



A COMPENDIUM OF PROJECT PROPOSALS SUBMITTED TO THE

# ICRI / UN Environment Grants Programme 2017

A prospectus for funders interested in catalyzing the development of innovative initiatives that enhance protection and management of coral reefs and related ecosystems



The development of this compendium was made possible due to the generous support of the Government of Sweden

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# INTRODUCTION

The ICRI/UN Environment Grants Programme is a joint initiative of the International Coral Reef Initiative (ICRI) and UN Environment which aims to catalyze the development of innovative and replicable initiatives that enhance protection and management of coral reefs and related ecosystems.

Grants under this programme are funded by UN Environment through generous contributions from France, the Principality of Monaco.

A call for concept notes closing 1 August 2017 resulted in 233 proposals submitted by a diverse group of applicants from across the globe. Projects ranged from engaging community education programs through to complex deep ocean reef research projects. In addition to the diverse and thoughtful project concepts, the submissions collectively conveyed an overwhelmingly strong sense of the passion, innovation and ingenuity that characterises the coral reef research and management community committed to improving the outlook for the world's coral reefs.

Of the 233 projects, 80 were shortlisted for further review based on the Programme's eligibility criteria, including the ability to progress the United Nations Environment Assembly (UNEA) resolution 2/12 on sustainable coral reefs management and catalyzing implementation of the ICRI Plan of Action 2016-2018. Shortlisted projects demonstrated the potential to deliver on the following Plan of Action themes:

- ▶ **THEME 1:** Help raise awareness of how coral reefs and related ecosystems help to fight climate change
- ▶ **THEME 2:** Meet international requirements regarding coral reefs
- ▶ **THEME 3:** Help to reduce human threats to coral reefs and associated mangroves and seagrasses, by making greater use of regulatory tools
- ▶ **THEME 4:** Monitor the state of reefs in order to better manage them
- ▶ **THEME 5:** Progress via education.

Amongst the shortlisted projects, 5 exhibited outstanding innovation, impact and ability to deliver on these themes, with the strongest potential to enhance the resilience of coral reefs. These stand-out projects were selected for funding under the 2017 grants programme (Figure 1).



Figure 1: Projects funded under the 2017 ICRI/UN Environment Grants Programme

The high calibre of proposals, many displaying significant innovation, collaboration and potential impact, represented valuable opportunities for future investment in improving the outlook for coral reefs. In an effort to attract funding support to allow implementation of additional projects, ICRI and UN Environment committed to investigate options for securing additional funding. The first step in this process was to establish a Review Team comprised of ICRI, UN Environment and Reef Ecologic to further review proposals and create this compendium of project proposals suitable for future funding.

The 80 shortlisted projects were assessed by the Review Team and rated for Quality, Feasibility, Relevance (to ICRI/UN Environment priorities), Impact, Innovation, Local involvement and Replicability/scalability. Thirty-two high-quality projects were chosen (Table 2) to represent the diverse opportunities available for tackling the range of issues driving coral reef decline. The proposals selected for inclusion in this compendium address a total of seventeen themes, grouped into five key categories (Table 1).

CATEGORY	THEME
▶ RESEARCH & MONITORING	Monitoring /Assessment
	Indicator development
	Targeted research
▶ GOVERNANCE & COMPLIANCE	Regulatory change
	Legislative change & enforcement
	Policy instruments
	Governance mechanisms
▶ ENTERPRISE & MARKET MECHANISMS	Market change
	Private sector action /education
▶ LOCAL MANAGEMENT	Spatial planning & management
	Ecological restoration
	Improved management of fisheries
	Adaptation / resilience
	Capacity building
	Improved management of WQ
▶ COMMUNITY & COMMUNICATION	Community action / education
	Awareness building

Table 1: Thematic categories & themes addressed by the project proposals in this compendium

The Review Team worked with the leads of each of the selected projects to condense applications into two page summaries, highlighting strengths and impact to inspire potential funders. The summarised project proposals included in this compendium showcase the diversity of projects being designed by communities, industries, researchers and reef managers, to help improve the future for coral reefs and reef-dependent communities. A list of the 32 projects grouped by thematic category, together with the applicant and geographical focus, is provided in Table 2.

The development of this compendium was made possible due to the generous support of the Government of Sweden.

Table 2: The 32 projects chosen for inclusion in the compendium

APPLICANT	LOCATION	PROJECT
<b>▶ THEMATIC CATEGORY A: COMMUNITY &amp; COMMUNICATION</b>		
Department of Fisheries	Saint Lucia	Saint Lucia's Call to Action for Coral Reefs Conservation
Corals for conservation	Kiribati (possible Fiji & Vanuatu)	Reefs of Hope- Restoring corals to severely impacted reefs through propagation of bleaching-resistant corals, no-take MPAs, and building resilience within reef-dependent communities via sustainable non-fishing livelihoods
SEEDO	Tanzania	Community Based Marine Ecosystems (coral reefs and mangroves) Protection in Tanga Region
Sustainable international Mexico	Mexico	The MARI Mesoamerican Reef Citizen Science program
ICSEM SL	Colombia & Jamaica	Resilience and social adaption to climate change impacts on coral reefs in Caribbean countries
MICS	Marshall Islands	Ajeltake Community Introduction to the "Reimaanlok" Community-Based Management Plan
Oma Tafua	Niue	Coral Reef Project Niue
<b>▶ THEMATIC CATEGORY B: ENTERPRISE &amp; MARKET MECHANISMS</b>		
Emae Makatu Community	Vanuatu, Fiji & Solomon Islands	The sustainable management of traditional marine protected ecosystems (reefs, mangroves and seagrass) and genetic biodiversity
WRCT	Sri Lanka	Enhancing Coral Reef Resilience through Research and Collaborative Resource Management.
Reef World	Dominican Republic	The Green Fins approach to managing a sustainable marine tourism industry in the Caribbean

UNAM	Mexico	Development of a sustainable land-based aquaculture system aiming to reduce human pressure on coral reefs, seagrass beds and mangroves in the Mexican Caribbean
UFRN	Brazil	Pledging sustainable parrotfish fishing for reef patch areas protection
Corcovado	Costa Rica	OSA Coral Reef Conservation Project

#### ► THEMATIC CATEGORY C: GOVERNANCE & COMPLIANCE

Ghizo Environmental Livelihood Conservation Association	Solomon Islands	Empowering the Ghizo community to take charge of protecting their coral reefs, mangroves and seagrasses in the fight against climate change
Konsorsium Mitra Bahari Papua Barat	Indonesia	Sorong Regency Marine Protected Area Initiative in the Bird's Head Seascape Papua, Indonesia
Marine Conservation Cambodia	Cambodia	Deployment of conservation and anti-trawling structures in the framework of the 2nd MFMA in Cambodia
Institute for socioecological research	Puerto Rico	Rapid assessment of coral reef habitats of Barbuda after hurricane Irma: the baseline for a restoration program
Reef Conservation	Mauritius	Building the resilience of coral reefs and local communities in Voluntary Marine Conservation Areas in Mauritius

#### ► THEMATIC CATEGORY D: LOCAL MANAGEMENT

Seychelles National Parks Authority	Seychelles	Certification of Peer Trainers in Effective Management of Coral Reefs, Seagrass Beds, Mangroves, & Beaches in Marine Protected Areas of the Western Indian Ocean
IRD Madagascar	Madagascar	Status and recovery capacities of coral communities to climate change and anthropogenic stresses in Toliara, southwest Madagascar
Equilibrio Azul	Ecuador	Rocky and Coral Reef research, protection and restoration, through local apnea fisherman involvement in Machalilla National Park, Ecuador.
GOAL international	Honduras	Resilience of the Blue Economy: Sustainable and inclusive Fisheries in the Coastal ecosystem of Guimoreto and Bacalar in the Northern of Honduras
Sanctuary Owners Association	Mozambique	Ecological monitoring and evaluation of a multi-habitat seascape in the Western Indian Ocean to promote collaboration between conservation areas and affected communities
WCS	Belize	Improving coral reef management by determining primary stressors responsible for coral bleaching at a remote Caribbean atoll

