, which can be reduced using established initiative and its positive impacts enhanced. Several initiatives of mangrove restoration in the area may be considered to reduce the impact of the interventions, but viability and stakeholder buy-in will be assessed during implementation and consultations under this component.
Conservation of Biological Diversity		Low/No Risk No activity under this project will pose any significant reduction or loss of biological diversity or facilitate the introduction of known invasive species. There are no real risks to biological diversity under this project. The need for conducting EIA under the project components have been considered in section E and will be determined by the Department of the Environment accordingly. Initial assessment of the project by DOE have indicated it will not require an EIA.

Climate Change	X	No Risk This project will contribute to Belize's climate change adaptation and mitigation efforts. This project, in no way, is intended to increase greenhouse gas emissions or contribute to any drivers of climate change. The disaster risk reduction measures of Component 3 have been identified as the most suitable for the identified implementation areas, with close consideration to reduce the impacts of climate change.
Pollution Prevention and Resource Efficiency	X	No Risk This project will ensure the maximization of energy efficiency, strive to avoid any potential pollution, and minimize the production of greenhouse gas. Under component 4.2 sargassum use/farming will be considered as a livelihood strengthening strategy, based on the feasibility study of the project and its viability. This will contribute to waste utilization for compost/green energy purposes.
Public Health	X	No Risk This project contributes to the enhancement of public health via the implementation of climate efficient building codes, limiting the development of inadequate zones in line with the coastal zone guidelines, strengthening a warning system, and monitoring saline intrusion in coastal communities, thus ensuring the provision of potable water to all coastal communities. The disaster risk reduction measures identified in Component 2 will protect Dangriga from climate hazards. This project will in no way compromise public health in project sites.
Physical and Cultural Heritage	X	No Risk This project embraces the protection of physical and cultural heritage in the coastal communities being targeted via the implementation of components 1, 2, and 3. It is the aim of the project to increase the adaptive capacity of the coastal communities to address issues such as coastal erosion that would result in the loss of land and thus physical and cultural heritage. By encouraging pro-environmental thinking and strategies, it will have a long-term positive impact to protect heritage assets.
Lands and Soil Conservation		Low/Moderate Risk This project will improve the productive capacity of productive lands in the coastal zone, by providing viable solutions for addressing the impacts of climate changes on farming activities via the analysis of data obtained from the saline assessment program under Component 2. The strengthening and implementation of the coastal zone guidelines, under Component 1, will for instance ensure that coastal development occurs only in selected areas to avoid any adverse impacts to land and soil conservation, which would occur as a result of vegetation removal. However, this component - through sector regulation - has a positive impact on even the inland communities. The activities under Component 3 will require the sourcing of materials of the restoration action. The project will ensure that no adverse impacts are posed to ecosystems where sand is sources; the identified areas consist only of sandbars; no seagrass beds or mangrove forests will be affected. This will be done via a comprehensive assessment and the identification of alternative sources during project implementation.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the Arrangements for Project Implementation.

The following mechanisms for project execution, coordination, and oversight have been agreed in close consultation with Protected Areas Conservation Trust (PACT), as the National Implementing Entity (NIE); and National Climate Change Office (NCCO), Coastal Zone Management Authority and Institute (CZMAI) Ministry of Infrastructure Development and Housing (MIDH), National Hydrological Service (NHS) and National Meteorological Service (NMS) as Executing Entities. The Ministry of Economic Development (GOB) is Belize's Designated Authority of the AF.

Project Governance

Figure 23 depicts the organogram. PACT is the NIE with fiduciary management responsibilities. PACT also has an oversight role and will report to the Adaptation Fund. The EEs of the project are NCCO, CZMAI, MIDH, NMS and NHS, all with project implementation responsibilities. The NCCO is responsible for the execution of components 3 and 4.1, the CZMAI for components 1.2, 2.2, 4.2, and 4.3; the MIDH for component 1.1, the NHS for 2.1, and the NMS for 2.3.

Project Management Unit (PMU)

A Project Management Unit (PMU) will be established with overall project management responsibilities – financial, monitoring, and reporting. The PMU will receive guidance from both EEs: the NCCO and the CZMAI. Physical placement Physical placement of the PMU will be at the NCCO office in Belmopan because various crucial institutions (e.g. PACT, Ministry of Finance, NCCO, etc) for this project are located in Belmopan.

The PMU will consist of a Project Manager and Technical Officer. The PMU will provide daily project management support, oversight, management of fund flow, and executing partners' delivery. The Project Manager will be engaged to coordinate project implementation. The Project Manager will oversee and keep abreast of project progress and facilitate the implementation of the project, including overseeing and cooperating with the project teams in the various lead agencies. The Technical Officer will keep track of the progress made according to the indicators and steer project implementation under the various components. The Technical Officer will also keep track of the environmental and social safeguards and gender indicators and standards

The Project Management Unit will be responsible for managing the project activities and ensuring compliance with the commitments set out in the project document, Environmental and Social Policy, with 15 principles of Adaptation Fund, as well as providing day-to-day support to all partner institutions. The project manager will develop, in collaboration with the partner agencies, a Monitoring and Evaluation Plan during the project inception phase. The project manager will also monitor project implementation, if needed, through periodic visits to the intervention sites. The PMU will ensure that the project is implemented on time and monitor the inter-institutional interventions.

Project Steering Committee (PSC)

A Project Steering Committee (PSC) drawn from a cross-section of stakeholders in the coastal resources management field with particular reference to the priority areas of the components will be established. The Implementing Entities will establish a PSC to provide oversight and technical guidance for the implementation of the project. The PSC will be chaired by the Chief Executive Officer of the Ministry of Sustainable Development, Climate Change & Disaster Risk Management (MSDCCDRM). Members of the PSC will be nominated by their respective ministries and/or organizations and appointed by the MSDCCDRM. Members are appointed for the entire duration of the project. The proposed composition of the PSC is as follows :

- CEO or a designated representative in the Ministry of Sustainable Development, Climate Change & Disaster Risk Management
- CEO or a designated representative in the Ministry of Natural Resources, Petroleum and Mining
- CEO or a designated representative in the Ministry of Infrastructure Development and Housing.
- Financial Secretary or a designated representative in the Ministry of Finance, Economic Development and Investment
- CEO or a designated representative of the Coastal Zone Management Authority & Institute
- Chief Climate Change officer or a designated representative of the National Climate Change Office
- CEO or a designated representative in the Ministry of Rural Transformation, Community Development, Local Government and Labour
- Executive Director or a designated representative of PACT as an ex-officio observer
- The Project Manager is the recording secretary and ex-officio observer.

The role of the PSC is among others (1) approving annual work plans of the components and reviewing key project periodical reports; (2) reviewing and approving the contractual agreements, including work plans, budgets, and payment schedules, with a particular emphasis on leveraging synergies and avoiding duplication; (3) reviewing any deviations and considering amendments to work plans and contractual agreements.

Project Implementation Agency Group (PIAG)

The PIAG will carry out the day-to-day management of the project including the coordination, supervision, monitoring, quality control, socio-environmental management and reporting. The PIAG will consist of the Project Manager, Technical Officer, staff

from the Executing Entities (NCCO and CZMAI) and key partner entities (NHS, NMS, MIDH) and fiduciary staff from PACT. PACT will be responsible for ensuring sound fiduciary management of the Project's resources.

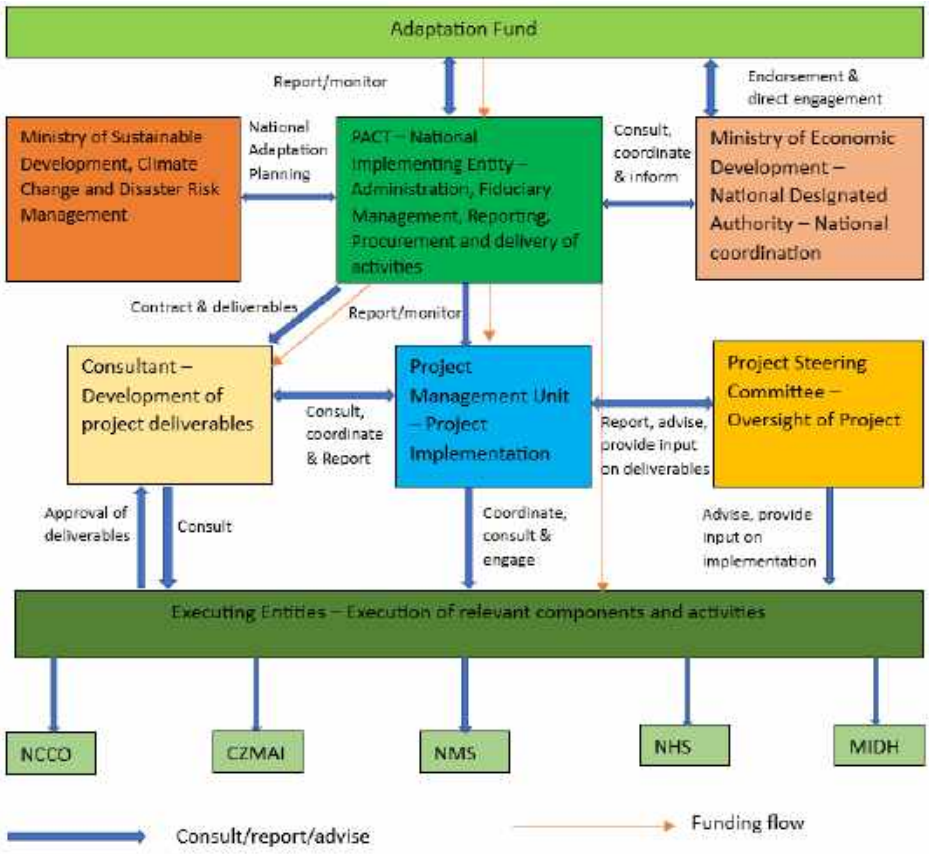


Figure 21: Project Organogram

B. Describe the Measures for Financial and Project Risk Management.

Table 30: Project Risk Management

Risk Type	Risk Category	Risk Level (Impact/ Probability) 1: Low 4: High	Management/ Mitigation Measure
Project Stakeholder Risk	National stakeholders do not support the project activities and do not participate in proposed interventions	Impact: 4 Probability: 2	Communities targeted for proposed interventions have been engaged during the development of the proposal to ensure the inclusion of their climate-adaptive needs including those of vulnerable and marginalized groups. Additionally, a communications professional will support raising awareness about the project interventions and the need for them throughout the lifespan of the project. This will strengthen community confidence regarding the adaptation measures.
Operational Risk	**Governance:** The national governance structures may not support the project.	Impact: 4 Probability: 1	Integration with policy and legislative priorities has been verified. The project integrates institutional collaboration and has supporting structures to promote the interventions: NIE, EE, PSC, PIU.
Institutional Risks	**Institutional:** Capacity constraints of local institutions may limit the effective implementation of interventions	Impact: 4 Probability: 1	The NIE, EE, and associated entities have competent staff. Additionally, the project will ensure to have competent staff. The project has a significant capacity building and training component 4, designed to promote effectiveness and sustainability at the national and local level for the implementation of interventions.
Design Risks	**Design:** The project design has provided insufficient integration of national, subnational, and technical requirements	Impact: 2 Probability: 1	The project design has ensured integration with policy, legislation, community views, technical considerations, financial considerations and has been determined sound. The project is in line with the NIE's commitment to Gender Equality and Equity, the Gender Action Plan, and the Environmental/Social Plan.
Performance Risk	**Operational:** Unavailability of experts in country	Impact: 3 Probability: 2	The timeframe for the project has been designed to take into consideration any unforeseen delays in the attainment of international support. Additionally, most

			entities have established strong working relationship with international and regional entities that have committed their support for the implementation of the project activities. This support can be attained virtually in most cases. Local experts can also provide on the ground support under the guidance of international experts for the implementation of activities.
Social Risks	**Social:** Lack of commitment/buy-in from local communities may result in delays.	Impact: 4 Probability: 1	Stakeholders have been widely involved in the early stages of the project design and will continue to be involved throughout the project cycle: implementation, monitoring, and evaluation. The involvement of key stakeholders at the community level and inclusion of vulnerable to climate change adaptation communities and groups such as youth, women, men local leaders, community beneficiaries, and fishers will continue to mitigate any risks related to stakeholders' involvement.
Social Risks	**Social:** Communities may fall back into negligent practices during or after the AF project.	Impact: 4 Probability: 2	The implementation of the communication strategy will have a long-term impact and inform stakeholders about the risks of unsustainable practices, e.g. related to mangroves, construction in high-risk areas, etc. The participatory approach has been integrated into the process design (e.g. coastal advisory committees, community wardens, beach erosion monitoring network, knowledge transfer, data availability) and will be applied throughout the project. The beneficiaries will be directly involved in the implementation of the adaptation options under component 3.
Financial	Financial Control Risk	Impact: 4 Probability: 2	PACT will receive, disburse, and manage all funds under the Project. Funds will not be disbursed to any other entity for management, as only direct payments for the provision of services and products acquired. PACT will apply its standard financial management procedures to ensure the proper management of funds

			in line with its Anti-Fraud Policies and Procedures. PACT has a solid track record of providing fiduciary and grants management services for third parties and its financial management structure is accredited by local, regional, and international organizations.
	The financial impact of the pandemic could lead to inflation depending on the government's fiscal measures, leading to price variations of good and services	Impact: 4 Probability: 2	The project will reprioritize activities and revise the budget accordingly.
	Late Disbursement of Funds could lead to implementation delays	Impact: 4 Probability: 2	Disbursements request will be made well in advance in accordance with the timelines as agreed upon by parties as set out in the project proposal. For disbursements from the AF, the project will follow the guidance of the funding agency.
Environmental	Natural disasters: Belize has recently become increasingly impacted by natural weather events, that may cause disruption in the project implementation	Impact: 4 Probability: 3	Natural disasters can disrupt the implementation of the project, especially since most of the interventions (active) are along the coastline. This will be mitigated by planning activities outside of the Hurricane Season, where possible and closely working with the NMS to track weather events.

C. Describe the Measures for Environmental and Social Risk Management, In Line with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

Part I, Section B describes how the project provides economic, social, and environmental benefits, including the most vulnerable groups within communities, including gender considerations. Part II and Sections E and K describes the results of the performed assessment related to national and AF standards and risks. Part II, Section H describes the consultation process that has been undertaken to ensure inter alia inclusion of potentially marginalized groups, including women and indigenous people. The results of these consultations and analyses have been integrated into the project design.

Based on the identification of financial, environmental, and social risk; appropriate measures have been incorporated to ensure that risks are avoided and that, where this is not the case, they are identified and mitigated on time (Part III, Section B).

Taking into consideration the principles of environmental and social policy of the Adaptation Fund, the project is classified as a "B" category project in terms of the environmental and social risks it poses. Table 31 sets out the Environmental and Social Risk screening including the identification of the potential risks and the preventative/mitigation measures that the project will take to reduce potentially adverse environmental and social risks to acceptable levels.

Table 31: Environmental and Social Risk Screening

Environmental and social principles	Environmental and Social impacts and risks / Component	Probability of Risks	Mitigation measures	Mitigation Action Plans
Compliance with the Law	The project does not carry any realistic risk of failing to comply with the law. All investments will be set up with the consent of the landowner or government agency responsible for the buildings and permits.	Low/No Risk	When and where applicable (e.g. NMS-weather monitoring stations, NCCO – coastal protection) the entities will check the status of the land-use and rights, conduct consultations with the right-holders and communities and collaboratively identify workable solutions. All required permits will be obtained.	-Implement mitigation actions on public land, and in the case of private land with the consent of right-holders. -Consult the legal procedures to establish a community-owned business model -In case of conflict utilize the national Land Rights Conflict Resolution Authority for resolution.
Access and Equity	Potential social inequality if preferential project benefits are shared with selected groups (Component 2.2 and 3)	Low/No Risk	There is a potential risk of conflict when project engagement is limited to a limited number of people, and questions could rise (why them, not us). There is also a potential risk of failure if traditional leaders in the Garifuna communities (Dangriga) are not engaged.	-Participatory approach has been integrated into the process design (e.g. coastal advisory committees, community wardens, beach erosion monitoring network, knowledge transfer, data availability) and will be applied throughout the project. By sharing the lessons learned in Dangriga, component 3 will also benefit communities that could not be included under this proposal.
Marginalized and Vulnerable Groups	Potential social inequality if preferential project benefits are shared with selected groups (Component 2.2 and 3)	Low/Moderate	Marginalized and vulnerable groups will benefit from the project adaptation efforts by being protected against pending climate hazards. If infrastructure and monitoring are improved, men/women/children/persons with disabilities/ elderly in the communities will benefit.	Monitoring will be conducted through a mix of informal interviews, meetings with communities and monitoring programs.
Human Rights	Human rights breaches of international and national human rights Laws (Component 1)	Low/No Risk	The project supports the Human Right of shelter.	By implementing the building policy and codes and the Coastal Zone Management Plan and guidelines, people's lives and investments are being protected. The project supports among others: the right to shelter: the right to safe housing; the right to participation, the right to use law rights to work. It encompasses and enhances climate change actions (SDG 13), decent employment (SDG8), safe water (SDG 6), gender equality (SDG 5), and resilient settlements (SDG 11)

Gender Equity and Women's Empowerment	Women could be denied access to information and excluded from making critical decisions (all Components)	Medium	The project partners will purposefully seek Gender Equity and Female participation in consultation and project activities, e.g. through quota systems and /or organization of separate working groups during the implementation.	The Project staff will monitor to ensure that the project follows best-practice guidelines for gender-balanced participation. The message 'women are encouraged to apply' will be included in the Terms of References. Remuneration will be based on the work requirements, irrespective of gender.
Core Labor Rights	Labor rights may not be respected when contracting communities (Components 2.2, 3, and 4.1)	Low/No Risk	The project will monitor international and national labor laws for any work that may be carried out concerning the project	All contracts will be reviewed to ensure these, and the project activities comply with both national laws and international standards, including ILO labor standards.
Involuntary resettlement	While there is no risk of resettlement arising from the project, there is a risk that there may be damage to homes or disruption of access, and as such management and mitigation actions are required. People can be temporarily inconvenienced by the establishment of the risk reduction measures under component 1.1 & 3.	Low/No Risk	Communities will be fully and regularly briefed on the nature and progress of the establishment of the risk reduction measure before they begin, including the expected duration, the disruption expected, and the grievance mechanism.	The project will conduct periodic informal discussions with households to ensure that they have had unhindered access to their homes and no damage or other issues have occurred.
Indigenous Peoples	Exclusion of indigenous peoples is unlikely	Low/Moderate	There is also a potential risk of failure if traditional leaders in the Garifuna communities (Dangriga) are not engaged.	Engagement strategies will be respectful of traditional/indigenous leaders and communities and traditional customs (Free Prior and Informed Consent).
Protection of Natural Habitats	Damage to natural habitats and threats to biological diversity are unlikely.	Low/No Risk	Relevant policies and guidelines will be explained to and understood by project personnel before implementation and monitored.	The project includes community consultation and involvement in identifying and protecting natural habitats. Sandbars from which the materials will be sourced under Component 3 do not consist of mangroves or seagrass beds, two of Belize's coastal ecosystem types.
Conservation of Biological Diversity	No realistic risks to biological diversity.	Low/No Risk	No mitigation or management actions required beyond those highlighted elsewhere, especially under pollution prevention and resource efficiency	No specific monitoring measures were included as no risks were identified.
Climate Change	No significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.	Low/No Risk	This project is inherently an adaptation project and as such, no maladaptation is foreseen.	n/a

Pollution Prevention, Resource Efficiency, and Public Health	Construction of infrastructure can generate wastes and may even have health consequences (Component 3 & 4.2)	Low/No Risk	The project will ensure that waste materials are properly being disposed of. All workers engaged under component 3 will be informed on proper procedures to dispose of waste materials generated during the construction, to ensure that there is no risk of improper disposal.	NCCO will conduct monitoring to assess whether the sector standards are adhered to. This will also be assessed during consultations with consultants/stakeholders. During the hydraulic pumping under Component 3, all mitigation measures recommended by the Mining Unit, e.g. the use of adequate silt curtains, will be used to contain materials within the pumping site.
Public Health	A lack of occupational health and safety standards and procedures could result in injuries to workers or community members (component 3)	Low/No Risk	Occupation health and safety training will be monitored for coastal works, and necessary safety equipment will be provided by the service provider.	The monitoring report will capture the results of occupational health and safety for the project components.
Physical and Cultural Heritage	Activities may not permanently interfere with existing access and use of such physical and cultural resources	Low/No Risk	No physical or cultural heritage impacts are foreseen	Although no physical or cultural heritage impacts are foreseen; this will have to be reviewed when the activities are taking place on-site. This review will include the tenure/ownership of the location for risk reduction measures (component 3).
Lands and Soil Conservation	Projects should promote soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services (component 3)	Low/Moderate Risk	Since the project will not be able to cover all the vulnerable areas of soil erosion there is a potential risk that the change of water dynamic and flow may affect other areas, which are not protected.	Consultations have and will continue to capture all critical issues and this risk will be monitored throughout the project through the beach monitoring that will be established under the project. Provisions for this have been made in the methodology under phase 2. Careful consideration will be given to the expected impacts of coastal protection intervention to find the best areas for implementation, based on the data available through the GAMMA study.

An assessment of social and gender issues (Annex 1 Social and Gender assessment) was conducted for compliance with AF gender policies, the results of which have been integrated into project activities and will be monitored by M&E arrangement and plans. The gender action plan of the project (Annex 1: Social and Gender assessment) aims to ensure equal participation of men and women and to integrate the gender-related needs of the local communities into the technical design and the way the project is implemented. The Gender Action Plan describes the proposed measures to be included in the project design and implementation to promote gender equality and mainstreaming in the activities and consequently the outputs of the project. Annex 4 demonstrates compliance of the project with the Environmental and Social Safeguards (ESS) of the Adaptation Fund. The ESMP located in Annex 4 identifies the mitigation measures that have been incorporated into the project to ensure that the project enhances environmental and social benefits, and prevents, reduces, or mitigates adverse environmental and social risks and impacts. The ESMP will form the bases of the project compliance with national and international standards for environmental and social safeguards. During project implementation all risks will be monitored periodically.

Grievance Mechanism

The grievance mechanism will be available to all the project's target communities and will be open to beneficiaries and non-beneficiaries. It will allow them an accessible, transparent, fair, and effective means to communicate with the project management staff (and Project Steering Committee) if there are any concerns regarding the project design and implementation. Access to information for the grievance mechanism will be available through the websites of the NIE and EE's, it will also be included on the social media pages of the entities. All employees, executing entities and consultants/service providers, and community members will be made aware of the grievance mechanism to lodge any complaint, criticism, concern, or query regarding the project's implementation. The mechanism will consider the needs of different groups in the target communities. It combines various options to communicate with the Project ImplementationUnit. Additionally, any stakeholder involved with the project can use any training event or any other event organized by the project, either in public or in private to raise a grievance verbally. Project staff, including those

from the executing entities, will also be trained to recognize grievances from community members and how to deal with grievance reports. The local facilitators in each community will also be trained to recognize dissatisfaction and how to report grievances. All stakeholders, including beneficiaries, will be made aware of the grievance mechanism, their options for reporting, what constitutes a grievance, and their right to anonymity at the start of the project, and/or whenever the project first contacts them. Stakeholders will be reminded of the grievance mechanism periodically throughout the project. Figure 22 provides an overview of the grievance redress flow chart. The process will be managed by the Project Management Unit.

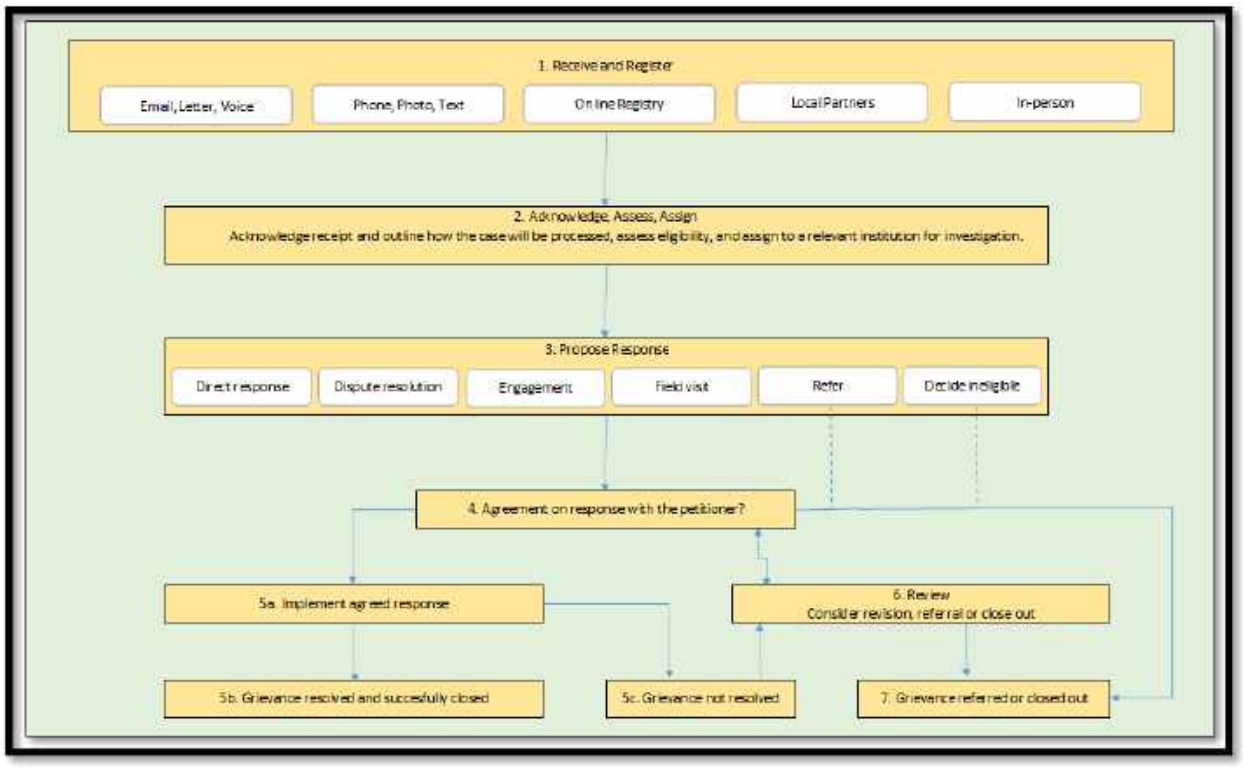


Figure 22: Flowchart of the Grievance Redress Implementation Framework

D. Describe the Monitoring and Evaluation Arrangements and Provide a Budgeted M&E Plan, In Compliance with the ESP and the Gender Policy of the Adaptation Fund.

This M&E plan follows the AF Evaluation Framework, ESP, and complies with its Gender Policy. M&E will be based on targets and indicators established in the Project Results Framework as set out in Part III, Section E. Additionally, the status of identified environmental and social risks and the Mitigation Action Plan, will be monitored throughout the project (6-months field mission reports, annual project progress and performance reports, mid-term, and terminal evaluation reports). The same applies to financial and project management risks and mitigation measures. Table 32 sets out the M&E Plan for this project.

Table 32: Outline Monitoring and Evaluation Plan

Type of M&E Activities	Responsible Parties	Time Frame for reporting	Reporting Format	Budget (US$)	Source
Inception workshop	Project Manager	Within the first quarter in year 1	Inception workshop report	5,000	5000 from PCM project support budget
Measurements of means of verification (baseline assessment and M&E plans for the components)	Project Manager; Project team; external consultant	First-quarter of year 1	M&E Plans / Result frameworks	8,000	8000 from PCM project support budget

Project progress and performance reviews	Project Manager	Quarterly, Annually	The quarterly project progress and annual performance reports	-	Covered by PE budget
Community consultations/ workshops/trainings	Project Manager; Project team	Max. 2 weeks after each event	Event reports		No additional cost
Steering Committee meetings	Steering Committee	Every 6 months	Steering Committee biannual reporting		Covered by PCM budget
Direct Project Monitoring and Quality Assurance including progress and financial reporting, project revisions, technical assistance, and risk management	Project Manager; With input from Project team; NAVCO, community-level monitoring	Quarterly and annually	The quarter, annual project progress, and performance reports	-	Covered by PE budget
Field missions	Project Manager	Every three months	Field mission reports	25,000	PCM Fee budget (evaluation support)
The Mid-term Evaluation	Project Manager + external consultant	After 26 months of the project period	Midterm evaluation report	7,500	PEC budget (mid-term evaluation)
The Terminal Evaluation	Project Manager + external consultant	Six months before the end of the project period	Terminal evaluation report	8,700	PEC budget (end-term evaluation)
Audit	External Consultant	Final project year	Audit report	25,000	PCM Fee budget (Evaluation support)
Conduct M&E and verification (including environmental and social management plans and gender indicators)	M&E Officer	Year 1,2,3,4	M&E verification reports	13,000	PEC budget (Office staff and technical support)
Hire monitoring and evaluation officer	Project Manager	Monthly	Monitoring and evaluation updates and reports	83,700	PCM Fee budget (PACT staff salary/supervision on report)
			Total Budget	**175,900**	

The project manager will coordinate the development of the M&E Plans during the project's inception phase through working sessions. The M&E plans will be distributed and presented to relevant stakeholders during the first community workshop. The emphasis of the M&E Plan will be on participatory outcome/result monitoring, project risks, collaboration and project sustainability, and informing stakeholders of the importance to collect gender-disaggregated data. Periodic monitoring, including gender indicators, will be conducted through a field mission to the intervention sites every six months.

Gender Action Plan for Monitoring and Evaluation

The following gender action plan of the project aims to ensure equal participation of men and women and to integrate the gender-related needs of the local communities into the technical design and the way the project is implemented. The Gender Action Plan (Table 45) describes the proposed measures to be included in the project design and implementation to promote gender equality and mainstreaming in the activities and consequently the outputs of the project. In particular it focuses on the gender concerns relating to equal access to opportunities, participation in decision-making, women's access to training and practical skills, and how the plans/strategies developed will ensure equal opportunities for women. Overall, the main approaches were undertaken so far, or to be undertaken, are 1) Conducting consultations with both genders to ensure equal consideration of the perspectives of women and men,

2) Gender sensitivity in the project's implementation and 3) Encouraging women to take staff and consultancy positions in the project. Proper consideration will be provided to pursuing a gender balance among staff/consultants/stakeholder beneficiaries, and in all procurement processes, in line with the NIE's commitment to Gender Equality and Equity under its operational frameworks. Additionally, remuneration will be based on the work requirements, irrespective of gender.

