STRATEGY FOR REEF RESILIENCE IN

BELIZE

Ambergris Caye, Belize
Photo: Noel Escalante

In loving memory of our dear colleague and friend Vivian Belisle-Ramnarace (1984-2023)

Vivian dedicated over fifteen years to the sustainable management of Belize's natural marine resources. She played a pivotal role in serving as the UNESCO focal point for Belize and more recently has sat on the leadership committee for the Resilient Reefs Initiative.

Vivian has contributed extensively to the development of this strategy and countless others to ensure a pathway for continued collaboration between entities, cohesion of national interests, and the achievement of conservation goals.

She will be remembered as a true ocean hero.

Abbreviations

AGRRA	Atlantic and Gulf Rapid Reef Assessment
BBFPU	Blue Bond and Finance Permanence Unit, Office of the Prime Minister
BBRS	Belize Barrier Reef System
BE	Blue Economy
BFiD	Belize Fisheries Department
BSOP	Belize Sustainable Ocean Plan (i.e. Marine Spatial Plan)
CRCL	Center for Resilient Cities and Landscapes
CRO	Chief Resilience Officer
CZMAI	Coastal Zone Management Authority & Institute
GBRF	Great Barrier Reef Foundation
GDP	Gross Domestic Product
GSAPP	Graduate School of Architecture, Planning and Preservation
ICZM	Integrated Coastal Zone Management

MBECA	Ministry of the Blue Economy and Civil Aviation
MAR	Mesoamerican Reef
MPA	Marine Protected Area
NGO	Non-governmental organization
PfP	Coastal-Marine Project Finance Initiative for Permanence
RMF	Resilience Measurement Framework
RRI	Resilient Reefs Initiative
SCTLD	Stony Coral Tissue Loss Disease
TASA	Turneffe Atoll Sustainability Association
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UB-ERI	University of Belize Environmental Research Institute
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund

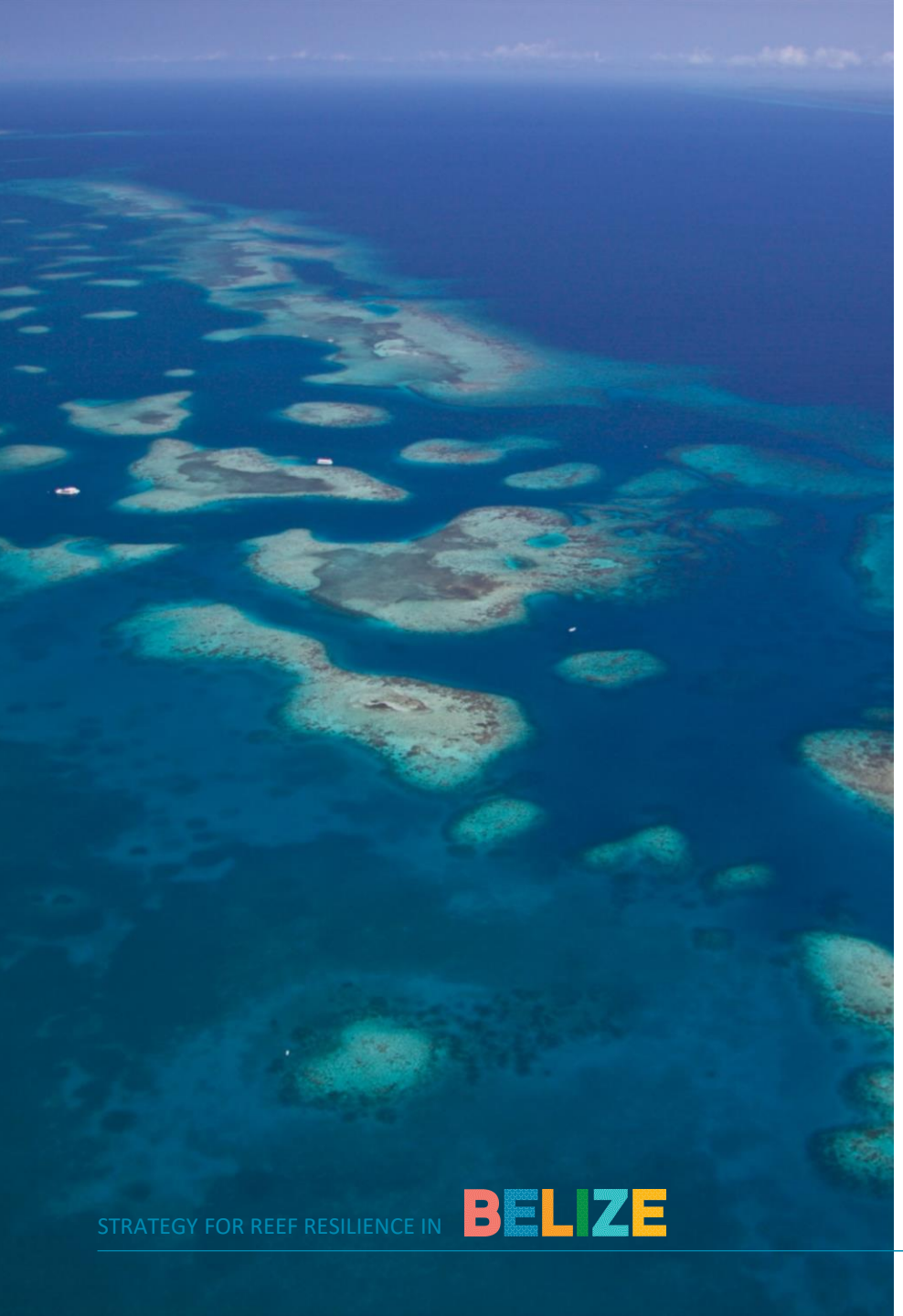


Table of Contents

Executive Summary

In 2021, the Government of Belize entered into partnership with the Great Barrier Reef Foundation through the Resilient Reefs Initiative to develop a Resilience Strategy for Belize's reef system. The objective being to identify threats to Belize's reef and to develop a bold and innovative vision for future management that includes solutions designed to build the resilience of both coral reef ecosystems and communities that depend on them.

Utilizing the Reef Resilience Framework, an assessment of governance strength, ecosystem health, and community well-being surrounding Belize's reef system was conducted through a series of interviews, community meetings, data and literature review, and stakeholder workshops. This crosscutting review led to an extensive mapping of existing efforts, and the identification and prioritization of threats where actions should be taken to improve reef and community resilience.

Communities identified rapid coastal development, livelihood diversification opportunities, and limited involvement in decision-making as challenges. Whereas stressors such as rising sea temperatures, diseases, poor water quality, extractive resource use, and poor watershed management were identified as ecosystem challenges. Concerning governance challenges, limited capacity (both human and financial) were identified as barriers to effectively enforcing existing environmental regulations, and outdated frameworks and management plans inhibit authorities from effectively managing protected areas and natural resources.

A robust co-design process was led to identify a set of actions that will address those threats, build on existing efforts and leadership, and demonstrate impacts for reef and community in the near term. With funding support from the Resilience Reefs Initiative, and in partnership with local NGOs and research partners, the Coastal Zone Management Authority and Institute will be advancing the below three key actions :

- **Strengthening coral reef resilience** through science for adaptive management and stakeholder engagement, to respond to long-term threats;
- Assessing **coastal-marine land tenure** to enable restoration and protection of key coastal habitats; and
- Improving the wellbeing of Belize's small-scale fisherfolk through the creation of viable, sustainable, and **resilient supplementary livelihoods.**

While we recognise that these actions alone are not sufficient to tackle all the challenges identified, they represent a swift responses, significant investment and much needed cooperation required for our nation to be better prepared to manage an ever-changing social, political, and physical environment.

Foreword

The Great Barrier Reef Foundation is delighted with the launch of the Strategy for Reef Resilience in Belize, delivered through our global Resilient Reefs Initiative. Resilient Reefs is a AUD $14 million global climate resilience program that includes the Belize Barrier Reef as a critical pilot site. Partnering with four World Heritage Sites, Resilient Reefs connects local reef managers and communities with a global network to catalyze and implement solutions that build both the reef and community resilience, together and at scale.

Each of these diverse and treasured natural wonders are under threat from a combination of both shared and site-specific challenges. Resilient Reefs partners with the reef management organisations of these sites and provides a wide range of resources, connections, and technical expertise, all focused on building concrete solutions. This includes funding for a new Chief Resilience Officer (CRO) position, advice, and technical support to develop a Resilience Strategy, connecting sites to a global knowledge network of climate resilience leaders, and access to AUD $1M to support the implementation of priority resilience actions.

Our partnership with Belize is based with the Coastal Zone Management Authority and Institute (CZMAI) and spans dozens of NGOs and government departments. We warmly congratulate all involved in showing the world what a new approach to resilience-based management of coral reefs can look like. We truly believe this is the best chance for reefs and reef-dependent communities to respond to the changes ahead – and it has been a privilege to witness the eagerness of the Belize stakeholders, reef management authority, and multiple government entities to embrace the challenge of a new approach.

2022 was a year of significant challenges and significant progress. The United Nations urged “ambitious, rapid and sustained” action on climate change to protect coral reefs. But it also featured tremendous momentum and resources for action in the oceans space including the Our Ocean Conference, the UN Ocean Conference, and the Biodiversity COP. The leadership of countries like Belize is crucial to demonstrating what climate action for oceans can and should look like. And this Strategy, which not only addresses ecological challenges, but also socio-economic and governance challenges, and is designed and delivered with local communities, NGOs, and multiple government partners is an exemplar in the field.

This Resilience Strategy builds on significant leadership and tremendous innovation happening across the country. A key aim of the Strategy is to integrate and leverage efforts—identifying the gaps and opportunities which can generate greater impact. Indeed, I believe the projects highlighted and funded in this document reflect just those opportunities. This Resilience Strategy presents an ambitious vision which aims to strengthen the community’s resilience through actions such as supporting local livelihoods and diversifying the economy, improving managers’ access to data and decision support tools on reef resilience, treating coral disease and trialing restoration methods, and conducting foundational analysis to support the development of a national blue carbon framework.

The Great Barrier Reef Foundation is immensely proud to lead the Resilient Reefs Initiative and on behalf of the entire Resilient Reefs network – including our partners, UNESCO, The Nature Conservancy’s Reef Resilience Network, Columbia University’s Center for Resilient Cities and Landscapes, Resilient Cities Catalyst, AECOM, and BHP Foundation – we celebrate the incredible work Belize has accomplished and look forward to deepening our partnerships there and globally to support implementing this strategy, and seeing its goals realised.

Anna Marsden
Managing Director
Great Barrier Reef Foundation

Ministerial Statement on behalf of the Belize Government

The Belize Barrier Reef System (BBRS) is a UNESCO World Heritage site that is deeply connected to our livelihoods and culture where a mosaic of mangroves, beaches, lagoons, coastal wetlands, limestone valleys and hills, and seagrass beds anchor a highly productive ecosystem that has sustained human settlements over hundreds of years. Today, the BBRS provides essential coastal and marine ecosystem services, sustains a growing and sustainable blue economy, supports livelihoods of thousands of people, and contributes to protecting coastal communities against adverse effects of climate change. It is estimated that the reef contributes more than a billion dollars to our national economy. Therefore, it is truly a national treasure worth protecting.