#### ► THEMATIC CATEGORY E: RESEARCH & MONITORING

Ucal, SantaCruz, TNC	Mexico	High-resolution assessment of the economic benefits of coral reef management for flood risk reduction provided by the Mesoamerican Reef in Quintana Roo, Mexico, and identification of priorities
IRCP	French Polynesia	First acoustic monitoring of coral reef's biodiversity
OMMM	Martinique, French West Indies	Deep lionfish populations and associated unexplored mesophotic reefs of Martinique, French West Indies
CRIOBE	French Polynesia	"HIDDECORALS": We protect what we know: Unravelling the hidden world of Polynesian coral reefs in the twilight zone to enhance their protection
Palau International Coral Reef Centre	Palau	Developing coral reef indicators to evaluate recovery potential after catastrophic coral mortality
CUFR	Mozambique	Mesophotic Ecosystem Coral Investigation in Mayotte and Mozambique (MECIM)
PCR	Brazil	Effects of depth on coral reef communities: testing insights of a "deep refuge hypotheses" in the South Atlantic for the first time
Macquarie University	Tanzania & Kenya	From Ridge to Reef: An Ecosystem Based Approach to Biodiversity Conservation in East Africa

## COMPENDIUM OF CORAL REEF PROJECTS: A PROSPECTUS FOR FUNDERS

Coral reefs are vital ecosystems that provide support to a quarter of all marine life on the planet. They provide food, income, recreation and protection from storms and flooding to an estimated one billion people across the globe – these ecosystem services are essential to wellbeing and livelihoods, especially the many vulnerable populations that live alongside coral reefs. These services are valued at \$10 trillion per annum globally– more than the world's largest corporations and many national economies.

An estimated 75% of all coral reefs globally are under threat from a combination of local stresses and the global impacts of climate change and population growth. Addressing this enormous challenge will require a global effort targeting all facets of the system that contribute to the decline of coral reefs - social, economic and ecological.

The unprecedented number of responses to the call for concept notes from the ICRI/UN Environment Grants

Programme and the diversity of approaches within them demonstrates that the global effort and focus on addressing all threats to coral reefs is growing. Additionally, the quality, innovation and passion evident in many of the proposals confirms that collaboratively the opportunity to reduce these threats and enhance the resilience of coral reef ecosystems to these threats is real.

Funding is urgently needed to harness the momentum and enthusiasm of communities, industries, managers and researchers and convert the proposals showcased in this compendium into on-ground actions. As we head into the International Year of the Reef 2018 ([www.iyor2018.org](http://www.iyor2018.org)), we hope that this compendium provides an important opportunity for funders to support innovative and impactful actions that can further inspire global efforts to protect and rebuild the resilience of the world's coral reefs.

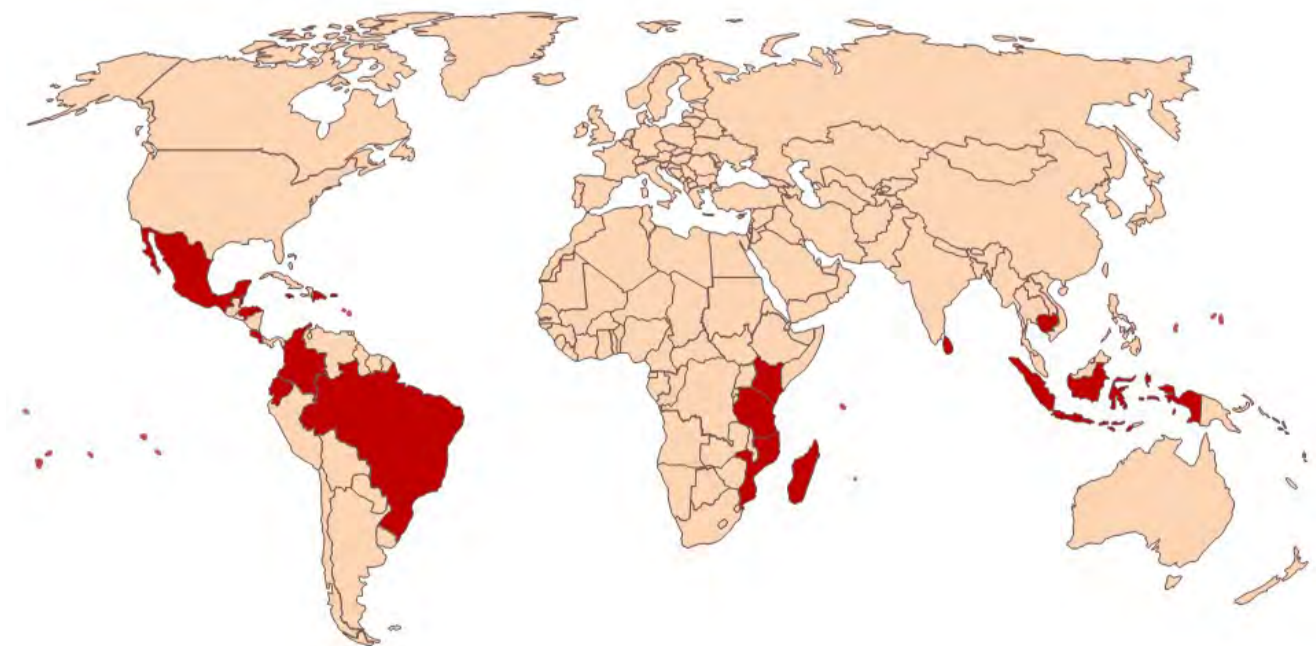


Figure 2: Geographic spread of compendium projects

Costanza, R., R. de Groot, P. Sutton, S. van der Ploeg, S.J. Anderson, I. Kubiszewski, S. Farber, and R.K. Turner. 2014. Changes in the global value of ecosystem services. *Global Environmental Change* 26: 152-158. (pdf, 508k)



## THEMATIC CATEGORY A

# Community & Communications

Reef communities are on the frontline for climate change impacts. More frequent and intense storms increase the risk of storm surge, flooding and wind damage, while rising sea levels are increasing the risk of salt water contamination of fresh water supplies. At the same time, climate change interacts with local pressures to threaten coral reefs and the ecosystem services that they provide in tangible and unprecedented ways. The threats to local livelihoods and social well-being are already being felt worldwide, and are expected to escalate. While the menace of external factors like climate change can seem overwhelming, local communities can do much to steer their future. Better knowledge, stronger engagement and greater empowerment can enable active adaptation, while improved awareness and opportunities for stewardship enables local people to take local actions that can restore and maintain the resilience of coral reefs to external stresses. Project proposals in the Community and Communication thematic category represent a range of innovative and grounded concepts that aim to harness the energy of local reef communities to increase awareness of the value of healthy coral reefs, educate the community on stresses, map out pathways for behaviour change and drive engagement that will all contribute actions that can improve the resilience of coral reefs and their communities.