Table 33: Gender Action Plan

Project Components	Outcomes	Gender issue	Action	Indicator	Beneficiaries	Responsible Party
Component 1 Improving coastal land use for resilient habitation and sectoral activities	1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	Female-headed households are particularly vulnerable to climate hazards and also in the lower-income segment.	The policymakers consider equally the needs of men and women, and particularly considers women who work in the home. Discussions with communities are gender-equal and disaggregated.	No. or women engaged in the development of the policy and codes Monitoring of Indicator: A detailed description of how the needs of men and women (particularly women who work in the home) will be incorporated. An equal number of men and women participate. Attendance registers are taken (anonymized) that identify numbers of men and women.	National level: 419,199 persons: 209,603 males and 209,596 females (Staff: 8 consultants: 4 male/4 female. Construction workers are generally male)	MIDH, M&E Officer, Project Manager. PSC (oversight)
		Female-headed household are particularly vulnerable and need information about	The policymakers consider equally the needs of men and women, and particularly considers women who	No. of women engaged and involved in the process Monitoring of Indicator:	National level: 419,199 persons: 209,603 males and 209,596 females (Staff: 12 persons: 6	CZMAI, M&E Officer, Project Manager. PSC (oversight)

	1.2 Improved coordination and implementation of the ICZM Plan	Importance of adhering to coastal zonation.	work in the home. Women will be encouraged to apply for positions as wardens and committee members. Discussions with communities are gender-equal and disaggregated.	A detailed description of how the needs of men and women (particularly women who work in the home) will be incorporated. Progress made about female inclusion as wardens and committee members are documented An equal number of men and women participate. Attendance registers are taken (anonymized) that identify numbers of men and women	male/6 female, however also influenced by available local capacities)	
Component 2 Coastal Vulnerability Monitoring	2.1 Strengthened data availability for the development of a national coastal saline intrusion program	Gender-neutral work based on qualification. Females will be encouraged to apply, with equal consideration to both genders.	Training sessions target an equal number of men and women. Men and women are targeted to be trained in equal numbers. However, this is dependent on the intrinsic composition of the institutions. Female participation will likely outnumber males.	No. of women involved and trained under program Monitoring of Indicator: Training sessions completed with records documenting equal participation from men and women. Documentation about these sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	27 coastal communities - 117,823 persons: 57,787men; 60,035women (Target 50 trainees: 25 male/25 female)	NHS, M&E Officer, Project Manager. PSC (oversight)

	2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	Gender-neutral work based on qualification. Females will be encouraged to apply, with equal consideration to both genders.	Training sessions target an equal number of men and women. Men and women are targeted to be trained in equal numbers. However, this is dependent on the intrinsic composition of the institutions. Female participation will likely outnumber males. Women will be encouraged to join the community committees.	No. of women involved in the program Monitoring of Indicator: Training sessions completed with records documenting equal participation from men and women. Documentation about these sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	27 coastal communities - 117,823 persons: 57,787men; 60,035women (Target 50 trainees: 25 male/25 female)	CZMAI, M&E Officer, Project Manager. PSC (oversight)
	2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	Gender-neutral work based on qualification. Females will be encouraged to apply, with equal consideration to both genders.	Training sessions target an equal number of men and women. Men and women are targeted to be trained in equal numbers. However, this is dependent on the intrinsic composition of the institutions. Female participation will likely outnumber males.	No. of women trained Monitoring of Indicator: Training sessions completed with records documenting equal participation from men and women. Documentation about these sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	27 coastal communities - 117,823 persons: 57,787men; 60,035women. (Target 10 trainees: 5 male/5 female)	NMS, M&E Officer, Project Manager. PSC (oversight)
Component 3 Coastal Protection and Adaptation response for High-Risk Areas	3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	Female-headed households are particularly vulnerable to climate hazards.	The engineer's methodology will consider equally the needs of men and women, and particularly considers women who work in the home, and how to avoid inconvenience.	No. of women involved in the pilot project Monitoring of Indicator: The engineer's progress report describes in detail how the needs of women	9,591persons (4,615 men, 4,976 women) in Dangriga, (Staff target 5 consultants: 2 male/3 female. Construction workers generally male)	Engineer, NCCO, M&E Officer, Project Manager. PSC (oversight)

			Discussions with communities are gender equal.	(particularly women who work in the home) have been met, and if any conflicts have occurred.		
		Female stakeholders are particularly explicit about the need for information.	Knowledge sharing sessions target an equal number of men and women. Interventions will consider equally the needs of men and women, particularly women who are not in a leadership position.	No. of persons engaged Monitoring of Indicator: Knowledge sharing sessions completed with records documenting equal participation by men and women. Documentation of sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	25 coastal communities – 106,622 persons: 52,395 men; 54,226 women (100 session participants: 50 male/50 female from 25 coastal communities)	NCCO, M&E Officer, Project Manager. PSC (oversight)
Component 4 Awareness raising, knowledge dissemination and capacity strengthening	4.1 Promotion of ecologically responsible behaviors through climate change communication	Female stakeholders are particularly explicit about the need for information.	Awareness sessions target an equal number of men and women. Interventions will consider equally the needs of men and women, particularly women who are not in a leadership position.	No. of communities and persons sensitized Monitoring of Indicator: Awareness sessions were completed with records documenting equal participation from men and women. Documentation of sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	National level: 419,199 persons: 209,603 males and 209,596 females (100 session participants: 50 male/50 female from 25 coastal communities)	NCCO, M&E Officer, Project Manager. PSC (oversight)

	4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	Gender-neutral work based on qualification. Females staff equally considered for training.	Training sessions target an equal number of men and women. Interventions will consider equally the needs of men and women, particularly women who are not in a leadership position.	No. of persons trained. Monitoring of indicator: Training sessions completed with records documenting equal participation from men and women. Documentation of sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	27 coastal communities - 117,823 persons: 57,787men; 60,035women (target 50 trainees: 25 male/25 female)	CZMAI, M&E Officer, Project Manager. PSC (oversight)
	4.3 Strengthening of GIS capabilities of CZMAI and partners	Gender-neutral work based on qualification. Females staff equally considered for training.			27 coastal communities - 117,823 persons: 57,787men; 60,035women (target 15 trainees: 7male/8 female)	

E. Include A Results Framework for the Project Proposal, Including Milestones, Targets, and Indicators, Including One or More Core Outcome Indicators of the Adaptation Fund Results Framework, and In Compliance With The Gender Policy of the Adaptation Fund.

Table 34: Results Framework for the Project Proposal

Expected Result	Indicators	Baseline Data	Targets[14]	Risks & assumptions	Data collection method	Frequency	Responsibility
Component 1: Improving coastal land use for resilient habitation and sectoral activities							
Outcome 1.1 *Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience*	Number of persons/communities knowledgeable of National Housing Policies including intercoastal habitation	Zero National Housing Policies with specification for coastal habitation	One (1) National Housing Policy with specification for coastal habitation developed 30% (35, 000) of men and women consulted during the development of the policy and building codes 65% (19 communities) of communities consulted during the development of Building Codes	R- Housing policy not accepted by beneficiary community members A - Beneficiary community members are aware of the need for the Housing policy	Visits to communities, formal and informal discussions, high-resolution photos/videos (to be added to the database)	Baseline, annual, mid-term, and end-term	MIDH, PMU
Output 1.1.1 National Housing Policy and implementation plan encompassing climate resilient housing	Number of persons/communities knowledgeable of National Housing Policy with clear a specification for coastal habitation	Zero National Housing Policies with specification for coastal habitation	Legislative review completed and Discussion paper developed and validated National Housing Policy for Belize developed and validated National Housing Policy Implementation Plan developed and validated	R- Housing policy not accepted by beneficiary community members A - Beneficiary community members are aware of the need for the Housing policy	The legislative review report, Discussion paper	Baseline, annual, mid-term, and end-term	MIDH, PMU
Output 1.1.2 *Implementation of National Building Codes with special reference on*	Number of persons/communities knowledgeable of National Building Code	National Building Codes with a specification for the climate change being developed	Implementation guidelines for building codes in the coastal zone developed, validated and disseminated	R- National Building Codes implementation guidelines not accepted by professional architects, engineers and contractors A - Professionals are aware of	Discussion paper, national building codes	Baseline, annual, mid-term, and end-term	MIDH, PMU

[14] Based on the number of beneficiary of each project component or subcomponent.

coastal climate resilient habitation	with a specification for climate change		All 28 communities and 30% (35,000) of its inhabitants	the need for the Building Codes and make use of the dissemination and training on the use of the building codes guidelines			
Output 1.1.3 *Capacity Building of stakeholders on implementing the Building Codes*	No. of men/women trained on the use of the guidelines No. of men/women who received the guidelines No. of architects, engineers, and contractors trained (M/F)	No implementation guidelines developed National building codes being developed	Awareness communication tools developed and capacity building of the new building code implementation guidelines among the key stakeholders Training of architects, designers, builders and service providers on housing and construction on the building codes and application (100)	R- National Building Codes not accepted by professional architects, engineers and contractors A – Professionals are aware of the need for the Building Codes and make use of the dissemination and training on the use of the building codes guidelines	Report on attendees of training sessions, with data segregated by profession or occupation and sex	At the end of each training session	MIDH, PMU
Outcome 1.2 *Improved coordination and implementation of the ICZM Plan*	Number of persons/communities knowledgeable of Integrated Coastal Zone Management Plan and associated management guidelines for zonation	One Integrated Coastal Zone Management Plan without associated management guidelines for zonation	Drone mapping and ground-truthing conducted and Coastal Land Use Inventory updated 50% (59,000) of coastal community members engaged with at least half being women 70% (19 communities) of coastal communities consulted	R- ICZMP and associated zonation guidelines not accepted by beneficiary community members A - Beneficiary community members are aware of the need for the ICZMP and associated guidelines	One Integrated Coastal Zone Management Plan without associated management guidelines for zonation	Baseline, annual, mid-term, and end-term	CZMAI, PMU
Output 1.2.1 *Updated land use inventory of three existing coastal planning regions (northern, central and southern)*	Number of persons/communities knowledgeable of Integrated Coastal Zone Management Plan and associated management	One Integrated Coastal Zone Management Plan without associated management guidelines for zonation	Integrated Coastal Zone Management Plan and associated management guidelines for zonation updated/developed All 28 communities with at least 30% (19,000) of the community	R- ICZMP and associated zonation guidelines not accepted by beneficiary community members A - Beneficiary community members are aware of the need for the ICZMP and associated guidelines	One Integrated Coastal Zone Management Plan without associated management guidelines for zonation	Baseline, annual, mid-term, and end-term	CZMAI, PMU

	guidelines for zonation						
Output 1.2.2 *Annual Monitoring and Evaluation of Implementation of the ICZM Plan*	No. of annual reports prepared and shared with stakeholders	Current ICZM plan's implementation not consistently monitored	Collection of information on Implementation progress of the ICZM Plan in accordance with the M&E Framework; preparation of annual reports on implementation progress with recommendations for implementation improvement; sharing with national stakeholders (5 reports, one for each of the years of the project – will continue post project as well)	Information from regulatory agencies across government and also from NGOs not shared in a timely manner Stakeholders will understand the importance of the ICZMP and implementation of its development guidelines and will cooperate Stakeholders will assist with ICZMP implementation	Sharing through emails and other virtual means: updates, new data, reports, new projects and project documents, reports on infractions of regulations in the Coastal Zone Advisory Council meetings	Quarterly, for annual reporting	CZMAI, PMU
Output 1.2.3 *ICZM Plan implementation process established and initiated with stakeholder engagement*	No. of meetings with Community Wardens, and Coastal Advisory Committee to monitor compliance with the Coastal Zone Management guidelines	No meetings with Community Wardens, and Coastal Advisory Committee to monitor compliance with the Coastal Zone Management guidelines	Regular quarter (4/year) site inspections and meetings with 8 Community Wardens and 4 Coastal Advisory Committees conducted and recorded.	R- ICZMP and associated zonation guidelines not accepted by beneficiary community members A - Beneficiary community members are aware of the need for the ICZMP and associated guidelines	Bi-weekly meetings or phone conversations with Community Wardens, and Coastal Advisory Committees to monitor compliance with the Coastal Zone Management guidelines	Monthly monitoring, Baseline, annual, mid-term, and end-term	CZMAI, PMU
Activities under Output 1.1.1 • Conduct Review of Existing Legislation and regulations related to Housing in Belize (Town Planning Act, Town Council Act, Land Utilization Act, Land Subdivision Act, Energy Act, Coastal Zone Management, etc.) and report preparation with concrete recommendations on how to use the legislation through consolidation or amendments • Consult with stakeholders (3x)					**Milestones** Activities under Output 1.1.1 begin by Month 1 complete by Month 24 Activities under Output 1.1.2 begin by Month 13		

• Prepare a discussion paper • Prepare draft Housing Policy taking into consideration economic, social, gender and climate factors • Raise awareness on the National Housing Policy **Activities under Output 1.1.2** • Prepare a discussion paper • Consult with stakeholders (2x) • Development of Building Code Implementation Guidelines • Conduct stakeholder sensitization **Activities under Output 1.1.3** • Awareness creation and capacity building of the new building code implementation guidelines among the key stakeholders • Developing a resource pool to implement the building guidelines • Training of architects, designers, builders and service providers on housing and construction on the building codes and application **Activities under Output 1.2.1** • Procure necessary software and equipment for data collection and processing • Utilize software and equipment for data collection and analysis • Continue drone mapping and ground-truthing exercise to update the Coastal Land Use Inventory to update the register for three planning regions in the northern, central, and southern Belize. • Collect information to update the ICZM Plan • Share updated recommendations with national stakeholders • Conduct site inspections, meetings with Community Wardens, and Coastal Advisory Committees to monitor compliance with the Coastal Zone Management guidelines **Activities under Output 1.2.2** • Collection of data from regulatory agencies on ICZMP implementation and coastal development • Consistent tracking of implementation progress, with recommendations for improvement • Annual reporting to stakeholders **Activities under Output 1.2.3** • Conduct site inspections, meetings with Community Wardens, and Coastal Advisory Committees to monitor compliance with the Coastal Zone Management guidelines					complete by Month 36 Activities under Output 1.1.3 begin by Month 25 complete by Month 48 Activities under Output 1.2.1 begin by Month 2 complete by Month 51 Activities under Output 1.2.2 and 1.2.3 begin by Month 4 complete by Month 49		
Component 2: Coastal Vulnerability Monitoring							
Outcome 2.1 Strengthened data availability for the development of a national coastal saline intrusion program	No. and type of targeted institutions with increased capacity at the national and sub-national level to	NHS (national level) has limited capacity to conduct saline intrusion research	Qualitative and quantitative research data on soil salinity were conducted to reduce the saline intrusion risk available.	R- Lack of mitigation measures to enable soil salinity research to have an impact A – Beneficiary stakeholders are aware or will be made aware of the salinity intrusion risks under component 4.1	Research data report available on salinity intrusion	Monthly monitoring, Baseline, annual, mid-term, and end-term	NHS, PMU

	minimize saline intrusion risks		50% of participants trained being women (25) 80% of the National Hydrological Services Staff Trained (40)				
Output 2.1.1 Enhance evidence-based knowledge to determine best use practices for freshwater supply for the coastal areas / Reducing probability of further saline intrusion	No. of meetings and training exercises with national, sub-national, community levels for technology transfer to stakeholders	Zero meetings and training exercises with national, sub-national, community levels for technology transfer to stakeholders	Regular (12 monthly) meetings/training exercises with national, sub-national, community levels for technology transfer to stakeholders conducted and recorded	R- Lack of mitigation measures to enable soil salinity research to have an impact A – Beneficiary stakeholders are aware or will be made aware of the salinity intrusion risks under component 4.1	Monthly report on Bi-weekly meetings or phone conversations with beneficiary stakeholders to support research	Monthly monitoring, Baseline, annual, mid-term, and end-term	NHS, PMU
Outcome 2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	No. and type of targeted institutions with increased capacity at the national and sub-national level to reduce beach erosion risks	CZMAI (national level) has limited capacity to conduct beach erosion research	Qualitative and quantitative research data outlining coastal beach erosion available 50% women participation in the program (25), 50 total	R- Lack of an early erosion detection program results in insufficient mitigation/preparedness A – Beneficiary stakeholders are aware or will be made aware of coastal erosion risks under component 4.1	Research data report available on coastal beach erosion	Baseline, annual, mid-term, and end-term	CZMAI, PMU
Output 2.2.1 Development and implementation of a National Beach Erosion Monitoring Program	No. and type of targeted institutions with increased capacity at the national and subnational level for coastal research and monitoring	CZMAI (national level) has limited capacity to conduct beach erosion research	Qualitative and quantitative research data outlining coastal beach erosion available Regular meetings / training exercises with national, sub-national, community levels for technology/knowledge transfer to stakeholders conducted and recorded (12 monthly) (10 institutions)	R- Lack of an early erosion detection program results in insufficient mitigation/preparedness A – Beneficiary stakeholders are aware or will be made aware of coastal erosion risks under component 4.1	Research data report available on coastal beach erosion Monthly report on Bi-weekly meetings or phone conversations with beneficiary stakeholders to support research	Baseline, annual, mid-term, and end-term; Monthly monitoring report	CZMAI, PMU

Outcome 2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	No. and type of targeted institutions with increased capacity to minimize exposure to coastal flooding and storm surge risks	NMS has limited capacity to conduct coastal flooding and storm surge research	Research data on coastal flooding and storm surge risks reduction available 2 institutions (NMS and NEMO)	R- Financing uncertainty to implement phases 2-4 A – Beneficiary stakeholders are aware or will be made aware of coastal flooding and storm surge risks under component 4.1	Progress report outlining EWS products designed and developed by staff	Baseline, annual, mid-term and end-term	NMS, PMU
Output 2.3.1 Early Warning System (EWS) Development & Storm Surge modeling (Phase 1 of a full EWS)	No. and type of targeted institutions with increased capacity to minimize exposure to coastal flooding and storm surge risks	NMS has limited capacity to conduct coastal flooding and storm surge research	Research data on coastal flooding and storm surge risks reduction available 2 institutions (NMS and NEMO)	R- Financing uncertainty to implement phases 2-4 A - Beneficiary stakeholders are aware or will be made aware of coastal flooding and storm surge risks under component 4.1	Progress report outlining EWS products designed and developed by staff	Baseline, annual, mid-term and end-term	NMS, PMU
Output 2.3.2 The establishment of Weather Stations/Sensors along the coast	No. and type of targeted institutions with increased capacity to minimize exposure to coastal flooding and storm surge risks	NMS has limited capacity to conduct coastal flooding and storm surge research	Chapter in progress reports regarding weather data collection 2 institutions (NMS and NEMO)	R- Financing uncertainty to implement phases 2-4 A - Beneficiary stakeholders are aware or will be made aware of coastal flooding and storm surge risks under component 4.1	Chapter in progress reports on weather stations utilization for data collection	Baseline, annual, mid-term, and end-term	NMS, PMU
Activities under Output 2.1.1 • Build the institutional capacity of NHS via the procurement of equipment and other tools for research on groundwater, water quality, and soil salinity • Conduct saline intrusion risk mapping and ground water risk mapping considering current and future conditions under various extreme weather and climate change scenarios • Develop a field program to assess the chemical quality of groundwater in high-risk areas • Develop training tools related to capacity building of / technology transfer are being developed • Conduct workshop/field visit for training purposes **Activities under Output 2.2.1** • Conduct research on Techniques available to assess erosion to determine best options analyzed • Analyze aerial films					**Milestones** Activities under Output 2.1.1 begin by Month 1 complete by Month 54 Activities under Output 2.2.1 begin by Month 1 complete by Month 54 Activities under Output 2.2.2 begin by Month 1 complete by Month 54 Activities under Output 2.2.3 begin by Month 1 complete by Month 54		

• Hardware and software for database procured • Establish database • Select and recruit members for monitoring program • Develop a training program • Train community network and CZMAI Staff **Activities under Output 2.3.1** • Improve the current server and/or workstation to link with existing Early Warning procedures • Determine user requirements for EWS • Integration and use of local products and other models in use • Train NMS staff in Delft-FEWS, coastal processes, and modeling **Activities under Output 2.3.2** • Purchase and installation of weather stations/sensors • Purchase 1 field vehicle • Utilize assets to strengthen weather data collection					Activities under Output 2.3.1 begin by Month 1 complete by Month 12 Activities under Output 2.3.2 begin by Month 1 complete by Month 12		
Component 3. Coastal Protection and Adaptation response for High-Risk Areas							
Outcome 3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	Beach recovered and stabilized to withstand climate change and variability-induced stress	Dangriga is under threat due to climate change	The beach stabilizing solutions for Dangriga are successfully executed 2.4Km of beach nourished 40% (40,000) of community consulted during the pilot (gender disaggregated data)	R- Insufficient public awareness of whether the risk reduction measure has a temporary nature leads to investments/habitation in high-risk areas A - Beneficiary stakeholders are insufficiently aware of climate change hazards	Monthly progress, Baseline, annual, mid-term and, end-term evaluation, including photos/videos and meeting records	Baseline, annual, mid-term and, end-term	NCCO/PMU
Output 3.1.1 Coastal protection and recovery programmed for high-risk beach and costal environments	Beach recovered and stabilized to withstand climate change and variability-induced stress	Dangriga is under threat due to climate change	The beach stabilizing solutions for Dangriga are successfully executed 2.4Km of beach nourished	R- Insufficient public awareness of whether the risk reduction measure has a temporary nature that leads to investments/habitation in high-risk areas Increase in costs of hydraulic pumping due to unregulated pricing on suction dredging and low competition among operators A - Beneficiary stakeholders are insufficiently aware of climate change hazards Competitive bidding will allow for the project to remain within	Monthly progress, Baseline, annual, mid-term and, end-term evaluation, including photos/videos and meeting records	Baseline, annual, mid-term and, end-term	NCCO/PMU

				its budget and achieve the desired objective for this activity			
Output 3.1.2 Monitoring programme is established in the high-risk zones	Monitoring and evaluation of activities and lessons learnt documented and disseminated to scale up in the future	The remaining 26 coastal communities are also under threat (with varying severeness levels) due to climate change	Lessons learned and a scale-up plan developed and disseminated Monitoring chapter in project progress reports.	R- Insufficient public awareness of whether the risk reduction measure has a temporary nature that leads to investments/habitation in high-risk areas A - Beneficiary stakeholders are insufficiently aware of climate change hazards	User-friendly report capturing process and lessons learned and scale-up recommendations	Baseline, annual, mid-term and, end-term	NCCO/PMU
Activities under Output 3.1.1 • Implementation of engineering solution(s) • Monitoring of the effectiveness **Activities under Output 3.1.2** • Assess the effectiveness of engineering solution (s) via monitoring • Develop a report on lessons learned and a plan to scale up is developed • Consult with stakeholders					**Milestones** Activities under Output 3.1.1 begin by Month 13 complete by Month 36 Activities under Output 3.1.2 begin by Month 37 complete by Month 54		
Component 4. Awareness raising, knowledge dissemination and capacity strengthening							
Outcome 4.1 Promotion of ecologically responsible behaviors through climate change communication	Percentage of the national population aware of predicted adverse impacts of climate change, and appropriate responses	Limited awareness of predicted adverse impacts of climate change, and appropriate responses among the national population	NCCCSAP activities related to this project successfully implemented using written, audio, and visual materials (communication tools) 30% (125,000) of the population aware of climate change impacts and adaptation measures	R- Insufficient public awareness to promote pro-environmental behaviors A - Beneficiary stakeholders are insufficiently aware of climate change hazards	Activities reports, materials, photo database	Baseline, annual, mid-term and end-term	NCCO/PMU, CZMAI, MIDH, NHS, NMS

Output 4.1.1 Implementation of the NCCSAP	Percentage of the national population aware of predicted adverse impacts of climate change, and appropriate responses	Limited awareness of predicted adverse impacts of climate change, and appropriate responses among the national population	NCCCSAP activities related to this project successfully implemented using written, audio, and visual materials 30% (125,000) of the population aware of climate change impacts and adaptation measures	R- Insufficient public awareness to promote pro-environmental behaviors A - Beneficiary stakeholders are insufficiently aware of climate change hazards	Activities reports, materials, photo database	Baseline, annual, mid-term and, end-term	NCCO/PMU, CZMAI, MIDH, NHS, NMS
Outcome 4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	No. of persons trained to predict, detect, respond to, and mitigate impacts of, climate-related events from targeted institutions increased No. of training workshops	Limited awareness of predicted adverse impacts of climate change, and appropriate responses among the national population	NCCCSAP activities related to this project successfully implemented using written, audio, and visual materials 50 persons trained (data disaggregated by sex)	R- Insufficient staff and stakeholder capacities to adopt pro-environmental behaviors and implement climate research A - Beneficiary stakeholders are insufficiently equipped with the necessary tools to mitigate and adapt to climate change hazards	Training reports, registration lists, high-resolution photos/videos (to be added to the database), training materials, materials	Baseline, annual, mid-term and, end-term	CZMAI, NCCO, PMU
Output 4.2.1 Training needs assessment for best coastal adaptation practices and development of training modules	No. of persons trained to predict, detect, respond to, and mitigate impacts of, climate-related events from targeted institutions No. of training workshops	Limited national level capacities to predict, detect, respond to, and mitigate impacts of, climate-related events from targeted institutions	Officials and community members trained and equipped with useful knowledge to promote pro-environmental behaviors (100)	R- Insufficient staff and stakeholder capacities to adopt pro-environmental behaviors and implement climate research A - Beneficiary stakeholders are insufficiently equipped with the necessary tools to mitigate and adapt to climate change hazards	Training reports, registration lists, high-resolution photos/videos (to be added to the database), training materials, materials	Baseline, annual, mid-term and, end-term	CZMAI, NCCO, PMU

Output 4.2.2 Implementation of training modules for best coastal adaptation practices	No. of persons trained to predict, detect, respond to, and mitigate impacts of, climate-related events from targeted institutions No. of training workshops	Limited national level capacities to predict, detect, respond to, and mitigate impacts of, climate-related events from targeted institutions	Officials and community members trained and equipped with useful knowledge to promote pro-environmental behaviors (100)	R- Insufficient staff and stakeholder capacities to adopt pro-environmental behaviors and implement climate research A - Beneficiary stakeholders are insufficiently equipped with the necessary tools to mitigate and adapt to climate change hazards	Training reports, registration lists, high-resolution photos/videos (to be added to the database), training materials, materials	Baseline, annual, mid-term and, end-term	CZMAI, NCCO, PMU
Outcome 4.3 Strengthening of GIS capabilities of CZMAI and partners	No. of persons trained to use GIS increased No. of training workshops	Limited national level capacities to use GIS technologies	(15) Officials trained and equipped with useful knowledge to use GIS technologies 50% (10) of CZMAI staff trained in GIS (data disaggregated by sex)	R- Insufficient staff and stakeholder capacities to use GIS technologies is a barrier to climate change research A - Beneficiary staff and stakeholders are insufficiently equipped to use GIS technologies in climate research	Training reports, registration lists, high-resolution photos/videos (to be added to the database), training materials, materials	Baseline, annual, mid-term and, end-term	CZMAI, PMU, NHS
Output 4.3.1 Identification and procurement of infrastructure and materials including computer hardware, software and data gathering equipment	No. of persons trained in GIS No. of training workshops	Limited national level capacities to use GIS technologies	(10) Officials trained and equipped with useful knowledge to use GIS technologies	R- Insufficient staff and stakeholder capacities to use GIS technologies is a barrier to climate change research A - Beneficiary staff and stakeholders are insufficiently equipped to use GIS technologies in climate research	Training reports, registration lists, high-resolution photos/videos (to be added to the database), training materials, materials	Baseline, annual, mid-term and, end-term	CZMAI, PMU, NHS
Output 4.3.2 Implementation of GIS training for risk mapping, collection of beach profile data and susceptibility to erosion	No. of persons trained in GIS No. of training workshops	Limited national level capacities to use GIS technologies	(10) Officials trained and equipped with useful knowledge to use GIS technologies	R- Insufficient staff and stakeholder capacities to use GIS technologies is a barrier to climate change research A - Beneficiary staff and stakeholders are insufficiently equipped to use GIS technologies in climate research	Training reports, registration lists, high-resolution photos/videos (to be added to the database), training materials, materials	Baseline, annual, mid-term and, end-term	CZMAI, PMU, NHS
Activities under Output 4.1.1 • Development of written, audio, and visual productions materials for publication • Carry out communications activities as envisioned in the NCCSAP					**Milestones** Activities under Output 4.1.1 begin by Month 1 complete		

• Conduct working sessions with AF proposal entities • Conduct monitoring, verification, and information sharing of communications activities **Activities under Output 4.2.1** • Conduct a training needs assessment and prepare a training plan (including modules) **Activities under Output 4.2.2** • Carry out training interventions • Share lessons learned **Activities under Output 4.3.1** • Conduct a GIS training needs assessment and prepare a training/investment plan • Purchase equipment and software • Prepare training materials **Activities under Output 4.3.2** • Carry out training interventions • Conduct M&E and verification • Share lessons learned	by Month 54 Activities under Output 4.2.1 begin by Month 1 complete by Month 12 Activities under Output 4.2.2 begin by Month 13 complete by Month 24 Activities under Output 4.3.1 begin by Month 1 complete by Month 54 Activities under Output 4.3.2 begin by Month 25 complete by Month 48

Output	Year 1				Year 2				Year 3				Year 4				Year 5	
Output 1.1.1 Development of the National Housing Policy with specification for coastal habitation	x	x	x	x	x	x	x	x										
Output 1.1.2 Development of Building Codes					x	x	x	x	x	x	x	x						
Output 1.1.3 Capacity building of stakeholders on implementing the building codes									x	x	x	x	x	x	x	x		
Output 1.2.1 Updated land use inventory of three existing coastal planning regions (northern, central and southern)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Output 1.2.2 Collaborative approach for strengthening the implementation of the Integrated Coastal Zone Management Plan		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Output 2.1.1 Enhance evidence-based knowledge to determine best use practices for freshwater supply for the coastal areas / Reducing probability of further saline intrusion	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Output 2.2.1 Development and implementation of a National Beach Erosion Monitoring Program	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Output 2.2.2 Strong local presence through community partnerships	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Output 2.2.3 Develop and implement training schedule and training programs	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Output 2.3.1 Early Warning System (EWS) Development & Storm Surge modeling (Phase 1 of a full EWS)	x	x	x																
Output 2.3.2 The establishment of Weather Stations/Sensors along coast	x	x	x																
Output 3.1.1 Coastal protection and recovery programmed for high-risk beach and costal environments					x	x	x	x	x	x	x	x							
Output 3.1.2 Monitoring programme is established in the high-risk zones													x	x	x	x	x	x	x
Output 4.1.1 Implementation of the NCCSAP	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Output 4.2.1 Training needs assessment for best coastal adaptation practices and development of training modules	x	x	x	x															
Output 4.2.2 Implementation of training modules for best coastal adaptation practices					x	x	x	x											
Output 4.3.1 Identification and procurement of infrastructure and materials including computer hardware, software and data gathering equipment	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Output 4.3.2 Implementation of GIS training for risk mapping, collection of beach profile data and susceptibility to erosion									x	x	x	x	x	x	x	x			