Sadly, this reef system is facing several local threats including rapid coastal development, invasive species, diseases, as well as multiple impacts from climate change such as coral bleaching, more severe storms, and rising sea levels. As these threats grow, it is crucial that we act now to increase resilience through strengthening the protection and management of the BBRS.

The Belize Barrier Reef Reserve System was taken off UNESCO's List of World Heritage in Danger in 2018 and since that time the Government has been unwavering in its commitment to protect our natural assets, especially our renowned World Heritage Site. More recently in November 2021, the Government of Belize has gained significant momentum in these efforts through the signing of the first-ever marine debt for nature swap termed as the "Blue Bonds."

However, addressing some of these long-standing issues/threats is a national, continuous, and collaborative effort. This strategy debuts three flagship actions that are intended to advance resilience-based management and complement existing efforts in the Blue Loan Agreement (BLA) and Conservation Commitments, the National Blue Economy Development Policy, Strategy and Implementation Plan, the Nationally Determined Contributions (NDC) and the development of the Belize Sustainable Ocean Plan (BSOP) as well as other strategies that highlight the need for international partnership ad local leadership.

The Government of Belize and our Ministry of the Blue Economy and Civil Aviation extends its heartfelt gratitude to all stakeholders, action partners, and the knowledge network of the Resilient Reefs Initiative who assisted in the delivery of the Strategy for Reef Resilience in Belize.

Special thanks the Great Barrier Reef Foundation and the strong partnership fostered by the Belize Coastal Zone Management Authority and Institute and the Belize Fisheries Department. We look forward to advancing this work and continuing the path to sustainability and building resilience within our ecosystem, institutions, and communities reliant on the BBRS.

Hon. Andre Perez

Minister of Blue Economy and Civil Aviation

Introduction

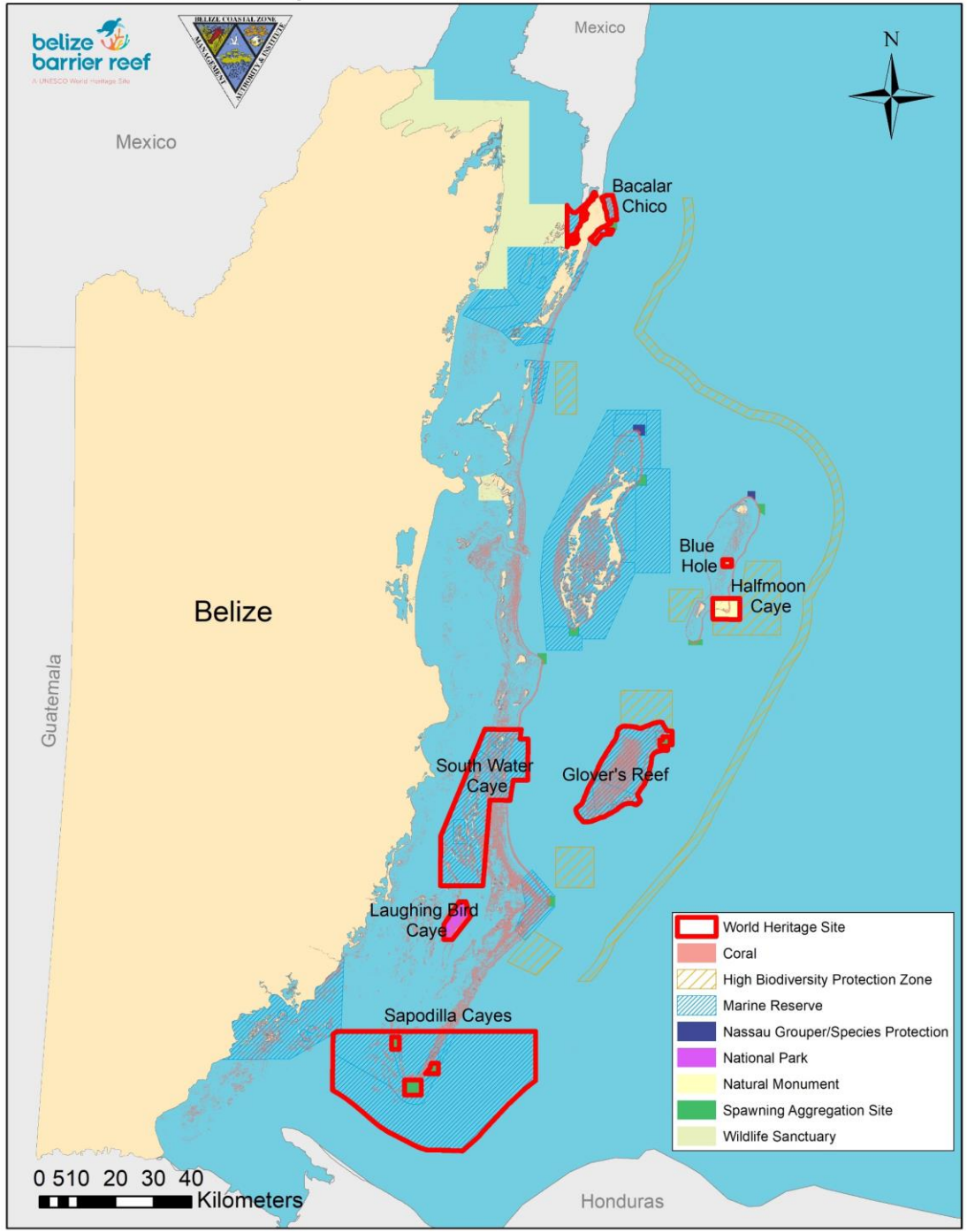
Photo: Wildlife Conservation Society

Belize

Belize is a global leader in conservation at a time when ocean and marine sustainability is paramount to delivering on global climate goals. Within the waters of Belize lies the heart of the Mesoamerican Reef, the second largest barrier reef in the world. Spanning approximately 300 km in length, the Belize Barrier Reef System (BBRS) is inclusive of cayes (barrier islands), mangrove forests, seagrass meadows, fringe reef, patch reef, and three coral atolls. Known globally for its incredible reefs and iconic features such as the Great Blue Hole, the BBRS supports an incredible biodiversity of flora and fauna, including many threatened and endangered species.

In 1996, a composite of seven marine protected areas (MPAs) along the BBRS, collectively referred to as the Belize Barrier Reef Reserve System, was inscribed as an United Nations Educational, Scientific and Cultural Organization (UNSECO) World Heritage Site for its outstanding universal value. The wealth of diversity found in the World Heritage Site and along the BBRS as a whole provides significant cultural and economic value for the country of Belize. Roughly half of the population of Belize is supported by incomes generated through the reef, mainly tourism and fishing, with wild caught spiny lobster, queen conch, and finfish, and farmed shrimp and tilapia as key exports. Valuation studies of the reef that include tourism and fisheries have found that these activities provide over US$200 million per year to the Belizean economy, around 15% total GDP (in 2014).

Belize Barier Reef System



Beyond these direct economic benefits, the BBRS provides multiple indirect ecosystem services. Through its mangrove forests and coral reefs, the BBRS provides significant coastal protection from storms and erosion which has been estimated at over US$300 million annually.

The cultural and heritage value of the reef is more difficult to measure. Belize is home to a variety of rich and diverse ethnic groups of distinct cultural and historical heritage. These groups (particularly the Garifuna, Kriol, Maya, & Mestizo), as well as other coastal communities, seek to preserve and maintain cultural values and heritage, and their link with the marine environment. Artisanal fishers gather lobster and conch by hand, and catch snapper and grouper with spears and handlines, preserving a traditional way of life that is closely tied to the sea.

The full value of the BBRS is not well defined, but it is clear that these benefits extend well beyond the borders of Belize. Due to the inherent connectivity of marine ecosystems, the BBRS can serve as a stock or source population to other segments of the Mesoamerican Reef. Additionally, as reef restoration efforts seek corals capable of surviving the climatic pressures of the future, the existing diversity and genetic variability of corals in the region may be vital to restoration efforts. The seagrass and mangrove habitats along the coast also represent a carbon stock with the possibility of blue carbon capture and natural shoreline protection.

Photo: Wildlife Conservation Society

While there are clear benefits of the reef to both the country of Belize and the greater region, there are also a variety of threats to the BBRS. This has previously led to the World Heritage Site being inscribed to UNESCO's List of World Heritage in Danger in 2009 due to the risk of irreversible damage to the reef system posed by potential oil exploration and coastal development. Since 2009, Belize has put in place measures to mitigate against the threats identified in the inscription such as the institution of a moratorium on oil exploration, banning unsustainable fishing practices, and revising regulations to better protect mangroves.

While these efforts have been sufficient to be removed from the List of World Heritage in Danger in 2018, many threats persist. The largest reaching of these is climate change. Anthropogenic increases in seawater temperatures are causing coral bleaching resulting in high mortality, while uptake of carbon dioxide is reducing the ocean's pH which slows coral growth and dissolves the reef matrix. Compounding these global stressors are local threats that deteriorate the health and resilience of the reef including mechanical damage from maritime activities, land- and marine-based pollution, coastal development, and fishing pressure on particular fish stocks. Sea level rise, coastal erosion, and extreme weather events all threaten the reef and the coastal populations, who simultaneously rely on, manage, and care for the reef system.

In light of the unique and diverse value of the BBRS, Belize continues to work to preserve its ecosystems. Belize has formally committed to a number of ambitious conservation goals through many avenues including the Blue Bonds for Ocean Conservation Program and through the Paris agreement. Through these commitments, Belize aims at halting coastal wetland loss, restoring mangrove habitat, improving policy and plans, and effectively managing the BBRS. Belize has fostered strategic partnerships with an array of international organizations to leverage global experts and resources towards achieving these goals. One such partnership is with the Resilient Reefs Initiative (RRI).