# Saint Lucia's Call to Action for Coral Reefs Conservation

01

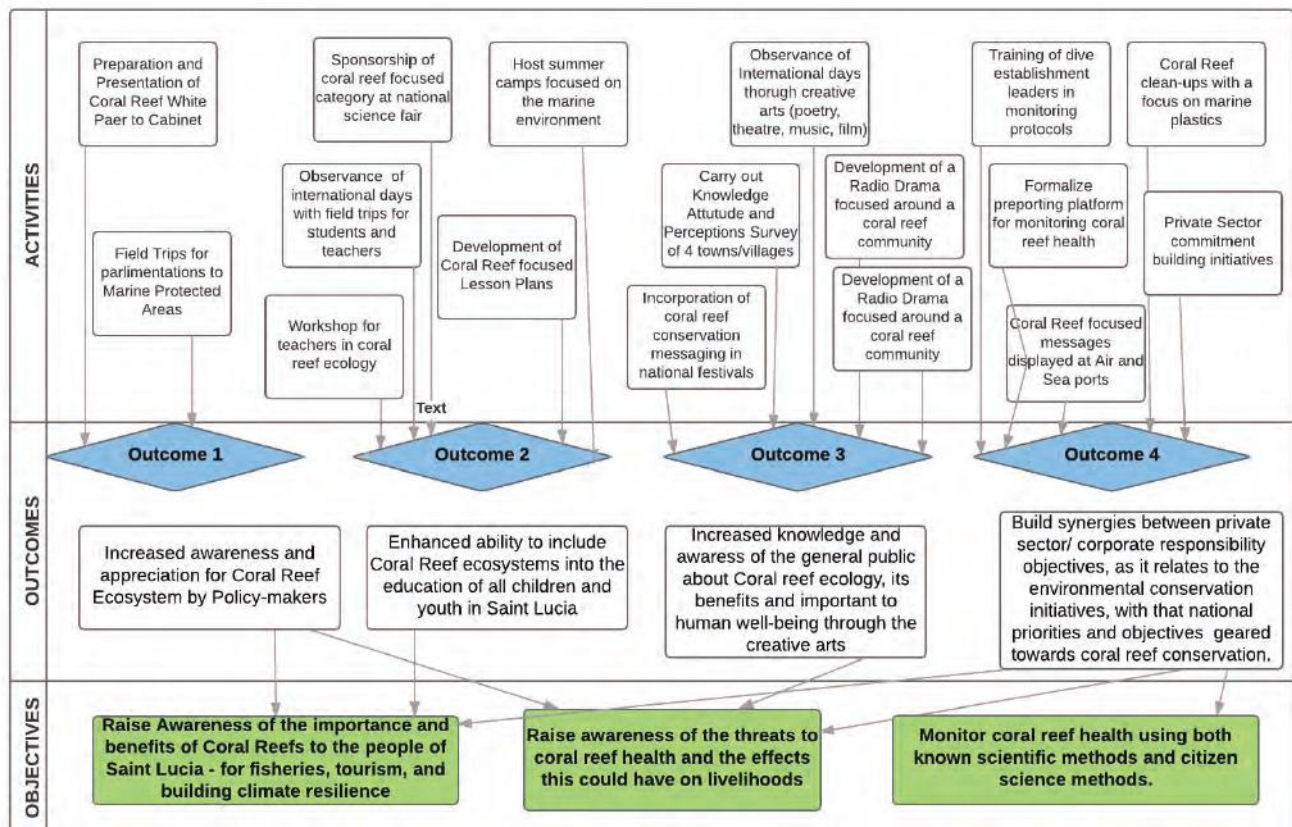
PROJECT LOCATION: St Lucia

## PROJECT DESCRIPTION

This project is a holistic Call to Action for Coral Reef Conservation in Saint Lucia. As a Small Island Developing State (SIDS), Saint Lucia is heavily dependent on the ocean, especially its reef ecosystems, for tourism, fisheries and recreation. However though there has been awareness raised on the importance of coral reefs especially at the school level, there is limited action or behavioural change geared towards reducing anthropogenic impacts on coral reefs and enhancing its resilience. This project will do more

than simply inform people of the benefits and importance to coral for life and livelihoods, but will engage civil society particularly private sector, community and youth based organisations to actively advance coral conservation initiatives through various innovative methods such as adopting a reef by communities, schools and private sector entities; reduction in the use of plastics.

## THEORY OF CHANGE



## IMPACT AND CONTRIBUTION

The importance of coral reefs for livelihoods, health and wellbeing will be embedded in the St Lucian community and private sector through a suite of novel education and engagement pathways including community engagement days, radio plays, arts and poetry, direct engagement of parliamentarians, science fairs and festivals, as well as training in coral reef health assessment. Engagement with the community will be leveraged to recruit reef users for monitoring reef health using scientific methods, and activities/interventions geared to reduce negative impacts on reef health through of behavioural change. Catalysing stewardship in the private sector will identify opportunities for collaboration across sectors on coral reef management and pressure reduction, for common benefits.

## INNOVATION

This is the first time that such a number of novel forms of engagement, targeting several different levels (community, youth, parliamentarians and private sector) has been employed to highlight the importance of coral reef ecosystems; increase benefits derived from healthy and productive coral reef systems; and to drive behavioural change. The project capitalizes on the vibrant social constructs of the Saint Lucian society, by targeting national

events and festivals, school based activities, and corporate society to advance the knowledge and action of the Saint Lucian public on coral reef conservation.

## STAKEHOLDER ENGAGEMENT

This project is focused on stakeholder engagement including: Public sector (Department of Education, Sustainable Development, Fisheries, Youth and Sports, tourism industry,), the private sector (waste management authorities, financial institutions, telecommunications, grocery stores, air and sea port authority, energy company, hotels, etc) and the NGO community (Soufriere Marine Management Association, Saint Lucia National Trust, Caribbean Youth Environment Network, Saint Lucia Divers Association).

## PROJECT SUSTAINABILITY

Project components are designed to outlive the project cycle. Engagement of the policy-makers will ensure that coral reef conservation is at the forefront of international treaty/ agreement negotiations and national development. Education will embed reef stewardship in future decision makers and reef users. The publication of reports and manuals are also an important component that will allow for the sustainability of the project outcomes.

PROJECT themes	Community engagement; policy change
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Department of Fisheries		
BUDGET: USD \$62,000	CO-FINANCING: USD \$120,000		

# Reefs of Hope - Restoring corals to severely impacted reefs through propagation of bleaching-resistant corals, support for no-take MPAs, and building resilience within reef-dependent communities via sustainable non-fishing livelihoods

02

PROJECT LOCATION: Kiribati, with extension to Fiji & Vanuatu

## PROJECT DESCRIPTION

Kiritimati and Tabuaeran atolls, Line Islands, Kiribati, experienced horrific coral mortality during a record fourteen-month coral bleaching event in 2015-16, losing an estimated 90-95% of all corals, thereby becoming among the most bleaching impacted coral reefs on the planet. While some branching coral species may have become locally extinct, we have found a few "super corals" which resisted the bleaching and survived, and have propagated fragments of these corals within a field nursery, aiming to begin the process of restoration and adaptation to a warmer climate. Even before the disaster, the reefs of Kiritimati were showing an altered food web due to over-fishing, lowering the capacity of the reef to recover from coral bleaching events. This project builds on existing coral restoration work with the Kiribati Ministry of Fisheries and supports their proposal to establish the first MPAs on the two islands, by engaging with reef fishing communities to implement a coral restoration, fisheries recovery, and alternative livelihoods plan as a practical way of

adapting to climate change, while enhancing community and environmental resiliency and well-being.

## IMPACT AND CONTRIBUTION

By better understanding the socio-economic impacts of bleaching and the mass coral die-off, the communities will be more willing to become engaged in coral-focused community service activities and the establishment of no-take areas- both as a means of protecting the restoration sites, and a means to secure vital fish breeding populations into the future. Non-fishing alternate livelihoods will be designed to meet community needs, and preliminary work indicates a great interest in enhancement of existing non-fishing livelihoods such as seaweed farming, poultry farming, coconut production, agricultural crops, and handicraft production. The introduction of value-adding products and processes, such as the production of virgin coconut oil, soap, various seaweed products, foods from under-used wild plants, will increase value derived from

## THEORY OF CHANGE

### PROBLEM

There are no conservation initiatives in Kiribati that recognise the need to couple human needs with marine conservation in order to sustain reef health and resilience. Communities have largely opposed government proposals to establish no-take MPAs as they have no alternate means to support their livelihoods.



### INTERVENTION

Work with communities to understand how they have been affected by the mass coral die-off and resource decline, their visions for the future, and the resources they wish to conserve and develop. Use this information to shape a participatory community-focused program in sustainable alternative livelihoods and reef restoration, including the implementation of the proposed no-take MPA's to support these outcomes- and with the full endorsement of a better informed community.



### OUTCOME

Successful government-proposed and community-supported MPAs incorporating coral nurseries and outplanting sites for bleaching resistant corals; Active multi-stakeholder community involved in viable long-term alternative livelihoods that are shifting the burden away from fishing.

ongoing activities, rather than introducing entirely new initiatives. This in turn will help the fishing communities increase their adaptive capacity by enhancing and diversifying livelihoods.