F. Demonstrate How the Project/Programme Aligns with the Results Framework of the Adaptation Fund

Table 35: Project alignment with the Results Framework of the Adaptation Fund

Project Outcomes	Project Indicators	Fund Outcome	Fund Outcome Indicator	Grant Amount (US$)
Component 1. Improving coastal land use for resilient habitation and sectoral activities				
1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	No. of National Housing Policies with clear a specification for coastal habitation No. of National Building Code with the specification for the coastal zone	Outcome 7: Improved policies and regulations that promote and enforce resilience measures	No. of policies introduced or adjusted to address climate change risks (by sector) (Include the housing policy and the building codes, the latter implemented) No. of beneficiaries including estimations for direct and indirect beneficiaries (117,000 direct beneficiaries and 302, 000 indirect beneficiaries) No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by sector) (These are the new buildings using the housing policy 50/year for a total of 250 for the duration of the project)	**240,174.00**
1.2 Improved coordination and implementation of the ICZM Plan	No. of Integrated Coastal Zone Management Plan associated management guidelines for zonation	Outcome 7: Improved policies and regulations that promote and enforce resilience measures	No. of policies introduced or adjusted to address climate change risks (by sector) (Include the housing policy and the building codes, the latter implemented and the implementation of the CZMP) No. of beneficiaries including estimations for direct and indirect beneficiaries (117,000 direct beneficiaries and 302, 000 indirect beneficiaries) Percentage of target population applying	**186,998.00**

			appropriate adaptation responses (30% minimum during the project implementation)	
Component 2. Coastal Vulnerability Monitoring				
2.1 Strengthened data availability for the development of a national coastal saline intrusion program	No. and type of targeted institutions with increased capacity at the national and sub-national level to minimize saline intrusion risks	Outcome 2: a strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks (27 coastal communities with associated institutions government and non-government) No. and type of development sector services modified to respond to new conditions resulting from climate variability and change (by sector and scale)	**709,000.00**
2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	No. and type of targeted institutions with increased capacity at the national and sub-national level to reduce beach erosion risks	Outcome 2: A strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks (CZMAI, community groups and institutions) No. of technical committees/associations formed to ensure transfer of knowledge (1 per coastal community – 27 minimum)	**250,000.00**
2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	No. and type of targeted institutions with increased capacity to minimize exposure to coastal flooding and storm surge risks	Outcome 2: A strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks (1 NMS) No. of beneficiaries including estimations for direct and indirect beneficiaries (117,000 direct beneficiaries and 302, 000 indirect beneficiaries) No. of early warning systems (by scale) and no. of beneficiaries covered (1)	**265,000.00**

Component 3. Coastal Protection and Adaptation response for High-Risk Areas				
3. Coastal Protection and Adaptation response for High-Risk Areas	*Beach recovery and stabilization* improved to withstand climate change and variability-induced stress	Outcome 4: Increased adaptive capacity within relevant development sector services and infrastructure assets	Physical infrastructure improved to withstand climate change and variability-induced stress (2 in Dangriga) No. of beneficiaries including estimations for direct and indirect beneficiaries (117,000 direct beneficiaries and 302, 000 indirect beneficiaries)	**1,463,734.00**
Component 4. Awareness Raising, Knowledge Dissemination and National Capacity Strengthening				
4.1 Promotion of ecologically responsible behaviors through climate change communication	Percentage of the national population aware of predicted adverse impacts of climate change, and appropriate responses	Outcome 3: A strengthened awareness and ownership of adaptation and climate risk reduction	Percentage of the targeted population aware of predicted adverse impacts of climate change, and appropriate responses (117,000 direct beneficiaries and 302, 000 indirect beneficiaries)	**55,000.00**
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	The capacity of staff/stakeholders to predict, detect, respond to, and mitigate impacts of, climate-related events from targeted institutions increased	Outcome 2: A strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	No. of staff trained to respond to, and mitigate impacts of, climate-related events (by gender) (200 direct beneficiaries and 117,000 indirect) No. of targeted institutions with increased capacity to minimize exposure to climate variability risks (by type, sector and scale) (all executing entities – 5)	**75,000.00**
4.3 Strengthening of GIS capabilities of CZMAI and partners	The capacity of staff/partners to predict, detect, respond to, and mitigate impacts of, climate-related events from targeted institutions increased	Outcome 2: A strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	No. of staff trained to respond to, and mitigate impacts of, climate-related events (by gender) (15 CZMAI staff and 50 relevant stakeholders) No. of tools and guidelines developed (thematic, sectoral, institutional) and shared with relevant stakeholders	**91,500.00**

Table 36: Project alignment with the Results Framework of the Adaptation Fund

AF Core indicator	Rationale	Baseline (project intervention)	Target Change/Impact
Number of Beneficiaries	Measures the number of people impacted by the project interventions, directly and indirectly	0	Direct - 117,823 (57,787 males and 60,035 females) Indirect – 302,000 (151,000 males and 151,000 females)
Early Warning Systems	Measures the number of people whose vulnerability is reduced because of the improved early warning systems installed and	0	Direct - 117,823 (57,787 males and 60,035 females) Indirect – 302,000 (151,000 males and 151,000 females))
Assets Produced, Developed, Improved, or Strengthen	Measures the improvements in protection of coastal infrastructure in the targeted communities, thus improving their resilience to the impacts of climate change.	0	Direct - 117,823 (57,787 males and 60,035 females) Indirect – 302,000 (151,000 males and 151,000 females))
Natural Assets Protected or Rehabilitated	Measures the area of natural beaches restored and rehabilitated by the project and its subsequent protection of lives and property.	0	Direct – 4,000 (2,000 males and 2,000 females of northern Dangriga) Indirect – 6,000 (3,000 males and 3,000 females remaining population of Dangriga and average visitors)

G. Include a Detailed Budget with Budget Notes, A Budget on the Implementing Entity Management Fee Use, and An Explanation and A Breakdown of the Execution Costs.

Table 36: Budget Summary

Project Component	Year 1	Year 2	Year 3	Year 4	Year 5	Total Budget (US$)
Component 1: Improving coastal land use for resilient habitation and sectoral activities	92,872	180,648	78,223	52,023	23,406	**427,172**
Component 2: Coastal Vulnerability Monitoring	671,625	397,125	66,750	59,250	29,250	**1,224,000**
Component 3. Coastal Protection and Adaptation response for High-Risk Areas	50,000	400,367	863,367	83,750	66,250	**1,463,734**
Component 4. Awareness raising, knowledge dissemination and capacity strengthening	85,000	47,500	40,000	37,500	11,500	**221,500**
5. Total Components	**899,497**	**1,025,640**	**1,048,340**	**232,523**	**130,406**	**3,336,406**
6. Project/Programme Execution cost	*84,500*	*70,500*	*78,000*	*70,030*	*47,200*	*350,230*
7. Total Project/Programme Cost	**983,997**	**1,096,140**	**1,126,340**	**302,553**	**177,606**	**3,686,636**
8. Project/Programme Cycle Management Fee	*66,750*	*69,250*	*69,250*	*69,250*	*38,864*	*313,364*
Amount of Financing Requested	**1,050,747**	**1,165,390**	**1,195,590**	**371,803**	**216,470**	**4,000,000**

Table 37: Budget Expected Concrete Outputs

Outcome	Output	Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Total Budget (US$)
Component 1: Improving coastal land use for resilient habitation and sectoral activities								
1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	1.1.1 Development of the National Housing Policy and Implementation Plan	Review of policy and legislation related to Housing	10,000					10,000
		Stakeholder Consultation		6,000	3,700			9,700
		Study climate change projections and vulnerabilities in relation to Housing	41,349					41,349
		Recommendation on how to use Legislation through consolidation or amendments		24,000				24,000
		Drafting and finalization of the National Housing Policy		59,125				59,125
		Drafting and finalization of Implementation Plan		10,000				10,000
		Output 1.1.1 Total	51,349	99,123	3,700			154,174
	1.1.2 Development of Building Codes Implementation Guidelines	Discussion paper on technical aspects of climate sensitive building codes		10,000				10,000
		Preparation of Housing Zoning Maps		20,000				20,000
		Conduct stakeholder consultation and validation		10,000	5,000			15,000
		Output 1.1.2 Total		**40,000**	**5,000**			**45,000**
	1.1.3 Capacity Building on Building Code Implementation	Awareness raising of stakeholders			15,000			15,000
		Training of architects, engineers, contractors, designers on housing and construction			13,000	13,000		26,000
		Output 1.1.3 Total			**28,000**	13,000		41,000
		Output 1.1 Total	**51,349**	**139,125**	**36,700**	**13,000**		**240,174**

1.2 Improved coordination and implementation of the ICZM Plan	1.2.1 Updated land use inventory of three existing coastal planning regions (northern, central and southern)	Procure necessary software and equipment for data collection and processing	7,523	7,523	7,523	7,523	7,506	37,598
		Utilize software and equipment for data collection and analysis	20,000	20,000	20,000	20,000	9,400	89,400
		Continue drone mapping and ground-truthing exercise to update the Coastal Land Use Inventory to update the register for three planning regions in northern, central, and southern Belize.	7,500	7,500	7,500	5,000	3,250	30,750
		Collect information to update the ICZM Plan	1,500	1,500	1,500	1,500	750	6,750
		Share updated recommendations with national stakeholders						
		Output 1.2.1 Total	**36,523**	**36,523**	**36,523**	**34,023**	**20,906**	**164,498**
	1.2.2 Annual monitoring and evaluation of implementation of the ICZM Plan	Collect information on Implementation progress of the ICZM Plan in accordance with the M&E Framework						
		Prepare annual reports on implementation progress of the ICZM plan						
		Share reports with national stakeholders						
		Output 1.2.2 Total						
	1.2.3 Collaborative approach for strengthening the implementation of the Integrated Coastal Zone Management Plan	Conduct site inspections, meetings with Community Wardens, and Coastal Advisory Committees to monitor compliance with the Coastal Zone Management guidelines	5,000	5,000	5,000	5,000	2,500	22,500
		Output 1.2.3 Total	**5,000**	**5,000**	**5,000**	**5,000**	**2,500**	**22,500**
		Output 1.2 Total	**41,523**	**41,523**	**41,523**	**39,023**	**23,406**	**186,998**
		Output 1 Total	**92,872**	**180,648**	**78,223**	**52,023**	**23,406**	**427,172**

Component 2: Coastal Vulnerability Monitoring								
2.1. Strengthened data availability for the development of a national coastal saline intrusion program	2.1.1 Enhance evidence-based knowledge to determine best use practices for freshwater supply for the coastal areas / Reducing probability of further saline intrusion	Procurement of equipment and other tools for research on groundwater, water quality, and soil salinity	142,375	142,375				284,750
		Plan and execute a field program to assess and verify soil salinity conditions	4,250	4,250	4,250	4,250	4,250	21,250
		Update GIS products to reflect newly acquired information	140,000	140,000				280,000
		Conduct workshop/field visit for training purposes	25,000	35,500	25,000	25,000	12,500	123,000
		Output 2.1.1 Total	**311,625**	**322,125**	**29,250**	**29,250**	**16,750**	**709,000**
		Output 2.1 Total	**311,625**	**322,125**	**29,250**	**29,250**	**16,750**	**709,000**
2.2. Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	2.2.1 Development and implementation of a National Beach Erosion Monitoring Program	Establish framework for coastal beach erosion monitoring program including the identification of best techniques available to assess erosion and conduct training	37,500	37,500				75,000
		Hardware and software for program and database	25,000					25,000
		Select and recruit members for programme	7,500	10,000	10,000	10,000	7,500	45,000
		Coastal Monitoring Officer	20,000	20,000	20,000	15,000		75,000
		Train members of community coastal erosion monitoring network	5,000	7,500	7,500	5,000	5,000	30,000
		Output 2.2 Total	**95,000**	**75,000**	**37,500**	**30,000**	**12,500**	**250,000**
2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	2.3.1 Early Warning System (EWS) Development & Storm Surge modeling (Phase 1 of a full EWS)	Improvement of the NMS's Surface Database to implement early warning system and model storm surge	120,000					120,000
		Purchase physical Server or Workstation	10,000					10,000
		SURFACE/PLUVO Integration for the importation of Numerical Weather Prediction (NWP) and other data	10,000					10,000

		from (NOAA GFS, Local products Belize Meteorological Service, etc.)						
	Output 2.3.1 Total		**140,000**					**140,000**
	2.3.2 The establishment of Weather Stations/Sensors along the coast	Purchase 1 field vehicle for monitoring weather stations	40,000					40,000
		Purchase and installation of weather stations/sensors to strengthen weather data collection	85,000					85,000
	Output 2.3.2 Total		**125,000**					**125,000**
	Output 2.3 Total		**265,000**					**265,000**
Output 2 Total			**671,625**	**397,125**	**66,750**	**59,250**	**29,250**	**1,224,000**
Component 3. Coastal Protection and Adaptation response for High-Risk Areas								
3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	3.1.1 Coastal protection and recovery programmed for high-risk beach and costal environments	Conduct hydraulic pumping for nourishment of beach in Dangriga	50,000	400,367	814,008			1,264,375
		Installation of geotubes at high-risk zones in Dangriga			29,359			29,359
	Output 3.1.1 Total		50,000	**400,367**	**843,367**			**1,293,734**
	3.1.2 Monitoring programme is established in the high-risk zones	Establish methodology and procedure for field and office work				17,500		17,500
		Beach nourishment and geo-tubes maintained			20,000	40,000	40,000	100,000
		Topographic leveling of beach profile				8,750	8,750	17,500
		Sedimentological sampling				8,750	8,750	17,500
		Meteorological survey				8,750	8,750	17,500
	Output 3.1.2 Total				**20,000**	**83,750,**	**66,250**	**170,000**
	Output 3.1 Total		**50,000**	**400,367**	**863,367**	**83,750**	**66,250**	**1,463,734**
Output 3 Total			**50,000**	**400,367**	**863,367**	**83,750**	**66,250**	**1,463,734**
Component 4. Awareness raising, knowledge dissemination and capacity strengthening								

	4.1.1 Implementation of the NCCSAP	Carry out communications activities as envisioned in the NCCSAP	10,000	10,000	15,000	15,000	5,000	55,000
		Output 4.1.1 Total	**10,000**	**10,000**	**15,000**	**15,000**	**5,000**	**55,000**
		Output 4.1 Total	**10,000**	**10,000**	**10,000**	**10,000**	**5,000**	**55,000**
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	4.2.1 Training needs assessment for best coastal adaptation practices and development of training modules							
		Development of modules via a consultant	30,000					30,000
		Conduct a training needs assessment and prepare training plan	20,000					20,000
		Prepare training materials	10,000					10,000
		Output 4.2.1 Total	**60,000**					**60,000**
	4.2.2 Implementation of training modules for best coastal adaptation practices	Carry out training interventions		15,000				15,000
		Output 4.2.2 Total		**15,000**				**15,000**
		Output 4.2 Total	**60,000**	**15,000**				**75,000**
4.3 Strengthening of GIS capabilities of CZMAI and partners	4.3.1 Identification and procurement of infrastructure and materials including computer hardware, software and data gathering equipment	Conduct a GIS training needs assessment and prepare a training/investment plan via a consultant		7,500	7,500	5,000		20,000
		Purchase equipment and software	15,000	15,000	12,500	12,500	6,500	61,500
		Output 4.3.1 Total	**15,000**	**22,500**	**20,000**	**17,500**	**6,500**	**81,500**
	4.3.2 Implementation of GIS training for risk mapping, collection of beach profile data and susceptibility to erosion	Carry out training interventions			5,000	5,000		10,000
		Output 4.3.2 Total			**5,000**	**5,000**		**10,000**
		Output 4.3 Total	**15,000**	**22,500**	**25,000**	**22,500**	**6,500**	**91,500**
		Output 4 Total	**85,000**	**47,500**	**40,000**	**37,500**	**11,500**	**221,500**

5. Total Components		***899,497***	***1,025,640***	***1,048,340***	***232,523***	***130,406***	***3,336,406***
6. Project/Programme Execution cost		84,500	70,500	78,000	70,030	47,200	350,230
7. Total Project/Programme Cost		**983,997**	**1,096,140**	**1,126,340**	**302,553**	**177,606**	**3,686,636**
8. Project/Programme Cycle Management Fee		66,750	69,250	69,250	69,250	38,864	313,364
Amount of Financing Requested		**1,050,747**	**1,165,390**	**1,195,590**	**371,803**	**216,470**	**4,000,000**

Table 38: Project Execution Cost

Description	Year 1	Year 2	Year 3	Year 4	Year 5	Total (US$)
Project Manager	24,000	24,000	24,000	24,000	12,000	108,000
Office staff and technical support	33,000	33,000	33,000	33,000	16,500	148,500
Office facilities/ Equipment	15,000	8,500	8,500	8,030	5,000	45,030
Travel	5,000	5,000	5,000	5,000	5,000	25,000
Baseline	7,500					7,500
Mid-Term Evaluation			7,500			7,500
End-Term Evaluation					8,700	8,700
Total for budget line 6	**84,500**	**70,500**	**78,000**	**70,030**	**47,200**	**350,230**

Table 39: Project Cycle Management Fee Budget

Description	Year 1	Year 2	Year 3	Year 4	Year 5	Total (US$)
Evaluation Support Cost	15,500	15,500	15,500	15,500	10,000	72,000
Project Support Costs, rent, utilities, etc.	18,750	18,750	18,750	18,750	9,000	84,000
Management Supervision	15,000	17,500	17,500	17,500	12,364	79,864
PACT staff salary/supervision of reports etc.	17,500	17,500	17,500	17,500	7,500	77,500
Total for budget line 8	**66,750**	**69,250**	**69,250**	**69,250**	**38,864**	**313,364**

H. Include A Disbursement Schedule with Time-Bound Milestones

Table 40-a: Disbursement Schedule with Time-bound Milestones

Schedule date	April 2024 (or Upon Signing)	Feb-25	Feb-26	Feb-27	Feb-28	Totals
Project Cost	983,997	1,096,140	1,126,340	302,553	177,606	3,686,636
Programme cycle Management	66,750	69,250	69,250	69,250	38,864	313,364
Total (US$)	**1,050,747**	**1,165,390**	**1,195,590**	**371,803**	**216,470**	**4,000,000**

Table 41-b: Milestones by outputs

	Year 1	Year 2	Year 3	Year 4	Year 5
	1st Disbursement - upon agreement signature	2nd disbursement - One year after project start	3rd disbursement - Two years after project start	4th disbursement - Three years after project start	5th disbursement - Four years after project start
Reporting		Upon the First Annual Report Upon financial report indicating disbursement of at least 70% of funds	Upon the Second Annual Report Upon financial report indicating disbursement of at least 70% of funds	Upon the Third Annual Report Upon financial report indicating disbursement of at least 70% of funds	Upon the Fourth Annual Report Upon financial report indicating disbursement of at least 70% of funds
Output	**Milestone (By the end of the year)**				
1.1. Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	i. Review of Existing Legislation and regulations related to Housing in Belize and report preparation with concrete recommendations on how to use the legislation through consolidation or amendments completed ii. Stakeholders consultations commenced and will continue throughout the implementation. iv. Study of the climate change projections and vulnerabilities of Belize, with special reference to the coastal zone	i. Draft and Final Housing Policy ii. Discussion paper on building codes prepared	i. Housing Policy Implementation Plan prepared i. Zoning Maps prepared for housing based on the climate risks and impacts	i. Draft Building Codes implementation guidelines prepared	i. Building codes implementation guidelines disseminated among stakeholders and training of professional completed
1.2. Improved coordination and implementation of the ICZM Plan	i. Drone mapping and ground-truthing have commenced and will continue throughout implementation	i. Updated information is being made available for updating the Coastal Land Use Inventory ii. Regular site inspections and meetings with Community Wardens and Coastal Advisory Committees are being conducted and recorded.	i. The Coastal Land Use Inventory is updated ii land use data gathered is being utilized to update the Integrated Coastal Zone Management Plan and associated management guidelines for zonation iii. Community Wardens and Coastal Advisory Committees are properly supporting the monitoring activities.	i. Integrated Coastal Zone Management Plan and associated management guidelines for zonation have been developed and distributed (through another project) ii. Staff fully trained in GIS and drone-mapping to support continuous updating of land use data; Annual reporting on ICZMP implementation progress	i. Roll-over activities and evaluation completed ii. Annual reporting on ICZMP implementation progress

	Year 1	Year 2	Year 3	Year 4	Year 5
2.1. Strengthened data availability for the development of a national coastal saline intrusion program	i. Equipment and other tools for research on groundwater, water quality, and soil salinity have been procured.	i. Research on groundwater, water quality, and soil salinity has commenced.	i. A research report on groundwater, water quality, and soil salinity is available. ii. Training tools related to capacity building of / technology transfer are being developed	i. Training tools related to capacity building of / technology transfer are available	Roll-over activities and evaluation completed
2.2. Strengthened data availability for the development of a national coastal saline intrusion program	i. Coastal monitoring technicians recruited	i. consultancy commenced assessing techniques available to assess erosion and determine best options ii. equipment and software purchased to enable analyzing aerial films and establish a database for the data collection and storage iii. action plan formulated and series of meetings techniques to establish community network for on the ground monitoring commenced	i. consultancy to assess techniques available to assess erosion and determine best options completed ii. action plan formulated and series of meetings techniques to establish community network for on the ground monitoring completed iii. assessment commenced to develop a sustainability/funding mechanism commenced	i. assessment commenced developing a sustainability/funding mechanism completed	Roll-over activities and evaluation completed
2.3. Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	i. Necessary equipment for data collection and monitoring purchased ii. Early Warning System (EWS) Development & Storm Surge modeling (Phase 1 of a full EWS) commenced iii. Weather stations established along the coast	i. Updating of National Meteorological Service web-based data management system has continued	i. Updating of National Meteorological Service web-based data management system has continued	i. Updating of National Meteorological Service web-based data management system has continued	Evaluation
3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	i. Implementation of beach stabilization through a pilot project in the high-risk coastal community of Dangriga to recover areas lost to erosion commenced	i. Implementation of beach stabilization through a pilot project in the high-risk coastal community of Dangriga to recover areas lost to erosion completed	i. M&E of the effectiveness of beach stabilization through a pilot project in Dangriga to recover areas lost to erosion conducted	i. M&E of the effectiveness of beach stabilization through a pilot project in Dangriga to recover areas lost to erosion conducted	Evaluation

	Year 1	Year 2	Year 3	Year 4	Year 5	
4.1. Promotion of ecologically responsible behaviors through climate change communication	i. Communications professional hired ii. Communication strategy and action plan is implemented	i. Communication strategy and action plan is implemented	i. Communication strategy and action plan is implemented	i. Communication strategy and action plan implementation completed	Evaluation	
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices for Belize	i. Training needs assessment, prioritization conducted, and plan developed	i. Training material being developed, and training is conducted	i. Training material being developed, and training is conducted	i. Training material development and training completed	Evaluation	
4.3 Strengthening of GIS capabilities within the CZMAI and partners	i. Training plan developed, and software/hardware purchased	i. Training material being developed, and training is conducted	i. Training material being developed, and training is conducted	i. Training material development and training completed	Evaluation	

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

A. Record of endorsement on behalf of the government[1] *Provide the name and position of the government official and indicate date of endorsement for each country participating in the proposed project / programme. Add more lines as necessary. The endorsement letters should be attached as an annex to the project/programme proposal. Please attach the endorsement letters with this template; add as many participating governments if a regional project/programme:*

Dr. Osmond Martinez Chief Executive Officer Ministry of Economic Development	Date: 02/12/2022

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 (Plan Belize: Medium-Term Development Strategy, National Climate Change Policy, Strategy and Action Plan and Belize's Nationally Determine Contributions to the UNFCCC) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.

Executive Director PACT

Mrs. Nayari Diaz-Perez
Executive Director of the Protected Areas Conservation Trust
Implementing Entity Coordinator

Date: 22-11-2022	Tel. and email: (501) 822-3637 ed@pactbelize.org
Project Contact Person: Mr. Eli Romero	
Tel. And Email: (501) 822-3637 – projdevofficer@pactbelize.org	

ADAPTATION FUND

Letter of Endorsement by Government

GOVERNMENT OF BELIZE

Ministry of Finance, **Economic Development** and Investment

ECONOMIC DEVELOPMENT
P.O. Box 42
Ground Floor, Sir Edney Cain Building
Belmopan City
Belize, Central America

Tel: (501) 880-2526
(501) 880-2527
Email:econdev@med.gov.bz

Our Ref: CCCC/1/2022(1) Vol. III

December 2, 2022

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

Subject: Endorsement for "Enhancing the Resilience of Belize's Coastal Communities to Climate Change Impacts"

In my capacity as designated authority for the Adaptation Fund in Belize, I confirm that the above national project/programme 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 country.

Accordingly, I am pleased to endorse the above project/programme proposal with support from the Adaptation Fund. If approved, the project/programme will be implemented by the Protected Areas Conservation Trust (PACT) and executed by the National Climate Change Office (NCCO) and the Coastal Zone Management Authority and Institute (CZMAI).

Sincerely,

Osmond Martinez, Ph.D.
Chief Executive Officer
Ministry of Economic Development

c: Ms. Kennedy Carillo, Chief Executive Officer, Ministry of Blue Economy and Civil Aviation
Mrs. Chantalle Samuels, Chief Executive Officer, Coastal Zone Management Authority and Institute, Ministry of Blue Economy and Civil Aviation
Dr. Lennox Gladden, Chief Climate Officer, National Climate Change Office, Ministry of Sustainable Development, Climate Change and Disaster Risk Management.
Mr. Carlos Pol, Director, Climate Finance Unit, Ministry of Economic Development

ANNEX I GENDER/SOCIAL ASSESSMENT

PART I: INTRODUCTION

Gender and Climate Change

Climate change has a more pronounced effect on poor and marginalized populations globally. This is because it is often that these populations are the most reliant on natural resources for their livelihoods and/or have the least capacity to respond to natural hazards, such as droughts, landslides, floods, and hurricanes. This vulnerability extends particularly to women who are generally responsible for securing water, food, cooking fuel, and other amenities that are required in the home. Women also experience a disproportionate denial of access to decision-making processes and resources that are required for income generation or survival. In more traditional communities, such as Mayan communities in the south, the men are expected to control resources and make decisions. In general, women are not expected to be landowners and entrepreneurs. This is further exacerbated by the fact that they are expected to be the caregivers in their communities.

Gender-based variations in time use, access to assets and credit, and treatment by markets and formal institutions (including the legal and regulatory framework) constrain women's opportunities and account for the discrepancy between women's and men's differentiated exposure and vulnerability to climate change risks. The United Nations Framework Convention on Climate Change (UNFCCC, 2017) suggests that:

> *Women commonly face higher risks and greater burdens from the impacts of climate change in situations of poverty, and the majority of the world's poor are women. Women's unequal participation in decision-making processes and labor markets compound inequalities and often prevent women from fully contributing to climate-related planning, policymaking, and implementation.*

Women nevertheless play a critical role in the response to climate change due to their local knowledge of and leadership in e.g. sustainable resource management and/or leading sustainable practices at the household and community level. Parties to the UNFCCC have recognized the importance of involving women and men equally in the development and implementation of national climate policies that are gender-responsive by establishing a dedicated agenda item under the Convention addressing issues of gender and climate change (UNFCCC, 2017). At the national level, Belize's National Climate Change Policy, Strategy and Action Plan (NCCPSAP) identifies as one of its guiding principles of gender equity and non-discrimination in access to opportunities. The NCCPSAP encourages all livelihood development initiatives to consider the gender-differentiated needs and roles of the society, encourage equity and non-discrimination, and provide equal access opportunities to all (NCCPSAP, 2015).

Country gender profile

Belize's midyear population estimate for 2020 is 209,603 males, 209,596 females, and 419,199 for the total population. The population estimates for the major administrative areas and urban/rural figures are indicated in Table 34. The 2013 Labor Force Survey recorded the labor force at 148,736, or 46.1% of the total population. Four out of every five men of working age were included in the labor force, compared to only one in two women of working age, revealing a distinctive gender-segregation in the formal labor market. Moreover, the unemployment rate for females far exceeded that of males, at 20.4% and 6.7% respectively.

Table 42: Midyear estimates: Major Administrative Areas (SIB, 2020)

Area	Males	Females	Estimated Mid-Year Population 2020
Country Total	209,603	209,596	419,199
Urban	91,405	95,844	187,249
Rural	118,198	113,752	231,950
Corozal	*25,163*	*25,327*	*50,490*
Orange Walk	*26,683*	*26,690*	*53,373*

Belize	*63,102*	*64,581*	*127,683*
Cayo	*51,028*	*51,086*	*102,115*
Stann Creek	*23,844*	*22,170*	*46,015*
Toledo	*19,783*	*19,742*	*39,525*

Ministry of Education statistics show that even in rural communities, women are enjoying increased access to resources, particularly education. Table 43 and Table 44 below are graphs that show the enrollment in high school and the transition from primary school to high school.

Table 43: Enrolment in high school

District and Sex	2017-18					2018-19				
	Form 1	Form 2	Form 3	Form 4	TOTAL	Form 1	Form 2	Form 3	Form 4	TOTAL
Belize	2,066	1,802	1,642	1,425	**6,935**	2,054	1,817	1,719	1,402	**6,992**
Male	1,013	866	744	615	**3,238**	1,005	859	806	614	**3,284**
Female	1,053	936	898	810	**3,697**	1,049	958	913	788	**3,708**
Corozal	743	632	573	469	**2,417**	710	616	590	501	**2,417**
Male	364	327	268	192	**1,151**	350	289	280	233	**1,152**
Female	379	305	305	277	**1,266**	360	327	310	268	**1,265**
Stann Creek	859	754	656	565	**2,834**	855	769	673	602	**2,899**
Male	442	369	289	232	**1,332**	420	379	326	279	**1,404**
Female	417	385	367	333	**1,502**	435	390	347	323	**1,495**
Toledo	639	568	477	407	**2,091**	708	553	517	429	**2,207**
Male	337	290	241	217	**1,085**	394	280	263	218	**1,155**
Female	302	278	236	190	**1,006**	314	273	254	211	**1,052**
TOTAL	4,307	3,756	3,348	2,866	**14,277**	4,327	3,755	3,499	2,934	**14,515**
Male	2,156	1,852	1,542	1,256	**6,806**	2,169	1,807	1,675	1,344	**6,995**
Female	2,151	1,904	1,806	1,610	**7,471**	2,158	1,948	1,824	1,590	**7,520**

Table 44: Transition from Primary School to High School

District and Sex	2017-18				2018-19		
	2016-17 Graduates	New Entrants	Rate		2016-17 Graduates	New Entrants	Rate
Belize	1,928	1,900	98.55%		1,912	1,871	97.86%
Male	948	909	95.89%		911	879	96.49%
Female	980	991	101.12%		1,001	992	99.10%
Corozal	874	716	81.92%		951	666	70.03%
Male	441	346	78.46%		480	327	68.13%
Female	433	370	85.45%		471	339	71.97%
Stann Creek	807	794	98.39%		774	800	103.36%
Male	403	395	98.01%		382	389	101.83%
Female	404	399	98.76%		392	411	104.85%
Toledo	787	600	76.24%		848	693	81.72%
Male	389	312	80.21%		446	383	85.87%
Female	398	288	72.36%		402	310	77.11%
Total	4,396	4,010	91.22%		4,485	4,030	89.86%
Male	2,181	1,962	89.96%		2,219	1,978	89.14%
Female	2,215	2,048	92.46%		2,266	2,052	90.56%

While most households are headed by males, approximately 1 in 4 households are headed by females (Figure 23). This means that they play an important role as decision-makers in the communities. Women participate in micro and small enterprises as entrepreneurs (cooking, handicraft, shops, hairdressers. etc.), but there is still some undervaluing of women's labor in monetary terms. There is a division of labor along gender lines within the home. Women are expected to care for the family while men are expected to earn the money that is spent in the home. However, the labor statistics show that the percentage of women and men who are employed as unskilled laborers is approximately the same. Gender divisions in agriculture, firewood, and water collection.