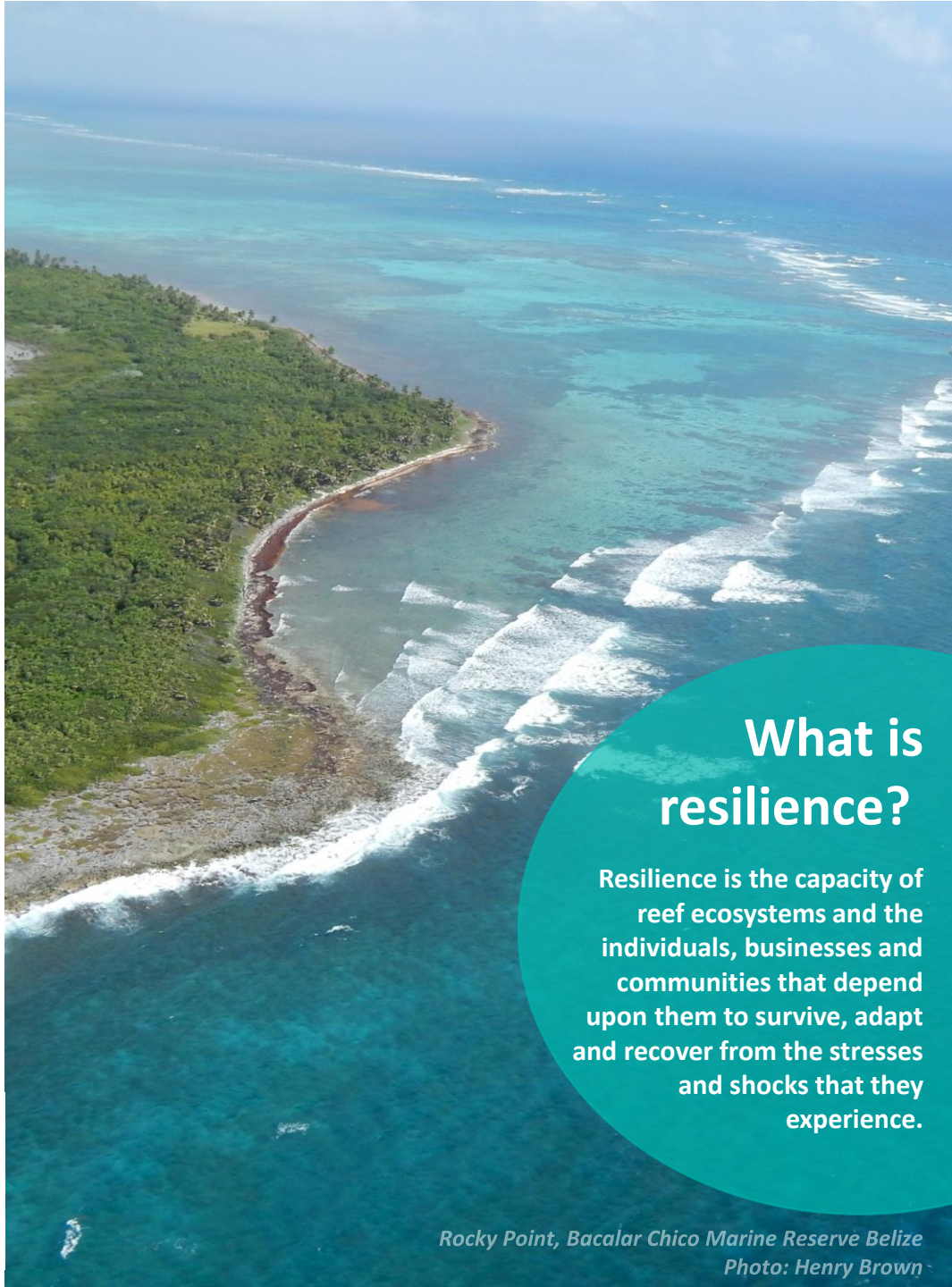
Resilient Reefs Initiative

The Resilient Reefs Initiative (RRI) is a global partnership working with UNESCO World Heritage coral reef sites and the communities that depend on them to adapt to climate change and local threats. Headed by the Great Barrier Reef Foundation (GBRF) and delivered in partnership with a series of global partners, RRI collaborates on the design and delivery of integrated solutions that build the resilience of coral reefs and the communities that depend on them. The work is led and delivered by local governments and communities and is informed by global experts and the best science available.

RRI is initially being piloted across four World Heritage reef sites (including the Belize Barrier Reef Reserve System, the Ningaloo Coast in Australia, the Lagoons of New Caledonia, and the Rock Islands Southern Lagoon in Palau). In each site, RRI's commitment to sites include:

- Local Leadership: Funding and support for a new Chief Resilience Officer (CRO) embedded within local reef management organizations
- Strategic Planning: Technical support and partnership in the development of a holistic Resilience Strategy
- Global Expertise: Connection to a Knowledge Network with the best available science and policy
- Action Implementation: AUD$1M seed funding and design support to implement solutions with community on the ground

Great Barrier Reef Foundation · unesco · The Nature Conservancy Reef Resilience Network · COLUMBIA Center for Resilient Cities and Landscapes RESILIENT CITIES CATALYST · AECOM · BHP Foundation



What is resilience?

Resilience is the capacity of reef ecosystems and the individuals, businesses and communities that depend upon them to survive, adapt and recover from the stresses and shocks that they experience.

Rocky Point, Bacalar Chico Marine Reserve Belize
Photo: Henry Brown

The Strategy Development Team

Several entities were involved in providing guidance, support, and inputs during the strategy development process.

The CRO, who is based within the Coastal Zone Management Authority and Institute (CZMAI), spearhead the process and development of the Resilience Strategy for the BBRS, as well as co-design of projects with local partners.

The core team was an amalgamation of international and local partners with representation from CZMAI, Belize Fisheries Department (BFiD), GBRF, AECOM, and Wildlife Conservation Society (WCS). The main role of the core team was to support the CRO and provide input throughout the strategy development process.

A leadership team, comprised of policy makers and directors within the CZMAI & the BFiD, provided overall guidance and support to the CRO and core team; oversaw the process of strategy development; and ensured outputs are integrated and well aligned with national interests, goals, and complementing strategies.

Finally, the project steering committee was a board of experts from the Belize Audubon Society, BFiD, Belize Tourism Industry Association, CZMAI, Belize Forest Department, MARFund, Southern Environmental Association, the Belize National Commission for UNESCO, WCS, World Wildlife Fund (WWF), and a Belize World Heritage Site expert. The steering committee provides overall feedback at each stage of the strategy process and provides general guidance and validation.

This strategy, and the actions being put forth, are a product of the RRI partnership.

This six-year, AUD$14 million program is a collaboration between the GBRF, UNESCO, The Nature Conservancy's (TNC) Reef Resilience Network (RRN), Columbia University's Center for Resilient Cities and Landscapes, Resilient Cities Catalyst and AECOM. The project is enabled by the BHP Foundation.

Assessing the Resilience of the Belize Barrier Reef System

Photo Credit: CZMAI

How was the Resilience of the BBRS Assessed?

Strengthening the resilience of ecosystems and community requires the resources, expertise and experience of many management agencies, organizations, researchers, and individuals. This is compounded by the fact that ecosystems and communities are complex, dynamic systems with intricate interconnections. Integrated planning is essential for delivering better outcomes for the reef and community, managing this complexity and leveraging synergistic effects.

The resilience assessment process provides a holistic assessment of threats and opportunities across ecosystem, community and governance based on a combination of research and stakeholder engagement. Using the Reef Resilience Framework and tools created and piloted by RRI, the local team conducted a review of the strengths and weaknesses of the socio-ecological system and determined critical resilience challenges that are affecting or are likely to affect the BBRS and the associated communities.

Existing research, management plans and policy documents, as well as the experience and knowledge garnered from the input of community members, key stakeholders, reef managers, and governmental agencies, were all synthesized to determine existing threats where actions could be taken to improve the resilience of the reef and community in Belize. Further refinement and validation of the results occurred with stakeholders, the leadership group, and steering committee. Elaboration on these steps are outlined in the following pages.

The Reef Resilience Framework

RRI has developed a Reef Resilience Framework to support managers to better understand the resilience of their reef and community, identify strengths and weaknesses, and prioritize actions. The framework helps holistically assess coral reefs, the communities that depend on them, and the governance arrangements that influence them as an integrated system. The results provide an understanding of the shocks and stressors to the system, local strengths, ongoing work, and gaps that can be addressed to improve resilience.

The Framework provides a structure for understanding reef resilience through layers of increasing detail including 3 Dimensions and 12 corresponding Attributes.

Framework Dimensions:

- **Ecosystem** - the preservation of ecosystem services.
- **Community** - maintaining or improving community wellbeing.
- **Governance** - the maintenance of robust and effective governance arrangements to support these outcomes.

The next page illustrates the resilience concept and framework in practice.

A Resilient Community...

... maintains community wellbeing in the face of disasters

... is able to retain its core community values while continually evolving in the face of change

... is equitable and can meet the basic needs of all

... is aware of, and plans for, current and future shocks and stresses

A Resilient Ecosystem...

...Supports a sustainable Blue Economy, recreational and cultural activities

... is robust in the face of natural disasters or local disturbances

... is able to evolve and adapt to changing environmental conditions while retaining core functions

Resilience is supported by...

- Robust infrastructure and services
- Holistic, integrated planning
- Access to adequate resources

Resilience is supported by...

- Minimising local pressures to ensure ecosystems are as healthy as possible
- Preserving key species, habitats and functional processes
- Strong legislative and regulatory protection and effective management

- Economic and livelihood diversification
- Community cohesion, cooperation and support for management
- Effective emergency planning and management

- Assisting ecosystems to recover (e.g. restoration)
- Connectivity with healthy source populations
- Sustained reproduction and recruitment

- Collective learning, experimentation and innovation
- Participatory, collaborative and transparent decision-making
- Flexible, adaptive approaches to management

- Maintaining a diversity of species, genes and habitats
- Promoting the development of resistant species
- Supporting the evolutionary potential of reefs

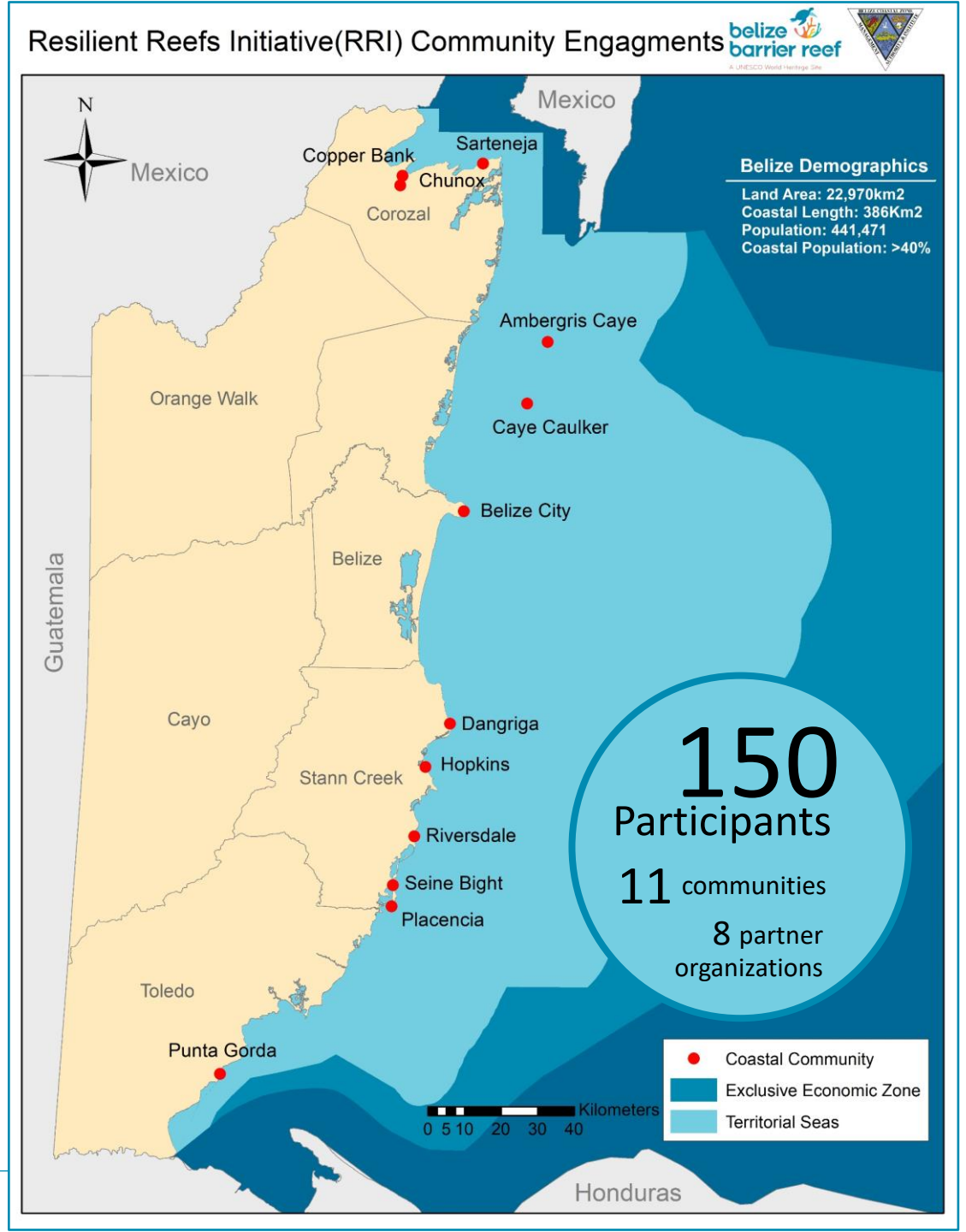
Maintaining inclusive, collaborative, and adaptive management arrangements
Transparent arrangements that ensure equitable rights and access to resources and opportunities
Adequately resourced governance systems that respect traditional users and reflect contemporary values

Community Meetings

In a collaborative effort with other ongoing projects and initiatives, the CZMAI team engaged eleven coastal communities (illustrated on the map) to determine resilience challenges in each area. Participants included fishers, tour operators, municipal and village councils, local non-governmental organizations, real estate agents, and concerned citizens. Discussion was prompted by asking community members about the current state of mangroves, seagrass, and coral ecosystems in the area, status of marine protected areas management, and perceived threats. Common resilience challenges and threats were identified across all eleven communities.