The participatory community-based educational approach will build support for the implementation of government-planned (but not yet implemented) no-take areas, helping build a co-management process between the government fisheries officers, island councils, and fishing communities. Community members and fisheries officers will be trained in reef restoration and coral nursery techniques and mapping and sampling of surviving corals, to begin incorporating new bleaching resistant coral/symbiont genotypes into the restoration activities. The restoration goal is to establish multi-genetic breeding populations of every branching coral species that has become rare or nearly extinct, and at several sites in support of protected no-take MPAs, while supporting a participatory and educational approach. The restoration of sexual reproduction and larval recruitment processes in each of the now very rare and dispersed branching coral species is the goal, which in turn will restore the natural recruitment and recovery processes of the reefs, rather than extensive outplanting of corals. The fact that the surviving corals have proven themselves resistant to bleaching will help ensure future survival in a warming climate.

## INNOVATION

In the wake of horrific coral bleaching, this project takes advantage of recent receptivity, while ensuring that

implementation of no-take areas does not increase reef user's vulnerability to climate change, but rather increases livelihood diversity and household wellbeing, facilitating community support while helping to counter losses in reef ecosystem services caused by the mass coral die-off, which now threatens the resilience, prosperity, and food security of the communities.

## STAKEHOLDER ENGAGEMENT

Multi-stakeholder involvement will be the key to the success of the project, and a high level of engagement is expected. During resource and vulnerability assessments, village elders, community leaders, government officers, tourism industry and NGO stakeholders will be approached to help in organisation of the events, so that full stakeholder engagement is realised. Training workshops and educational outreach will include all members and social classes within each community.

## PROJECT SUSTAINABILITY

A foundation of local support and action has been built on three previous site visits and annual follow-up visits to the islands will occur for the next five years, to help ensure that the achievements are nurtured. The restoration work within the no-take MPAs should be completed within about five years, as the natural reproductive processes of each species is restored and viable larvae are produced, allowing natural recovery processes to take over, with the corals spreading naturally to other reefs around the two atolls.

PROJECT themes	Alternate livelihoods; community supported MPA's; bleaching resistant coral propagation
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Corals for Conservation
BUDGET: USD \$60,000	CO-FINANCING: USD \$10,000

# Community Based Marine Ecosystems (coral reefs and mangroves) Protection in Tanga Region

03

PROJECT LOCATION: Tanzania

## PROJECT DESCRIPTION

The project aims to rebuild coral reefs and mangroves together with coastal communities in Tanzania as over-fishing, use of explosives, as well as mangrove cutting is a common practice in the region due to poor law enforcement as well as weak governance structures. Results of focus groups have shown the inextricable links between marine degradation and vulnerability to climate change, food insecurity, poor health, and unmet family planning needs - the lack of alternative livelihood options and unmet family planning needs threaten to restrict and undermine the viability of community-based marine conservation and management efforts. This inspired

us to work in a holistic approach that aims to conserve priority ecosystems supporting community-based natural resource management efforts and institutional strengthening, with complementary support for livelihood diversification and access to health (following the Population-Health-Environment Approach). The project will be implemented with 7,250 people in 5 villages of 3 wards within the Mkinga and Tanga districts. The project aims to sustain coral reefs and mangroves and in doing so, empower coastal communities to plan and better provide for their families, improving food security; allowing women to play a more active role in marine conservation efforts, and boosting the sustainability of local

## THEORY OF CHANGE

Trainings on sustainable, non-destructive fishing methods are provided	Communities are committed to sustainable fishing methods and use non-destructive fishing gears	By the end of 2018 community awareness and education on coral reefs and mangroves conservation is improved	The marine ecosystem is healthy and productive and contributes to an improved livelihood and climate change resilience of women and men in coastal 5 villages of Tanga region by 2019
Awareness sessions on the importance of corals reefs for climate change resilience are conducted			
Trainings on alternative income generating activities are provided	Communities pursue alternatives to mangrove cuttings		
Awareness sessions on the importance of mangroves for climate change resilience are conducted			
The district, BMU and village fisheries management plans and by-laws are reviewed and enforced	Institutional co-management of fisheries is improved and effective	By 2019 the institutional arrangement, fisheries policies and act for the management of marine ecosystems are strengthened	
Plans for the protection of mangrove forest in place/reviewed			
Institutional capacity development trainings are provided to district, ward and village level on co-management of fisheries	The capacity of district councils and villagers is improved thus fisheries policies and acts are enforced		
Blasting data are frequently monitored and disseminated			
Cross-sector partnership are established with health organisations and local government	More women are engaged in the management of the marine ecosystem; More men are involved in discussion about family health	By 2018 communities (especially women) are empowered and healthy enough to be more actively involved in the conservation of coral reefs and mangroves	
Integrated community outreach engages men and women in discussions about the inter-linkages between population, health and environment			
Access to voluntary family planning services is provided	Couples choose to use family planning to attain their desired family sizes		
Basic health information and services on common illnesses (e.g. malaria, HIV) are provided	Common community illnesses are effectively prevented and / or treated		

marine conservation efforts by 2019. This will enable coastal communities to be able to live more healthily and sustainably with their marine environment and build social and ecological resilience to climate change. The project is promoting local ownership and transparency, which will be implemented in collaboration with local authorities.

### IMPACT AND CONTRIBUTION

The project is using a holistic approach to the protection of the coral reefs and mangroves by equipping the community that depends on a healthy ecosystem with the skills and awareness they need to manage their resources sustainably, while empowering people to live healthily and make their own reproductive health choices. Through cross-sectorial health-environment collaboration the project seeks to promote gender equality by engaging men in discussions about family health while involving women in marine resource management decision-making. Ultimately the project aims to preserve and recover corals reefs and mangroves and reduce the vulnerability of coastal communities to the effects of climate change.

### INNOVATION

The project recognises that to achieve healthier coral reefs and mangroves, the community that depends on a healthy

ecosystem not only required skills and awareness to manage their resources sustainably, but services to promote healthily living and reproductive choice so they are better equipped to transition to more sustainable livelihoods.

### STAKEHOLDER ENGAGEMENT

The project will be implemented in close collaboration with Mkinga and Tanga District councils. The Tanga Marine Unit and Beach Management Unit will be directly involved, authorities and those projects dealing with climate change and marine conservation will be engaged direct and indirect.

### PROJECT SUSTAINABILITY

The early involvement of stakeholders (LGAs, NGOs, and conservation groups) and communities in decision-making and management of resources in the project area will create ownership and transparency. Replication of the project will be supported by proper documentation of activities, sharing of lessons learnt, as well as showcasing this project within Tanzania and abroad with support of our partner Blue Ventures.

PROJECT themes	Holistic reef & community management; improved fishing practices; alternate livelihoods
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Sustainable Environment & Economic Development Organization (SEEDO)
BUDGET: USD \$58,000	CO-FINANCING: USD \$1,640 (in-kind)

# The MARTI Mesoamerican Reef Citizen Science Program

04

PROJECT LOCATION: Mexico

## PROJECT DESCRIPTION

The Mexican Government has declared a large new marine park (Mexican Caribbean Biosphere Reserve), which encompasses the entire Mexican portion of the Mesoamerican Reef, and 50% of the entire reef system. The authority responsible for managing the marine park, CONANP (National Commission for the Natural Protected Areas), has insufficient resources to adequately monitor and survey the new 5.5-million-hectare marine park. The Mexican Caribbean is experiencing rapid development for tourism, receiving more than 10 million visitors a year, placing considerable pressure on the reef: most visitors are unaware of the existence of the reef, and hence for the need to conserve and protect it. STI leads MARTI, an initiative created in 2006 to reduce the negative impacts, generated from tourism's uncontrolled growth, on the Mesoamerican reef. MARTI's director, Dr Sarah Connor, has many years of experience working on the Great Barrier Reef in Australia and is interested in bringing successful programs from the GBR to the Mesoamerican Reef region.

Through STI, MARTI and its partners will provide CONANP with a robust solution to assist in monitoring the marine park and the reef, based on a two-pronged citizen science program, leveraging the power of tourism and modelled on the successful Australian program Eye on the Reef.

## IMPACT AND CONTRIBUTION

The creation and deployment of this App provides reef manager CONANP with a means to monitor the large new marine park – without the app, they lack the resources to effectively do this. The powerful mobile tool will increase participation by local citizens and the tourism sector in reef conservation efforts, and in doing so, raise public awareness amongst the tourism industry, visitors and local community as to the presence of Mesoamerican reef, its value and the need to preserve it. Additionally, the comprehensive database of geo referenced sightings and observations will support management decisions by CONANP and made available to support the work of scientists in the region and other stakeholders.