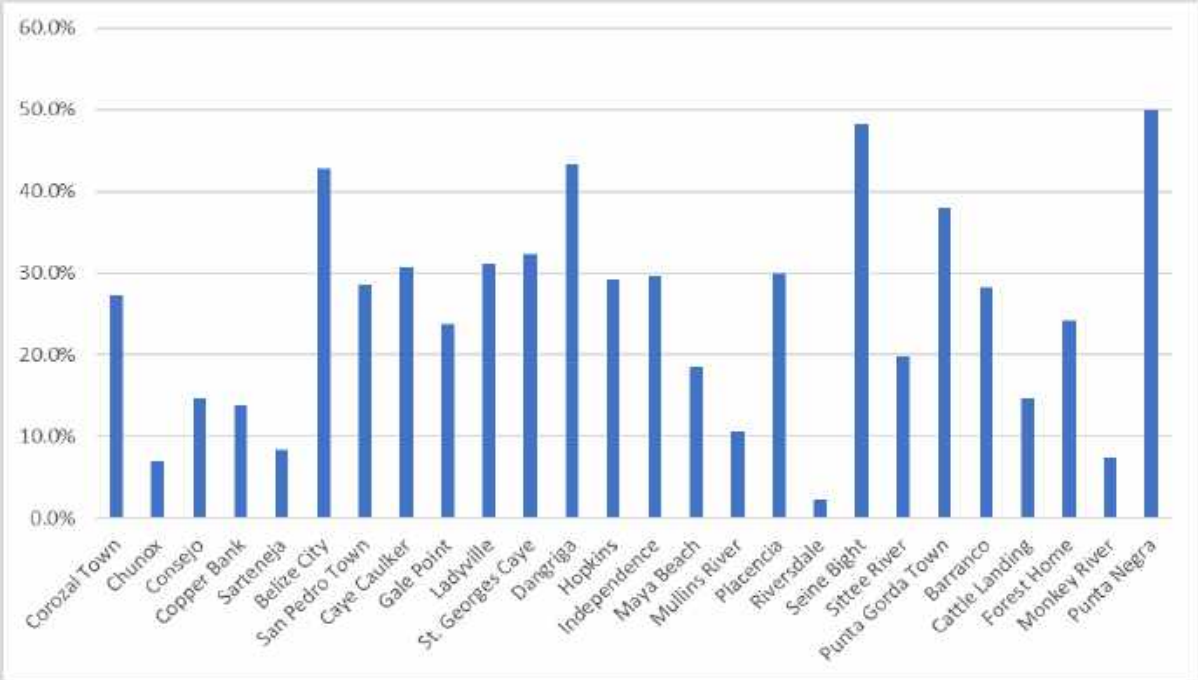


Figure 23: Percentage of Households in the coastal communities headed by women

According to the CDB 2016 Gender profile, Belize has a significantly gender-segregated and male-dominated labor force, demonstrated, for example by male participation in the primary industries outnumbering female participation by nearly 19 to 1. The male to female employment ratio diminished from primary to secondary, to tertiary industries at 3.9 to 1 in secondary industries, and 1.2 to 1 in tertiary industries. Males earn more than females, with female (annual) average income estimated at U$4,475 and male (annual) estimated average income at U$10,317 (2016), at a ratio of 0.46:1. Tourism is significant to the Belizean economy, and the industry employs one in seven persons. Male to female participation in tourism was estimated at 55% to 45% (2016). Despite the effective integration of women in the tourism sector, compared to the primary and secondary sectors, male and female labor is highly gender segregated.

The National Women's Commission estimated in 2016 that approximately 60% of female labor was concentrated in services, shop sales, clerical duties, and elementary occupations, further revealing the significance of the tourism sector to their labor and underscoring the nature of female employment opportunities. Females are highly concentrated in domestic services-related jobs such as cleaning, housekeeping, and other poorly paid service jobs, including hair-braiding and souvenir selling. Male employment is most prevalent in areas including resort ownership and management; building and grounds maintenance; taxi driving and tour guiding (CDB, 2016) – although accounts suggest that female participation is becoming more widespread in the latter case.

This study

Analysis of the available statistics indicates some interesting gender-related trends in Belize. The 2010 census is the most recent source of disaggregated population data for the communities that are the beneficiaries of the project. A review of the information shows that the total population in the coastal districts of Corozal, Belize, Stann Creek, and Toledo was 201,461 in 2010, with 100,568 males and 100,893 females. In rural Belize, there is an est. population of 231,950 of which 118,198 males and 113,752 females. This entails an increase of approximately 30% for the total population, 28% for urban areas, and 31% for rural areas compared to the 2010 census figures. The disaggregated information for 2010 shows a total population of 117,613 living in the coastal communities that are the areas of focus for this project. There were some 33,035 households of which an average of 25.2% was headed by women. This represents a range of 2.3% in Riversdale to 50% in Punta Negra. The graph in Figure 1 below provides information on the percentage of households headed by women in coastal communities in 2010. (SIB, 2019). Using the 30% average population increase between 2010 and 2020 calculated above and applying it to the coastal communities, the 2020 estimated mid-year population would be approximately 152,897. Extrapolating further, using the average of 3.6 persons per household calculated from the information above, it is estimated that in 2020 there are some 42,471 households in the coastal communities, of which 25.2% or some 10,617 are headed by women. These estimates need to be validated by the 2020 population census when this data becomes available.

Purpose

The purpose of the Gender/Social Assessment is to:

- Assess the social and gender-based aspects of the project in all coastal communities inclusive of indigenous people, marginalized and vulnerable groups
- Analyze positive and adverse impacts the project components may pose to persons in coastal communities and devise mechanisms for mitigating adverse impacts
- Ensure that the project components, activities, and outcomes are not biased to negatively impact or put one gender or social group at a disadvantage.

Methodology

The methodology selected relied on the Capacities and Vulnerabilities Analysis tool that is used primarily for disaster preparedness and humanitarian relief. The tool specifically looks at a community's existing strengths (or capacities) and weaknesses (or vulnerabilities) to determine the impact that a crisis has (or may have) on them, as well as the way they respond to the crisis. The rationale for this approach is that a crisis becomes a disaster when it outstrips a community's capacity to cope. The analysis helps to avoid this by identifying the weaknesses that need to be addressed and building on the strengths in the community concerning natural disasters, in this case, response to climate change. Capacities include existing strengths of individuals and social groups, while vulnerabilities include the long-term factors which weaken the community's ability to cope with the sudden onset of disaster, or with drawn-out emergencies.

The Capacities and Vulnerabilities Analysis was done during the stakeholder consultation process. To this end, extra effort was made to ensure the participation of women and youth in the consultation process. All groups present were asked to collectively identify how vulnerabilities and capacities differ (or coincide) by gender and economic class. The intention was to complete the Capacities and Vulnerabilities Analysis Matrix, then disaggregate CVA by gender and economic class. This was only partially realized because the information provided was not enough to do a meaningful disaggregation. Conducting a full statistically representative CVA was not feasible due to challenges related to time, timing, resources, competition with stakeholders' other priorities (Annex 3 Stakeholder Consultation Report), and the fact that communities strongly prefer in-person consultations.

The consultation process of stakeholders in the AF Project's 27 target coastal communities (Corozal Town, Belize City, Dangriga, Punta Gorda Town, Altamira, St. Georges Caye, Hopkins, Barranco, Consejo, Ladyville, Sittee River, Cattle Landing, Chunox, San Pedro Town, Independence, Forest Home, Copper Bank, Caye Caulker, Seine Bight, Punta Negra, Sarteneja, Gales Point, Placencia, Monkey River, Mullins River, Riversdale, Maya Beach) Corozal, Belize, Stann Creek, and Toledo Districts provided the following data relevant to the Gender and Social Assessment[15]:

Women are in charge or are the primary contacts for all the lead and key stakeholder agencies involved in the project. Women are also in charge of 8 of the 10 NGO stakeholders that do work in the coastal zone and which are potential collaborators with the project (SEA, TIDE, BAS, Fragments of Hope, Wildlife Conservation Society, The Nature Conservancy, WWF, Oceana). This guarantees that there will be female participation in the project at the decision-making level and places them in a position to ensure that there is gender equity built into the planning and implementation.

Of the 18 villages that we were able to consult during this assignment (Stakeholder Consultation Report), five have female chairpersons and all have at least two women on the council. At the municipal level, none of the municipalities have a woman mayor or deputy mayor, but all have at least one woman elected to the council. The two towns in the north (Corozal and San Pedro) both have one female councilor each, Belize City has three, and the two towns in the south (Dangriga and Punta Gorda) have two each. In the communities, the level of participation by women appears to be in direct relationship to the position that was held. Thus, there are women in local level leadership positions, although not always in equal representation. The women who were chairpersons, leaders of community-based organizations, business owners, or heads of households appeared to be more vocal. This is an indication that women are taking a more active leadership role in their communities and appear to be more assertive. It also provides a platform on which to develop gender-sensitive collaboration with the communities during and after the implementation of the project.

The women from the Southern and Central portion of the country, including Belize City, were more engaged in the discussions and more vocal about the issues that were identified. On average, the women who were heads of organizations, held senior positions in organizations, were community leaders or were actively involved in the communities tended to be younger (40 years and below) and have some education level (at least high school but mostly junior college and above). Ministry of Education statistics indicate that while equal numbers of males and females enter the school system at primary school, by the time they graduate from high school there is an average of 25% attrition in males and 10% in females. This indicates that increasingly women are becoming better equipped to undertake academically biased roles. This finding is an indication that, of necessity, women will be required to undertake tasks that were traditionally reserved for men. It was pointed out that there was no such thing as gender-specific roles within any of the project components. In that regard, the project provides a host of opportunities for anyone with the requisite training and skill.

Women in the villages tended to adhere more closely to the culturally/traditionally assigned gender-specific roles. In some instances, it was pointed out that they felt some of the activities and decisions were for the men and that they were comfortable with making some of the decisions.

While 60% of the Belizean population is 26 years of age and younger, most of the community representatives were 30 years of age and older. This suggests that the traditional community structure where decisions are made by the elders is still in place in most rural communities. These are cultural practices that should be respected until or unless a community member is negatively impacted.

Women in some of the communities want equal standing with men when it comes to land ownership, leadership roles, and decision-making. They feel that they are not taken seriously even though the laws do not differentiate between males and females. Studies have shown that women tend to be more judicious owners and managers of the property. This is important in a project where buy-in and active participation is a key requirement, particularly with coastal monitoring. It was felt that while the impacts of climate change affected everyone equally, during natural disasters women, particularly those who were heads of households were affected disproportionately. They are tasked with the bulk of the preparation, evacuation coordination, care during the disaster, and the post-disaster recovery work that needs to be done. Additionally, because of their role as caregivers, anything that impacted the home or the immediate environment normally placed undue stress on them. The planned activities for the project could be done by anyone who was properly trained to carry out the work, particularly the coastal monitoring and flood watch because they were mostly at home in the community.

While no legislation currently exists that specifically addresses gender disparity in Belize, by default much has been done to address the issues of gender in society. As more girls make their way further along the academic ladder it will become increasingly more difficult to deny them the opportunities that were culturally and traditionally reserved for males. There is still much to be done but it needs to be targeted. One example is the issue of natural disasters and the role that women play in preparation and response. The Gender Policy states that the Government of Belize is committed to "Foster social and community development to enhance gender equity within families."

Conclusions

[15] The full collected dataset, as well as a summary thereof, is included in Annex 3 Stakeholder consultation report

Women leaders in the communities, Government, and NGOs ensure female participation in the project. Belizean women are increasingly becoming better equipped to undertake the roles that used to be reserved for men. Consequently, their role as decision makers in the communities is stronger, although some prefer to adhere to the culturally/traditionally assigned gender-specific roles and decision-making by elders. Enhanced education levels among female participants are beneficial for the project as there will be a cadre of people at the community level who will be able to function as a change agent within their communities (e.g. support data collection, communication activities, decision-making, etc.), as will their increased interest on climate change and disaster preparedness. There is room for improvement in the area of valuing women's labor in monetary terms (e.g. cooking, handicraft, shops, hairdressers, etc).

During natural disasters, women are disproportionately affected, especially in female-headed households (1 in 4). They lead preparation, evacuation coordination, care during the disaster, and the post-disaster recovery actions. Additionally, because of their role as caregivers, they are responsible for themselves and others. Emerging issues that women are increasingly showing interest in wanting to be considered on equal standing with men are land rights, access to investment financing, information about climate change, and disaster preparedness. There are concerns about safety and security, particularly around times of disasters. Women, particularly heads of households indicate that they do not feel safe, and worry about the timing of actions, adequacy, and availability of emergency shelters and the fact that emergency response appears to be tailored to male heads of households primarily. As such, the NCCCSAP needs to pay special attention to information sharing with women.

The result of the analysis suggests that in most communities, women prefer not to assume what are considered to be non-traditional roles. Culturally, gender roles have been clearly defined over time and most communities prefer to keep it that way. However, in communities where there were younger women who attended school up to the tertiary level, they expected that there would be a greater role for women to play in the project. Women who attend school and graduate are beginning to outnumber men at approximately 3:1. This puts them in a better position to make effective use of the project and the products thereof.

The results of the community consultations indicate that participants were supportive of the project and felt that the proposed activities were beneficial to coastal communities. It was felt that all the activities could be considered gender-neutral and would not adversely impact one gender, ethnic group, or demographic over the other. The project was seen as providing opportunities for communities to become more involved with the adaptation to climate change and sea-level rise. The project activities will be done by anyone who is properly trained to carry out the work, particularly the coastal monitoring and flood watch because they were mostly at home in the community.

The request for continued consultation and participation is an implementation detail that will be addressed with the understanding that there are clear gender-based roles within these communities that are slowly changing with the increased access to education by young women and girls.

PART III: Gender Action Plan

The following gender action plan of the project aims to ensure equal participation of men and women and to integrate the gender-related needs of the local communities into the technical design and the way the project is implemented. The Gender Action Plan (Table 45) describes the proposed measures to be included in the project design and implementation to promote gender equality and mainstreaming in the activities and consequently the outputs of the project. In particular, it focuses on the gender concerns relating to equal access to opportunities, participation in decision-making, women's access to training and practical skills, and how the plans/strategies developed will ensure equal opportunities for women. Overall, the main approaches were undertaken so far, or to be undertaken, are 1) Conducting consultations with both genders to ensure consider equally the perspectives of women and men, 2) Gender sensitivity in the project's implementation and 3) Encouraging women to take staff and consultancy positions in the project. Proper consideration will be provided to pursuing a gender balance among staff/consultants/stakeholder beneficiaries, and in all procurement processes, in line with the NIE's commitment to Gender Equality and Equity. Additionally, remuneration will be based on the work requirements, irrespective of gender.

Table 45: Gender Action Plan

Project Components	Outcomes	Gender issue	Action	Indicator	Beneficiaries	Responsible Party
Component 1 Improving coastal land use for resilient habitation and sectoral activities	1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to	Female-headed households are particularly vulnerable to climate hazards and also in the	The policymakers consider equally the needs of men and women, and particularly considers women who work in the	No. or women engaged in the development of the policy and codes Monitoring of Indicator:	National level: 419,199 persons: 209,603 males and 209,596 females (Staff: 8 consultants: 4 male/4 female.	MIDH, M&E Officer, Project Manager. PSC (oversight)

	increased resilience	lower-income segment.	home. Discussions with communities are gender-equal and disaggregated.	A detailed description of how the needs of men and women (particularly women who work in the home) will be incorporated. An equal number of men and women participate. Attendance registers are taken (anonymized) that identify numbers of men and women.	Construction workers are generally male)	
		Female-headed household are particularly vulnerable and need information about	The policymakers consider equally the needs of men and women, and particularly considers women who work in the home. Women will be encouraged to apply for positions as wardens and committee members. Discussions with communities are gender-equal and disaggregated.	No. of women engaged and involved in the process Monitoring of Indicator: A detailed description of how the needs of men and women (particularly women who work in the home) will be incorporated. Progress made about female inclusion as wardens and committee members are documented An equal number of men and women participate. Attendance registers are taken (anonymized) that identify numbers of men and women	National level: 419,199 persons: 209,603 males and 209,596 females (Staff: 12 persons: 6 male/6 female, however also influenced by available local capacities)	CZMAI, M&E Officer, Project Manager. PSC (oversight)
	1.2 Improved coordination and implementation of the ICZM Plan	Importance of adhering to coastal zonation.				

Component 2 Coastal Vulnerability Monitoring	2.1 Strengthened data availability for the development of a national coastal saline intrusion program	Gender-neutral work based on qualification. Females will be encouraged to apply, with equal consideration to both genders.	Training sessions target an equal number of men and women. Men and women are targeted to be trained in equal numbers. However, this is dependent on the intrinsic composition of the institutions. Female participation will likely outnumber males.	No. of women involved and trained under program Monitoring of Indicator: Training sessions completed with records documenting equal participation from men and women. Documentation about these sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	27 coastal communities - 117,823 persons: 57,787men; 60,035women (Target 50 trainees: 25 male/25 female)	NHS, M&E Officer, Project Manager. PSC (oversight)
	2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	Gender-neutral work based on qualification. Females will be encouraged to apply, with equal consideration to both genders.	Training sessions target an equal number of men and women. Men and women are targeted to be trained in equal numbers. However, this is dependent on the intrinsic composition of the institutions. Female participation will likely outnumber males. Women will be encouraged to join the community committees.	No. of women involved in the program Monitoring of Indicator: Training sessions completed with records documenting equal participation from men and women. Documentation about these sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	27 coastal communities - 117,823 persons: 57,787men; 60,035women (Target 50 trainees: 25 male/25 female)	CZMAI, M&E Officer, Project Manager. PSC (oversight)
	2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	Gender-neutral work based on qualification. Females will be encouraged to apply, with equal consideration	Training sessions target an equal number of men and women. Men and women are targeted to be trained in equal numbers. However, this is	No. of women trained Monitoring of Indicator: Training sessions completed with records documenting	27 coastal communities - 117,823 persons: 57,787men; 60,035women. (Target 10 trainees: 5 male/5 female)	NMS, M&E Officer, Project Manager. PSC (oversight)

		to both genders.	dependent on the intrinsic composition of the institutions. Female participation will likely outnumber males.	equal participation from men and women. Documentation about these sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.		
Component 3 Coastal Protection and Adaptation response for High-Risk Areas	3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	Female-headed households are particularly vulnerable to climate hazards.	The engineer's methodology will consider equally the needs of men and women, and particularly considers women who work in the home, and how to avoid inconvenience. Discussions with communities are gender-equal.	No. of women involved in the pilot project Monitoring of Indicator: The engineer's progress report describes in detail how the needs of women (particularly women who work in the home) have been met, and if any conflicts have occurred.	9,591persons (4,615 men, 4,976 women) in Dangriga, (Staff target 5 consultants: 2 male/3 female. Construction workers generally male)	Engineer, NCCO, M&E Officer, Project Manager. PSC (oversight)
		Female stakeholders are particularly explicit about the need for information.	Knowledge sharing sessions target an equal number of men and women. Interventions will consider equally the needs of men and women, particularly women who are not in a leadership position.	No. of persons engaged Monitoring of Indicator: Knowledge sharing sessions completed with records documenting equal participation by men and women. Documentation of sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	25 coastal communities – 106,622 persons: 52,395 men; 54,226 women (100 session participants: 50 male/50 female from 25 coastal communities)	NCCO, M&E Officer, Project Manager. PSC (oversight)

Component 4 Awareness raising, knowledge dissemination and capacity strengthening	4.1 Promotion of ecologically responsible behaviors through climate change communication	Female stakeholders are particularly explicit about the need for information.	Awareness sessions target an equal number of men and women. Interventions will consider equally the needs of men and women, particularly women who are not in a leadership position.	No. of communities and persons sensitized Monitoring of Indicator: Awareness sessions were completed with records documenting equal participation from men and women. Documentation of sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	National level: 419,199 persons: 209,603 males and 209,596 females (100 session participants: 50 male/50 female from 25 coastal communities)	NCCO, M&E Officer, Project Manager. PSC (oversight)
	4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	Gender-neutral work based on qualification. Females staff equally considered for training.	Training sessions target an equal number of men and women. Interventions will consider equally the needs of men and women, particularly women who are not in a leadership position.	No. of persons trained. Monitoring of indicator: Training sessions completed with records documenting equal participation from men and women. Documentation of sessions prepared by M& E Officer and reviewed by the Project Manager and PSC.	27 coastal communities - 117,823 persons: 57,787men; 60,035women (target 50 trainees: 25 male/25 female)	CZMAI, M&E Officer, Project Manager. PSC (oversight)
	4.3 Strengthening of GIS capabilities of CZMAI and partners	Gender-neutral work based on qualification. Females staff equally considered for training.			27 coastal communities - 117,823 persons: 57,787men; 60,035women (target 15 trainees: 7male/8 female)	

Through this project, it will be ensured to include female and youth involvement, including indigenous women and youth groups in climate change discussions, trainings, and capacity building initiatives. Women are represented in all NGO and community groups that have been met with to develop this project proposal and so communications with these women and youth will be continued if the project is implemented. While implementing activities women's knowledge, needs and roles will be reflected, while also incorporating indigenous expertise and traditional practices. Women comprise of large portion of the workforce in the tourism and agricultural sector; thus, they need to be provided with the same access to resources and training opportunities. When reaching out to community groups and indigenous groups special effort will be made to ensure equal representation of males and females, while ensuring that those who are chosen have the interest in supporting the project and in the learning opportunities that will be provided. Groups such as NAVCO, BENIC, the National Women's Commission and others will also be consulted throughout the entire process. The project will

build on the capabilities, unique knowledge, and perspectives of women, to not only build their climate resilience but also make them active agents of the project.

ANNEX II FEASIBILITY STUDY

PART I: ANALYSIS OF THE SITUATION

Analysis of the current situation of the coastal zone vulnerability and exposure, opportunities and gaps

Belize's Coastal Risk Profile

Belize's recent Coastal Risk Profile study concluded that both mangroves and coral reefs provide effective protection to people and properties. The study identified the entire country of Belize being at high to extreme risk to climate change vulnerability (Figure 24), with red being assigned for the areas that are at extreme risk and orange for the risk-not-extreme (CAF 2014).

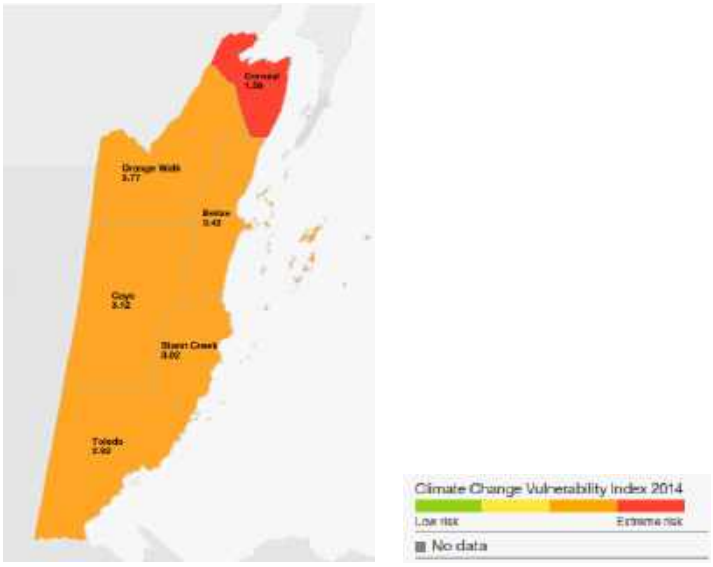


Figure 24: Risk Profile Map (CAF 2014)

Through the study, it was determined that impact was greater across the northern area of the country, whereas the southern part of the country is less exposed to coastal flooding associated with tropical cyclones. In terms of population and infrastructure, Belize City, Ambergris Caye, and Corozal Town are the most exposed and vulnerable areas, showing higher estimates of serious injuries/loss of life and damage to households and associated replacement costs. There is a significant shoreline retreat estimated in all sandy coastal areas of the country, but this beach erosion derived from tropical cyclones can be naturally covered after a period because the beaches are resilient. Shoreline retreat and beach surface loss are estimated to be the highest in Ambergris Caye and, second, in the beaches of Central and Southern Belize. Although the effect on coastal structures of coastal erosion derived from tropical cyclones is limited and it has been estimated to be relevant only in Placencia and Ambergris Caye (IHCantambria and IDB, 2020).

As for the environmental component, relevant and protected ecosystems play an important role in the northern and central regions not only due to their protection services but also due to the cultural, provisioning, and regulatory services they provide. Mangroves, in particular, avoid coastal erosion derived from tropical cyclones very effectively, i.e. where there are mangroves, the coastline doesn't move at all, and erosion is minimal; limited to perhaps the loss of the 1-2 rows of mangroves (more or less 2ft.).

Recommended risk reduction measures

Based on their intensive review, - which included scenario building related to coastal flooding and erosion due to tropical cyclones, - with as a basis the current situation and Horizon 2050, - using 69 historical tropical cyclones (45 category 1 or higher) and expanding the dataset with 652 synthetic tropical cyclones (290 category 1 or higher), IHCantambria and IDB (2020) identified a set of suitable risk reduction measures addressing diverse strategies and approaches. At least one of these identified Risk Reduction Measures will

be utilized in this AF Project as demonstrated in (Table 38), thus pursuing the pre-event risk management strategies: Prevention, Protection, Preparedness strategies[16] (Table 46).

Table 46: Strategies, approaches, and RRM in the catalogue (adapted from IHCantambria and IDB; 2020, Blue Carbon Working Group; 2020)

Strategy	Approach	Risk Reduction Measure	AF Project
Prevention: Protect through actions taken in advance of the hazard, reducing the exposure to the hazard or the vulnerability of the exposed investments or people.	Receivers adaptation	Building codes implementation guidelines	Housing Policy and Building codes implementation guidelines; Component 1.1
		Flood-proofing	n/a
	Exposure reduction	Land use regulations and urban planning	Coastal Zone Management; Component 1.2
	Modeling and assessments to enhance prevention	Hazard, exposure, vulnerability, and risk assessments under coastal flooding and erosion	Saline intrusion; Component 2.1
	Maintenance and conservation of the coastal system	Maintenance of coastal structures, beach width, coastal ecosystems, and habitats	Beach Erosion Monitoring; Component 2.2
Protection: Shield from the direct impacts of the hazard through mitigation measures.	Soft Engineering	Sand re-nourishment	Component 3
Preparedness: Knowledge and skills development to anticipate and respond to the impacts of a climate hazard.	Forecasting and warning	Early warning systems	Early Warning; Component 2.3
	Emergency response	Emergency and contingency plans	n/a
	Enhance Public awareness	Education programs	Component 4.2 & 4.3
		Raising awareness campaigns	Component 4.1

Preliminary analysis of key issues and risk reduction measures

Component 1

Housing Policy and Building codes; Component 1.1

Goal: To safeguard citizens from dangers related to construction methods that are inadequate to withstand the impacts of weather hazards. Building codes are a set of recommended good practices or legislation; when enforced by the Central Building Authority provide minimum standards for safety, health, and general welfare including structural integrity and other requirements, especially in disaster-prone areas.

With the recent passing of the tropical storms, Eta and Iota over the Central American region and Belize not escaping the effects of these, the Ministry of Infrastructure Development and Housing (MIDH) recognizes that it is not only coastal communities being affected by climate change but also flood-prone inland communities. This highlights the need for National Building Codes for the coastal communities and inland communities. Standards will vary, depending on the reality of the different affected communities.

Table 47: SWOT ANALYSIS BUILDING CODES (adapted from IHCantabria and IDB, 2020)

STRENGTHS	WEAKNESSES	Mitigation measures

[16] Further explanation of each risk reduction measure in IHCantambria & IDB (2020) Deliverable 6. Final Proposal of Risk Reduction Measures in Priority Hotspots.

● Building codes help the sustainability of structural integrity and safeguard construction quality and reduce building vulnerability. ● Building codes outline standard requirements for commercial, industrial, and residential structures design and construction according to an acceptable safety level. ● The current regulations were updated following major devastation caused by Hurricane Hattie (1961).	● Limited stakeholder buy-in to the implementation of these standards as they raise initial costs of construction. ● Implementation is slowed down due to bureaucracy. ● The central and local building authorities are responsible for the generation of building codes and regulations, but there are other guidelines (e.g. ICZMP) that are not regulated via legislation.	● Establish a social housing pilot Communication to improve buy-in ● M&E and adjustments of bureaucratic procedures ● Continue – through other interventions – strengthen the regulatory framework
OPPORTUNITIES	**THREATS**	**Mitigation measures**
● Examples of good practices are expected to support the acceptance of building codes and laws. Therefore, the AF project also includes the establishment of a pilot home/building.	● Building codes can include non-scientific regulation/limitations. ● There are accounts of low-income families in Belize that construct houses that do not comply with the regulations. ● Building codes may not comply with cultural heritage designs	● Properly designed sound building codes ● Enforcement of building codes and targeted subsidies for low-income families ● When developing the building codes, an assessment should be conducted on how the traditional housing structures (cultural heritage) of the Indigenous and Garifuna peoples will be integrated.

Coastal Zone Management guidelines; Component 1.2

Goal: To limit certain uses in hazardous areas, in accordance with coastal risks (e.g. industrial, residential), whereas other uses (e.g. recreational, natural ecosystems) are limited or forbidden. A buffer zone is established between a hazard area and coastal development using specific regulation/legislation. This buffer protects properties against coastal flooding and erosion by regulating that buildings are not located in an area susceptible to climate impacts.

Table 48: SWOT analyses Land use regulation (adapted from IHCantabria and IDB, 2020)

STRENGTHS	WEAKNESSES	Mitigation measures
● An effective method to minimize property damage due to coastal flooding and erosion. ● A low-cost alternative for shoreline erosion or flood protection.	● ICZM Plan is not regulated via legislation. ● The establishment of land use guidelines requires good quality data, which is not always available. ● Existing structures are usually permitted to stay within the buffer area ● Coastal erosion or sea-level rise can reduce the buffer zone between structures and the sea. ● Land use regulations are widely used globally and also used nationally (e.g. Punta Negra, Dangriga), but are currently moderately enforced in Belize.	● Continue to strengthen the regulatory framework ● Strengthen data availability through research/monitoring ● If existing structures are significantly damaged or destroyed, they are to be reconstructed in line with the new regulation ● Buffer zones must be reviewed from time to time ● Improved enforcement of Land use regulations
OPPORTUNITIES	**THREATS**	**Mitigation measures**
● They help to maintain shoreline access by regulating development in the immediate seafront area. ● They help to sustain the natural appearance of the coastline and protect natural shoreline dynamics.	● If good quality data related to hazards is lacking, the established buffer either provides too little protection or are too restrictive to shoreline development. ● Setbacks do not protect structures in the buffer area.	● Strengthen research/data collection ● Intensive communication about the risks of building in the buffer area

● They result in an open space for the enjoyment of the natural shoreline.		