Stakeholder Interviews

Stemming from the stakeholder mapping exercise, targeted consultations/interviews were conducted with key organizations working on the ground to inform the status of resilience in each dimension (Governance, Ecosystem, and Community). Targeted interviews also served to corroborate common challenges faced by coastal communities and to provide additional context to each of these challenges.



Existing Policy and Strategy Review

An incredible amount of work pertaining to the health of the reef and community has been undertaken and is currently occurring in Belize. Much of this work is captured in management plans, action plans, existing policy, frameworks, strategies, and guidelines. For this assessment, plans focused primarily on fisheries, corals, MPA management, tourism, coastal development, waste management, trade, and emergency response work were collected and reviewed (Appendix I) to highlight ongoing or planned actions related to resilience building, identify ongoing threats to the resilience of the reef and community, find synergistic projects, and corroborate findings from community and stakeholder engagement. 429 distinct actions were identified that address at least one of the dimensions of the Reef Resilience Framework. These actions and plans informed the analysis of gaps, strengths, and ongoing threats to the resilience of the reef and community in Belize.

62
Plans reviewed
From 20 organizations
&
429
resilience actions identified

Design Studio and Resilience Accelerator

After initial consultation with communities and target interviews, the Water Urbanism Design Studio* and Resilience Accelerator program** were used to unpack and contextualize the most cited challenge/threat to resilience: coastal development. Working in partnership with Columbia University's Climate School, the objectives of the accelerator program were to convene local and global experts to advance new thinking about coastal development challenges focused on multi-scale and multi-disciplinary perspectives. Design and policy principles, and conceptual design and spatial visions at 11 sites across Belize were used to guide the development of the key focus areas in the next section.

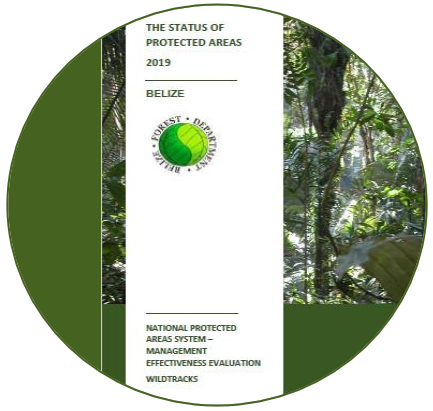
*The Graduate School of Architecture, Planning, and Preservation (GSAPP) Water Urbanism Design Studio investigates the process of urbanization in a global context and examined sites facing substantive structural and social change.

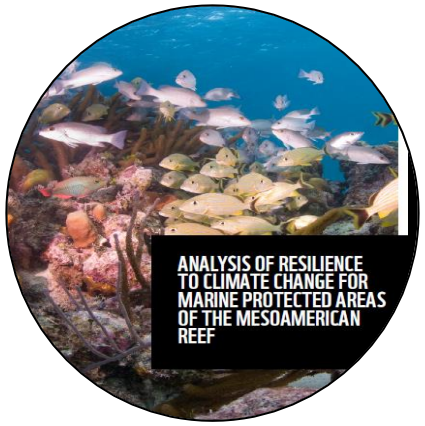
**The Resilience Accelerator program delivered by the Center for Resilient Cities and Landscapes (CRCL) at Columbia University. The accelerator works with an expended network of partners to strengthen the biophysical, drive social and climate justice, build institutional capacity, and expand equitable economic outcomes of projects.

Current Assessments

In addition to community engagements and policy reviews, the resilience assessment also relied on existing studies and reports that provided relevant information on identifying resilience challenges and defining opportunities for embedding resilience-based management. Below is a summary of these reports:

Status of Protected Areas 2019: The evaluation of management effectiveness of protected areas has been recognized as a critical tool in the conservation of Belize's natural resources, protection of critical ecosystem services and provision of socioeconomic benefits. Under this evaluation exercise, all Marine Protected Areas (MPAs) scored within the range 60-85% under the seven management categories listed. Key threats were also identified for MPA management including, but not limited to, anchor damage/ship grounding, mangrove/ littoral forest clearance, inappropriate coastal development, & sewage pollution. This report also generated many management measures for consideration by the government.





Reef Resilience Index: This research aimed to analyze anthropogenic and natural threats to targeted MPAs as well as assess their resilience. The analysis intended to provide baseline figures for the BBRS to use as reference for future resilience assessments. Data collected stemmed from all sites, Healthy Reefs Initiative report cards, and modelling exercises. The research targeted a total of 25 MPAs within the Mesoamerican Reef (MAR) region within the period spanning 2006-2018. Belize's scores range from Very Good to Fair.

SMART Coasts: This project aimed to mainstream climate-smart principles into marine protected area management and coastal development policies in countries within the MAR Region with a view to improving the adaptive capacities of coastal communities. The project designed a portfolio of ecosystem-based adaptation measures. That is, those that use biodiversity and ecosystems to help people adapt to climate change. Adaptation measures produced from this project include mangrove protection, mangrove restoration, coral reef protection, reef restoration, watershed basin restoration, watershed basin protection, and sustainable agriculture.

Validation & Prioritization

To ensure findings from the resilience assessment are aligned with local knowledge and did not miss key threats or opportunities, multiple rounds of validation were held. Throughout the process, the experts from both the Leadership Group and Steering Committee were key in confirming findings from the resilience assessment. In addition, stakeholder workshops and further targeted consultations were held to validate the findings and prioritize areas to focus on for action development.

Stakeholder Workshops

Two stakeholder workshops were held to further unpack the resilience challenges surrounding watershed management and livelihood diversification. Local stakeholders were asked to participate in action scoping activities that would address the prioritized challenge areas. The goal was to build actions upon existing achievements and findings to date in collaboration with these stakeholders.

Resilience can also be said to be "threat agnostic". It does not try to identify particular threats, but rather assumes that at some stage, some threat or combination of threats will materialize and disrupt the system. The goal therefore is to be ready for whatever happens, even if it cannot be anticipated and has never happened before. (Hynes, 2019)

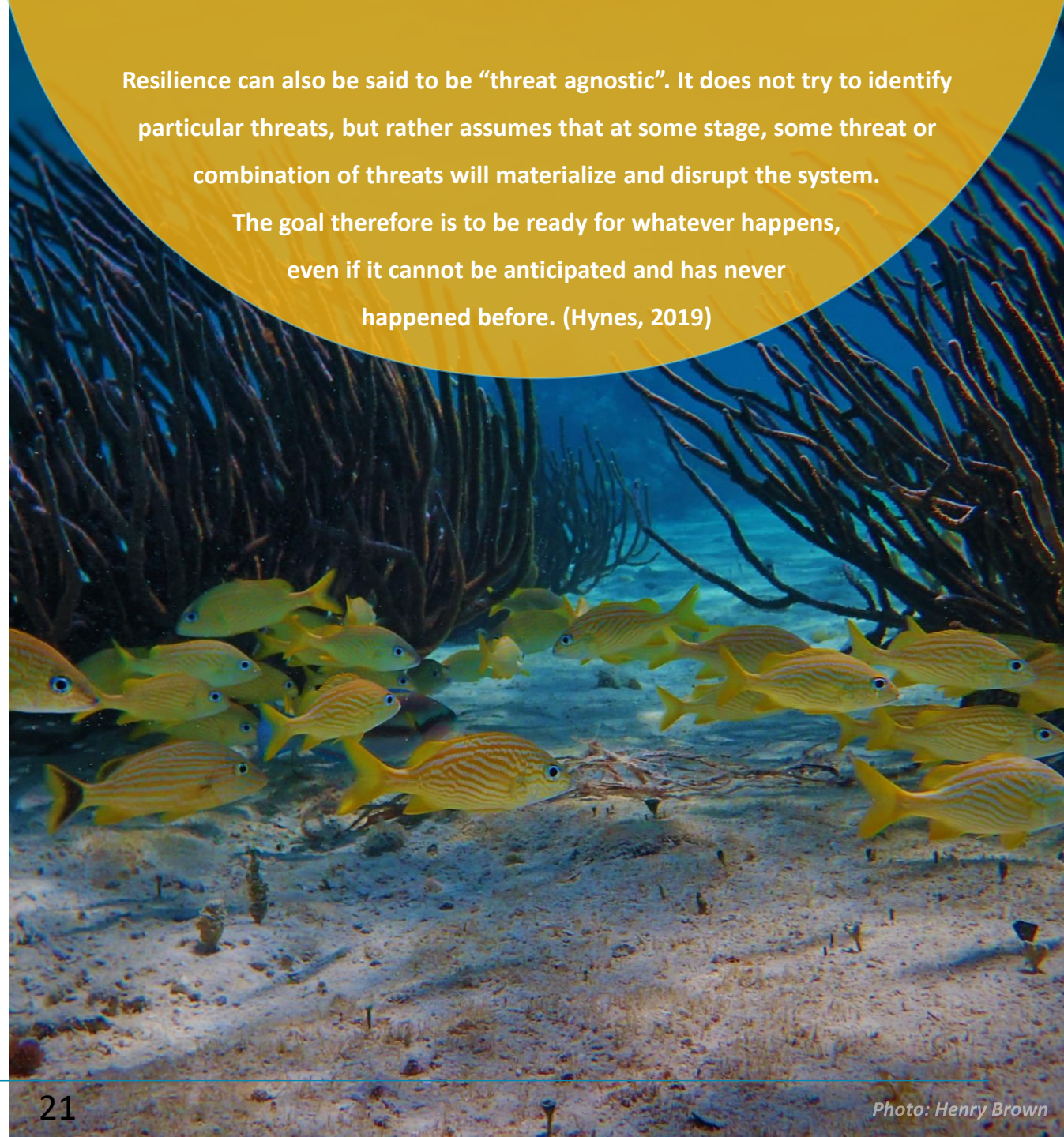


Photo: Henry Brown

Results of the Resilience Assessment

Hol Chan Marine Reserve, Belize
Photo: Marcus Alamina

Resilience Challenges

Engagement sessions revealed long-standing issues and areas of significant interest for community members and managers. Findings also revealed past projects, interests for current work, and perceived roadblocks to make meaningful change. Threats identified within each dimension of the Reef Resilience Framework do not exist in silos from each other. To fully appreciate each threat, the interconnectedness of shocks, stressors, and potential opportunities need to be considered. The image below illustrates the main resilience challenges identified that account for interconnections, persisting issues, and opportunities for action. Outlined below is a summary of the most cited challenges.