## THEORY OF CHANGE

### PROBLEM

MPA managers lack resources to monitor and manage reef health. Community, tour operators and tourists know little about the marine park resulting in limited participation in reef stewardship and conservation.

### INTERVENTION

Work with local MPA managers, Australian GBRMPA, scientists, NGO's, tour operators and the community to develop a mobile app to record sightings and incidents in the the marine park for use by citizens.  
Develop and provide a citizen-science based reef monitoring program (modelled on Eye on the Reef) to develop monitoring and assessment capacity for divers, tour operators and outlets and a pathway for managers to access data.

### OUTCOME

MPA managers increase ability to monitor and surveil leading to more efficient, targeted and effective management. Tourism industry, tourists and community are more knowledgeable, actively engaged and championing reef stewardship.

## INNOVATION

Using citizen science to assist in marine conservation is widely accepted in Australia, but rarely utilized in the Mesoamerican reef region. While the app is based on Australia's Eye on the Reef program, this app will also allow users to upload their sightings via a dedicated Face Book page and as a "postcard" to their friends. This new tool will provide a fun, interactive means of collecting information which is vital to the authorities, whilst simultaneously empowering 'reef champions' to share their knowledge with friends to create a greater understanding of marine and coral reef issues in the broader community. The app will be developed in English and in Spanish. Since there is currently nothing like this program in the region, and given the timely need for monitoring support, we believe that this program will prove to be an extremely useful tool for the authorities and an effective means of educating about the reef and the new marine protected area to the community, both for locals and visitors.

## STAKEHOLDER ENGAGEMENT

CONANP has welcomed the program and will incorporate it into its own monitoring and surveillance work program. The project will invite relevant stakeholders to participate in focus group workshops to ensure that both CONANP and multiple stakeholder needs are met during development phase of the citizen science program and app. This will foster buy-in and ownership from the beginning. The Hotel

Association of the Riviera Maya, a MARTI partner, will also be engaged to promote the citizen science program to their visitors and associated tour operators and transportation companies for promotion.

The program will be extended to other MARTI partners (CORAL REEF Alliance, Rainforest Alliance, Travel Foundation, Amigos de Sian Ka'an, GI Cozumel), who will, in turn, engage with their own stakeholder groups, inviting them to become involved in the program and to promote the program.

## PROJECT SUSTAINABILITY

MARTI will be the custodian of the program, managing the database and providing data to CONANP and relevant groups in an agreed format. The program will be considered a pilot for the Mexican Caribbean. Once it has been proven to be successful we intend to replicate it in the other 3 countries of the Mesoamerican Reef. This will enable countries to easily compare data using a standardised methodology. Visitors to all regions of the Mesoamerican reef will be familiar with the app, its functionality and look and feel from one country to another and will be more likely to wish to download the local version for each country they visit. To support awareness of the program and its extension into other regions, a comprehensive marketing and communications plan will promote the program as part of the International Year of the Reef 2018.

PROJECT themes	Citizen science program; enhanced monitoring to support reef managers
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Sustainable Travel International (STI)
BUDGET: USD \$60,000	CO-FINANCING: None



# Resilience and Social Adaption to Climate Change Impacts on Coral Reefs in Caribbean Countries

05

PROJECT LOCATION: Colombia & Jamaica

## PROJECT DESCRIPTION

Climate change directly affects ecosystem services provided by coral reefs. This situation results in social changes, especially in fishing communities. Those changes have not been analysed in Caribbean countries. Through the investigation of bio-socio-economic impacts of climate change on coral reefs in Caribbean countries, the project aims to compile documented empirical evidence of social transformations after climate change impacts and develop a framework to deal with these impacts.

analytics to provide a framework that maps biophysical and social impacts from climate change and their interdependencies. This information, combined with the interdependency models will allow managers to develop and focus resources towards actions that can be demonstrated to have the highest impact.

## IMPACT AND CONTRIBUTION

The importance of managing and supporting communities affected by climate change is becoming increasingly recognised as a critical step in strengthening the resilience of natural system, especially coral reefs. This project combines stakeholder engagement and data

## THEORY OF CHANGE

### PROBLEM

To date, no one has compiled a comprehensive and integrated synthesis of social changes due to climate change and consequences for marine ecosystem services provided by coral reefs.

### INTERVENTION

Investigate the bio-socio-economic impacts of climate change on coral reefs in Caribbean countries.

Spatially map the social distribution of benefits and costs of climate change & document evidence of social transformations after climate change impacts.

Co-develop an adaptive framework to deal with climate change impacts that can be scalable and easily operationalized.

### OUTCOME

Developed information, tools and framework being used by managers and policy makers to support interventions that improve the resilience of coral reefs and reef communities to climate change.

## INNOVATION

An innovative transdisciplinary approach, not implemented in the field of coral reefs in the Caribbean will be utilised (Integrated Valuation of Ecosystem Services and Trade-offs (InVEST) Overlap Analysis Model). The InVESTOA model is based on production functions that define how an ecosystem's structure and function affect the flows and values of environmental services. It allows managers to estimate how policies, plans and programs can affect multiple ecosystem services and different fisheries management objectives - guiding selection of the best interventions.

## STAKEHOLDER ENGAGEMENT

Research will be conducted jointly with local users of coral reefs, who will contribute their substantial knowledge and provide input into the synergies and trade-offs of potential policy actions at local level. Stakeholder involvement will be critical to understand how the local and global drivers affect the use of ecosystem services in these countries.

## PROJECT SUSTAINABILITY

Sustainability is promoted from the beginning of the Project. All actions are designed from a participatory

approach involving public and private actors to ensure that all views and interests are identified and considered. Also, the process has a pedagogic character that will allow a major comprehension of the bio social and economic relevance of coral reefs and what the CC impact means to communities' development. This will surely allow the design of an implementation strategy of the plan among actors. Appropriation is a key for sustainability.

ECOMAR will bring the results to other geographic areas and will apply methodology so far. Even if funding is not available to do so, it will introduce to other Administrations as well as in their research groups to share it. Furthermore, ECOMAR offers to prepare a publication with the obtained results so replication will reinforce through communication actions.

PROJECT themes	Bio-social-economic impacts of climate change
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	ICSEM SL
BUDGET: USD \$57,000	CO-FINANCING: USD \$45,200 (in-kind)

# Ajeltake Community Introduction to the “Reimaanlok” Community-Based Management Plan

06

PROJECT LOCATION: Republic of the Marshall Islands (RMI)

## PROJECT DESCRIPTION

“We want to protect our marine resources!” is the confident statement made in early July 2017 by the community of Ajeltake, a neighbourhood of Majuro, Marshall Islands. The community officially requested the assistance of the Marshall Islands Conservation Society (MICS) to implement the Reimaanlok process (8 steps). The Reimaanlok (Looking to the future in Marshallese) is a community-driven process that assists a community in the design and implementation of a management plan based on local needs and robust data (socioeconomic and ecological). This project aims at initiating the discussion and work toward the development of a concrete management plan while putting the community in “the driver seat”.

The Reimaanlok process enables the community to lead the development of their management plan by identifying and prioritizing management targets and threats aligned with their needs and also translate to national, regional and international conservation goals. Deep engagement with communities ensures that management priorities will be met, strengthening the resilience and adaptability of coral reefs reef resources and reef communities.

## IMPACT AND CONTRIBUTION

This project responds to a request from the Ajeltake community for help to manage their marine resources.

## THEORY OF CHANGE

### PROBLEM

Community want to protect their marine resources but lack the resources and knowledge to develop their management plan.



### INTERVENTION

Establish baseline of community commitment and knowledge relating to resource conservation.

Deliver awareness program to align the issues and concerns of the community and stakeholders, build trust and consider the benefits and implications of resource management and conservation.

Collect ecological and socio-economic data.

Develop management plan drawing on socio-economic and ecological data.



### OUTCOME

A fully developed and realistic management plan that identifies and prioritizes the main targets and threats - that is being implemented by the Ajeltake community.