Component 2

Saline intrusion; Component 2.1

Goal: To define coastal risks. It is an assessment that helps to enhance the understanding and awareness of coastal saline intrusion and to reduce its impact on nature, production, and people. These assessments enable the identification of at-risk-areas and help prioritize risk reduction efforts. As such, this component strengthens various relevant sectors/activities, such as Water Resource Management (including agricultural water management), agricultural planting decisions and, zoning (including planning tourism and residential facilities). It will contribute to water security in the coastal communities.

Table 49: SWOT analyses Saline intrusion (adapted from IHCantabria and IDB, 2020)

STRENGTHS	WEAKNESSES	Mitigation Measures
● It quantifies the existing saline intrusion risk and identifies the areas at risk. ● It is a basic tool for Integrated Coastal Zone Management, and it strengthens other planning and prevention measures (establishing production zones, tourist facilities, water resource management, agricultural planting decisions) and preparedness measures (early warning systems, emergency and contingency plans). ● Moderately accepted in Belize.	● It does not reduce the risk by itself. Without proper mitigation measures, the information is useless.	● Implementation of a comprehensive program that targets the prevention, protection, preparedness, and recovery. The proposal contributes to three of these areas.
OPPORTUNITIES	THREATS	Mitigation Measures
● It helps in the zoning and selection of mitigation measures. ● It enhances the development of coastal areas with lower risk. ● It informs water allocation and improves decision making for water resources management. ● Informs agricultural water management.	● It might contribute to impoverish coastal areas with higher risk, due to hesitation among investors.	● Identification/Promotion of alternative opportunities, e.g. seaweed harvesting

Beach Erosion Monitoring; Component 2.2

Goal: Beach erosion monitoring is considered a first step in the maintenance of the coastal system (structures, land features, and ecosystems): ensuring optimal levels of serviceability and safety and minimizing costs and environmental impact. Beach coastal structures do not provide permanent protection. Maintaining a wide beach buffers wave energy and slows retreat rates.

Table 50: SWOT analyses Beach Erosion Monitoring (adapted from IHCantabria and IDB, 2020)

STRENGTHS	WEAKNESSES	Mitigation Measures
● Monitoring and timely prevention reduces climate impacts on the environment and can be cost-effective. ● Well-maintained coastal structures and wide beaches, as well as healthy mangroves effectively	● Without an early erosion detection program, maintenance of beach width is likely limited to the availability of large volumes of sand.	● Early detection of erosion through monitoring

prevent coastal erosion and flooding. ● There exists a legal requirement for a 66-feet buffer to be maintained next to all water bodies.		
OPPORTUNITIES	**THREATS**	**Mitigation Measures**
● The improvement of beach areas at a lower cost. ● Early erosion detection and the maintenance of ecosystems retain the ecological value of the beaches. ● Beach restoration programs can be linked to environmental education initiatives. ● Wide beaches protect against coastal flooding and erosion and are a valuable coastal habitat for many highly specialized plants and animals.	● Erosion rates have increased in Belize. Additionally, land titles were granted before the 66-feet buffer was legally binding.	● Intensive communication about the risks of building in the buffer area

Early Warning System and Storm Surge Modelling; Component 2.3[17]

Goal: The goal of developing an early warning system and storm surge modeling is to detect or forecast hurricanes or other threatening flood events early so that the public can be alerted in advance and can undertake appropriate responses to minimize the impact of the event. It has two distinct stages: (1) flood or hurricane warning and (2) response. Through forecasting and monitoring of meteorological conditions, detection of threatening events to take place before it hits a community.

Table 51: SWOT Analyses Early Warning System (adapted from IHCantabria and IDB, 2020)

STRENGTHS	WEAKNESSES	Mitigation measures
● It is relatively low-cost, and it has proven its benefit globally. ● Widely accepted in Belize. ● This preparedness measure reduces the damages related to coastal flooding and storm surges. ● It minimizes losses particularly human lives.	● The warning alone does not reduce the hazard impacts. ● Its effectiveness depends on the public's responses, on the coordination between local communities and state agencies, and intergovernmental coordination. ● Skilled and experienced staff is necessary for its development and implementation.	● National emergency planning measures (evacuation routes and shelters) need to be evaluated and where necessary strengthened. ● Awareness and education campaigns are also needed. ● Strengthening staff capacities
OPPORTUNITIES	THREATS	Mitigation measures
● It improves the timing and efficiency of some flood control measures (e.g. storm surge barriers, temporary flood defenses, sandbags). ● It promotes timely evacuation. ● The system can be useful for other purposes (e.g. to inform coastal works, fishing, and navigation).	● It relies on the available means of communication which is not equally efficient everywhere. ● It might encourage the development of areas-at-risk where the system is implemented.	● Investing/improving in reliable communication ● Intensive communication about the risks of investing in areas-at-risk

[17] An EWS is a preparedness measure that reduces the damages related to coastal flooding and storm surges. The development of a full EWS requires 4 phases. The AF proposal relates to implementation of Phase 1 – EWS development & Storm Surge modelling. This is a first step towards implementing Belize's vision for establishing a full EWS. Flooding (coastal, riverine, pluvial, etc. or any combination) is a function of Hydrological Services and the mandate of NHS. Storm surge EWS is a function of Meteorological Services and the mandate of NMS. NMS and NHS will collaborate to have a joint system where the data from the storm surge monitoring system and coastal flood warning system are incorporated.

Component 3

Dangriga , the beneficiary community of component 3, is situated in the Stann Creek district. Research has indicated that Dangriga has an extremely high exposure risk (0.54) (CAF 2014). The choice for the inclusion of this specific community was also based on experts' advice (from CCCCC, NCCO and CZMAI), its high vulnerability, reliance on natural resources, sensitive ecosystems and funding that is already being provided through the Fourth National Communication to carry out the required assessments and determine what are the best options to restore the beach in Dangriga.

The following sections include a brief examination of the key issues regarding coastal flooding and erosion and a non-extensive exploration of risk reduction measures for Component 3. The final design is the result of comprehensive research using an analysis of sea dynamics, land characteristics, and lab analysis which were conducted under Belize's Fourth National Report to the UNFCCC. Although coastal erosion has been observed in Dangriga, many uncertainties remain regarding the processes that cause this erosion. Therefore, it is a priority that a comprehensive coastal modeling and assessment is completed to understand the causes of erosion, sediment sources, and sinks and estimate shoreline position changes. The result of the research on coastal erosion and recommended measures for shoreline recover can be found in Annex V.

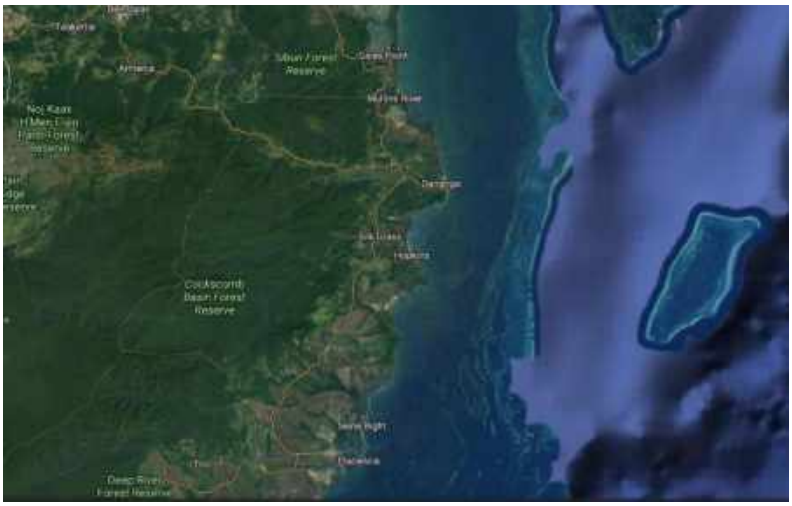


Figure 25: Geographical depiction of the Component 3 Location

Site description and key issues

Dangriga, the beneficiary community of component 3 of this AF Project Proposal, is situated in coastal units 14 and 15 – the South Northern region where the environmental component plays an important role (Figure 25). Coastal erosion is very evident in Dangriga's coastal areas. Beach scarp, dead trees, exposed roots, waves reaching building foundations, and inefficient coastal protection structures, validate the widespread character of coastal erosion in this area. According to local accounts, the shoreline has retreated around 20-25 feet in the last 5 years. The anthropogenic causes are river mining and the incorrect location of buildings in the coastal area and the construction of inefficient shore protection structures. The GAMMA S.A. research conducted between 2021 and 2022 reported the following findings regarding the causes of erosion at the site and along the southern Belizean coast:

- The possible increase in the volumes of sand in the submarine bars, observed in the beach profiles and in the deposits formed by the overtopping landward, likely add up to compensate for the volume of sediment removed from the coastal strip by the erosion process, which means a redistribution of the material in the profile itself and not a net loss in the sedimentary balance of the system.
- The analysis of the redistribution of the material in the profile is in correspondence with the interpretation of the Brunn (1962) and Dean and Maurmeyer (1983) models, and offers a better-grounded approach, to understand how the sea level rise caused by climate change, can be an important cause of the erosion process in the coasts of Belize.
- During the fieldwork (August-September 2021), it was found that there is no correspondence between the intense erosion process observed in all the sites visited and the low level of human intervention in the coastal strip.
- In Dangriga, sand mining activity in rivers could cause a certain reduction in sediment inputs to the coastal system but could not explain the intensity and generalization of the erosion process. The absence of biogenic carbonate sediments throughout the coastal strip makes it clear that the possible deficit in the production of sand from marine ecosystems does not represent a cause of the erosion process that takes place on the coast.
- The biogenic sand production deficit likely influences the erosion process that is reported on the beaches of the outer cayes, formed mainly by this type of sand, but it would require monitoring and research to prove it.
- Regarding the possible increases in the other elements of outputs in the system, the lack of measurements and previous sampling does not allow evaluations of changes in the circulation patterns of the currents. In the field work, the occurrence of anthropic actions capable of generating significant changes in the behavior of these output elements was not observed.

- It should not be ruled out that other processes associated with climate change, such as the ocean biogeochemical changes, the ocean acidification by carbon dioxide and biological changes, such as coral bleaching, will in the future have a much greater impact on reducing the sedimentary balance of coastal systems, and consequently intensifying the erosion processes.

Table 52: Key issues in Dangriga (sources: Gamma, 2019; IHCantabria and IDB, 2020; own analyses

Dangriga
The mouths of North Stann Creek and Havana Creek are clogged for long periods, cutting off river flow and retaining river sediment yield, until heavy rains open-up the river mouths, especially at Havana Creek. Between North Stann Creek mouth and Havana Creek mouth, the urban area is densely populated with several properties located on the seafront, whereas south of Havana Creek the seafront is mainly covered with parks and recreation areas.
Hurricane Greta (1978) made landfall in Dangriga town and there was minimal flooding on the mainland despite a high storm surge. Storm tides in Dangriga were 1.8 to 2.1 m above normal, which did not cause much flooding. Beach erosion related to tropical cyclones has been estimated in around 6 m of shoreline retreat for the 500-year return period and over 8 m including the effect of climate change.
Further research required. However, preliminary possibilities for risk reduction measures include beach restoration, hard engineering (seawall), and soft engineering (sand re-nourishment for beach restoration) to limit or avoid erosion and the definition of coastal setbacks (land use regulations and urban planning), where erosion cannot be avoided.

Table 52 provides a summary of the initial findings, prior to the conclusion of the study in 2022.

Table 53: Probable Risk Reduction Measures under Component 3 (Sources: Gamma, 2019; IHCantambria/IDB, 2020; Blue Carbon Working Group, 2020; own analysis)

		Dangriga
Key issues	Coastal erosion	✓
	Coastal flooding	×
	Impacts of climate change	✓
Recommended RRM	Building codes and regulations	×
	Flood-proofing	×
	Land use regulations and urban planning	✓
	Hazard, exposure, vulnerability, and risk assessments under coastal flooding and erosion	✓
	Maintenance of coastal structures, beach width, coastal ecosystems and habitats	✓
	Beach restoration	✓
	Wetland restoration	×
	Coral reef conservation	×
	Riparian buffer restoration	×
	Forest conservation	×
	Seawalls	✓

	Breakwaters and groins	×
	Land claim	×
	Managed retreat	×
	Sand re-nourishment	✓
	Early warning systems	×
	Emergency and contingency plans	×
	Education programs	✓
	Raising awareness campaigns	✓
	Clean-up and restoration activities	×
	Disaster assistance	×
	Insurance policies	×

Possible proposed measure: Sand re-nourishment

Goal: To restore the sedimentary balance in the coastal zone when a deficit of sediment exists. It is a soft engineering technique based on the addition of sand to the coastal system. Sand can be retrieved from inland sources or offshore dredging. It does not reduce erosion but provides extra sediment upon which continuing forces will act, eventually returning the beach to its original state if the beach is not in equilibrium after the nourishment.

Table 54: SWOT analysis sand re-nourishment (adapted from IHCantabria and IDB, 2020)

STRENGTHS	WEAKNESSES	Mitigation measures
● Protects the area at the back of the renourishment against coastal flooding and erosion ● Technology and methods clear and relatively easy to implement ● Soft solution compatible with many other supplementary risk reduction measures ● Moderately accepted in Belize	● The renourished area usually continues to be vulnerable to coastal flooding and erosion ● Low public awareness that this solution has a temporary nature	● Renourishment is required regularly or the implementation of other engineering measures ● Awareness-raising needs are strengthened
OPPORTUNITIES	**THREATS**	**Mitigation measures**
● Possible benefits in adjacent areas ● Disposal option for maintenance dredging of harbors and channels ● Promotion of beach tourism through beach widening	● Damage of seafloor with potentially high ecological value in the dredging area.	● Proper Environmental Impact Assessment before dredging

Component 4

Communication and Awareness; Component 4.1

Goal: To promote among the public, leaders, and decision-makers understanding of the importance of hazard management to reduce the risks of future climate impacts. Communication action plans include a wide variety of activities focused on various audiences and implemented by different means such as media (social media, radio, tv, newspapers), public bulletins, permanent displays (memorials, museums, high watermarks), commemorative activities, conferences, etc. A National Climate Change Communication Strategy and Action Plan (NCCSAP) is being formulated to effectively increase and improve the level of awareness, interest, positive attitudes,

behaviors, and practices towards climate change adaptation and mitigation among the public, vulnerable communities, and stakeholders in Belize. This action plan is formulated based on a comprehensive research of:

- communities' understanding and attitude towards the impact of climate change and behavioral actions related to adaptation and mitigation.
- Identification of the gaps in communication, coordination, and dissemination of climate change adaptation and mitigation information among various stakeholders.

Table 55: SWOT analyses Communication and Awareness (adapted from IHCantabria and IDB, 2020)

STRENGTHS	WEAKNESSES	Mitigation measures
● A high level of awareness is crucial to enhance cooperation between the government and the public. ● Can result in long-term benefits ● Widely accepted in Belize.	● Communication actions in indigenous communities according to a rights-based approach can come at a high cost. ● Credibility is crucial for efficient awareness-raising activities and depends on communication channels (e.g. influential community leader, media) and the credibility of the information. ● Highly variable costs for an effective awareness-raising campaign, depending on the target group.	● Proper cost planning to respect FPIC rights ● Utilizing credible information channels
OPPORTUNITIES	**THREATS**	**Mitigation measures**
● Awareness among the public and leaders is key to the success of many other risk reduction measures. ● Communication and awareness can act as a catalyzer for discussion and innovations in the design and implementation of other risk reduction measures.	● An awareness-raising campaign can be misused for propaganda.	● Proper planning of relevant strategies and actions

Education and Training; Component 4.2 & 4.3

Goal: Transfer of knowledge and skills related to coastal risk to the public through teaching/training. Educational programs can be implemented for different target groups:

- Universities may incorporate coastal risk related topics in their teaching curricula and research.
- Capacity building programs in institutions to increase staff capacity to perform core functions related to hurricane risk reduction.
- Educational campaigns to promote behavioral changes.

Table 56: SWOT analyses Education and Training (adapted from IHCantabria and IDB, 2020)

STRENGTHS	WEAKNESSES	Mitigation Measures
● High level of effectiveness due to the availability of manuals and programs, which have been successfully implemented in Belize. ● Relatively low cost when incorporated in a formal education curriculum. ● The implementation of each risk reduction measure requires a high level of technical knowledge that needs to be learned and updated as new technologies are continuously developed.	● Implementation depends on commitment from the government institutions, educational institutions, and community leaders as well as on the personal motivation of learners. ● Relatively high cost when implemented using external experts.	● Motivate the relevant stakeholders and secure commitment ● Quality-cost based public procurement

● Many different capacity building methods can be combined and improve their effectiveness. ● Commonly used and accepted in Belize.		
OPPORTUNITIES	**THREATS**	**Mitigation Measures**
● It results in professionals with adequate skills. ● It improves the effectiveness of ● several Risk Reduction Measures at a relatively low cost. ● A critical mass of well-trained professionals (e.g. technologists, scientists, managers) ● It ensures the intrinsic capability of the system to generate new skilled professionals.	● If it is not done by trained educators there is a risk of disseminating wrong content. ● Badly trained professionals might cause new problems instead of solving them.	● Careful selection of experts

Conclusions

Having considered the data, the following has been concluded:

- Housing Policy and Building codes (Component 1.1), Coastal Zone Management (Component 1.2), Saline intrusion (Component 2.1), Beach Erosion Monitoring (Component 2.2) are vital contributions of this project to Belize's preventive climate actions. The Housing Policy and Building codes benefit the nation, not just coastal communities.
- The impacts of climate change are evident in Dangriga, but erosion is also due to anthropogenic causes. Considering the anthropogenic causes, the housing policy and building codes, coastal zone management guidelines, and beach erosion monitoring project components will have a positive (preventive) impact on these communities. To diminish the anthropogenic causes of beach erosion, it is recommended to consider awareness/training regarding river mining for inclusion in the Education and Awareness interventions (component 4).
- Recovery and protection measures for Dangriga include beach nourishment, soft engineering
- The impacts of climate change in Dangriga are partially due to anthropogenic causes. Component IV should consider including awareness actions regarding river mining and training interventions strengthened with information-sharing on alternative livelihood opportunities like sargassum farming, which was identified under the feasibility study.
- Enhancing interest in the utilization of Sargassum will support national challenges relating to waste management of this product and has the potential to contribute to eco-friendly crop production and energy sustainability, through enhanced communication.
- Investments in Belize's Early Warning System (Component 2.3) and Training, Education, and Awareness (Component 4.1 – 4.3) are important contributions to climate change preparedness.
- Recovery aspects to climate change adaptation (e.g. restoration, disaster assistance, insurance) - not being covered under the Adaptation Fund project – should be further explored and proposals developed. A comprehensive study is required to assess the efficacy of the existing systems, and if needed strengthen them.

PART II FEASIBILITY

POLICY AND LEGISLATION

The feasibility study indicates that Belize has a sufficient legal and policy base for the implementation of this project. Several key strategies and plans have been developed in recent years. The general targets of the national climate strategy are to enhance climate-compatible sustainable development (Figure 26): the country's capacities in implementing adaptation measures and reducing greenhouse gas emissions to secure human safety and property as well as for sustainable development. It also aims to strengthen people and natural systems' adaptability to climate change while developing a low-carbon economy to protect and improve quality of life, guarantee national security and sustainable development in the context of global climate change, and proactively work with the international community in protecting the earth's climate system.

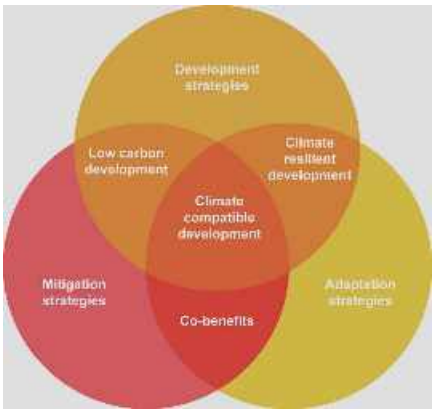


Figure 26: Climate compatible development Venn diagram (Source: CDKN, 2020)

The most relevant national development plans for this project include the Horizon 2030 Vision (2010-2030), Growth and Sustainable Development Strategy, The National Climate Change Policy, Strategy and Action Plan (NCCPSAP) 2015-2020, and The Integrated Coastal Zone Management Plan (2016). Also relevant is the Nationally Determined Contribution (NDC) presented in 2021 before UNFCCC which set out the plan what Belize wants to achieve (Table 57).

Table 57: Policy Analysis

Project Outcomes	**Policy / Plan**	**Description**
Component 1. Improving coastal land use for resilient habitation and sectoral activities		
1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	NDC	Review and strengthen planning legislation and building codes, especially as it relates to coastal development
	NCCPSAP	Integrating Climate Change adaptation and mitigation into key national developmental plans, strategies, and budgets.
1.2 Improved coordination and implementation of the ICZM Plan	NDC	Adaptation strategies in management and development planning in all coastal and marine sectors / Revise and streamline the current legislation and policies that relate to the management and regulation of development in the coastal zone to eliminate overlaps and close existing gaps /
	ICZMP	Support the allocation, sustainable use, and planned development of Belize's coastal resources through increased knowledge and building of alliances, for the benefit of all Belizeans and the global community / Recommends several areas in the Informed Management Zoning Scheme for Conservation (conservation, informed management, development), some of which include privately held lands.
Component 2. Coastal Vulnerability Monitoring		
2.1 Strengthened data availability for the development of a national coastal saline intrusion program	GSDS	Completing a Water Master Plan, a National Groundwater and Surface Water Assessment, and a Water Vulnerability Profile, including salt intrusion risk assessment
2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	NDC	Manage and regulate further development of the coastline, especially in vulnerable areas
2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	NCCPSAP	Strengthen Climate Change resilience to prevent, reduce, or adapt to the negative impacts of Climate Change on key sectors, economic activity, society, and the environment through policies and strategic processes.
Component 3. Coastal Protection and Adaptation response for High-Risk Areas		

3. Coastal Protection and Adaptation response for High-Risk Areas	NDC	Implement an adaptation strategy through mangrove restoration, sea, and river defense structures to prevent coastal and riverine erosion and ecosystem disruption
	NCCPSAP	Strengthening Climate Change resilience to prevent, reduce, or adapt to the negative impacts of Climate Change on key sectors, economic activity, society, and the environment through policies and strategic processes.
	ICZMP	Takes into consideration Blue Carbon sinks (mangroves and seagrass beds) initiatives / Mangrove restoration projects to mitigate the effects of climate change, and to ensure the delivery of coastal protection services especially in areas, such as the Central and Southern regions of Belize, which are highly prone to erosion and inundation.
Component 4. Awareness Raising, Knowledge Dissemination and National Capacity Strengthening		
4.1 Promotion of ecologically responsible behaviors through climate change communication	Horizon 2030	Put in place effective communication systems to protect the environment while promoting sustainable social and economic development.
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices	NDC	Enhance the capacity of the CZMAI and municipal authorities to ensure developments within the coastal and urban areas of Belize.
	Horizon 2030	Need to strengthen national capacities, e.g. engineers, urban and regional planners, architects, social scientists, environmental scientists, environmental lawyers, marine biologists, and those trained in integrated coastal zone management.
	NCCPSAP	Capacity building and networking across all implementing agencies
4.3 Strengthening of GIS capabilities of CZMAI and partners	ICZMP	Increase the technical and management capacity of both management and co-management agencies to ensure sound management practices
Other relevant aspects	Horizon 2030	Respect for the rule of law and human rights. Environmental protection laws will be enforced in a fair and just manner and, where needed, the legislation will be reformed (e.g. petroleum policy, mangrove legislation, and solid waste).
	GSDS	Eradicate poverty by 2030 and achieve more equitable income distribution / Tourism and agriculture, crucial sectors for the Belizean economy, dependent for their sustainability on the care of the environment and the integrity of Belize's ecosystems.
	ICZMP	Research to better capture the biomass, coverage, spatial distribution, and rates of change for mangroves in Belize and make this information available to support decisions on the issuing of mangrove alteration permits

The Constitution of Belize does not mention or explicitly refer to Climate Change. There is no specific Climate Change legislation in Belize, there is however a National Climate Change Policy, Strategy and Action Plan which was approved in 2015 and is currently in the process of being updated. This policy is not legally binding but outlines goals and target actions for key production sectors, such as agriculture, fisheries, forestry, etc. There is also a wide range of environmental, planning, and natural resource legislation that are relevant to the effective mainstreaming of Climate Change in Belize. Impact assessments are specifically dealt with by the Environmental Protection Act and EIA Regulations. Another important area for Climate Change mainstreaming is land use planning, which is regulated through statutes such as the Land Utilization Act, the National Lands Act, and the Housing and Planning Act (MAFFESD & CCCCC, 2014). Table 57 lists the lead institutions of the AF project and the relevant environment-related legislation. The responsibilities assigned to the various Agencies stem, in some cases, from their statutory mandate e.g., PACT, which was

established by the Protected Areas Conservation Trust Act. However, in some cases, laws may not exist to cover certain topics. In such cases e.g., NMS, the responsibility is assigned to a particular Minister by virtue of his appointment by the Governor General (on the advice of the Prime Minister), and portfolio subjects are assigned to the Ministry at the time of his appointment. The Coastal Zone Management Act is currently in the process of being updated.

Table 58: The lead institutions for the AF Project and Legislative Framework (Adapted from NCCPSAP)

Agencies	**Portfolio Responsibility**	**Legislation/Policy**
National Climate Change Office (NCCO)	Climate Change	NCCPSAP
Coastal Zone Management Authority and Institute (CZMAI)	Coastal Zone Management	Coastal Zone Management Act Cap 329
Protected Areas Conservation Trust (PACT)	Protected Areas Conservation	Protected Areas Conservation Trust Act Cap 2018
National Hydrological Service (NHS)	Management of water resources	National Integrated water resources Act No. 19, 2010
National Meteorological Service	Meteorological and climate-based products and services	Support implementation of Disaster Preparedness and Response Act Chapter 145
Ministry of Infrastructure Development and Housing	Regulation of land use, housing, and infrastructural development Approve building plans Issue building permits	Housing and Planning Act

Regarding communication and awareness, this policy document points out that the growing awareness of the need to address Climate Change impacts is welcomed and expresses concerns about the coordination of effort. To be effective it is important that collaboration amongst ministries and departments takes place to make the best use of limited financial and human resources. Sufficient attention must be paid to the need for national coordination of Climate Change efforts. This will ensure that there is a coherent national approach and avoid the duplication of policies and/or avoid conflicting policies regarding the inefficient use of resources.

INSTITUTIONAL AND HUMAN RESOURCE CONSIDERATIONS

Belize has a strong institutional base for effective climate change adaptation. The National Climate Change Policy, Strategy and Action Plan coordinated by the NCCO and the Integrated Coastal Zone Management Plan of the CZMAI are key policy guidelines that provide the framework for the implementation of this Project to increase resilience.

While several institutions have responsibilities for the management of resources that are likely to feel the effects of Climate Change, there are overarching and sector-specific policies that are in line with each another. Table 59 lists the institutional structure related to this AF project and its key responsibilities.

Table 59: Institutional Structure and Key Management Responsibilities

Ministry	**Key Agencies**	**Key Responsibilities**
Ministry of Sustainable Development, Climate Change & Disaster Risk Management[18]	National Climate Change Office	Climate Change Coordination and Communication, UNFCCC Focal Point
	Coastal Zone Management Authority and Institute	Protection of the coastal zone and associated resources
	Protected Areas Conservation Trust	Preservation and protection of the Belize National Protected Areas System
	National Meteorological Service	Climate Change Research and Scientific Review, IPCC Focal Point
Ministry of Natural Resources	National Hydrological Service (NHS)	Water Industry (except water supply and services)
Ministry of Infrastructure Development and Housing	Housing and Planning Department Central Building Authority	Housing and Planning Department, Central Building Authority Regulation of land use, housing, and infrastructural development Approve building plans Issue building permits

Belize's institutional framework is backed up by knowledgeable and dedicated professionals. However, as the institutions have limited funding, and technologies progress over time, there is room for capacities to be strengthened to promote adaptation efforts and the effective implementation of technical solutions. Successful pilots exist but these need to be scaled up and strengthened, and opportunities for complementarity utilized to increase the impacts in the different areas of this AF proposal. Various policy documents emphasize the need for stronger capacities, such as the 'need for technical capacity strengthening, especially CZMAI' in the Horizon 2030 and the NDC. The ICZMP mentioned that increasing and strengthening the capacity of the CZMAI will improve the success rate of climate change adaptation and mitigation.

Given the intensified climate hazard impacts in Belize, there is a need for urgent implementation of the strategies included in this project. Successful implementation will require a mélange of national and international expertise. Table 59 depicts an overview of the sourcing of human resources for each component.

Table 60: Review of Human Capacities Sourcing

	Availability of required Human and Technological resources		
	National	**International**	**Explanation**

[18] Key responsibilities include forestry, coastal zone management, environmental protection and the sustainable development of Belize's natural and cultural resources.

1. Improving coastal land use for resilient habitation and sectoral activities			
1.1. Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	x	x	This component will require the integration of good practices and lessons learned from other countries. Working collaborations have been established with regional experts.
1.2. Improved coordination and implementation of the ICZM Plan	x	x	This component will require the integration of good practices and lessons learned from other countries. Local structures will be established: community wardens. Working collaborations have been established with regional and international experts.
2. Coastal Vulnerability Monitoring			
2.1. Strengthened data availability for the development of a national coastal saline intrusion program	x	x	The capacities are not in-country.
2.2. Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	x	x	This component will require the integration of good practices and lessons learned from other countries.
2.3. Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	x	x	The capacities are not in-country. The NMS has pro-actively started discussions with an internationally leading institution in this area to have a better understanding of the process of establishing an EWS.[19]
3. Coastal Protection and Adaptation response for High-Risk Areas			
3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events	x	x	Expertise possibly not in the country. Working collaborations have been established with regional experts.
3.2 Monitoring and evaluation of activities' effectiveness and documentation of lessons learnt	x	-	Expertise available in the country
4. Awareness-raising, knowledge dissemination, and capacity strengthening			
4.1. Promotion of ecologically responsible behaviors through climate change communication	x	-	Expertise is available in the country. Certain existing channels for raising public awareness exist within NCCO and NMS. Partnerships should be utilized.
4.2 Improved knowledge and skills for AF entities on the use and	x	-	Expertise is available in the country

[19] An EWS is a preparedness measure that reduces the damages related to coastal flooding and storm surges. The development of a full EWS requires 4 phases. The AF proposal relates to implementation of Phase 1 – EWS development & Storm Surge modelling. This is a first step towards implementing Belize's vision for establishing a full EWS. Flooding (coastal, riverine, pluvial, etc. or any combination) is a function of Hydrological Services and the mandate of NHS. Storm surge EWS is a function of Meteorological Services and the mandate of NMS. NMS and NHS will collaborate to have a joint system where the data from the storm surge monitoring system and coastal flood warning system are incorporated.

deployment of adaptation best practices for Belize			
4.3 Strengthening of GIS capabilities within the CZMAI and partners	x	-	Expertise is available in the country. A certain extend of staff capacities exist within CZMAI and NCCO/REDD+. Partnerships should be utilized.