Community Challenges

Rapid coastal development has been highlighted as a main local driver for many threats to resilience in Belize. Habitat loss and degradation because of coastal development was the top challenge identified from the resilience assessment. Communities identified several cases where mangrove clearing, and marine dredging are occurring to advance private coastal developments, which severely impacts key marine ecosystems and ecosystem services. The pace of development also impacts the capacity to implement key infrastructure such as water treatment and drainage. There is a clear need to ensure a balance of commercial use, ecosystem protection, and community priorities.

Livelihood diversification programs are a common remedy used by projects to support and improve community resilience in Belize. However, these programs are often embedded in two- to five-year projects where goals are achieved only so far as grant funding allows, and at times the project produces vocations that people do not identify with. This project-cycle approach does not allow for long-term monitoring, livelihood development, or gains in financial sustainability of small business startups, leaving target community members economically vulnerable and thereby reverting to the original extractive resource uses such as fishing. Revisiting and comprehensively cataloging the challenges encountered by previously implemented and existing projects that focus on livelihood diversification is needed to inform and improve future livelihood diversification efforts.

Limited pathways to partake in decision-making processes and distrust between government and community have been a concern for coastal communities. The ease of access to information is also mentioned as a challenge for transparency. While there are many grassroots organizations and community groups present in coastal communities, there is a need to solidify top-down connections between these organizations and governmental agencies. Suggestions to improve this include increasing government collaboration in engagement sessions, and consistent updating and publication of projects on government websites.

Photo: Thad Pawlowski

Ecosystem Challenges

Coral ecosystems in Belize face many threats that inhibit their capacity to rebound from shocks. Stressors such as rising sea temperatures, disease, poor water quality, and extractive resource use have been highlighted by reef managers and communities that utilize the reef. In particular, the stony coral tissue loss disease (SCTLD) has been identified as a pressing threat to coral ecosystems. Response efforts, however, have varied across the barrier reef and MPAs and there is limited research to inform management on the appropriate management responses. Other direct threats to reef ecosystems include anchor strikes/ damage from boats, high volumes of tourist visits to reef sites, and unsustainable tourism practices.

Watershed management remains a key priority for management entities and coastal communities; however, overlapping mandates and limited capacity to effectively implement management strategies have led to reactive measures rather than proactive planning. Looking further inland, additional concerns for watersheds in Belize include soil erosion, which is exacerbated by mining activities, deforestation, development, and climate change. This, combined with industrial and agricultural effluent and other wastewater concerns, also threatens watersheds, coastal habitats, coral reefs, and local communities.

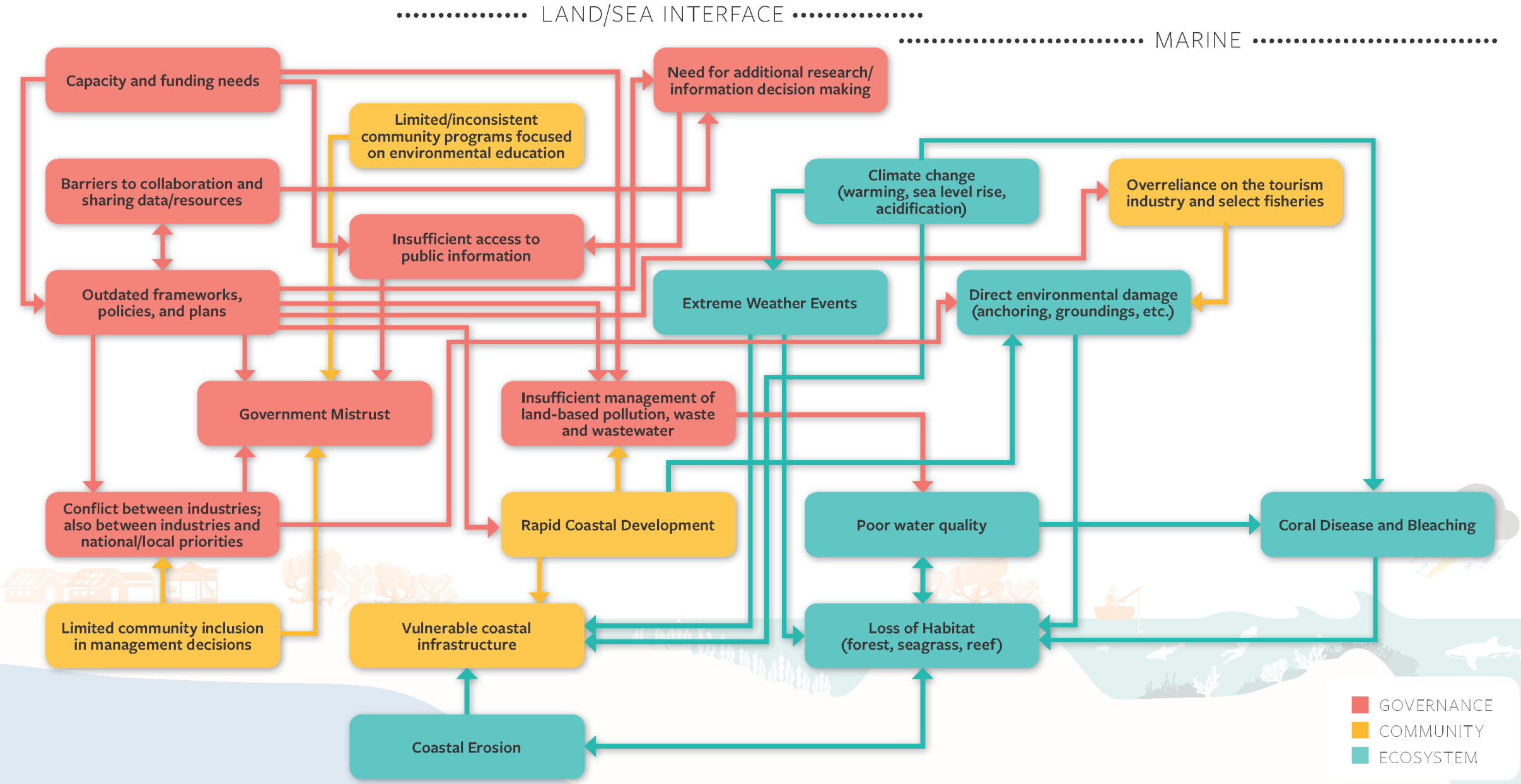
Conservation and Compliance Unit, Belize Fisheries Department
Photo: Wildlife Conservation Society

Governance Challenges

There is limited capacity (human & financial) to effectively enforce existing environmental regulations. Often times, the 'damage has been done' once authorities are made aware of infractions and limited action is done to restore habitats affected. While many strategies and tools have been introduced and implemented to assist enforcement, sustainable capacity-building measures and financial constraints need to be addressed.

Outdated frameworks and management plans inhibit managing entities from effectively carrying out their mandates to manage protected areas and resources. The lack of cohesive legal framework is worsened by a separated institutional framework dividing water resource management across the country. This is further compounded by a lack of comprehensive monitoring data, limiting the ability to make decisions based on evidence.

Interconnectedness of Resilience Challenges



Focus Areas

The resilience assessment findings and challenges outlined in the previous section were then synthesized into the following focus areas and cross-cutting themes:

- Ecosystem restoration & protection
- Enabling an environment for livelihood diversification
- Community engagement
- Climate change

Each of these focus areas provides a broad range for action development and flexibility to respond to multiple resilience challenges. They were also chosen in part by the timeliness for action, interconnectedness of challenges, political appetite for action, and cost effectiveness.

Focus Area 1: Ecosystem restoration & protection

Goal: The BBRS and supporting coastal and marine ecosystems are able to survive, recover and adapt to shocks and stresses in the future.

Focus Area 2: Enabling environment for livelihood diversification

Goal: Supplementary and alternative livelihood strategies equip coastal communities to respond and adapt to shocks and stressors affecting coastal and marine ecosystems.

Cross-cutting themes

Through the resilience assessment and collaboration, two key themes became apparent to the success of improving resilience in Belize:

Community Engagement

Meaningful community engagement is imperative for the success of public policy or management actions within the coastal and marine areas of Belize. While some recent initiatives have been geared toward formalizing fishing groups and committees, there is limited capacity and/or interest to meet continuously and actively to provide input of management decisions. There is a need to provide formal channels for the public and traditional owners to have a role in providing input on decision making and to provide transparency and accountability.

Climate Change

Climate change poses an existential threat to coral reef ecosystems and the communities that depend on them, globally. Belize is considered exceptionally vulnerable to climate change risks which include coral bleaching, more frequent and severe storms, flooding, sea level rise, and coastal erosion. Because these risks impact communities and ecosystems in a variety of ways, it's essential that all actions being developed to address the resilience of the BBRS incorporate likely future climate scenarios.

Taking Action

Lighthouse Reef Atoll
Photo: Johanna Lovecchio

Flagship Actions

Tackling the challenges found in the resilience assessment and finding innovative ways to leverage those opportunities is a robust effort, involving multiple sectors and national and international actors. This Resilience Strategy seeks to highlight and integrate that work towards a common vision of reef and community resilience. By focusing on high impact collaborative actions that are integrated in thinking and design, this strategy aims to catalyze ongoing and future projects, while reaching beyond the direct scope of each action to embed wholistic principles of resilience into the governance, communities, and ecosystem management of Belize.

With funding support from RRI, and in concert with key government agencies, non-government organizations (NGOs) and research partners, CZMAI is currently advancing three key actions to advance reef and community resilience. These actions were co-designed with local and global partners and address several of the key gaps and opportunities identified throughout the Resilience Assessment.

These actions alone are not sufficient to tackle all the challenges identified, but they do signal important investment and coordination toward that end. It will take significant coordination and partnership across the many remarkable NGO, research, and management efforts underway to create a Belize that is not only responsive to current environmental, social, and political pressures, but able to be resilient in the face of future conditions.