## INNOVATION

The Reimaanlok itself is an innovative process as it puts the community in “the driver seat”. Using a “bottom-up” integrated approach, all Ajeltake stakeholders will be involved in every step of the process. In terms, they will design and implement their own management plan while addressing environmental, social and cultural issues, relating to land and sea. The Reimaanlok process has proven successful multiple times already in the atolls of Ailuk, Namdrik and Wotje, and Woja community on Majuro.

## STAKEHOLDER ENGAGEMENT

Every step of the process involves the community through meetings, discussions and presentations. As they are designing their own management plan, we will ensure that they stay focused on the goals of the project. To do so, the community will be divided into several stakeholder groups such as men, women, youth, traditional leaders, elected leaders, etc. A representative from each group will form a Local Resource Committee, to ensure that issues from each stakeholder group is addressed throughout the process.

## PROJECT SUSTAINABILITY

Sustainability will be attained through the Local Resource Committee as it will be responsible for implementation of the management plan after completion. It is a priority for MICS to ensure that the community understands the issues and gaps it faces, the network it will be a part of once the management plan is finalized, along with the roles and responsibility of the community members and representatives. An official sign-off of the management plan from the Majuro Atoll Local Government, will also allow for the sustainability of the project.

PROJECT themes	Community led management of reef resources
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Marshall Islands Conservation Society (MICS)
BUDGET: USD \$58,570	CO-FINANCING: USD \$2,500 (in-kind)

# Coral Reef Project Niue

07

PROJECT LOCATION: Niue

## PROJECT DESCRIPTION

In late 2016 and early 2017 Niue experienced wide spread coral bleaching. Irrespective of El Nino, Niue now suffers high intensity cyclones annually and increased weather and water temperatures. With additional pressures from human impacts and visitation by tourists, our coral reefs are becoming increasingly vulnerable every year. Their growth and health is at high risk and for the first time recently, IUCN have declared certain corals critically endangered including the Acropora corals that are predominantly endemic to Niue. Much education needs to be instilled in our people and visitors regarding the vulnerability of coral reef habitats and their importance in sustaining reef fish.

The Project aims to educate and create awareness among all levels of the community through our coral

watch program which will tie in with the University of Queensland's community monitoring activities. Our vision for education will be delivered through ecotourism – allowing visitors to partake in diving and reef flat monitoring and our educational showroom with 360 degree underwater photography experiences that will give the elderly and those with disabilities who are unable to access the reef, the ability to experience Niue's coral reef ecosystems. In allowing this project to be submersed into the village plans – our community will become involved in setting precedent for good stewardship by protecting coral reefs for future generations and allowing visitors the opportunity through monitoring, to visit even the most secluded coral reefs here in Niue.

## THEORY OF CHANGE

### PROBLEM

The reefs of Niue are being decimated by bleaching, cyclones and local pressures - the community want to educate their people about the importance of these systems and drive initiatives to protect their reefs but require resources to do this.

### INTERVENTION

Educate the community about the importance of reefs via innovative and active learning (monitoring, 360 videography, walks & dives) and creative ideas (festivals, music, art). Sustain and enhance coral reef ecotourism in Niue via facilitating innovative and active learning. Empower villages through monitoring reefs in their own villages to instill and reinforce ownership and continuation of the project for the overall wellbeing of their coral reef ecosystems and food security.

### OUTCOME

An engaged and educated community equipped to face and respond to the challenges that climate change posed to their reef and livelihoods.

## IMPACT AND CONTRIBUTION

This is an entirely community designed and led project aimed at providing education and awareness to the Niue people and visitors. Through participation in coral watch, health assessments, diving and the creation of an educational showroom with 360-degree underwater photography experiences to engage the elderly or less able – villagers will be empowered to conduct monitoring of their own reefs, reinforcing ownership and wellbeing for their reef ecosystem and food security and visitors will be more aware of the challenges facing coral reefs and become advocates for change and future funding and support.

## INNOVATION

The project will be innovative because nothing proposed in this project has been done in Niue before. Projects run by government are slow to get up and running – this project leverages the passion of locals dedicated to the cause to drive change, making it innovative! With a budget of only \$6k Oma Tafua has achieved big change - this is testament to the dedication and passion of the active members behind the scenes. The 360-degree underwater photography will provide the less abled and underfunded the opportunity to see the reef – allowing a larger number

of people to be educated about the vulnerability and importance of coral reefs.

The logbooks will be the first of its kind. While SPC has their artisanal fisheries logbooks, they are poorly maintained. With the villages hosting of the logbooks this will be the first, with benefits going directly with the villages – it will be a great way forward!

## STAKEHOLDER ENGAGEMENT

Oma Tafua is a local organisation with strong support from the community to lead this project. Many local villagers and businesses have already committed time and resources. The local community including more remote villagers will be involved in all project elements.

## PROJECT SUSTAINABILITY

As this project is aimed at embedding reef stewardship within the Niue community and visitors and is led by passionate and motivated locals, the outcomes of this project will be enduring.

PROJECT themes	Innovative and novel community engagement and education
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Oma Tafua
BUDGET: USD \$59,425	CO-FINANCING: None



## THEMATIC CATEGORY B

# Enterprise & Market Mechanisms Regulation and legislation are powerful tools Enterprise & Market Mechanisms

Businesses, industry sectors and economic policies provide the many of the systems and structures that drive human interaction with coral reef ecosystems. Businesses that depend on coral reefs in some way can be heavily impacted by changes in coral reef health, while many other enterprises can inadvertently add stress to reef ecosystems, such as agriculture or waste processing. Markets, policies and businesses can play key roles in shaping individual and business actions so that the resilience of coral reefs is supported, rather than eroded. These sectors will need to understand the risks associated with their decisions and their operations, and manage their businesses to minimise impacts and harness opportunities. Inform or make better choices about how they operate and do business in the face of a climate change and increasingly connected and informed communities and clients - allowing them to be resilient to emerging shocks and stresses. Project concepts in the Enterprise and Market Mechanism thematic category aim to educate and empower reef-connected businesses to identify and implement solutions that can both optimise reef health and build business success.

# The Sustainable Management of Traditional Marine Protected Ecosystems (reefs, mangroves & seagrass) & Genetic Biodiversity

08

PROJECT LOCATION: Vanuatu, Fiji & Solomon Islands

## PROJECT DESCRIPTION

Coral reefs within the Melanesian LDC's of Solomon Islands, Vanuatu and Fiji are the "rainforests of the sea", prized for their beauty and resources. They are also the most vulnerable ecosystems threatened by climate change. While coral reefs cover less than two percent of the ocean floor, nearly 25 percent of all marine life depends on them for survival. According to the World Resources Institute (WRI), nearly all coral reefs worldwide will be threatened with death by 2050 with drastic food security consequences. Coupled with the threat of humans are overfishing and the commercial exploitation of marine wild stock, pollution and sediment runoff. There is an urgent need to restore the biodiversity of marine life and coral, mangrove and seagrass ecosystems.

Arresting the loss of valuable coral reef ecosystems and marine biodiversity requires linking conservation efforts with incentives for stakeholders to manage their economic livelihoods in an environmentally sustainable way. The

island of Emae in Vanuatu has recently made strides towards this process by pursuing an island-wide ridge-to-reef organic certification programme through POETCom. However, organic certification per se may not contribute to improved conservation and positive livelihoods outcomes unless the attributes associated with good marine environmental stewardship are communicated effectively to sustainably add value for producers and service providers.

Our aim in this initiative is to develop a suite of conservation based livelihoods activities, with emphasis on reaching vulnerable groups, which are linked under a participatory branding platform to demonstrably showcase the individual stakeholder's efforts to protect specific types of biodiversity. Innovative technology will be used to communicate these stories with consumers. This represents a unique means to add value to local products and services, and is scalable to the outer lying remote islands and developing country contexts.

## THEORY OF CHANGE

### PROBLEM

Reef reliant communities require healthy and resilient reefs to survive. Transition to more sustainable livelihoods and products is occurring, but financial incentives are at risk due to the commoditisation of these goods and services.

### INTERVENTION

To further incentivise and sustain community conservation activities, environmental stewardship and financial return - activities will be linked under a participatory branding platform which demonstrably showcases the individual stakeholders' story and achievements to consumers.