RESEARCH AND TECHNOLOGIES

1B Improved coordination and implementation of the ICZM Plan

Since the inception of the 2016 ICZMP, marine spatial planning has been utilized to assess and quantify the protective services provided by natural habitats of nearshore environments and human use activities within the marine environment of Belize. While the lead agency for this subcomponent is the CZMAI, other associated agencies will also benefit from the availability of the technology as the related subcomponent on training envisions capacity strengthening of CZMAI and partners.

To carry out mapping, analysis, and data collection on human use activities occurring within the coasts, the utilization of ESRI Geographic Information Systems (GIS) Software, such as ArcMap, ArcGIS Pro, spatial extensions for analysis, and Drone2Map is needed.

Additionally, the utilization of such software under this project will ensure that CZMAI's key GIS staff have the capacity and resources to carry out field data collection, and mapping to efficiently generate and analyze baseline coastal development data. The data will be used to update coastal development guidelines and zoning schemes within Cayes and coastal areas outlined in the Belize Integrated Coastal Zone Management (ICZM) Plan.

ArcGIS, ArcMap, and ArcGIS Pro are all owned by ESRI, which is the international supplier of GIS software, web GIS, and geodatabase management applications. Collectively the suite of products is a powerful mapping tool that allows people to create maps, analyze data, compile and share geographic information. ArcMap is currently the main component of the GIS system, however ArcGIS Pro, which is the latest professional desktop GIS application that can explore, visualize, and publish data to ArcGIS Online. Users of ArcGIS Online can share information with field staff and field workers can use mobile apps for ArcGIS, like Collector and Survey123, which allow them to add data directly to a map from the field using a mobile device. Drone2Map is also one of the latest desktop applications, which combines a large amount of captured drone images to produce one seamless high-resolution orthomosaic of an area.

2.1 Development of a national coastal saline intrusion program

Activities of the National Hydrological Service are detailed below.

Determine the salinity of soils.

The goal of the national saline intrusion program is to assess and map soil salinity and link this to current and future crop productivity vulnerability and risk.

Shallow soil salinity is determined by measuring the electrical conductivity (EC) of the upper soil horizons by preparing a soil-water mixture and assessing it using an EC probe. Large surficial areas can be assessed more broadly by the completion of terrain conductivity surveys using depth-integrated measurements of electromagnetic readings that can extend several meters to 10s of meters into the subsurface for deeper reconnaissance. The higher the salinity of the soil and associated porewater, the higher the ability of the soil to conduct an electrical current. Soil salinity negatively impacts crop yields; therefore, with limited knowledge in this subject area, it is challenging for farmers to ascertain whether soil salinity is the culprit responsible for the reduction of their crop yields.

Conduct water quality analyses to determine the effect of water quality on coastal influences and agricultural activity.

The goals of this task are to i) assess the occurrence and possible extent of saline water intrusion along with coastal areas, and ii) determine the levels of nutrients in the groundwater beneath the study area.

Saline water has a higher density than freshwater (i.e. 1.03 g/cm3 versus 1.00 g/cm3). Along every coastline, there is an interface established between an upper layer of freshwater originating from the landward side and an underlying layer of seawater. This interface is dynamic and affected by long-term sea levels, storm surges, as well as disturbances from groundwater pumping. As such, there is the potential for saline water encroachment into freshwater systems (surface and groundwater) over time. Measuring the EC, chloride (Cl-) and, sodium (Na+) concentrations in shallow groundwater along coastal areas provides data on the extent of seawater intrusion (including the highest risk areas) and provides the basis for future projections regarding groundwater quality under various sea-level rise and groundwater use scenarios. This is also amenable to geophysical mapping (as outlined in goal No. 4). With respect to agricultural influences, common sources of influence include nutrients related to fertilizers, sewage effluents, and animal and food processing wastes. One of the primary constituents of concern to groundwater quality is nitrate (NO3-), due to its mobility in the subsurface. Phosphate (PO43-) is also a concern given its potential to cause eutrophication in receiving water bodies.

Use of Geophysical Surveys.

Completion of geophysical surveys will provide the spatial data density necessary to resolve the extent of saline water intrusion along the coastal areas. This will be accomplished by electromagnetic (EM) mapping or processing of multispectral satellite imagery.

IIC Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge

Detailed information about the data collection and storage that is envisioned by the National Meteorological Service and the technologies that will be utilized under component 2.3 are included hereafter.

Establishment of Weather Stations/Sensors along the coast

- The weather stations will be capable of measuring rainfall, temperature, wind speed and direction, solar radiation, and water level.
- The data loggers will be capable of
    - using visibility sensors and ceilometers
    - 16 ports capable of Measuring single ended sensors,
    - 8 ports capable of differential measurements,
    - 10 pulse counting ports, 8 of which should be able to be configurable for digital input and outputs including but not limited to SDI-12[20], RS232[21], RS485
    - 4 excitation terminals
    - Connecting to satellite and mobile data modems for the transmission of stored data

[20] SDI-12 (Serial Digital Interface at 1200 baud) is an asynchronous serial communications protocol for intelligent sensors that monitor environment data. These instruments are typically low-power (12 volts), are used at remote locations, and usually communicate with a data logger or other data acquisition device. The protocol follows a master-slave configuration whereby a data logger (SDI-12 recorder) requests data from the intelligent sensors (SDI-12 sensors), each identified with a unique address.

[21] RS-232 and other protocols. RS-232, Recommended Standard 232 (RS-232) is a standard for serial communication transmission of data. It formally defines signals connecting between a DTE (data terminal equipment) such as a computer terminal, and a DCE (data circuit-terminating equipment or data communication equipment), such as a modem. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pinout of connectors. The current version of the standard is TIA-232-F Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange, issued in 1997. The RS-232 standard had been commonly used in computer serial ports and is still widely used in industrial communication devices.

Early Warning System Development and Storm Surge Modeling

The establishment of a proper early warning system is a comprehensive intervention, consisting of a 4-phase approach: 1. EWS development & Storm Surge modeling, 2. EWS extension: wave modeling and wind enhancement scheme, 3. EWS extension: Coastal inundation and connection with a web-based management system, and 4. EWS extension: Offline analysis and update of coastal models.

Under this project the NMS will implement phase 1 and will utilize the following tools/technologies:

- Delft3D-FM (Flexible Mesh Suite) storm surge model will be developed for Belize's coastal area. The Delft3D FM can simulate storm surges, hurricanes, tsunamis, detailed flows and water levels, waves, sediment transport and morphology, water quality and ecology, and can handle the interactions between these processes. The suite is designed for use by domain experts and non-experts active in one or more of the stages of the design, implementation, and management cycle.
- Storm surge model validation - Include regional/seasonal water level variations from ocean models (HYCOM). The HYCOM model (Hybrid Coordinate Ocean Model) is used to simulate oceanographic conditions.
- Delft-FEWS based EWS - an initial set-up of the coastal EWS with Delft-FEWS. Delft-FEWS is an open data handling platform initially developed as a flood forecasting and warning system. Essentially it is a sophisticated collection of modules designed for building a hydrological forecasting system customized to the specific requirements of an individual organization.
- Numerical Weather Prediction (NWP) using NOAA GFS (National Oceanic and Atmospheric Administration Global Forecast System) and local products of Belize's Meteorological Service. The Global Forecast System is a weather forecast model through which numerous atmospheric and land-soil variables are available (e.g. temperatures, winds, precipitation, soil moisture, atmospheric ozone concentration).
- Early Warning Products in conjunction with PLUVO.AI. The NMS uses a combined suite of software called SURFACE/PLUVO to accomplish the following tasks:
    - SURFACE CDMS (Climate data management system) stores, manages, displays, and exports weather and climate data received from the observation network and is the CDMS developed and used by the NMS.
    - PLUVO.AI enables the creation and dissemination of early warning alerts based on information from multiple data sources such as weather and hydrological models, surface stations, and remote sensing data from satellites and radars combined with machine learning models to help users to identify life-threatening conditions related to severe weather and natural disasters.

The specifications for the geographic data sets that will be acquired for the Delft3D-FM storm surge model for Belize coastal area are indicated below.

<u>Topography</u>

- Digital land-sea boundaries (Lat-Lon coordinates) at for instance the level of Mean Sea Level (MSL) or Mean High Water (MHW). *Alternative source:* on-screen digitizing from Google Earth
- List of coastal areas of specific interests (e.g. low-lying and densely populated areas, airports, ports, critical industry). *Alternative source:* Google Earth

<u>Bathymetry</u>

- Digital depths from detailed bathymetry surveys along the Belize coast up to a distance of about 100km offshore (dwg or xyz format, including a description of applied horizontal and vertical reference datum). Of particular interest for the modeling is to have accurate bathymetry data of the reef slope (from deep water to the reef edge) and depths between the small islands on top of the reef.
  Alternative source: digital depth information from Nautical Charts or data from global ocean depth databases (GEBCO or ETOPO)
- Digital land heights/Digital Elevation Model (DEM) from topographic surveys or LIDAR, ideally with high-resolution of a few meters in populated areas.
  Alternative source: global database with land heights (e.g. SRTM)

<u>Data for model validation</u>

- Measured time-series of wind, air pressure, water levels, currents, or waves, including survey reports presenting measurement locations, instruments type, and settings. Ideally, these measurements are available for the same and recent periods and include measurements during hurricanes or other extreme events.
  Alternative source: satellite observations of significant wave heights e.g. from JASON or Sentinel satellites
- Locations or contours of maximum inundation extents during specific extreme events, or
- Storm reports, with quantitative/qualitative descriptions of the wind, water levels, storm build-up, inundation depths, inundation extents, etc.
  Alternative source: site visits
- Other available reports describing the governing physics in Belize coastal area and/or hydrodynamic modeling studies.

Component 3: Coastal Protection and Adaptation response for High-Risk Areas

Under Belize's Fourth National Communication and First Biennial Update Report to the UNFCCC, financing was provided for the completion of assessments in Dangriga and Hopkins to be linked to this proposed project. GAMMA S.A. from Cuba has carried out the necessary assessments and has made recommendations based on their findings. These recommendations formed the basis for work to be done in Dangriga and will lead to beach recovery and stabilization activities being implemented.

1. Preliminary Research

- Organization and assurance of the logistics for field, desk, and laboratory works.
    - Research on the coastal system functioning.
        - Preparation of basic information.
- Compilation and analysis of archive information regarding morphology, hydrology, hydrography, oceanography, geology, geophysics, and meteorology.
- Compilation of topographic and hydrographic information (topographic maps and nautical charts)
- Compilation of geodetic points of the cadaster.
- Inventory of the anthropogenic and natural transformations that occurred in the coastal zone.
- Characterization of coastal dynamics, maritime climate, and beach and river sediments.
- Inventory of hurricanes that have affected the area of interest.
- Study of the reanalysis of a wave affecting the study area.

2. Fieldwork

2.1 Sea Research

- Surveying of 36 km of the coastal front between Colson Point and Sittee Point, for the definition of the coastal system, as well as the collection of 10 sediment samples.
- Execution of 5 bathymetric/geophysical profiles on the 36-km coastal front, from The coastline to the keys (between 13 - 15 km per profile), to characterize the seabed (morphology and stratigraphy). Collection of 25 sediment samples (5 samples per profile).
- Checking and updating the existing bathymetric chart in the coastal fronts of Dangriga and Hopkins, 2 bathymetric profiles from the coastline to the keys (between 13 - 15 km per profile).
- Execution of a detailed bathymetric survey on the coastal fronts of interest.
    - Dangriga: 80 survey lines of 1 km in length on a 4-km coastal front, scale 1:5000.
    - Hopkins: 120 survey lines of 1 km in length on a 6-km coastal front, scale1:5000.
- Survey to find sand deposits (borrow area) to be used for sand fills on Dangriga and Hopkins coastal fronts.
    - Carrying out of 100 diving stations, 10 stations per line of 10 km in length. Each diving station includes manual drilling of the seabed, collection of sediment samples (50 samples indicated), exploration within a 20-m radius, and description of the seabed.
    - Bathymetric/geophysical survey to characterize the identified borrow area.
- Mooring of 2 current meters to measure currents in the identified sand borrow area.
- Lifting of the 2 current meters.
- Inventory of the benthos in the identified sand borrow area.

2.2 Land Research

- Establishment of a baseline and profile network along the coastal front of interest.
    - Dangriga: establishment and measurement of 16 profiles, as well as a collection of 8 sediment samples.
    - Hopkins: establishment and measurement of 24 profiles, as well as a collection of 12 sediment samples.
- Survey of the escarpment line at both sites (Dangriga and Hopkins).
- A sedimentological sampling of the hydrographic basins (5 samples) that contribute to the coastal area of interest.

3. Laboratory research

- Grain size analysis of 110 sediment samples.
- Composition analysis of 35 sediment samples.

4. Design of the recovery and stabilization project and planning actions (Desk research)

- Processing of the information measured and collected during the Field Works (surveys: topographic, bathymetric, sedimentological, geophysical, etc.)
- Application of mathematical models to simulate hydrodynamic processes: waves, currents, sediment transport, and post-storm evolution of the beach profile.
- Definition of the scheme for the coastal system functioning.
- Determination of the technical and design parameters of the proposed solution.
- Analysis of the suitability of the sand from the available sand borrow areas.
- Determination of the sand volumes necessary for beach recovery.

- Identification of the induced works that may be necessary.
- Feasibility analysis of the solution engineering alternatives.
- Analysis of the project's expected effectiveness.
- The approach of the ways for work execution (methodology).
- Estimation of the economic cost of project execution.
- Assessment of possible environmental impacts.
- Preparation of thematic maps, graphs, figures, and tables.
- Preparation of the Project (Descriptive Report and Graphic Memoirs.
- Preparation of Concept Note

Based on this ongoing research and its resulting recommendations, and using the technical and design parameters, NCCO will implement the beach stabilizing solutions for erosion control and shore protection, recovery and stabilization under component 3 of this Adaptation Fund project (beach nourishment, coupled with geo-tubes).

Component 4: Awareness raising, knowledge dissemination, and capacity strengthening

One of the technical interventions that the entities envision under this component, is raising awareness and strengthening capacities related to alternative livelihood opportunities, namely sargassum harvesting. Sargassum seaweed (is a species of brown algae), which is commonly washed up along the coastal regions throughout Belize, can be harvested and used in several products.

Anaerobic digestion (AD) is a technology that can provide a waste treatment solution for beached Sargassum. Available information on Sargassum natans and fluitans, the two species of primary concern across the Caribbean, is scarce. A regional study has indicated that 'old', beached Sargassum, when milled to a powder and digested, had an exceptionally low Biochemical Methane Potential at 61 m^3/tonne Volatile Solids added (compare with food waste at 421 m^3/tonne VS added). However, this research concluded that despite Sargassum's low Specific Methane Yield, it could still be treated through AD, as an amendment to a plant taking other wastes as its only feed. Regarding the economic viability of an AD approach to generate energy from sargassum, the study suggests that it should be possible to make a financial return on utilizing AD technology in this region. The percentage contribution to electricity and/or heat supply will be relatively small but significant. Varying levels of financial interventions will be needed to help sargassum-to-energy investment yield positive returns (CPI, 2017).

This intervention is linked to component 4.1 Communication and 4.2 Capacity building.

Conclusions

Having considered the data, the following has been concluded in this section:

- Belize has a sufficient legal and policy base for the implementation of this project. The most relevant policies and plans for this proposal -the NDC, Horizon 2030, GSDS, NCCPSAP, and ICZMP- have been considered and are in line with each other.
- The AF project integrates strategic alignment with national and sectoral development strategies as well as an obligation under international conventions to which the country is a Party.
- Under the new administration, four of the six lead entities to this project are situated under the same Ministry, which should facilitate inter-agency collaboration and decision-making.
- Coordination of effort is also crucial to climate change communications.
- The implementation of the project components will require utilizing a combination of national and international expertise, as well as national and sub-national, inter-agency, and intra-agency collaboration.
- The research and technologies envisioned under the components are feasible. Their utilization will require staff training.
- The utilization of Sargassum will contribute to eco-friendly crop production and energy sustainability.

PART III: FINANCIAL CONSIDERATIONS

Socio-economic analysis

The impacts of climate change in Belize will not only affect natural habitats, but it will affect human welfare in several ways, as well as the economy and the need for continued financial growth. Given that many sectors and industries in Belize rely on natural habitats, their services, and resources for economic purposes, then the impacts of climate change will drastically affect the nation. Scarcity of resources due to climate change and other factors will lead to conflicts. The nature of conflict will have to be understood and appropriate conflict resolution mechanisms put into place. Communication with stakeholders is required from the outset for those sub-sectors of the economy that are directly affected such as food producers and processors, manufacturers, the Belizean people, and their visitors.

Agriculture

Agriculture is important for the economy of Belize. Economic performance in the agriculture sector is primarily dependent on traditional export crops such as sugar, citrus, and banana which currently account for about 60% of the earnings, with citrus exports being the principal source of income followed by sugar and banana. Rice, corn, and beans are the main domestic food crops.

Climate change is already affecting the agriculture sector: variability of yields/harvests for rainfed agriculture is already suffering from changes in the timing and amounts of rainfall and there is a widespread perturbation of the agricultural calendar. Intense rainfalls are causing problems of soil drainage and erosion and warmer temperatures are leading to the increased incidence of yield-reducing weeds, pests, and diseases. These impacts will then affect food security and the social and economic development of the country. Sea level rise will also cause flooding of agricultural land near the coast and lead to saltwater intrusion and salinization of groundwater and soil, thus affecting crop productivity as well.

Fisheries

The fishing industry of Belize provides direct employment for 3000 licensed fishermen. Most fishermen are between the ages of 15 and 35 years and most of these fishers originate from impoverished rural and coastal communities. Fishermen cooperatives and the aquaculture farms also employ persons in the sector for processing, packaging, and administrating the daily activities.

In coastal and rural communities, over the years young Belizeans have encountered reduced opportunities to pursue further education. Most of the fishers and plant workers are only equipped with primary school education. In some instances, youths are removed from school to fish commercially with their fathers and brothers to supplement the family income. The erosion of the traditional preferential markets for Belize's sugar coupled with the low prices have motivated many young sugarcane farmers in northern Belize to abandon their sugarcane fields and join the fishing industry.

Fisheries require healthy habitats to survive and reproduce, such as coral reef systems, wetlands, mangroves, seagrass beds; these are areas where fish spawn, breed, feed or grow to maturity. Rising sea levels could lead to a partial or complete disappearance of these habitats through inundation. Also, rising near-surface water temperature and increasing acidification may cause massive coral bleaching and dieback of corals. Healthy reefs provide habitat and nutrients for numerous species, and fishermen rely on reefs for fishing as well, therefore, a decline in healthy corals will affect the livelihoods of many Belizeans.

Therefore, these impacts will lead to a decrease in fish production, thus making it more difficult for fishermen to capture the same number of fish that they are accustomed to catching and affecting their livelihoods.

Aquaculture production systems are also vulnerable to the impacts of climate change, mostly as a function of geography and changes in various water quality parameters on the migration and consequent availability of brood stocks for hatchery production. The primary climate change drivers affecting aquaculture production are the loss of land and mangrove as a function of sea-level rise, the consequent loss of sheltered locations, and impacts from hurricanes and extreme weather events.

Water

The water sector will be critically affected by changes in precipitation patterns. Climate projections have shown that rainfall is projected to decrease and become more variable, leading to intense rains and flooding while also worsening drought conditions. Variability in rainfall will result in risks of flooding from excessive rainfall in the low-lying coastlands; and decreases in water supply with lower levels of rainfall. Less rainfall and increased temperature will also lead to increased evapotranspiration and loss of available freshwater. A decrease in precipitation will reduce groundwater and aquifer recharge, increase saltwater intrusion, and contamination of freshwater resources.

Despite water abundance in Belize, issues with water scarcity in some areas and water quality have been known to occur. Key issues with water vulnerability in Belize are the uneven distribution of water resources. The southern region (Toledo) has the lowest population, with the highest amount of freshwater availability, whereas the central and northern regions (Orange Walk and Corozal) both have much larger populations and much fewer water resources. Several Cayes have become popular tourist destinations but have low availabilities of freshwater. Caye Caulker is vulnerable to contamination of its underground water through poor sewer construction and intrusion of saltwater into aquifers. It has also been noted that there have been changes in precipitation and that this has led to severe droughts that have affected many parts of the country.

The lack of groundwater information, especially in northern Belize, where karstic conditions may promote the leaching of solutes and salinization, leads to difficulty in the management of future water resources under climate change and increases the vulnerability of communities. Belize consumes annually around 600 million m^3 of water. The demand for freshwater resources in Belize emanates from three (3) broad economic sub-sectors: agricultural, industrial, and domestic/residential. A growing population and economy will lead to greater competition amongst key sectors, namely agriculture, industry, and domestic/residential (including tourism) for increasingly lesser and lesser water supplies.

Sea level rise and storm surges will also affect the water sector through saline intrusions into coastal aquifers and soils, as well as flooding of coastal lowlands and communities; where many Belizeans live and base their livelihoods. A one-meter rise in sea level will impact 30% of Belize's wetlands and none of the remnant Cayes in Belize will have a source of potable water. Some coastal areas in Belize will experience high levels of saltwater intrusion and rising water tables, thereby reducing water quality. A decline in water quality due to the salinization of aquifers would lead to higher costs of water because Cayes and other coastal areas would need to invest in desalinization plants.

Tourism
The tourism industry in Belize is developing at a fast rate, engaging a wide range of tourism operators and employment of significant numbers of Belize's population. Belize's tourism industry is the largest contributor to the gross domestic product and the largest source of foreign exchange.

Climate Change and climate-driven sea-level rise will most likely have important and severe impacts on the tourism industry of Belize. Increases in air temperature (2°C to 4°C) towards the end of the century may make conditions unbearable, especially for the elderly retired tourist population, a major age group of tourists. The projected variability in precipitation will very likely lead to extreme conditions, namely increasing drought in the dry season, torrential rains and flooding in the rainy season, and water and food shortages or higher prices of local and imported food. Tropical storms and hurricanes, compounded by sea-level rise, are also likely to increase in numbers and intensity, causing flooding and erosion of coastlines, flooding will also likely cause damage to transport and other infrastructure. Moreover, these projected changes in climate will have indirect secondary and tertiary effects, including loss of beaches, properties, and public infrastructure, heat stress and other health impacts, loss of coral reefs due to temperature-induced bleaching, loss of food supply chains, and loss of coastal infrastructure.

These impacts will lead to a decrease in tourism activity due to a decrease in the aesthetics of the country as a travel destination, loss of natural resources will affect tourist arrivals. An increase in the intensity of tropical storms and hurricanes will also discourage persons from visiting Belize. Loss in tourism arrivals will have adverse effects on the livelihoods of many Belizeans employed in the tourism sector. There will also be coastal areas in Belize that experience high levels of saltwater intrusion and rising water tables, leading to a decrease in water quality.

The loss of beaches and coastline due to erosion, inundation, and coastal flooding, and loss of tourism infrastructure, natural and cultural heritage would reduce the amenity value for coastal users. The overall effect of the changing climate on Belize's tourism industry would be a loss of employment and higher insurance costs for properties in vulnerable areas.

Health
The health of people worldwide is impacted each year by the acute and long-term effects of climate. Public health depends on sufficient food, safe drinking water, secure shelter, good social conditions, and a suitable environment for controlling infectious diseases. All of these factors can be affected by climate. The basic requirements for good health are clean air and water, sufficient food, and adequate shelter and each of these conditions is likely to be affected by future climate changes. Acute Respiratory Infections - one of the leading causes of mortality and morbidity in Belize – will be exacerbated by extreme heat. Certain vector-borne diseases such as dengue and malaria, respiratory diseases such as asthma, and water-borne diseases such as cholera and dysentery may become more acute and prevalent in the future with Climate Change.

Tropical storms are known to cause death, illness, injury, psychosocial impacts, and destruction of health facilities and health services. Floods can cause drowning and physical injuries; heighten the risk of diseases transmitted through water, insect vectors, and rodents; damage homes and infrastructure and disrupt the supply of essential medical and health services. On the other hand, droughts can increase the risk of water and food shortages and malnutrition, necessitate greater reliance on contaminated water, and lead to diminished health among vulnerable members of the population. Droughts and floods also increase the risk of diseases spread by contaminated food and water and foodborne diseases such as Salmonella, Shigella, Campylobacter, and Escherichia Coli. The combination of extreme heat and drought are also important risk factors for causing wildfires, resulting in direct health and economic losses, and increased risk of respiratory illnesses due to smoke pollution.

Beneficiaries
The direct beneficiaries of this project are Belize's 27 coastal communities. These will participate directly in the project, and thus benefit from a comprehensive combination of pre-event risk management strategies: Prevention, Protection, Preparedness strategies.

The second tier of direct beneficiaries are the individuals and experts – local and international – who will be employed under this project; an estimated number of 62 persons (full-time staff, consultants, wardens, trainers, workers). Approximately 175 persons will be trained. The training will have long-term benefits, considering that each trainee will use the acquired skills ranging from 5-10 years in contributing to adaptation efforts, before the knowledge becomes outdated or retired. During the recruitment/consultations/training process, consideration should be given to maintaining a gender balance.

Component 1.1 and 4 have nation-wide benefits. When considering both subcomponents, component 3 also benefits all coastal communities (Table 61).

Table 61: Beneficiary Overview

Beneficiaries	**Indirect**	**Direct**	**Human Resources**		**Cost/Capita**
			Staff/Consultants/workers		**(In US$)**
			National	**Int.**	

1. Improving coastal land use for resilient habitation and sectoral activities	**Nationwide**	**Coastal Comm.**	**staff**	**tertiary**	**unskilled[22]**		
1.1. Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	X & visitors	X		8	5		0.35
1.2. Improved coordination and implementation of the ICZM Plan		X			12		1.59
2. Coastal Vulnerability Monitoring							
2.1. Strengthened data availability for the development of a national coastal saline intrusion program		X & agriculture	50 persons trained	1		1	6.02
2.2. Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize		X	50 persons trained	4	4		2.12
2.3. Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge		X	10 persons trained			4	2.25
3. Coastal Protection and Adaptation response for High-Risk Areas							
3.1 Adaptive capacity of the coastal community of Dangriga is increased to respond to climate induce erosive events		Dangriga		2	7[23]	3	12.40
4. Awareness-raising, knowledge dissemination, and capacity strengthening							
4.1. Promotion of ecologically responsible behaviors through climate change communication	X	X		3			0.13
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices for Belize	X	X	50 persons trained	3			0.18
4.3 Strengthening of GIS capabilities within the CZMAI and partners	X	X	15 persons trained	1			0.22
Project Management				3			
Total			175	26	28	8	

[22] Unskilled labor, measured by educational attainment, refers to jobs that require a high school diploma only, or could be filled by a high school dropout who masters specific skills. Skilled labor requires additional skills or education.

[23] As the RRM under comp. 3 are to be determined during phase 1 (ongoing), these figures are an estimate. The contractor will be encouraged to hire local community members.

The indirect beneficiaries for component 1.1 extend towards the population of Belize and visitors (approximately 419,199 inhabitants and 260,000 visitors) because the housing policy and building codes (i.e. the zone of influence of the project) will benefit everyone by increasing resilience. The cost per beneficiary of the housing component is US$0.71 per person.

Calculation:

Cost per beneficiary = (Total Cost of the Component / Est. number of beneficiaries)

Ex. Component 1.1: Cost/beneficiary = 240,174/(419,199+260,000)

Component 1.2 and 2.2 mobilize local people from the coastal areas to make decisions regarding their resilience (coastal advisory committees), to play an active role in coastal zone monitoring (community wardens, community network). Through this process, communities/beneficiaries will have greater ownership of the coastal zone management process, and it will result in reduced implementation costs (e.g. field costs). This will be also be supported by the capacity building exercises under the various project components. The cost per beneficiary per component 1.1 and 1.2 are US$1.59 and US$1.86 per person respectively. While the calculated costs for component 2.1 comes down to US$6.02 per person, because of its importance for the agriculture sector – which is not a per capita cost – the benefits are higher. The project cost for the early warning and storm surge component is US$ 2.25. However, the actual cost for setting up this system is higher as this project only covers the first phase of establishing the EWS. The cost for component 3 is estimated at US$9.36. However, the actual cost is lower, as – similarly to component 2.1- this calculation does not consider the benefits for the agriculture and tourism sector, nor the temporal aspects of this component. The costs for the project components 4.1, 4.2, and 4.3 are US$ 0.30, US$ 0.36, and US$ 0.24 respectively which are very low. The average cost for the project is US$2.83 which is low considering its significant contribution to Belize's climate change adaptation efforts and the project's contribution to strengthening professional, academic, and local capacities.

Financial Strategies
Based on Part I – Section III and the financial considerations thereof, the following strategies have been identified.

Strategy I Affordable housing for low-income families and Indigenous and Tribal Peoples' (ITP) communities
Ensuring effective implementation of disaster resilient housing requires (i) Local expertise and knowledge on risk reduction, which is valuable for building disaster resilient housing, (ii) improving local awareness and supporting the local economy are key essential parts to raise resilience, and (iii) applying planning and construction regulations through building permits is significant to ensure a resilient housing system. These findings also generate some policy implications related to the demand for improving governance mechanisms.

While the costs of housing construction are relatively low in Belize, the affordability of this investment in the status quo, and especially when building standards will be applied, will be beyond the reach of many rural families. Besides, the calculation of costs will be significantly impacted by the availability of credit, and potential interest rate calculations. It is essential that the Government of Belize (GoB) links these investments to appropriate land use regulation and associated investments in basic infrastructure and services. Successful housing projects should consider access to finance for the lower-income class. This project should aim to contribute to the safety and security of lower-income buildings when establishing the envisioned model home/building. Additionally, when developing the building codes, an assessment should be conducted on how the traditional housing structures (cultural heritage) of the Indigenous and Garifuna peoples will be integrated.

Strategy II Investing in communication actions for a sustainable impact e.g. discourage investments in at-risk-areas, stakeholder buy-in for housing codes and alternative livelihoods opportunities
Disasters, environmental degradation, and climate change pose significant and increasing threats to the achievement and sustainability of positive development outcomes. Synergies between these threats and development trajectories are complex. For example, increasing climate variability raises the magnitude, intensity, and frequency of extreme events, triggering more disasters. Failure to adequately account for disaster, environment, and climate change can leave coastal populations with increased exposure and vulnerabilities to disaster, climate, and environmental impacts. Hence the need for zonation guidelines, and the enforcement thereof. However, existing structures are usually permitted to stay within the buffer area and run the risk of being damaged in case of climate change hazards. As such, this component links to component 4.1, because it requires intensive communication about the risks of building in at-risk-areas. Additionally, stakeholder buy-in is expected to be limited if they do not understand the need for building standards as these raise the initial costs of construction. Anthropogenic causes also function as drivers of environmental degradation. Hence the importance of informing local communities about alternative livelihood options and training them in these, e.g. seaweed farming.