Strengthening coral reef resilience through science for adaptive management and stakeholder engagement, to respond to long-term threats

PARTNERS:

- University of Belize Environmental Research Institute (UBERI)
- Turneffe Atoll Sustainability Association (TASA)
- Belize Fisheries Department (BFiD)

Assessing coastal-marine land tenure to enable restoration and protection of key coastal habitats

PARTNERS:

- World Wildlife Fund (WWF)
- Lands & Surveys Department
- Blue Bond Finance & Permanence Unit (BBFPU)
- Ministry of the Blue Economy & Civil Aviation (MBECA)

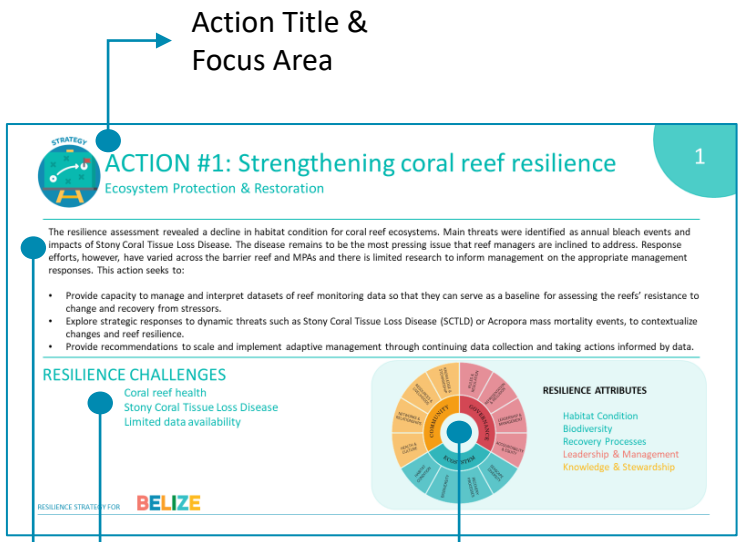
Improving the wellbeing of Belize's small-scale fisherfolk through the creation of viable, sustainable, and resilient supplementary livelihoods

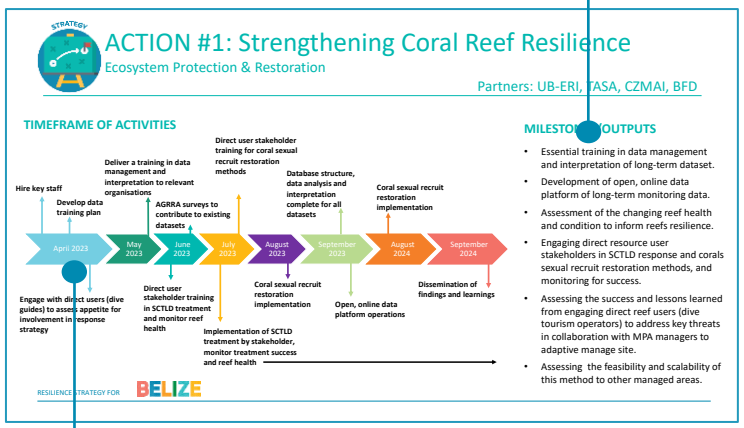
PARTNERS:

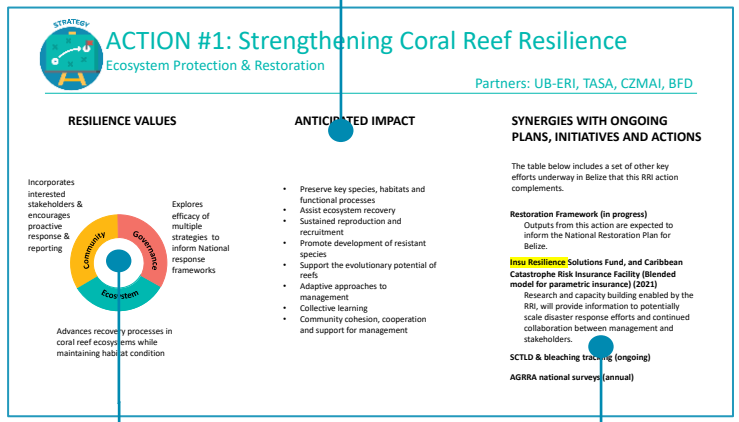
- Wildlife Conservation Society (WCS)
- Coastal Zone Management Authority & Institute (CZMAI)

How to Read the Actions

Each action is outlined in three pages, where details of implementation are depicted along with expected outcomes and overall resilience value.







Action Title & Focus Area

Resilience Challenges

Action Description

Resilience Framework Attributes

Milestones

Timeframe of Activities

Anticipated Impact

Resilience Value

Synergies with ongoing work

ACTION #1: Strengthening Coral Reef Resilience

Ecosystem Protection & Restoration

1

Partners: UB-ERI, TASA, CZMAI, BFiD

The health and resilience of Belize coral reef ecosystems are in decline, with the two most pressing threats identified as stony coral tissue loss disease (SCTLD) and bleaching events. Analyses and interpretation of large, long-term reef monitoring datasets are required to aid effective decision making on how to address these threats and build restoration solutions. However, reef managers have limited capacity and time to analyze the health and resilience of their system. Further, while Belize has been strategic in their response to SCTLD, the disease continues to spread. New response plans to treat this threat and restore reef ecosystems need to be explored. This action, which will be piloted at Turneffe Atoll Marine Reserve, aims to:

- Build the capacity of reef managers through trainings in data management and interpretation of long-term reef monitoring datasets to increase their understanding of the ecological resilience of their monitored sites, thereby aiding response decisions.
- Develop an open, online data platform to disseminate analyzed reef monitoring results to all reef users, using FAIR Principles.
- Directly respond to SCTLD and restoring reefs by engaging direct reef stakeholders (dive guides) to treat SCTLD, implement sexual restoration solutions, and monitor reef health.

Utilizing the outlined methods, this action aims to improve the capacity of reef managers to adaptively manage their response to these threats and therefore increase overall reef resilience. The feasibility of scaling this approach to managed areas nationally will also be assessed.

RESILIENCE CHALLENGES

- Coral reef health
- Stony coral tissue loss disease & bleaching events
- Limited data availability
- Capacity and funding need
- Barriers to collaboration and sharing data/resources

RESILIENCE FRAMEWORK ATTRIBUTES

Habitat Condition
Biodiversity
Recovery Processes
Leadership & Management
Knowledge & Stewardship

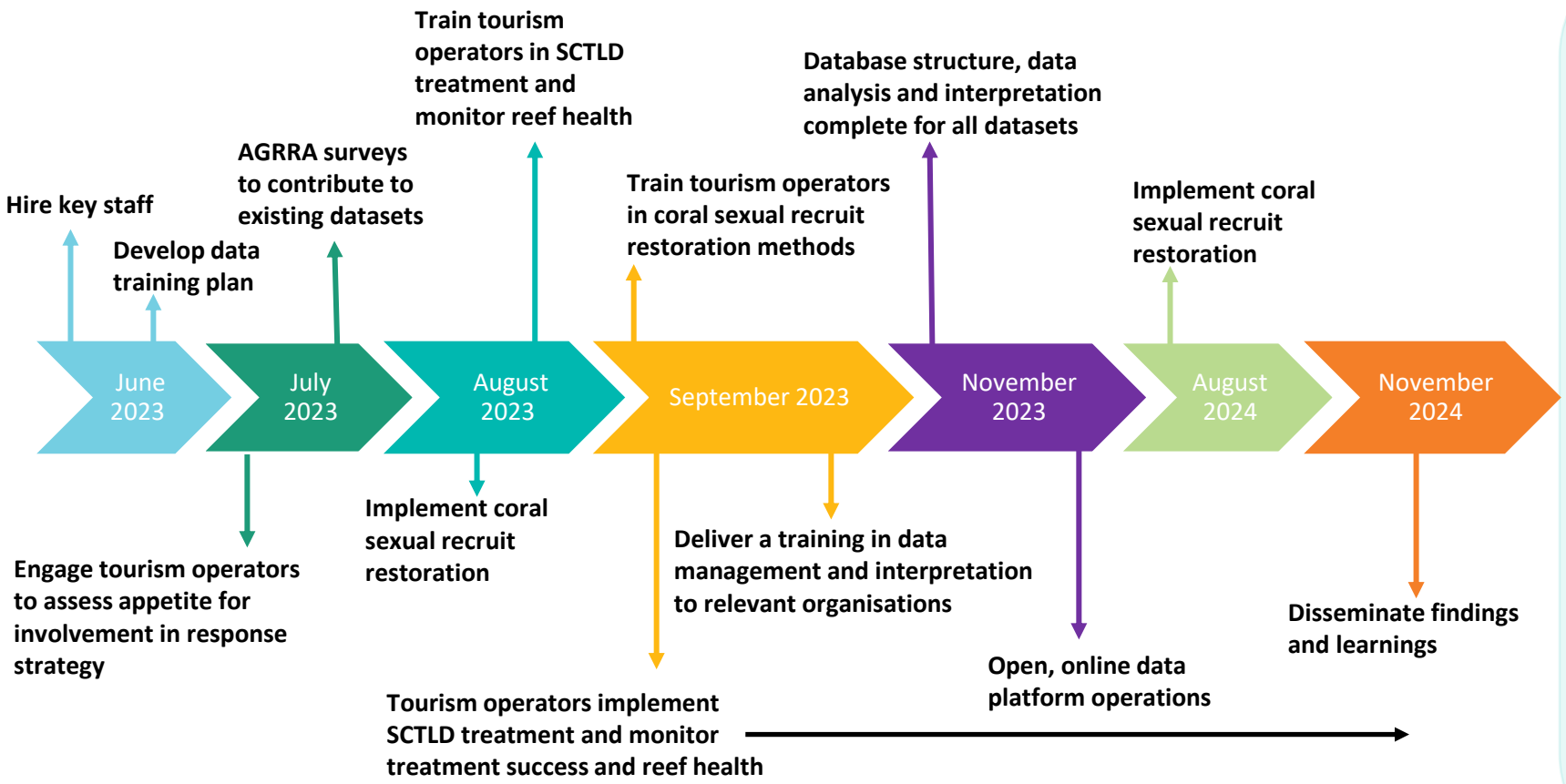
ACTION #1: Strengthening Coral Reef Resilience

Ecosystem Protection & Restoration

2

Partners: UB-ERI, TASA, CZMAI, BFiD

TIMEFRAME OF ACTIVITIES



MILESTONES/OUTPUTS

- Deliver essential training in data management and interpretation of long-term dataset
- Develop open, online data platform of long-term monitoring data
- Use new dataset to assess changes in reef health over time and identify areas of resilience
- Engage managers and tourism operators to deploy SCTLD response, corals sexual recruit restoration methods, and monitoring
- Assess effectiveness and lessons learned for addressing key threats in collaboration with MPA managers
- Assess the feasibility and scalability of this adaptive management approach to be delivered in other managed areas

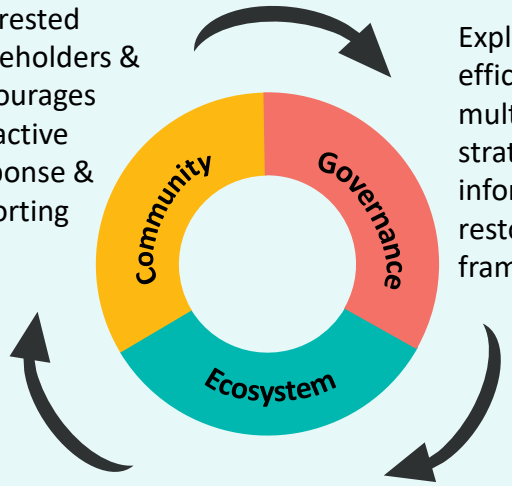
ACTION #1: Strengthening Coral Reef Resilience

Ecosystem Protection & Restoration

Partners: UB-ERI, TASA, CZMAI, BFiD

RESILIENCE VALUES

Incorporates interested stakeholders & encourages proactive response & reporting



Explores efficacy of multiple strategies to inform national restoration frameworks

Advances recovery processes in coral reef ecosystems while maintaining habitat condition

ANTICIPATED IMPACT

- Accelerates adaptive management approaches and collective learning
- Provide key lessons on how protected area managers can effectively engage tourism operator in activities to ensure the continuity of long-term resilience strategies.
- Educates and empowers key stakeholders in response planning process to address reef threats
- Promote the development of heat and disease resistant species, thereby supporting the evolutionary potential of reefs

SYNERGIES WITH ONGOING PLANS, INITIATIVES AND ACTIONS

The table below includes a set of other key efforts underway in Belize that this action will inform or complements.