### OUTCOME

Community conservation activities are sustained and measurably improving species diversity and populations of targeted species.

Financial value is created and sustained for the individual and their conservation work is a marketable brand. More individuals are incentivised to participate.

Consumers have a greater connection with the people and their local products, receive lasting benefit and pass on the story (participatory marketing).



## IMPACT AND CONTRIBUTION

Vulnerable communities who have transitioned to sustainable livelihoods will improve their financial wellbeing by showcasing and communicating their conservation story under a community participatory brand, providing market advantage. This approach hedges the risk of current 'organic' branding becoming commoditised, particularly as it becomes a minimum standard by which all sustainable fishing communities must comply for market access. It is anticipated that the project will incentivise additional vulnerable and remote communities (fisherfolk and turtle hunters) to transition to conservation based livelihoods.

Increased uptake of sustainable organic farming that enhances traditional best practices and responsible aquaculture that is science based will not only preserve traditional farming knowledge but also reduce stressors to the coral reef ecosystem by human activities (over fishing, destructive fishing, run-off pollution). This will enhance the sustainable management of coral reefs through the restocking of targeted fish species and management of crown of thorns through the introduction of predators (aquaculture). As the individual conservation stories spread, consumers will also become educated about the risks facing coral reef systems and the great efforts

the people who rely on them for survival, are making to become more resilient.

## INNOVATION

This project is innovative because of its participatory branding platform that showcases and markets community conservation efforts. Artificial spawning of giant conch shells to manage CoTs and the use of underwater drones to monitor effectiveness and impact, which footage can be used to support participatory branding.

## STAKEHOLDER ENGAGEMENT

This project is driven by the Emae and Makatu communities and endorsed by the Emae Ngarikitu Council of Chiefs.

## PROJECT SUSTAINABILITY

Through this project, the communities on Emae in Vanuatu, Fiji and Solomon Islands will have improved financial incentives to reduce impacts and nurture biodiversity, resulting in a healthier coral reef, mangrove and seagrass ecosystems.

PROJECT themes	Community and reef resilience; market change
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Emae_Makatu Community		
BUDGET: USD \$57,000	CO-FINANCING: None		

# Enhancing Coral Reef Resilience through Research & Collaborative Resource Management

09

PROJECT LOCATION: Sri Lanka

## PROJECT DESCRIPTION

The resilience of coral reefs to climate change has been shown to be highly dependent on the biological and ecological 'health' of the reef ecosystem, with healthier reefs showing greater resilience to natural impacts and a greater ability to recover from mass mortality events such as mass coral bleaching. In Sri Lanka, fisheries (for food fish and the aquarium trade) and tourism are the two main anthropogenic activities that directly impact reef health. The project seeks to integrate on-going scientific research, conservation activities, and awareness programmes with local and regional tourism operators with a collaborative approach to improving both food and aquarium fishery management to protect the health of the coral reefs in the project site.

## IMPACT AND CONTRIBUTION

Coral reefs in Sri Lanka are heavily impacted by anthropogenic actions, especially destructive fishing methods and overexploitation of target species. Growth

in tourism has also resulted in an increase of visitor impacts through reef walking, boat anchoring and pollution. Coral bleaching caused by global climate change has further exasperated the problem with severely declining reef health and associated fish yields that are negatively affecting biodiversity and livelihoods of coastal communities.

The project will expand and increase the effectiveness and sustainability of current initiatives in the region by focusing on advancing current knowledge, and increasing reef resilience by managing human impacts. Long-term research will advance the understanding of coral reef ecology in Sri Lanka, and develop a knowledge base and monitoring indicators for effective management. A fisheries improvement program in collaboration with community stakeholders will aim to improve fishing practices through both regulatory and participatory mechanisms. Educational activities and capacity building for local schools and boat operators will aim to increase

## THEORY OF CHANGE

### PROBLEM

Anthropogenic actions and coral bleaching are severely impacting coral reef health in Sri Lanka resulting in declining biodiversity and livelihoods. Effective management has been hindered by a lack of sound scientific data, funding, resources and a top down management structure.



### INTERVENTION

Build on existing programs to establish long term monitoring program focused on climate change impacts, reef resilience and fish stocks.  
Develop a collaborative sustainable fisheries improvement program, establish mooring buoys for tour operators and implement community education and capacity building program as a basis for community based coral reef fish fisheries management.



### OUTCOME

Increased knowledge base to support the scientific management of the coral reef & resources.  
Sustainable management model being co-implemented by the community and regulatory bodies - reducing impacts and increasing reef and community resilience.

awareness on responsible use of reef resources and improve community owned tourism operations. Activities such as demarcating snorkelling areas and establishing mooring buoys will also reduce physical damage to shallow coral reef ecosystems.

This collaborative approach to resource management will address key stressors to the system including physical damage and stable populations of indicator species for both fisheries for reef health improving the resilience of the reef to future bleaching events and providing an important seed bank to repopulate reefs along the east coast.

### INNOVATION

The project will address major gaps in the understanding of coral reef ecology and response to climate change as well as promote a more participatory approach towards resource management within a localised reef system. It will also attempt to apply MSC criteria for fisheries improvement to a small-scale fishery supplying both local and export markets.

### STAKEHOLDER ENGAGEMENT

Communities will be encouraged to determine

management actions within existing regulatory frameworks that can be implemented through fisheries societies. Working with existing fisheries societies will ensure stakeholder consultation and participation into the decision-making and enforcement process. Engaging resorts in Pasikudah will promote partnerships with the private sector to support sustainable tourism. Current initiatives by WRCT and BRT are funded through the CSR program of the Tokyo Cement Group and will continue to support some activities of the proposed project.

### PROJECT SUSTAINABILITY

The project will build upon work carried out by WRCT and BRT in the area. This includes extensive field research, reef rehabilitation, awareness and stakeholder consultations for future management. By encouraging community driven management initiatives, the project will attempt to develop interventions that are both supported by local communities and can be implemented without extensive external funding in the long term. The model for fisheries improvement will be based upon a successful fisheries improvement project implemented by Pelagikos PVT Ltd for the blue swimming crab fishery in northern Sri Lanka.

PROJECT themes	Long-term monitoring; collaborative reef & fisheries management
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Wildlife Research & Conservation Trust (WRCT)		
BUDGET: USD \$60,000	CO-FINANCING: USD \$204,000		

# The Green Fins Approach to Managing a Sustainable Marine Tourism Industry in the Caribbean

10

PROJECT LOCATION: Dominican Republic

## PROJECT DESCRIPTION

Tourism drives considerable economic growth globally but can constitute a locally significant driver of coral reef degradation, putting direct as well as indirect pressures on the ecosystem. Green Fins (GF) is a public-private partnership developed by UN Environment and The Reef-World Foundation. GF fosters environmental stewardship in the coastal tourism industry and leads to a measurable reduction in negative environmental impacts associated with diving and snorkelling activities. The approach has been implemented extensively in Asia which has proven that the approach works, that it is replicable, and that it delivers concrete and measurable results in terms of reducing pressures on coral reefs to promote resilience. This proposal responds to calls to implement the approach in the Caribbean using the Dominican Republic (DR) as a pilot site where dive tourism is significant but has received little attention, both in terms of

environmental impacts and sufficiency of regulatory frameworks.

## IMPACT AND CONTRIBUTION

Impacts on coral reef ecosystems from dive and snorkel tourism represents a pressure on coral reefs that can simply be reduced with interventions that guide tour operators and tourists towards more sustainable practices for mutual benefit. The implementation of the 'Code of Conduct' by participating operators and subsequent assessment of business practices and polices identifies areas of high-risk threats both above and below the water, offers practical alternatives to operators and provides support for implementation from trained GF resource managers. The resulting changes, reduce the impact of stressors to reefs and associated ecosystems, thereby enhancing their resilience to larger scale threats.

## THEORY OF CHANGE

### PROBLEM

Dive and snorkel tourism are directly and indirectly impacting the health of Caribbean coral reefs (e.g.: anchor damage). Levels of dive tourism in the region is high yet its impacts receive little attention in terms of management or regulatory frameworks.

Scientific reports indicate that live reef cover is significantly lower at sites frequently visited by tourists (diving and snorkelling).