Strategy III Investing in disaster preparedness risk reduction measures
Natural disasters can result in people losing their lives, major damage to residential housing and public-sector property, agriculture, and infrastructure (irrigation, transport, power, and telecommunications). The Government of Belize, the private sector, and donors absorb some of these losses, but there is still an estimated large resource gap between available financial resources and post-disaster expenditure requirements. Additionally, there are no local insurance policies that cover the costs of damage caused by climate hazards.

While more research is required to quantify the average size of losses in recent years, this is likely a combination of (i) the values of residential, commercial, and industrial properties, public infrastructure, tourism, and agricultural assets (including perennial crops) exposed to risk, (ii) the timeliness of the warning, (iii) the frequency and intensity of climate hazards. Ensuring all investment flows are disaster-resilient presents a substantial opportunity to reduce rather than generate risk, an increase which could slow development and economic progress. Investing in disaster preparedness risk reduction measures is therefore a sound prevention strategy that in this project is targeted via saline intrusion monitoring, beach erosion monitoring, and the first steps towards the establishment of an early warning system.

Strategy IV Investing in Coastal Protection
The construction of a seawall, in general, is a capital-intensive intervention. The cost of the project may even exceed the economic value at risk. This intervention may require a heavier lift with the public than others. For example, while it may face opposition as waterfront leaseholders' properties are usually be directly affected by a seawall, supporters argue that it may capture revenue from tourists as important users of the Seawall. A port may apply a cruise ticket surcharge, and with the revenue going towards the cost of the seawall maintenance.

The financial and economic analysis of mangrove regeneration and restoration based on several assumptions: i) investment inputs (2 options: regeneration and replanting); ii) the total economic value of mangroves; iii) the rotation period of mangroves: 20 years with no conversion and damages. A cost/benefits analysis is not a sufficient indicator of the benefits from regenerating and replanting mangroves as environmental benefits are very site-specific values. Regeneration and reforestation of mangroves greatly contribute to the mitigation of climate change impacts in coastal areas such as coastline erosion, damage reduction for sea dykes system, and reduction of impacts of sea wave on production and lives of local communities. Implementing a mangrove component also contributes to job generation by engaging local people in mangrove related activities. Other impacts are that the capacity of local people and officials are enhanced through training. Livelihoods of local people will be improved through enhanced capacities on sustainable livelihoods practices (e.g. Sargassum use/harvesting, aquaculture farming, harvesting of fishery sources in mangrove areas). Payment for Ecosystem Services, PES, is a topic with increasing significance in Belize – especially in the context of REDD+. If in future Belize implements PES, local communities can be compensated financially – provided that they practice sustainable management of forests/mangroves.

In contrast, sand renourishment is usually a repetitive process. Large scale nourishment involves a large financial investment, and usually an additional commitment to future nourishment campaigns. Most projects would require a large international dredger with high mobilization costs. High erosion rates may also render nourishment financially impractical. Once the sediment that was lost through drift or erosion is replaced from other sources, this intervention is likely to be repeated, because nourishment mitigates the effects of erosion, but does not remove the causes. However, the benefits derived from tourism and job creation may be sufficient to warrant repetition. A gentle environment (i.e. without extreme currents, temperatures, etc.) increases the interval between nourishment projects, reducing costs.

Strategy V Investing in national capacities for long-term in-house and national expertise
Improving institutional and technical capacities is the key to achieving successful adaptation in Belize. Building national capacities is central to this project – not only strengthening the public sector, but also the community members and the next generation of professionals. Oftentimes, local and national capacities -if available- are a good alternative to international professionals. The project will continue to mobilize local people from the target communities to take decisions regarding their resilience, to play an active role in the implementation of the measures and support them in implementing this process. Through this, community beneficiaries will have greater ownership of the process of building resilience and will result in reduced implementation costs. Researchers at the University of Belize have expressed interest in participating in the project and accommodating students. The project partners are open to this possibility of collaboration, and -considering the analysis set out in the national policies (Horizon 2030, NDC)- need to strengthen their staff capacities as well.

Strategy VI Cost-effectiveness, ownership, and other long-term benefits through strategic partnerships
Local participation is crucial. The project will be implemented in close partnership with communities and local institutions. This implementation approach will reduce implementation costs by using community workers instead of external contractors, procuring local materials where they are available. Moreover, the ownership and long-term impact of the interventions will be improved with community participation.

Inter- and intra-institutional collaboration are also important. By pooling and coordinating the resources of institutions, partnerships will maximize results. For example, there is much existing capacity and experience on GIS utilization within CZMAI. Since these are crucial components of the project it is recommended to leverage the power of partnerships to enhance staff capacities within institutions, and also with other institutions (e.g. NMS, NHS). Additionally, coordination of efforts in communication will ensure that there is a coherent national approach and avoid the duplication of efforts, thus promoting the efficient use of resources.

Considering that the project makes progress in the areas of an early warning system but does not complete the full set of four stages it is recommended to pursuing co-financing possibilities. A strength of the proposal is that it builds on existing structures which already have financing without duplicating them (components 1.1, 2.2, 2.3, 3, 4.1).

The activities presented in the AF proposal feasible within the project budget. Awaiting the recommendation resulting from the ongoing research related to component 3, a reservation has been made for its implementation.

PART IV: CONCLUSIONS

Despite it being a carbon sink, Belize is vulnerable to Climate Change impacts. Following the comprehensive analysis of the national mechanisms and ongoing initiatives of the Government of Belize, the implementation of the Adaptation Fund project is determined to be feasible (Table 62) and will have a considerable impact on the country in the achievement of climate resiliency through adaptation

Table 62: Feasibility Assessment

	Feasibility scale			
Criteria	Not Feasible	Possible /Needs Action	Yes, is feasible	Summary findings
Relevance		X		The project incorporates prevention, protection, and preparedness strategies. The protection measures for Dangriga (component 3) included in this document are based on recommendations made after comprehensive research conducted by GAMMA S.A. (Annex V).
Policy and legislation			X	The project components are important contributions in climate change preparedness and in line with government policies, and there is a sufficient legislative policy base to facilitate implementation.
Human resources			X	The successful implementation of the project components, particularly under component 4, will require utilizing a combination of national and international expertise, skilled and unskilled labor as well as national and sub-national, inter-agency, and intra-agency collaboration.
Research and technologies			X	Utilization of the research and technologies envisioned under the components are deemed feasible. The technologies will benefit the country through enhanced capacities of government staff, as building new capacities among youth, through collaborations with the University of Belize.
Beneficiaries			x	This project is required because people living in coastal regions, as in Belize, are particularly vulnerable in different ways. Populations in these regions are vulnerable to death and injury and destruction of not only their public health infrastructure from increasingly severe tropical storms but also salinization of water resources and agricultural land from sea level rise. Components 1.1 and 4 extend benefits to a national level, not just coastal communities.
Cost			X	The cost per beneficiary ranges from US$0.30 per person (component 4.1) to US$9.36 per person (component 3). The average cost for the project is US$2.83 which is low considering its significant contribution to Belize's climate change adaptation efforts and the project's contribution to strengthening professional, academic, and local capacities.
Sustainability			X	Six strategies have been incorporated in the Proposal to achieve cost-effectiveness as well as a long-term impact: Strategy I Affordable housing for low-income families and Indigenous and Tribal Peoples' (ITP) communities, Strategy II Investing in communication actions to discourage investments in at-risk-areas and stakeholder buy-in for housing codes, Strategy III Investing in disaster preparedness risk reduction measures, Strategy IV Investing in Coastal Protection, Strategy V Investing in national capacities for long-term in-house expertise, Strategy VI Cost-effectiveness and ownership through local participation.

ANNEX III STAKEHOLDER CONSULTATION REPORT

PART I STAKEHOLDER ENGAGEMENT

Introduction

As a part of the project development process, a series of consultations were conducted to help to gather information on resource use and the effects of climate change in the coastal areas. A social and gender assessment was also done to determine if there are differences in access and use of coastal resources based on demographics and gender. The stakeholder engagement process began in September 2020 and concluded in November 2020. The process faced several challenges due to its timing such as the COVID-19 pandemic, national elections, and tropical storms. Because of the current COVID-19 restrictions, there are limits on the number of persons that can gather in any location at the same time. As a result, three persons from each of the target communities will be asked to represent their community in the consultations. At least one community representative had to be female. Consultations were held by the district beginning in Corozal. COVID-19 precautions were taken at all the consultations. The target communities are listed below (Table 63)

Table 63: Target Communities for Consultations

Corozal District	Belize District	Stann Creek District	Toledo District
Corozal Town	Belize City	Dangriga	Punta Gorda Town
Altamira	St. Georges Caye	Hopkins	Barranco
Consejo	Ladyville	Sittee River	Cattle Landing
Chunox	San Pedro Town	Independence	Forest Home
Copper Bank	Caye Caulker	Seine Bight	Punta Negra
Sarteneja	Gales Point	Placencia	Monkey River
	Mullins River	Riversdale	
		Maya Beach	

Methodology

The advent of COVID-19 in Belize required that the traditional mechanisms for consultation and stakeholder engagement be revisited and adapted to comply with the requirements of the advisories and regulations put out and/or instituted by the Government of Belize. During the inception meeting and initial engagement with the lead agencies, several options were proposed to address the various scenarios that were envisioned based on the regulations that were or could be in effect during the consultations. Four options were presented that were designed to be flexible and responsive to changes in Belize's COVID-19 regulations and advisories. The consultations were done using the two options presented below. The other two options were designed specifically for in-person consultations if the number of persons allowed at gatherings was changed.

Each option had its challenges that were addressed as they presented themselves. The following consultation methodologies were used in combination:

- Option 1: Conduct all the meetings and consultations virtually.
  Participants to a virtual meeting were invited by the district or organization. It was planned that all the communities in the district would form part of a simultaneous virtual consultation. The number of persons that could be invited to participate in a virtual consultation would depend on the virtual platform available, the resources available (devices, internet access), and the extent to which potential participants were able to use the technology. This option required much planning to identify the resources available in each community and persons who were knowledgeable in the use of the technology. It also required that background information be provided to potential participants before the meeting to ensure that they conversant with the material.
- Option 2: Conduct in-person meetings with gatherings restricted to 10 persons or less.

This option was in response to the COVID-19 regulation that limited gatherings to a maximum of 10 persons. The communities were grouped into clusters of two or three based on proximity and/or ease of travel. Each community was then be asked to select three participants to represent that community and a consultation session would be convened in a central location. A focus group type consultation would be conducted in each of the central locations where information was provided, and participants directly engaged. Mechanisms would be put in place to ensure that all the requirements for social distancing and hygiene were practiced. Meetings would be kept as short as possible to limit the exposure of the participants. A listing of proposed community groupings is presented below in Table 55.

The COVID-19 regulations that were in place at the time of the consultations required that gatherings be limited to a maximum of ten persons. It also required strict social distancing and the wearing of masks. Adjusting to those regulations, it has become necessary to do increased planning in the communities before the consultations were held. All communities were contacted through NAVCO, DAVCO, the most active NGO, or another social partner in their area to identify potential participants from the respective communities. In addition to the standard contact information, prospective participants were asked to provide information on their ability to use current online meeting technology and whether they owned the required hardware.

Government agencies and NGOs were invited to identify one person to represent their organization. Most organizations indicated that they preferred to participate in virtual consultations. This suggestion was taken on board and all those consultations were done virtually.

PART II: PLANNING, CHALLENGES, AND RESULTS

Planning and Challenges

Following the schedule that was prepared and revised, several meetings and consultations were held with communities, agencies, and organizations across the country. A combination of in-person and virtual meetings was held. Option 1 was used for NGO and Government of Belize consultations while a combination of Options 1 and 2 were used for the community consultations Most communities wanted to have in-person meetings. However, it was not possible to hold in-person consultations in some communities because of COVID-19 restrictions that curtailed movement into and within those communities, notably San Pedro Town and Caye Caulker Village. The communities were grouped into twos and threes, and each community was asked to identify three persons to represent the community. The community leaders were contacted through the National Association of Village Councils and the Association of Mayors. The agencies were contacted through the person identified as the contact for the project. NGOs were contacted through their executive directors. For several reasons, it was not possible to meet with all the communities or organizations on the list. Some organizations were added because during the consultations it was found that their participation would add to the consultative process. Attempts were made to reschedule the meetings that were missed. Table 64 outlines the meetings that did not materialize, the reasons, and responses.

The consultations were planned to last no more than three hours. They included three short presentations and two interactive sessions in which feedback was solicited from those present. Responses were captured in a table and synthesized below by district.

Table 64: Communities that could not be Consulted

Community or Organization	Date scheduled	Reason for not meeting on the scheduled date	Follow-up Response (Rescheduling attempt)
Alta Mira	3rd October 2020	After initial confirmation, no one attended the scheduled session, no formal response was provided.	One attempt was made to reschedule the session, however, there was no response from the community focal point.
Punta Gorda, Forest Home, Cattle Landing	10th October 2020	Only one individual (from the Forest Home community) attended the session, due to communication deficiencies. Many persons that were invited to the session indicated that the Covid-19 deaths in the community may have contributed to the poor attendance.	Two attempts were made to reschedule the session. The first attempt, an in-person session for the 7th November 2020, was disrupted by Hurricane Eta, which resulted in heavy rainfalls and flooding in Central America and Belize. The second attempt, a virtual session scheduled for the 9th November 2020, was disrupted by the preparation for the General elections.
Barranco	10th October 2020	There was a communication deficiency between the contact person and the community members. The livelihood of many community members also limited the days within which the community could be engaged, as the engagement	There were two attempts at rescheduling. However, due to the availability dates, Covid-19 deaths in the community, and preparations for General Elections, the meeting never materialized.

		sessions were scheduled during the peak of the lobster and conch fishing season.	
Hopkins	24th October 2020	No one attended the scheduled session, no formal response was provided.	Two attempts were made to reschedule the session. During the first rescheduled session, on the 9th November 2020, the community experienced technical problems and the session was further rescheduled to the 12th November 2020. The community did not attend the second rescheduled session
Sittee River	24th October 2020	After initial confirmation, no one attended the scheduled session, and no formal response was provided. No further contact was made with the community.	No further contact was established after the first confirmation was given.
Independence	24th October 2020	The community formally requested that they be engaged virtually.	Rescheduling attempt to a virtual modality was successful.
Seine Bight	24th October 2020	After initial confirmation, no one attended the scheduled session, and no formal response was provided. No further contact was made with the community.	No further contact was established after the first confirmation was given.

Results

For the communities that were consulted, copies of the attendance sheets are attached as Annex 5, (a) – (h).

Issues that were highlighted during the consultations include:

i) Participants felt that the project did not focus enough on the individual needs of all communities. It was explained that the project was designed to address national climate change issues across coastal communities as it relates to affected Belize. It was pointed out that the coastal communities would be the direct beneficiaries of the deliverables of the project in the form of improved data, better land-use planning, better early warning for storm surges and floods, and community participation in the entire process.

ii) Communities were generally concerned that for previous national projects/programmes the consultative process concluded with project development. Limited to no engagement with communities occurred during the implementation of the projects. Communities were reassured of the entities' commitment to continuous and active stakeholder engagement through the communications strategy to be implemented under the project. It was further explained that through this project communities would be directly involved and could take ownership through the training and monitoring that was an integral part of the project under Components 2 and 4.

iii) First Prominent Issue Expressed by Communities - Coastal erosion is an issue communicated by every community consulted. Communities expressed relief that the problem was being addressed after it was originally reported to national entities. Communities expressed concerns regarding the selection of only two target communities, Dangriga and Hopkins. It was explained that those communities were selected following initial assessments by the partner agency GAMMA S.A. from Cuba; these assessments followed recent work completed in those areas. It was also explained that under Component 3 of the project the information and technology obtained from the two pilot sites, would be used as a guide to possibly scale-up engineering recommendations in other communities that were severely affected.

iv) Second Prominent Issue Expressed by Communities - Land use was another issue vocalized in participating coastal communities. Community members voiced concerns on issues relating to land tenure, which in their opinion was inappropriate for the type of development planned for ad eventually executed on land. Development in these environmentally significant areas resulted in the cutting of mangroves, dredging, and other activities that posed a threat to the natural environment. It was felt that erosion was exacerbated by the improper use of coastal resources or the lack of proper planning and environmental impact assessment. It was explained that the project intends to address such issues through the implementation of the Coastal Zone Management Plan under Component 1.

Concerns related to the inequality in the issuing of land or the activities that were permitted in coastal areas were also voiced. Communities also pointed out the need to address the enforcement of existing national legislations such as the mangrove and land use regulations.

v) Need for Building Codes

The development of building codes for the coastal zone is viewed as beneficial to communities. Most communities felt that the development of building codes for the coast was long overdue action to guide development. Two concerns were expressed by the communities, with an urge for them to be addressed by the project:

a. In addition to a relevant design, provide information on appropriate building materials that would be suitable for coastal buildings.
b. Make sure that all income levels were taken into consideration when developing the model buildings.

vi) Communities also expressed the need for more autonomy in the national process and the ability to enforce building codes and land use regulations at the municipal level (towns and village councils) as this is where most of the effects of climate change and bad land-use planning are seen.

vii) Flooding monitoring and flood early warning were applauded as very necessary in most coastal communities.

viii) Participants also brought up climate change issues that directly affected them. These are mentioned by the district below.

ix) Most participants asked if they could be consulted on the final document that was sent to the Adaptation Fund.

Consultation synopsis by Stakeholder group

Table 65: Consultation Synopsis

Stakeholder/Community	Objective	Outcome	Conclusion
NGOs & Independence community Virtual, 28 Oct. 20	Inform about the project concept and receive feedback on relevant aspects, including their interventions.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment. Ngo's collaborative support for implementation was obtained.	Relevant information was obtained and integrated into the Project Proposal and Annexes
Javier Sabido – NAVCO Virtual, 11 Sept. 20	Inform the national village council and request support to organize community consultations.	NAVCO is positive about the project and supports to organize community consultations in villages received.	Consultations were supported by NAVCO
IHCANTIABRIA/IDB Virtual, 16 Sept. 20	Map lessons learned from other projects/ assess synergies	Relevant aspects of Belize's Disaster Risk Profile research integrated into feasibility analysis (Annex 2)	Relevant information was obtained and integrated into the Feasibility Study
Timothy Hawthorne (UCF) Virtual, 10 Dec. 20	Learn about UCF's PGIS research at Hopkins	Relevant aspects of UCF PGIS research were considered, and UCF was identified as a potential partner.	Relevant information was obtained and integrated into the Project Proposal and Feasibility Study
Stakeholder Session (Corozal) Chunox, Sarteneja Copper Bank Chunox, 3 October 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Recommendations: GoB needs to monitor and ensure compliance. housing codes need to enforce the mangrove regulations; coastal zone management. Indicate the need for communications.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment.
Stakeholder Session (Corozal) Corozal Town/Altamira, Consejo, Corozal Town, 3 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Recommendation: Consider alternative energy sources that are less expensive. Worried about groundwater contamination. Indicate the need for communications.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment.
Stakeholder Session (Belize District) San Pedro Town, Belize City	Inform about the project concept and receive feedback on relevant aspects,	Recommendations: Proper development planning, zoning; collaboration, and communication with local authorities. Worried about flooding and advocate EWS& mangroves. Positive about beach nourishment. Indicate the need for	Relevant information was obtained and integrated into the proposal, feasibility

Virtual, 22 Oct. 2020	vulnerability, social, and gender.	communications. Useful to have the GIS capabilities in the CZMAI.	study, safeguards assessment.
Stakeholder Session (Belize District) St. George's Caye, Belize City, Ladyville Belize City, 17 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Recommendations: Need for protection and management of mangrove areas; development of a management plan for the cayes; development plans and land use laws, zoning regulations; improved governance structures at the central and local levels; monitoring and compliance; Legislation that includes building codes; a minimum standard for building construction in the city for people who don't have the resources; Awareness and education. Need flood/shoreline protection.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment.
Stakeholder Session (Belize District) Gales Point, Mullins River Gales Point, 17 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Worried about water due to droughts affecting supply. Want erosion controlled.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment.
Stakeholder Session (Stann Creek) Placencia Placencia, 24 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Highlights: Want to collaborate.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment.
Stakeholder Session (Stann Creek) Riversdale, Maya Beach Maya Beach, 23 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Highlights: Suffering from Climate Change impacts& saltwater intrusion; no zoning regulation.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment.
Stakeholder Session (Stann Creek) Dangriga Dangriga, 24 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Highlight: Advocate for decentralization and collaboration. Suffer from saltwater intrusion. Happy that the town was chosen as a pilot. Advocate for control of man-made causes. Indicate the need for communication.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment.
Stakeholder Session (Toledo) Forest Home Punta Gorda, 10 Oct. 2020	Inform about the project concept and receive feedback on relevant aspects, vulnerability, social, and gender.	Highlight: Want more consultations with council chair present.	Relevant information was obtained and integrated into the proposal, feasibility study, safeguards assessment.

Conclusions

The COVID-19 pandemic has dictated that new and innovative ways need to be found to ensure that stakeholders are engaged in the consultative process. Being one of the first consultations to be conducted under the new regulations, several challenges were encountered that needed to be addressed *in situ*. Nonetheless, the results from the consultations were informative and of much value. The following points are offered in conclusion:

- There was also a thread of common concerns across all the coastal communities that involved land use, how approvals are given for development, and the inability of local communities to adequately respond to infractions that impact the communities.
- Erosion is an issue that most communities feel is not being adequately addressed by the people in authority.
- The NGO community is actively involved in working on issues impacting the coastal zone and have a wealth of information that could be useful in addressing the

- There is a need for increased communication between agencies and communities to ensure that there is a constant flow of relevant information that can be used in decision-making.
- Communities want a bigger role in deciding on and managing the activities that impact them.
- Communities are hoping that the project will have some direct tangible benefits.
- The communication strategy needs to ensure that communities are engaged at all times and that the responses to their concerns are highlighted at every opportunity.

PART III: PARTICIPANTS LISTS

MONKEY RIVER 9/10/2020

Adaptation Fund Project Proposal Development Stakeholder Consultation Session

Date: Location:

	Name	Position	Organization	Email	Contact Number	Gender	Signature
1	Mario Muschamp	President	Monkey River Watershed Assoc.	president.mra@gmail.com	691-6568	M	
2	Paula Williams	chairlady	Punta Negra	—	6654714	F	
3	Consuda Lira		punta negra	—	650-2380	F	C. Lira
4	Suzette Sacaby	Secretary	Punta Negra	—	6695726	F	
5	Godwin Coleman		Monkey River		664-[illegible]	M	
6	Debora Burgess	vice secretary	Monkey River	—	664-5584	F	D Burgess
7	Leonardo Cotzo	Chairman	Monkey River	[illegible]@gmail.com	621 5263	M	
8							

Adaptation Fund Project Proposal Development Stakeholder Consultation Session

Date: 10 October 2020 Location: Punta Gorda

	Name	Position	Organization	Email	Contact Number
1					
2	Rockel Romero	Councillor	Forest Home Village / Community	romerorockel927@gmail.com	634-0749

ADAPTATION FUND PACT Protected Areas Conservation Trust

MONKEY RIVER 9/10/2020

Adaptation Fund Project Proposal Development Stakeholder Consultation Session

Date: Location:

	Name	Position	Organization	Email	Contact Number	Gender	Signature
1	Mario Muschamp	President	Monkey River Watershed Assoc.	president.mra@gmail.com	691-6568	M	
2	Paula Williams	chairlady	Punta Negra	—	6654714	F	
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4	Suzette Sacaby	Secretary	Punta Negra	—	6695726	F	
5	Godwin Coleman		Monkey River		664-[illegible]	M	
6	Debora Burgess	vice secretary	Monkey River	—	664-5584	F	D Burgess
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8							

ADAPTATION FUND

PACT
Protected Areas Conservation Trust

Adaptation Fund Project Proposal Development Stakeholder Consultation Session

Date: 14 OCTOBER 2020

Location: BELIZE CITY

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17 OCTOBER 2020

Adaptation Fund Project Proposal Development Stakeholder Consultation Session

Date: 17 October 2020

Location: Gales Point Manatee + Mullins River

Name	Position	Community/ Organization	Email	Contact Number	Gender	Signature
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3 TeSarah Myers		Gales point	tesarahmyers554@gmail	672-0[illegible]	F	[illegible]
4 Rizden [illegible]	Secretary	Mullins River		650647[illegible]	M	[illegible]
5 Edward [illegible]	Chairman			6676824	M	
6 [illegible]		Mullins River		651-2117	M	
Sandra Flowers	viceChairman	Mullins River		6594460	F	[illegible]
Jason Altschaft	Chairman	Gales Point Manatee		651-0425	M	[illegible]
Tanya Santos	Consultant	ECGD				[illegible]

Date: 24 October 2020

Location: Placencia Community Center

Name	Position	Organization	Email	Contact Number	Gender	Signature
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3 Elliot Cabral	V Chair PTGA	Placencia Tourguide Assoc	[illegible]	6698745	M	[illegible]

Invite me to next meeting BWSFA-Belize Women Seaweed Farmers Association

Mariko Wallen 671-1222 · whatsapp

Email Bwsfa2019 @J

Adaptation Fund Project Proposal Development Stakeholder Consultation Session

Date: [illegible]

Location: [illegible]

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M	[illegible]
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[illegible]						
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Tanya Santos						
Dwight Neal						

List of Virtual Attendees

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Sandra Miranda	Belize National Indigenous Council	Member	
Timoteo Mesh	Belize National Indigenous Council	Member	

Annex IV Demonstrating Compliance with the Adaptation Fund's Environmental and Social Policy through the Environmental and Social Management Plan

Purpose

The purpose of this overview is to demonstrate compliance of the project with the Environmental and Social Safeguards (ESS) of the Adaptation Fund. This section provides an overview of the measures taken in the project design phase to ensure that the project enhances environmental and social benefits, and prevents, reduces, or mitigates adverse environmental and social risks and impacts considering the 15 Adaptation Fund principles. This section also details the measures put in place to uphold the principles throughout the project implementation.

Compliance Process

ESS is vital to prevent and mitigate the potential for undue and unintended harm that could arise from project activities. In line with the Adaptation Fund's Environmental and Social Policies, the project partners have conducted risk screenings and impact assessments of all activities even though they have a negligible risk of causing unintended harm. To ensure that the project complies with the Environmental and Social Policy of the Adaptation Fund, all project activities have been screened against the 15 environmental and social principles, as defined in the Environmental and Social Policy of the Adaptation Fund. Where risks have been identified, this annex analyses the potential for impact and describes the measures that have been built into the project to avoid or mitigate risks and their impacts. To make sure that the project is in line with the Adaptation Fund Gender Policy, a social and gender assessment was conducted, and a gender action plan developed, the results of which have been outlined separately. This assessment also integrates the results of the two aforementioned gender assessments. This section provides a baseline that has been integrated into the project's results framework. This analysis integrates the insights acquired from the desk research of relevant literature and consultations with communities and other stakeholders to identify disaster-related risks and strategic opportunities for the project related to the environment and social issues. The initial concept of this proposal was verified with the stakeholders and their insights obtained for strengthening the components.

Table 66 Environmental and Social Risk Screening and Categorization

Checklist of Environmental and social principles	No further assessment for compliance	Potential impacts and risks- further assessment required for compliance	Explanation why principle has been triggered (or not)
Compliance with the Law		X	-If the interventions of the project do not consider the existing legislation, permitting and requirements, there is the risk of this principle to be triggered. The project has done the following to avoid this: -Implement mitigation actions on public land, and in the case of private land with the consent of right-holders. -Consult the legal procedures to establish a community-owned business model -In case of conflict utilize the national Land Rights Conflict Resolution Authority for resolution.
Access and Equity		X	Potential social inequality if preferential project benefits are shared with selected groups. To avoid this the project has: -Participatory approach has been integrated into the process design (e.g. coastal advisory committees, community wardens, beach erosion monitoring network, knowledge transfer, data availability) and will be applied throughout the project. By sharing the lessons learned in Dangriga, component 3 will also benefit communities that could not be included under this proposal.
Marginalized and Vulnerable Groups		X	Potential social inequality if preferential project benefits are shared with selected groups. To avoid this the project has: Monitoring will be conducted through a mix of informal interviews, meetings with communities and monitoring programs.
Human Rights	X		The project is in accordance with various human rights principles: the right to shelter: the right to safe housing; the right to participation, the right to use law right to work. It also supports the SDGs: climate change actions (SDG 13), decent employment (SDG8), safe water (SDG 6), gender equality (SDG 5), and resilient settlements (SDG 11)
Gender Equity and Women's Empowerment		X	Women could be denied access to information and excluded from making critical decisions. While the impacts of climate change affected everyone equally, our stakeholders indicated that during natural disasters women, particularly those who were heads of households were affected disproportionately. As such, this project, through enhanced resilience of the coastal communities resilience, will have a positive impact on the lives of women. The project partners will purposefully seek Gender Equity and Female participation in consultation and project activities. Monitoring of gender-balanced participation and distribution of benefit is crucial. Payscale within the project will be regardless of gender.
Core Labor Rights		X	Labor rights may not be respected when contracting communities. To avoid this the project will take mitigation actions. The project will use – through a contractor- some community labor to do unskilled construction tasks. Appropriate risk mitigation measures are required to ensure that there is no exploitation of people providing their labor to the project.
Involuntary resettlement	X		There is no risk of involuntary resettlement arising from the project. However, there may occur temporarily inconvenience by the establishment of the risk reduction measures under component 1.1 & 3. This needs to be monitored and mitigated if necessary.

Checklist of Environmental and social principles	No further assessment for compliance	Potential impacts and risks- further assessment required for compliance	Explanation why principle has been triggered (or not)
Indigenous Peoples	X		Exclusion of indigenous peoples is unlikely Dangriga is a Garifuna community. Engagement strategies will be respectful of traditional/indigenous leaders and communities and traditional customs (Free Prior and Informed Consent). The development process for the building codes will include an assessment of the traditional housing structures (cultural heritage) of the Indigenous and Garifuna peoples and their implications for and integration into the housing policy and building codes.
Protection of Natural Habitats		X	While damage to natural habitats and threats to biological diversity are unlikely, there is a possibility that dredging, construction work undertaken or reforestation measures may adversely impact local biodiversity (Component 3). All relevant studies will be conducted to remove or reduce any potential ES risks.
Conservation of Biological Diversity	X		No realistic risks to biological diversity. The AF Project will enhance close collaboration NHS-CZMAI- NHS and integration in ICZMP & guidelines and benefit flora, fauna, and man.
Climate Change	X		No significant or unjustified increase in greenhouse gas emissions or other drivers of climate change. This project is inherently an adaptation project and as such, no maladaptation is foreseen.
Pollution Prevention, Resource Efficiency		X	Construction of infrastructure can generate wastes and may even have health consequences The project will ensure that waste materials are properly being disposed of. All workers engaged under component 3 will be – through the contractor- informed on proper procedures to dispose of waste materials generated during the construction, to ensure that there is no risk of improper disposal. Monitoring will be required and include a waste management plan for the disposal of solid waste generated by the project component.
Public Health	X		A lack of occupational health and safety standards and procedures could result in injuries to workers or community members Occupation health and safety training will be monitored for construction works, and necessary safety equipment, such as boots and hard hats will be provided by the contractor.
Physical and Cultural Heritage	X		Although no physical or cultural heritage impacts are foreseen; however, this will have to be reviewed when the activities are being taken place on-site for surrounding influence.
Lands and Soil Conservation	X		The project has no specific geographical target area yet. However, for the location of the weather stations, and risk reduction measures under component 3 further assessment will have to be done about their impacts.