Restoration Framework (in progress) Will inform the National Restoration Plan for Belize.
InsuResilience Solutions Fund, and Caribbean Catastrophe Risk Insurance Facility (Blended model for parametric insurance) (2021) Will provide information to scale disaster response efforts and continued collaboration between management and stakeholders.
SCTLD & bleaching tracking (ongoing) Will inform on the level of stakeholder involvement in ongoing response mechanisms
AGRRA national surveys (annual) Will directly support the collection of information for the AGRRA database

ACTION #2: Coastal-Marine Land Tenure Analysis

1

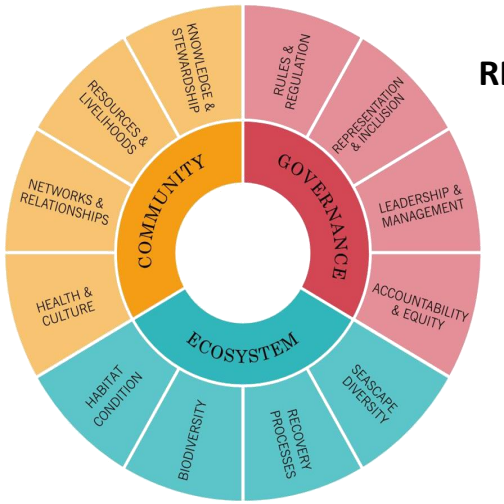
Ecosystem Protection & Restoration

Partners: WWF, CZMAI, Lands & Surveys Department

Multiple uses and demand for coastal properties are propelling deforestation and impacts to coastal areas. Better understanding of existing land tenure-ship along Belize's coast is needed to grow a knowledge base on blue carbon systems, including risk reduction, and carbon sink and restoration. This project aims to produce an updated coastal-marine land tenure inventory for Belize (within a 10km inland area of interest of the coast) to contribute to the engagement of coastal-marine land stakeholders (public and private) on better policies, plans, practices, and actions to foster sustainable and climate-smart development on the ground. The approach will be multi-disciplinary with empirical analysis based not only on understanding ownership but also the development threat and footprint on the land properties. Additionally, by having the proactive participation of key government entities in undertaking the project, it will be helping to build capacity and ownership of the project findings as well as allow for the opportunity for the project to be replicated in the future.

RESILIENCE CHALLENGES

- Rapid coastal development
- Limited platforms to access public information
- Infrastructure vulnerabilities
- Transparency & accountability
- Barriers to collaboration and sharing data/resources
- Outdated framework, polices and plans



RESILIENCE FRAMEWORK ATTRIBUTES

Habitat Condition
Seascape Diversity
Rules & Regulation
Leadership & Management
Accountability & Equity
Knowledge & Stewardship
Resources & Livelihoods

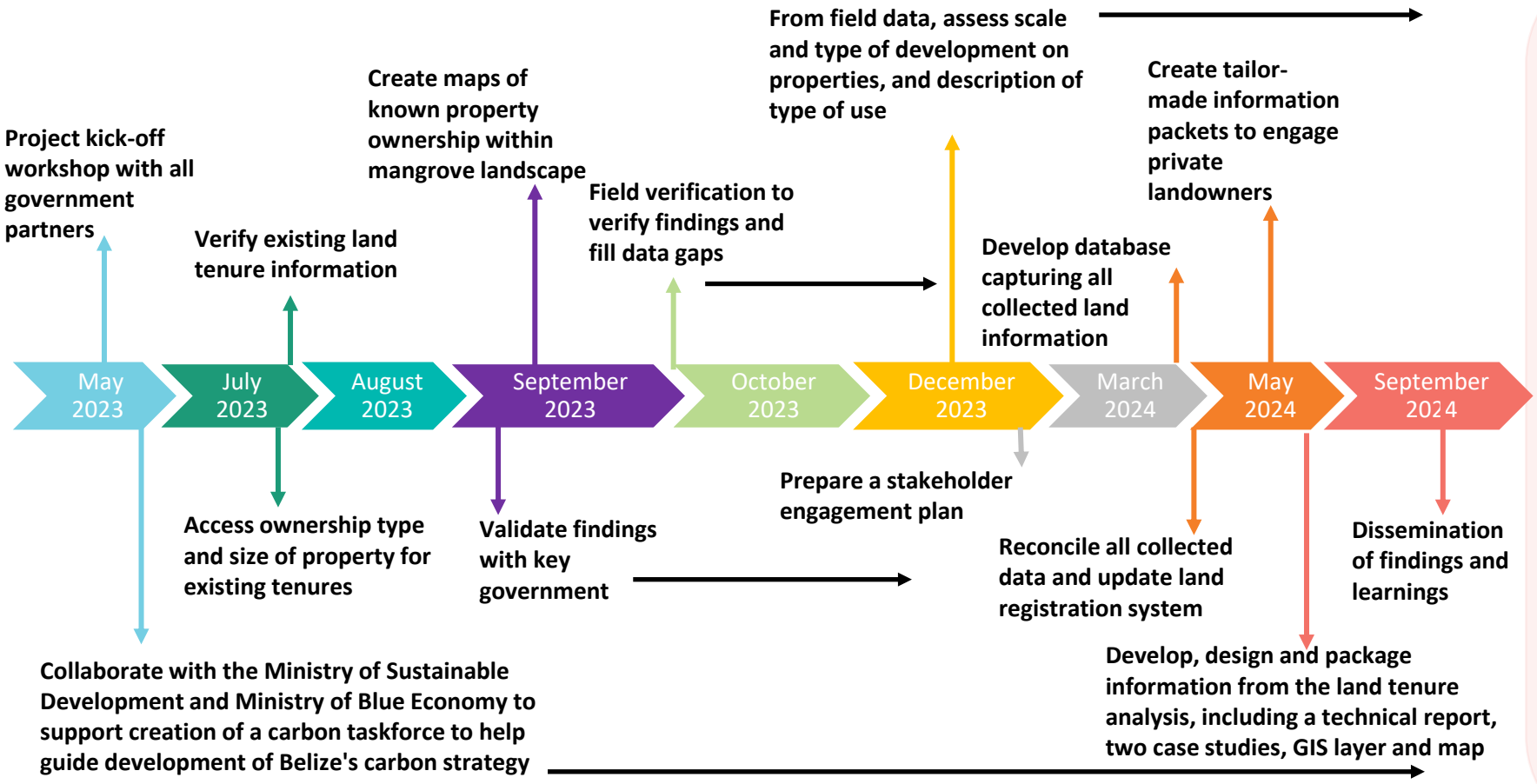
ACTION #2: Coastal-Marine Land Tenure Analysis

2

Ecosystem Protection & Restoration

Partners: WWF, CZMAI, Lands & Surveys Department

TIMEFRAME OF ACTIVITIES



MILESTONES/OUTPUTS

- Update the land registration system
- Create a database with information on mangrove property habitat type, ownership type and boundary, georeferenced location, owner name and contact information, size of land holding, and condition of land.
- Develop a map, differentiated by ownership type, that details the coastal-marine land tenure ship.
- Disseminate findings and products to inform the national blue carbon framework and mangrove restoration plan
- Create tailor-made information from the land tenure analysis and options for mangrove protection and restoration to engage private landowners

ACTION #2: Coastal-Marine Land Tenure Analysis

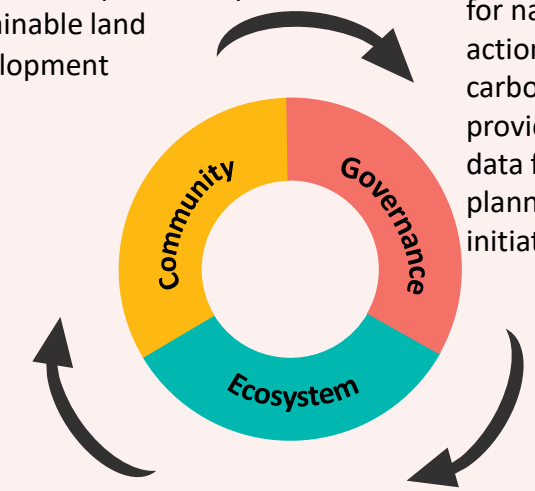
Ecosystem Protection & Restoration

Partners: WWF, CZMAI, Lands & Surveys Department

RESILIENCE VALUES

Provides an understanding of land use, interests of landowners to maximize partnerships on sustainable land development

Builds capacity for national action on blue carbon, and provides key data for multiple planning initiatives



Advances interest and potential new partnerships in ecosystem restoration activities and facilitating recovery processes and improving habitat condition

ANTICIPATED IMPACT

- Strengthen legislative and regulatory protection & effective management which will help preserve key species, habitats and functional processes and assist ecosystems to recovery
- Increases community, cohesion, cooperation and support for management through engagement and education
- Builds capacity and project ownership through participatory, collaborative, and transparent decision-making across multiple government agencies

SYNERGIES WITH ONGOING PLANS, INITIATIVES AND ACTIONS

The table below includes a set of other key efforts underway in Belize that this action will inform or complements.

Conservation Commitments under the Belize Blue Bond Agreement *Belize Blue Bonds for Ocean Conservation Program (2026)* *Integrated Coastal Zone Management Plan* Outputs will help advance the conservation commitments
National Carbon Framework Analysis will provide an invaluable source of information to inform the development of the policy framework
Belize Blue Economy Development policy, Strategy, & Implementation Plan (2022-2027) Findings will advance priority areas outlined in the policy and advance overall national interest.
Coastal-Marine Project Finance Initiative for Permanence (PfP) Advances the PFP approach and interests for long term conservation and management
Updated Nationally Determined Contribution (2021) Supports Belize's commitment to emission reduction under the Paris Climate Change Agreement

ACTION #3:
Sustainable Resilient Supplementary Livelihoods

Enabling Environment for Livelihood Diversification

Partners: WCS, CZMAI

1

Climate-induced degradation of coastal and marine ecosystems, exacerbated by human pressure, have significant impacts on livelihoods dependent on the health of these ecosystems. An estimated fifteen thousand Belizeans directly benefit from the country's small-scale fisheries, however a recent vulnerability and livelihood assessment of Belize's fisheries sector and coastal zone areas identified fisherfolk and fishing communities, particularly from the southern region of Belize, as being the most vulnerable to the impacts of climate change. This project aims to improve economic resilience to climate change for fishing communities in Glover's Reef Marine Reserve and South Water Caye Marine Reserve by exploring supplementary livelihood options. Belize has had numerous alternative livelihood initiatives in the past, but impacts haven't been enduring. This project will identify the barriers to success from past initiatives, opportunities to reduce those barriers in the future, and new training or partnership options through engagement with local communities. Lessons from this work will have implications for coastal communities nationwide.