The monitoring of environmental and social risk will be conducted periodically by the PIU and the EEs. The staff of the PIU will be responsible for the implementation of the environmental and social risk measures through hired consultants/contractors. Member of PIAG along with the PIU will conduct period site supervision and monitoring of the ESMP's implementation. A dedicated Environmental Expert will provide further support for the monitoring of the project activities in adherence to the ESMP and the Environmental and Social Policy of the Adaptation Fund. Training will be provided to the PIU staff to effectively enable the implementation of the ESMP and for the achievement of environmental and social safeguard monitoring responsibility. Direct management responsibility of the ESMP will be under the Project Manager.

Table 67: Environmental and Social Management Plan

Checklist of Environmental and social principles	Potential impacts and risks Explanation why principle has been triggered (or not)	Environmental and Social impacts and risks / Component	Probability of Risks	Mitigation measures	Mitigation Action Plans	Monitoring Roles and Responsibilities
Compliance with the Law	All project components comply with the law (Feasibility Study Part II)	All Components	Low/No Risk	The project will monitor compliance with international and national laws	Due diligence to ensure compliance with national and international laws	NIE, PIU
Access and Equity	The project components have integrated a policy approach based on inclusiveness and participation and showcases/pilots.	Some groups are disenfranchised by project activities (Components 1, 3, and 4)	Low/No Risk	The project will ensure that men, women, youths and vulnerable groups are engaged effectively throughout the life-span of the project.	Women, men and vulnerable groups will be given equal opportunities to be engaged under the project. Project components will not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.	NIE, EEs and Key Partner Agencies
Marginalized and Vulnerable Groups	Several project interventions encompass intrinsic benefits for marginalized and vulnerable groups.	Some groups are disenfranchised by project activities (Components 1, 3, and 4)	Low/Moderate Risk	The project will ensure that men, women, youths and vulnerable groups are engaged effectively throughout the life-span of the project.	The Project will monitor to ensure that the project follows best-practice guidelines for the involvement of marginalized and vulnerable groups. Project components will not adversely affect marginalized or vulnerable groups.	NIE, EEs and Key Partner Agencies
Human Rights	The project is in accordance with various human rights principles: the right to shelter: the right to safe housing; the right to participation, the right to use law, the right to work. It also supports the SDGs: climate change actions (SDG 13), decent employment (SDG8), safe water (SDG 6), gender equality (SDG 5), and resilient settlements (SDG 11)	Some human rights may not be respected during implantation (All Components)	Low/No Risk	The project will monitor human rights throughout implementation	Due diligence to ensure compliance with national and international human rights legislations.	NIE, PIU
Gender Equity and Women's Empowerment	While the impacts of climate change affected everyone equally, our stakeholders indicated that during natural disasters women, particularly those who were heads of households were affected	Not all groups are engaged (Components 1, 2, 3, 4)	Medium	The project will ensure that men, women, youths and vulnerable groups are engaged effectively	Women, men and vulnerable groups will be given equal opportunities to be engaged under the project.	NIE and EEs

Checklist of Environmental and social principles	Potential impacts and risks Explanation why principle has been triggered (or not)	Environmental and Social impacts and risks / Component	Probability of Risks	Mitigation measures	Mitigation Action Plans	Monitoring Roles and Responsibilities
	disproportionately. As such, this project, through enhanced resilience of the coastal communities resilience, will have a positive impact on the lives of women. The project partners will purposefully seek Gender Equity and Female participation in consultation and project activities. Monitoring of gender-balanced participation and distribution of benefit is crucial. Payscale within the project will be regardless of gender.			throughout the life-span of the project.	The Project will monitor to ensure that the project follows best-practice guidelines for gender-balanced participation. PACT is an equal opportunity employer and will not discriminate against protected characteristics (gender, age, sexual orientation, race, nationality, ethnicity, religion, disability) NCCCSAP for information-sharing. Community engagement meetings for FPIC and decision-making.	
Core Labor Rights	The project will use – through a contractor- some community labor to do unskilled construction tasks. Appropriate risk mitigation measures are required to ensure that there is no exploitation of people providing their labor to the project.	Labor rights may not be respected when contracting communities (Components 2.2, 3, and 4.1)	Low/No Risk	The project will monitor international and national labor laws for any work that may be carried out concerning the project	All contracts will be reviewed by the Ministry of Labor and the Contractor General to ensure these and the project activities comply with both national law and international standards, including ILO labor standards.	NIE, PIU
Indigenous Peoples	Dangriga is a Garifuna community. Engagement strategies will be respectful of traditional/indigenous leaders and communities and traditional customs (Free Prior and Informed Consent). The development process for the building codes will include an assessment of the traditional housing structures (cultural heritage) of the Indigenous and Garifuna peoples and their implications for and integration into the housing policy and building codes.	The traditional rights of communities not respected (Components 1.1, 1.2 and 3)	Low/Moderate Risk	Engagement strategies will be respectful of traditional/indigenous leaders and communities and traditional customs (Free Prior and Informed Consent). The Maya Peoples and the Government of Belize have established engagement protocols.	Indigenous Communities will be engaged via their respective committees. Indigenous Committees will also form an integral part of the TAC for project implementation.	NIE, EEs and Key Partner Agencies

Checklist of Environmental and social principles	Potential impacts and risks Explanation why principle has been triggered (or not)	Environmental and Social impacts and risks / Component	Probability of Risks	Mitigation measures	Mitigation Action Plans	Monitoring Roles and Responsibilities
Involuntary Resettlement	There is no risk of involuntary resettlement arising from the project. However, there may occur temporarily inconvenience by the establishment of the risk reduction measures under component 1.1 & 3. This needs to be monitored and mitigated if necessary.	Communities affected by erosion can be driven to resettle in other areas if proper climate adaptive measures to reclaim eroded land is not in place.	Low/No Risk	Communities will be fully and regularly briefed on the nature and progress of the establishment of the risk reduction measure before they begin, including the expected duration, the disruption expected, and the grievance mechanism.	All possible alternative to avoid resettlement will be examined under the project, due to loss of land. Engagement of communities to ensure that information is disseminated in a timeline manner, in order to avoid possible inconveniences.	NIE, EEs and Key Partner Agencies, PIU
Protection of Natural Habitats	While damage to natural habitats and threats to biological diversity are unlikely, there is a possibility that dredging, construction work undertaken or reforestation measures may adversely impact local biodiversity (Component 3), but these impacts are expected to be temporary and the long-term benefits to the coastal areas will outweigh those impacts. An EIA will not be required given the revised scope of the interventions under component 3	Damage caused to habitat during the sourcing of materials for the beach nourishment activities (Component 3)	Low/Moderate Risk	The environmental clearance from the Department of Environment will be on the condition that strict protocols are followed during dredging, compliance with Environmental Laws is maintained, all necessary measures are taken to reduce impact on natural systems and a DOE personnel is present during operations.	All interventions under this component will be required to be in compliance with all relevant environmental laws and/or conditions given by DOE under the environmental clearance. Areas pinpointed as sources for the extraction of materials for project interventions will be informed by the 2021 GAMMA study that identified the viable sources of material for this intervention. The project includes community consultation and involvement in identifying and protecting natural habitats. If it is recommended that the Dangriga protection measures consist of mangroves, the mangrove species will be tested for sustainability based on community participation because mangrove species that are not indigenous may affect the existing local ecosystem.	NIE, EEs and Key Partner Agencies, PIU

Checklist of Environmental and social principles	Potential impacts and risks Explanation why principle has been triggered (or not)	Environmental and Social impacts and risks / Component	Probability of Risks	Mitigation measures	Mitigation Action Plans	Monitoring Roles and Responsibilities
Conservation of Biological Diversity	No realistic risks to biological diversity. The AF Project will enhance close collaboration NHS-CZMAI- NHS and integration in ICZMP & guidelines and benefit flora, fauna, and man.	Damage caused to habitat during the sourcing of materials (Component 3)	Low/No Risk	The project will monitor all possible adverse impacts to biodiversity resulting from activities	Project components will be required to comprehensively assess any potential impacts to biodiversity and avoid all activities that would result in harm.	EEs, Key Partner Agencies and PIU
Climate Change	This project is inherently an adaptation project and as such, no maladaptation is foreseen.	All components	Low/No Risk	The project will monitor all possible climate change impacts resulting from activities	All project activities will be properly examined to avoid mal-adaptation	EEs, Key Partner Agencies and PIU
Pollution Prevention, Resource Efficiency	The project will ensure that waste materials are properly being disposed of. All workers engaged under component 3 will be – through the contractor- informed on proper procedures to dispose of waste materials generated during the construction, to ensure that there is no risk of improper disposal. Monitoring will be required.	Pollution resulting from malpractice (Component 1.1 3)	Low/No Risk	The project will monitor the utilization of material and their disposal in line with national regulations to control pollution and effluent discharge.	The contractor(s) will be required to closely monitor the production and disposal of all waste materials from the implementation of project components.	EEs, Key Partner Agencies and PIU
Public Health	Occupation health and safety training will be monitored for construction works, and necessary safety equipment, such as boots and hard hats will be provided by the contractor.	A lack of occupational health and safety standards and procedures could result in injuries to workers or community members. (Component 3)	Low/No Risk	The project will monitor health and safety standards for any work that may be carried out concerning the project	The contractor(s) will be required to provide occupation health and safety training, and necessary safety equipment, such as boots and hard hats.	PIU
Physical and Cultural Heritage	Although no physical or cultural heritage impacts are foreseen; however, this will have to be reviewed when the activities are being taken place on-site for surrounding influence.	Damage to physical or cultural heritage resulting from the selection of improper sites (Components Component 1.1, 2.3, 3)	Low/No Risk	The project will carefully select sites for project activities avoiding an damage to physical or cultural heritage.	Areas will be properly surveyed to ensure that there are no physical or cultural heritage in selected sites. Alternative sites will be selected if original site contains physical or cultural heritage.	EE, and Key Partner Agencies, PIU

Checklist of Environmental and social principles	Potential impacts and risks Explanation why principle has been triggered (or not)	Environmental and Social impacts and risks / Component	Probability of Risks	Mitigation measures	Mitigation Action Plans	Monitoring Roles and Responsibilities
Lands and Soil Conservation	The project will change the landscape of the norther beach front of Dangriga Town for the beach stabilizing component and will convert small areas of land for the establishment of the early warning systems. The location of the weather stations, and risk reduction measures under component 3 have been identified and linked selected based on the technical knowledge by the National Meteorological Services (NMS) and the GAMMA study of 2021.	Negative impacts to lands and soils (Component 1.1, 2.3, 3)	Low/Moderate	The project will follow all existing land acquisition regulations to erect the EWS, follow established construction guideline, including those of the NMS. The impact of the beach stabilizing activities are being mitigated by the selection of the recommended beach stabilizing interventions by the GAMMA study of 2021.	The selected sites for the EWS will have primary sites and alternative sites, in the remote scenario the primary sites are not suitable for construction. Coordination with all relevant parties will be maintained. The implementation of the beach stabilizing interventions will be informed by relevant past and required studies by the Department of the Environment (DOE). The DOE has and will be involved in the entire execution of this component, with their technical experts.	EEs, Key Partner Agencies, PIU

Table 68 Compliance with the ESP part 1 of 5

Project Outcomes	Compliance with the law	Access and equity	Marginalized and vulnerable groups
Component 1. Improving coastal land use for resilient habitation and sectoral activities			
1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	Housing and Town Planning Act Ch. 182: Regulation of the use and subdivision of urban and rural lands, considering: (a) in the case of urban land the location and dimensions of the lots, the conditions of accessibility and the supply of public goods and services; (b) in the case of rural lands, water catchment areas, conservation of vegetation, prevention of erosion, easements of public domain lands, among others.	Limited stakeholder buy-in to the implementation of these standards as they raise initial costs of construction. MITIGATION: The pilot social home: Examples of good practices are expected to support the acceptance of building codes and laws.	There are accounts of low-income families in Belize that construct houses that do not comply with the regulations. MITIGATION: The pilot social home: Examples of good practices are expected to support the acceptance of building codes and laws.
1.2 Improved coordination and implementation of the ICZM Plan	Coastal Zone Management Act Cap 329: Establishes the legal framework for coastal zone management for cross-sectoral integration and coordination of resilience-building management interventions. The plan applies both Ecosystem Services Valuation and Marine Spatial Planning approaches to map, zone, and allocate permissible human uses that promote a balanced mix of conservation and utilization. It examines the tradeoffs of three future management scenarios: Conservation, Development, and Informed Management, and the consequent impacts on key habitats and the delivery of ecosystem benefits.	ICZMP and guidelines help to maintain shoreline access by regulating development in the immediate seafront area.	Setbacks do not protect structures in the buffer area.
Component 2. Coastal Vulnerability Monitoring			
2.1 Strengthened data availability for the development of a national coastal saline intrusion program	National Integrated water resources Act No. 19, 2010: This Act concerns the management and conservation of water resources in Belize. Conservation measures also aim at the prevention of pollution of water resources. The Act establishes the National Integrated Water Resources Authority as a body corporate. It shall enforce the policy of the Government for the orderly and coordinated development and use of Belize's water resources, to conserve and protect such resources for the benefit of present and future generations of Belizeans,		Coastal saline intrusion research enhances the development of coastal areas with lower risk. It might contribute to impoverish the coastal areas with higher risk due to hesitation among investors. MITIGATION: Identification/Promotion of alternative opportunities, e.g. seaweed harvesting The lack of groundwater information, especially in northern Belize, where karstic conditions may promote the leaching of solutes and salinization, leads to difficulty in the management of future water resources under

Project Outcomes	Compliance with the law	Access and equity	Marginalized and vulnerable groups
	and to provide the Belizean public with a safe, adequate and reliable supply of water.		climate change and increases the vulnerability of communities. MITIGATION: Component 2.1 Strengthened data availability.
2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	The establishment of land use guidelines requires good quality data, which is not always available.	If good quality data related to hazards is lacking, the established buffer either provides too little protection or are too restrictive to shoreline development.	
2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	Disaster Preparedness and Response Act Chapter 145: Provides for the organization of State actions for the mitigation of, preparedness for, response to, and recovery from disasters in Belize. It includes requirements for public inquiries in the decision-making process of plans, programmes, and policies.	The EWS relies on the available means of communication which is not equally efficient everywhere.	
Component 3. Coastal Protection and Adaptation response for High-Risk Areas			
3. Coastal Protection and Adaptation response for High-Risk Areas	Environmental Protection Act Cap 328: The enabling legislation provides the Government with the comprehensive environmental protection authority it needs to address modern environmental pollution problems. The Act grants the Department of the Environment broad regulatory and enforcement authority for the prevention and control of environmental pollution, conservation and management of natural resources, and environmental impact assessment. Mines and Minerals Act: This Act empowers the Inspector of Mines to grant mining licences which is needed for the extraction of sand.		Promotion of beach tourism through beach widening.
Component 4. Awareness Raising, Knowledge Dissemination and National Capacity Strengthening			
4.1 Promotion of ecologically responsible behaviors through climate change communication			A high level of awareness is crucial to enhance cooperation between the government and the public.
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices		High level of effectiveness due to the availability of manuals and programs, which	

Project Outcomes	Compliance with the law	Access and equity	Marginalized and vulnerable groups
		have been successfully implemented in Belize.	
4.3 Strengthening of GIS capabilities of CZMAI and partners			
OTHER	In December 2019, the Government of Belize voted to implement an indefinite moratorium on all new oil exploration in its waters, to safeguard the marine environment and further promote dive tourism. By doing so, it became one of the first developing countries to turn away from oil and seek to embrace environmentally sustainable development pathways by protecting the ocean environment. Sufficient legal and policy base for the implementation of this project. Nationally Determined Contribution (NDC) presented in 2015 before UNFCCC, the Horizon 2030 Vision (2010-2030), Growth and Sustainable Development Strategy, The National Climate Change Policy, Strategy and Action Plan (NCCPSAP) 2015-2020, and The Integrated Coastal Zone Management Plan (2016).	There is a potential risk of conflict when project engagement is limited to a limited number of people, and questions could rise (why them, not us).	
Mitigation Measures	The project does not carry any realistic risk of failing to comply with the law. All investments will be set up with the consent of the landowner or government agency responsible for the buildings and permits. When and where applicable (e.g. NMS- weather monitoring stations, NCCO – coastal protection) the entities will check the status of the land-use and rights, conduct consultations with the rightsholders and communities and collaboratively identify workable solutions. All required permits will be obtained.	A participatory approach has been integrated into the process design (e.g. coastal advisory committees, community wardens, beach erosion monitoring network, knowledge transfer, data availability) and will be applied throughout the project. By sharing the lessons learned in Dangriga, component 3 will also benefit communities that could not be included under this proposal. By establishing a model social house, with due diligence to IP cultural rights-stakeholders will witness evidence and more will become convinced. ICZMP and guidelines help to maintain shoreline access by regulating	The model social house provides a showcase for low-income households. The promotion of alternative livelihood opportunities e.g. sargassum use/farming will have a positive impact on vulnerable stakeholders, as will beach widening, by acting as a catalyst for small and medium local entrepreneurs, and it will also make life in the two Garifuna communities (every man/woman/child/person with a disability/ elderly) somewhat safer from climate hazards. Strengthening data on saline intrusion will enhance business growth and create more employment opportunities. Lastly, a

Project Outcomes	Compliance with the law	Access and equity	Marginalized and vulnerable groups
		development in the immediate seafront area.	grievance redress mechanism will be in place to address any conflicts that may arise.

Table 69 Compliance with the ESP part 2 of 5

Project Outcomes	Human rights	Gender equality and women's empowerment	Core labor rights
Component 1. Improving coastal land use for resilient habitation and sectoral activities			
1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	Right to shelter: A National Housing Policy with a clear specification for coastal habitation and Building codes with a specification for the coastal zone will help the sustainability of structural integrity and safeguard construction quality and reduce building vulnerability.		The project will use – through a contractor-some community labor to do unskilled construction tasks.
1.2 Improved coordination and implementation of the ICZM Plan	Erosion rates have increased in Belize. Additionally, land titles were granted before the 66-feet buffer was legally binding. MITIGATION: Intensive communication about the risks of building in the buffer area.		
Component 2. Coastal Vulnerability Monitoring			
2.1 Strengthened data availability for the development of a national coastal saline intrusion program	Coastal saline intrusion research informs water allocation and improves decision making for water resources management.		
2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize			
2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge			Skilled and experienced staff is necessary for EWS development and implementation.
Component 3. Coastal Protection and Adaptation response for High-Risk Areas			
3. Coastal Protection and Adaptation response for High-Risk Areas	Right to information: Low public awareness that beach nourishment has a temporary nature needs to be corrected through communications.		The project will use – through a contractor-some community labor to do unskilled construction tasks.
Component 4. Awareness Raising, Knowledge Dissemination and National Capacity Strengthening			
4.1 Promotion of ecologically responsible behaviors through climate change communication			
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices			

Project Outcomes	Human rights	Gender equality and women's empowerment	Core labor rights
4.3 Strengthening of GIS capabilities of CZMAI and partners			The implementation of each risk reduction measure requires a high level of technical knowledge that needs to be learned and updated as new technologies are continuously developed. Training enhances the intrinsic capability of the system to generate new skilled professionals.
OTHER		Firstly, women leaders in the communities, Government, and NGOs ensure female participation. Belizean women are increasingly becoming better equipped to undertake the roles that are more academically biased. SECONDLY, this means that they play an important role as decision-makers in the communities. Women participate in micro and small enterprises as entrepreneurs (cooking, handicraft, shops, hairdressers. Etc.), but there is still some undervaluing of women's labor in monetary terms. THIRDLY, there are no gender-specific roles within any of the project components. In that regard, the project provides a host of opportunities for anyone with the requisite training and skill. FOURTHLY, Women in the target villages tended to adhere more closely to the culturally/traditionally assigned gender-specific roles. FOURTHLY, Women in some of the communities want equal standing with men when it comes to land ownership, leadership roles and decision-making. FIFTHLY, It was felt that while the impacts of climate change affected everyone equally, during natural disasters women, particularly those who were heads of households were affected disproportionately. They are tasked with the bulk of the preparation, evacuation coordination,	The implementation of each risk reduction measure requires a high level of technical knowledge that needs to be learned and updated as new technologies are continuously developed. Training enhances the intrinsic capability of the system to generate new skilled professionals.

Project Outcomes	Human rights	Gender equality and women's empowerment	Core labor rights
		care during the disaster and the post-disaster recovery work that needs to be done. Additionally, because of their role as caregivers, anything that impacted the home or the immediate environment normally placed undue stress on them. The planned activities for the project could be done by anyone who was properly trained to carry out the work, particularly the coastal monitoring and flood watch because they were mostly at home in the community. IN CONCLUSION, the result of the analysis suggests that in most communities, women prefer not to assume what are considered to be non-traditional roles. Culturally, gender roles have been clearly defined over time and most communities prefer to keep it that way. However, in communities where there were younger women who attended school up to the tertiary level, they expected that there would be a greater role for women to play in the project. IMPLICATIONS FOR THE PROJECT, The results of the community consultations indicate that participants were supportive of the project and felt that the proposed activities were beneficial to coastal communities. It was felt that all of the activities could be considered gender-neutral and would not adversely impact one gender, ethnic group, or demographic over the other. The project was seen as providing opportunities for communities to become more involved with the adaptation to climate change and sea-level rise. The request for increased consultation and participation is an implementation detail that should be addressed with the understanding that there are clear gender	

Project Outcomes	Human rights	Gender equality and women's empowerment	Core labor rights
		based roles within these communities that are slowly changing with the increased access to education by young women and girls	
Mitigation Measures	The project is in accordance with various human rights principles: the right to shelter: the right to safe housing; the right to participation, the right to use law right to work. It also supports the SDGs: climate change actions (SDG 13), decent employment (SDG8), safe water (SDG 6), gender equality (SDG 5), and resilient settlements (SDG 11).	in most communities, women prefer not to assume what are considered to be non-traditional roles. Culturally, gender roles have been clearly defined over time and most communities prefer to keep it that way. However, in communities where there were younger women who attended school up to the tertiary level, they expected that there would be a greater role for women to play in the project. Payscale within the project will be regardless of gender. Women will be encouraged to apply for project jobs.	Appropriate risk mitigation measures are required to ensure that there is no exploitation of people providing their labor to the project. Additionally, The implementation of each risk reduction measure requires a high level of technical knowledge that needs to be learned and updated as new technologies are continuously developed. Training enhances the intrinsic capability of the system to generate new skilled professionals.

Table 70 Compliance with the ESP part 3 of 5

Project Outcomes	Indigenous people	Involuntary resettlement	Protection of Natural Habitats
Component 1. Improving coastal land use for resilient habitation and sectoral activities			
1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	Building codes may not comply with cultural heritage designs. MITIGATION: An assessment of the traditional housing structures (cultural heritage) of the Indigenous and Garifuna peoples and their implications for and integration into the housing policy and building codes.		
1.2 Improved coordination and implementation of the ICZM Plan		Existing structures are usually permitted to stay within the buffer area. If existing structures are significantly damaged or destroyed, they are to be reconstructed in line with the new regulation. Project will NOT result in involuntary resettlement. Land use regulations are widely used globally and also used nationally (e.g. Punta Negra, Dangriga), but are currently moderately enforced in Belize.	ICZMP and guidelines help to sustain the natural appearance of the coastline and protect natural shoreline dynamics.

Project Outcomes	Indigenous people	Involuntary resettlement	Protection of Natural Habitats
Component 2. Coastal Vulnerability Monitoring			
2.1 Strengthened data availability for the development of a national coastal saline intrusion program			
2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize			
2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge			
Component 3. Coastal Protection and Adaptation response for High-Risk Areas			
3. Coastal Protection and Adaptation response for High-Risk Areas	There is also a potential risk of failure if traditional leaders in the Garifuna communities (Dangriga) are not engaged.		Damage of seafloor with potentially high ecological value in the dredging area. Construction work also has risks MITIGATION: Conduct EIA.
Component 4. Awareness Raising, Knowledge Dissemination and National Capacity Strengthening			
4.1 Promotion of ecologically responsible behaviors through climate change communication	Communication actions in indigenous communities according to a rights-based approach can come at a high cost. MITIGATION: Proper cost planning and continue to respect indigenous FPIC rights		
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices			
4.3 Strengthening of GIS capabilities of CZMAI and partners			
OTHER			Anthropogenic causes in Dangriga (e.g. river mining)
Mitigation Measures	The development process for the building codes will include an assessment of the traditional housing structures (cultural heritage) of the Indigenous and Garifuna peoples and their implications for and integration into the housing policy and building codes. Communication and engagement with indigenous leaders needs to occur in accordance with FPIC protocols.	There is no risk of involuntary resettlement arising from the project. However, there may occur temporarily inconvenience by the establishment of the risk reduction measures under component 1.1 & 3. This needs to be monitored and mitigated if necessary.	An EIA may need to be conducted depending on the recommended RRM under component 3.

Table 71 Compliance with the ESP part 4 of 5

Project Outcomes	Conservation of biological diversity	Climate change	Pollution prevention and resource efficiency
Component 1. Improving coastal land use for resilient habitation and sectoral activities			
1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased			

Project Outcomes	Conservation of biological diversity	Climate change	Pollution prevention and resource efficiency
social and infrastructure costs due to increased resilience			
1.2 Improved coordination and implementation of the ICZM Plan	Wide beaches protect against coastal flooding and erosion, they are a valuable coastal habitat for many highly specialized plants and animals.	ICZM is an effective method & low-cost alternative to minimize property damage due to coastal flooding and erosion.	
Component 2. Coastal Vulnerability Monitoring			
2.1 Strengthened data availability for the development of a national coastal saline intrusion program	Coastal saline intrusion does not reduce the hazard risk by itself. Without proper mitigation measures, the information is useless. MITIGATION: AF Project with close collaboration NHS-CZMAI and integration in ICZMP & guidelines		
2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize	Early erosion detection and the maintenance of ecosystems retain the ecological value of the beaches.		The improvement of beach areas at a lower cost. Without an early erosion detection program, maintenance of beach width is likely limited to the availability of large volumes of sand.
2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	An EWS is useful for many purposes e.g. to inform coastal works, fishing, and navigation.	The EWS alone does not reduce the hazard impacts. Its effectiveness depends on the public's responses, on the coordination between local communities and state agencies, and intergovernmental coordination.	
Component 3. Coastal Protection and Adaptation response for High-Risk Areas			
3. Coastal Protection and Adaptation response for High-Risk Areas			Disposal option for maintenance dredging of harbors and channels
Component 4. Awareness Raising, Knowledge Dissemination and National Capacity Strengthening			
4.1 Promotion of ecologically responsible behaviors through climate change communication			
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices			Training has a relatively low cost when incorporated into a formal education curriculum.
4.3 Strengthening of GIS capabilities of CZMAI and partners			
OTHER			The project will ensure that waste materials are properly being disposed of.

Project Outcomes	Conservation of biological diversity	Climate change	Pollution prevention and resource efficiency
Mitigation Measures	The AF Project will enhance close collaboration NHS-CZMAI- NHS and integration in ICZMP & guidelines and benefit flora, fauna, and man.	ICZM is an effective method & low-cost alternative to minimize property damage due to coastal flooding and erosion.	The project will ensure that waste materials are properly being disposed of.

Table 72 Compliance with the ESP part 5 of 5

Project Outcomes	Public Health	Physical and cultural heritage	Land and soil conservation
Component 1. Improving coastal land use for resilient habitation and sectoral activities			
1.1 Reduced instances of habitation in vulnerable inland and coastal areas and decreased social and infrastructure costs due to increased resilience	Building codes outline standard requirements for commercial, industrial, and residential structures design and construction according to an acceptable safety level.		
1.2 Improved coordination and implementation of the ICZM Plan			Well-maintained coastal structures and wide beaches, as well as healthy mangroves effectively prevent coastal erosion and flooding.
Component 2. Coastal Vulnerability Monitoring			
2.1 Strengthened data availability for the development of a national coastal saline intrusion program		Saline intrusion monitoring reduces the risk of damage to properties.	A basic tool for Integrated Coastal Zone Management and it strengthens other planning and prevention measures (establishing production zones, tourist facilities, water resource management, agricultural planting decisions) and preparedness measures (early warning systems, emergency and contingency plans).
2.2 Improved shoreline monitoring and coastal erosion baseline establishment for key areas in Belize		Beach erosion monitoring reduces the risk of damages to assets.	
2.3 Improved infrastructural capacity of the NMS to develop a coastal early warning system and model storm surge	EWS minimizes losses particularly human lives. It improves the timing and efficiency of some flood control measures (e.g. storm surge barriers, temporary flood defenses, sandbags) and promotes timely evacuation. The EWS might encourage the development of areas-at-risk where the system is implemented. MITIGATION: Communicate about the existing risks despite this RRM.	EWS is a preparedness measure that reduces the damages related to coastal flooding and storm surge.	
Component 3. Coastal Protection and Adaptation response for High-Risk Areas			

Project Outcomes	Public Health	Physical and cultural heritage	Land and soil conservation
3. Coastal Protection and Adaptation response for High-Risk Areas			Sand re-nourishment protects the area at the back of the renourishment against coastal flooding and erosion. However, the renourished area usually continues to be vulnerable to coastal flooding and erosion. MITIGATION: Maintenance Plan.
Component 4. Awareness Raising, Knowledge Dissemination and National Capacity Strengthening			
4.1 Promotion of ecologically responsible behaviors through climate change communication			
4.2 Improved knowledge and skills for AF entities on the use and deployment of adaptation best practices			
4.3 Strengthening of GIS capabilities of CZMAI and partners			
OTHER	A lack of occupational health and safety standards and procedures could result in injuries to workers or community members		
Mitigation Measures	Occupation health and safety training will be monitored for construction works, and necessary safety equipment, such as boots and hard hats will be provided by the contractor.	Component 2 reduces the risk of damages to assets.	The ICZM and guidelines promote land soil conservation. The project has no specific geographical target area yet. However, for the location of the weather stations, pilot social house, and risk reduction measures under component 3 further assessment will have to be done about their impacts.

Annex V FINAL REPORT: CONSULTANCY TO DESIGN THE PROJECT FOR SHORELINE RECOVER AND SHORELINE STABILIZATION IN DANGRIGA TOWN AND HOPKINS VILLAGE, BELIZE

The Final Report: Consultancy to design the project for shoreline recovery and stabilization in Dangriga and Hopkins village, Belize, conducted by GAMMA – Technologia y Medio Ambiente was completed in January 2022 and the full report is in link provide. https://governmentofbelize-my.sharepoint.com/:b:/g/personal/romeroes_gobmail_gov_bz/EZhGPWt26GBEn8Y_vPyDW8cBrWTfD3qjIFc_yRLNOW3IZA?e=O0bYmZ