RESILIENCE CHALLENGE

- Overreliance on extractive activities
- Limited pathways to decision making processes
- Conflict between industries and national/local priorities

RESILIENCE FRAMEWORK ATTRIBUTES

Accountability & Equity
Knowledge & Stewardship
Resources & Livelihoods
Health & Culture
Biodiversity

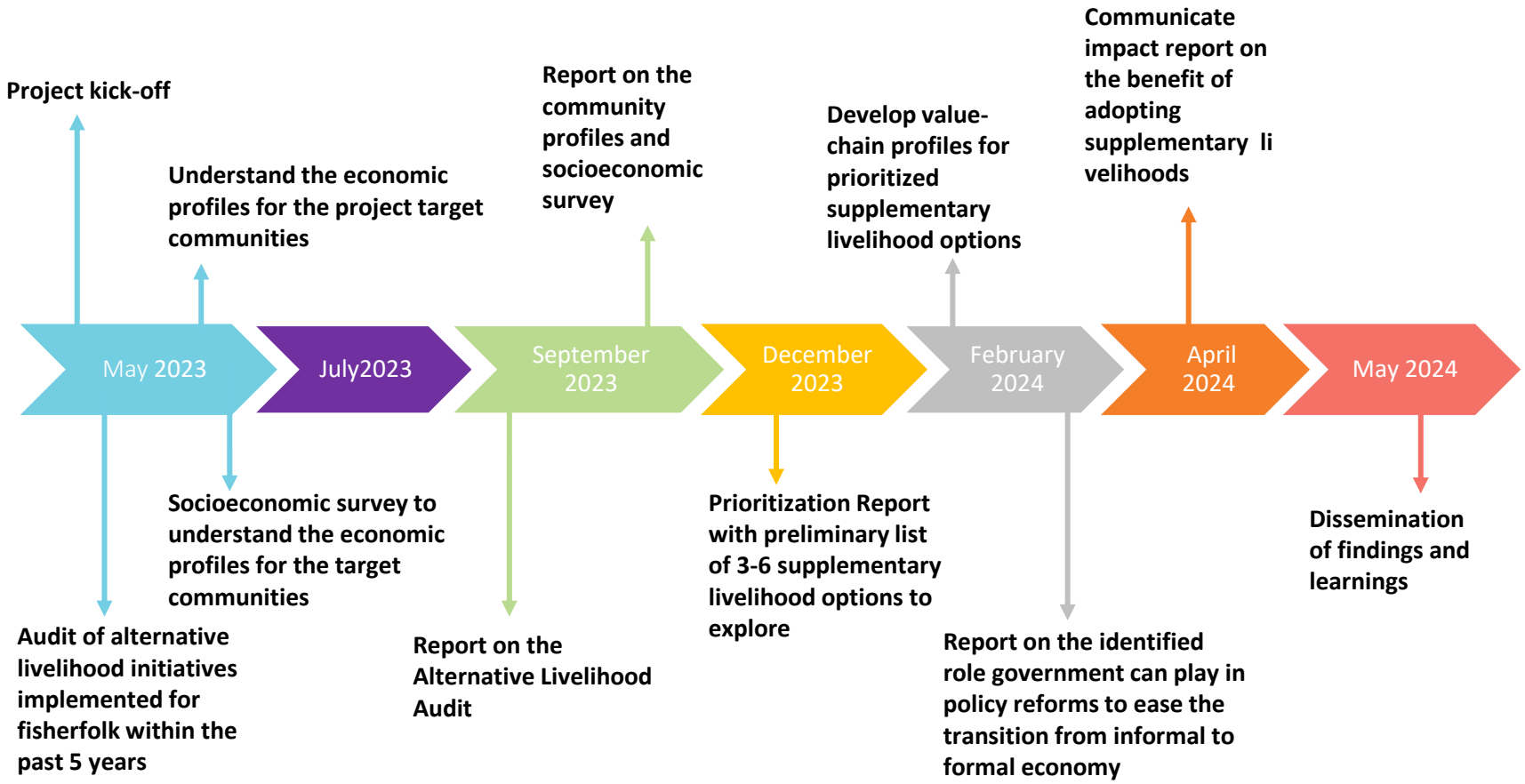
ACTION #3:
Sustainable Resilient Supplementary Livelihoods

Enabling Environment for Livelihood Diversification

Partners: WCS, CZMAI

2

TIMEFRAME OF ACTIVITIES



MILESTONES/OUTPUTS:

- Livelihoods audit report will identify barriers to success, and the enabling factors/conditions required to assist member to successful transition and remain engaged in supplementary livelihoods.
- Community profiles, and baseline socioeconomic report will determine enabling factors required to aid with uptake of supplementary livelihoods
- Supplementary livelihoods prioritization report will include recommendations on which options offer the most potential for successful development
- Product profiles developed along with recommendations for value chain improvement
- Communications Campaign
- Recommendations for needed policy reform regarding SSF livelihoods

ACTION #3:
Sustainable Resilient Supplementary Livelihoods

Enabling Environment for Livelihood Diversification

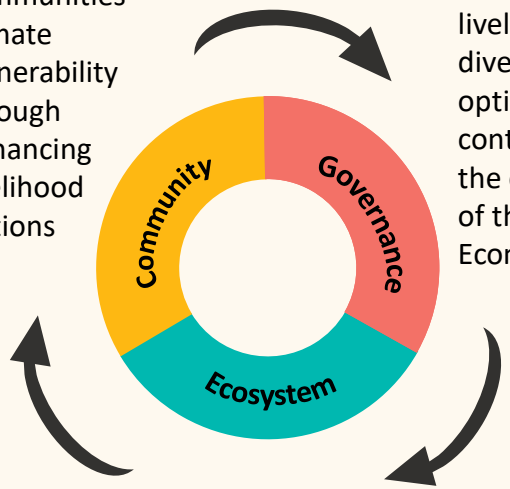
Partners: WCS, CZMAI

3

RESILIENCE VALUES

Seeks to reduce fisherfolk and fishing communities' climate vulnerability through enhancing livelihood options

Informs managing agencies on efficacy of livelihood diversification options and contributes to the expansion of the Blue Economy



Reduces pressure on degraded ecosystems

ANTICIPATED IMPACT

- Identifying viable and sustainable supplementary livelihoods for Belize's fishing communities will improve their economic resilience in the face of climate change.
- Diversify fisherfolk household income to reduce local pressures on the reef aiding healthier ecosystems

SYNERGIES WITH ONGOING and PRIOR PLANS, INITIATIVES AND ACTIONS

The table below includes a set of other key efforts underway in Belize that this RRI action will inform or complements. It also builds on the progress made by other projects.

Belize Blue Economy Development policy, Strategy, & Implementation Plan (2022-2027)
Findings will advance priority areas outlined in the policy and advance overall national interest.

Enhancing adaptation planning and increasing climate resilience in the coastal zone and fisheries sector of Belize- GCF (2021)
Complement ongoing efforts to develop & prioritize adaptation options for the coastal zone and fisheries sectors in Belize

Marine Conservation and Climate Adaptation Project (MCCAP) (2015-2020)
Activities will build upon previous project and livelihood strategies and help inform MCCAP 2 (in development).


Looking
Ahead

Future Work

Developing solutions for watershed management and additional resilience challenges

The resilience assessment discussed above outlined several challenges for which there are not designed actions in this strategy. That is intentional—this is a first set of actions in a longer-term commitment and multi-partner effort to build the resilience of the Belize Barrier Reef System.

One of the key challenges for future work will be watershed management. Taking a systems approach, the resilience assessment explored many different factors influencing the current status of watershed management (outlined in the table to the right) and held several engagement sessions with multiple stakeholders to identify potential actions.

The Resilient Reefs Initiative remains committed to continuing to advance conversations and scope additional actions targeting the complex challenges that affect the reef and the communities that depend on it. If you are interested in future partnership to deliver on the vision outlined in this strategy, please reach out to the resilience team at CZMAI.

Summary of watershed management challenges
Land-based inputs of chemical, biological, and **physical pollution**
Soil erosion, exacerbated by mining activates, deforestation, development, and climate change
Lack of comprehensive **water monitoring data**, limiting the ability to detect and address point source pollution
Lack of a **cohesive legal framework,** worsened by a separated institutional framework dividing water resource management across the country
Increased **demand on water resources** from expanding agriculture and growing population
Inadequate infrastructure for solid waste and wastewater collection, treatment, and disposal threatens watersheds, communities and the environment
Most **landfills** in Belize are not controlled or sanitary and can allow leakage into the groundwater

Closing Notes

The development of this strategy has been a two-year journey in analyzing resilient attributes of Belize's reef system, its communities, and governance arrangements. Launching during a pandemic also brought additional challenges in gathering current information and providing a full scope of the status of resilience for the BBRS. Nevertheless, our team has worked diligently with local and international partners in providing the best course of action for resilience building in the BBRS. Scoping sessions and community engagement have revealed many ongoing and potential threats to the system and further highlight the need for additional and coordinated efforts in addressing identified threats.

Actions outlined in this document mark important steps in advancing adaptive management, building resistance to existing threats, and assisting in recovery from shocks. It is intended to act as the catalyst for larger change, acknowledging that systematic change cannot happen overnight. The three actions interlink with ongoing work and interests held by partners, governing entities, and overall national interest. They are intended as starting points for a roadmap to building long term resilience where continued collaboration and coordinated efforts are strongly encouraged.

While this strategy focuses on three flagship actions, the RRI team will continue to engage key stakeholders in determining the feasibility and scoping for additional actions, including projects focused on improving watershed management—a key challenge we know must be addressed.

As we move into implementation of the actions, we encourage others to use the findings of the resilience assessment to plan new actions, seek additional funding, and to explore additional routes to building resilience throughout the region. We see this strategy as a living document that is revisited and built upon regularly. We hope the actions outlined here support a broader shift from reactive management to a proactive and holistic approach in dealing with threats and shocks to this critical system. Clearly, there is much work left to do and the RRI partners remain steadfast in continuing to design and deliver key actions and sharing lessons learned within and beyond the Belize Barrier Reef System.

Kalene Eck, Chief Resilience Officer
Hol Chan Marine Reserve, Belize
Photo: Marcus Alamina

Thank You to Our Partners

Thank you to all our partners in the development of this strategy.

We look forward to continuing this work, implementing these actions and, to building lasting partnerships for resilience-based management.

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Appendix I

List of management plans reviewed for the resilience assessment

- Belize City Rediscover, Reconnect: Action plan for sustainable urban development
- Belize Cruise Tourism Policy
- Belize Health Sector Strategic Plan 2014-2024
- Belize Maritime Economy Plan
- Belize National Lionfish Management Strategy 2019-2023
- Belize Oceans Economy and Trade Strategy
- Caye Caulker Marine Reserve Management Plan 2021-2026
- Comprehensive National Transportation Master Plan
- Corozal Bay Wildlife Sanctuary Management Plan
- Gladden Spit and Silk Cayes Marine Reserve Management Plan
- Glover's Reef Marine Reserve Management Plan 2019-2023
- Hol Chan Marine Reserve 2019-2024 Management Plan
- HORIZON 2030. National Development Framework for Belize: 2010-2030
- Integrated Coastal Zone Management Plan 2016 & 2022
- Management Plan for the Belize River Watershed 2018
- National Agriculture Food Policy of Belize 2015 to 2030
- National Climate Resilience Investment Plan
- National Fisheries Policy, Strategy & Action Plan
- National Institute of Culture & History Strategic Plan
- National Integrated Water Resources Management Policy (Including Climate Change) For Belize
- National Protected Areas System Plan Revised Edition
- Port Honduras Marine Reserve Management Plan 2017-2021
- Stony Coral Tissue Loss Disease Monitoring and Action Plan
- Sustainable Finance Strategy and Plan for the Belize Protected Area System
- Sustainable Finance Strategy and Plan for the Belize Protected Area System
- The National Trade Policy