### INTERVENTION

Conduct situation analysis of local impacts, legislation and stakeholder concerns and opportunities to shape tailored site level action plan.

GF training to 4 local assessors who will conduct outreach and awareness activities and assessment of dive/snorkel operators.

Engage 20 marine tourism operators in environmental training, provision of GF toolkit and assessment to identify baseline of their business practices, actions for improvement and progress assessments.

Analyse national and local legislation to identify gaps and needs.



### OUTCOME

>10% improvement in the baseline of tour operators business practices every year resulting in a commensurate reduction in environmental impact to local coral reefs.

Increased awareness and engagement of dive tourists.

## INNOVATION

This project is innovative to the DR and the broader Caribbean region. There are a number of past initiatives in the Caribbean on tourism in general and diving specifically, and indeed the GF Code of Conduct was developed based on work originally done in the Caribbean (by CORAL, UNEP and others). However, there are no initiatives in the Caribbean which combine a code of conduct with performance assessment and public-private collaboration like GF does.

## STAKEHOLDER ENGAGEMENT

The primary beneficiaries of this project are representatives of the diving industry. Typically, wherever GF is implemented 75% of dive operations participate voluntarily. Dive operations employ many local community representatives, who will be engaged through the awareness raising activities. Diving tourists will also be engaged in awareness raising activities, as well as benefiting from educational materials displayed at the dive centres, improved environmental pre-dive briefings and increased knowledge of environmental issues from their dive guides and instructors. RCDR have committed to leading GF implementation and have a decade long history of work with marine assessment and management. It is expected that this will be done in partnership with the Ministry of the Environment and Natural Resources, the

Ministry of Tourism, and other localised partners such as hotel and restaurants associations, local business associations and relevant NGOs.

## PROJECT SUSTAINABILITY

The adoption and application of GF by authorities, organisations and institutions has been seen to be most successful where government and non-government entities operate in partnership, with commitment to supporting implementation in the long-term. Because of its emphasis on private sector responsibility and performance, GF lends itself to implementation through corporate social responsibility programmes of businesses to supplement national funding. Long term financial support for implementation of GF has successfully been met in other countries by applying these two models.

This project will result in GF being fully established in one of the busiest diving destinations in the DR. It is the intention of RCDR to replicate GF to other diving destinations in the DR, to eventually become a national programme accessible to all dive operators. Expressions of interest in GF have already been received from the governments of Colombia, Antigua and Barbuda, Jamaica and Barbados. It is expected that this project will initiate replication across the region.

PROJECT themes	Sector awareness building and behaviour change
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	The Reef-World Foundation			
BUDGET: USD \$56,000		CO-FINANCING: USD \$55,400 (in-kind)		

# Development of a Sustainable Land-based Aquaculture System Aiming to Reduce Human Pressure on Coral Reefs, Seagrass Beds & Mangroves in the Mexican Caribbean

11

PROJECT LOCATION: Mexico

## PROJECT DESCRIPTION

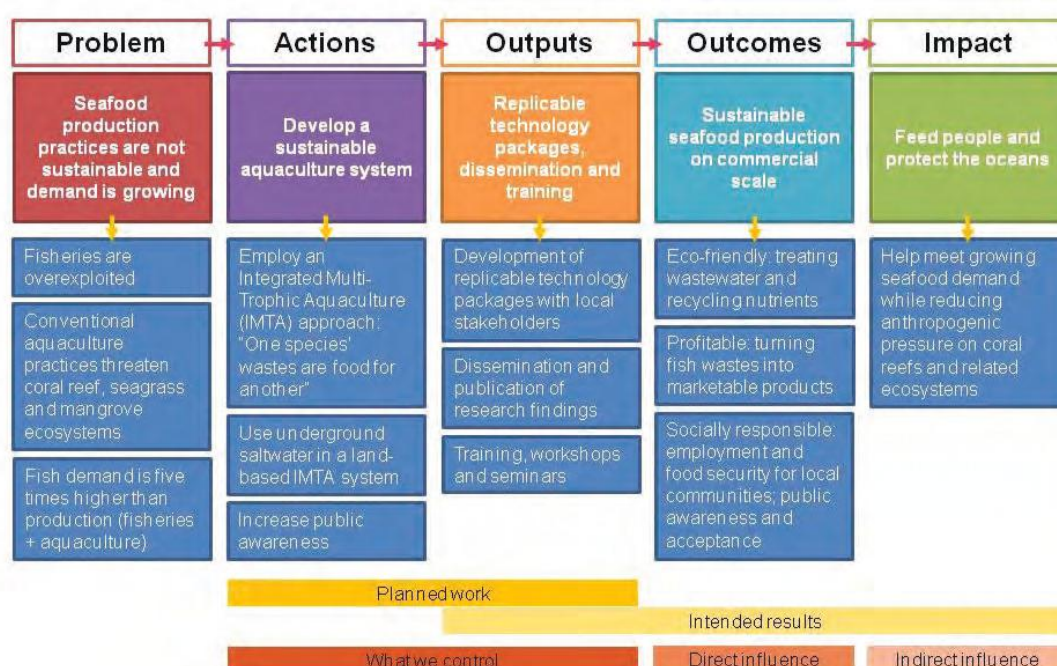
Fisheries have reached their limit worldwide. In the state of Quintana Roo, Mexico, importation of seafood is five times the local production; therefore, it is urgent to develop and establish sustainable aquaculture systems to satisfy the fast-growing demand of seafood by the local population and tourism industry. In the Mexican Caribbean, however, it is not advisable to use sea cages or enclosures to cultivate marine species, as this practice may increase nutrient load and eutrophication with potentially negative impacts on sensitive ecosystems such as coral reefs, thus coming into conflict with environmental conservation efforts. The proposed project aims to develop a land-based Integrated Multi-Trophic Aquaculture (IMTA) system using underground saltwater, which abounds in the Yucatan Peninsula due to the intrusion of seawater through the

karstic matrix. IMTA is a practice in which the wastes from one species are recycled to become inputs (fertilizers, food) for another. Hence, IMTA promotes economic and environmental sustainability by converting the by-products and uneaten feed from fed organisms into harvestable crops, thereby reducing eutrophication, and increasing economic diversification. Brought to commercial-scale, an aquaculture system of this kind could generate food security and employment for local communities.

## IMPACT AND CONTRIBUTION

IMTA refers to the farming of different aquaculture species together in a way that allows one species' wastes to be recycled as feed for another. By recycling nutrients that would otherwise be wasted, IMTA systems offer the advantage of increasing economic gains while reducing

## THEORY OF CHANGE



the nutrient load of waste products in the marine environment.

Environmental and economic resilience will be strengthened by using underground saltwater to grow a wide variety of targeted marine species inland, thus keeping delicate reef ecosystems intact. Social resilience will be strengthened by providing training, employment and food security to local marginalized communities.

## INNOVATION

Land-based IMTA using underground saltwater is an innovative idea that would allow the sustainable production of seafood avoiding the mistakes of conventional aquaculture (waste of energy as well as organic and inorganic water pollution).

The project will explore the possibility of cultivating native target species such as *Octopus maya*, *Penaeus brasiliensis*, *Ocyurus chrysurus* and *Lobatus gigas*, that are currently underexploited by the aquaculture industry despite their high market value and demand. These species may also be reared for repopulating degraded reef ecosystems. The target species will be cultivated in combination with deposit feeders (e.g. sea cucumber, polychaete worms) which can take up settling organic matter (excrements and uneaten feed), and biofilter species like seaweed and mussels which are able to remove inorganic nutrients and suspended organic

matter from the water column. A constructed wetland planted with edible halophytes (e.g. *Salicornia bigelovii*) will further purify wastewater, while also providing an additional marketable product.

## STAKEHOLDER ENGAGEMENT

The proposed project seeks to carry out applied research and transfer ecological and profitable solutions to the aquaculture industry. Seminars and workshops will be organised for students and researchers of the University of Quintana Roo and other local technological institutes. Also, an electronic leaflet explaining the possibilities of IMTA and other sustainable aquaculture techniques will be developed for distribution to state universities, CANAINPES (National Chamber of Fisheries) and private companies. If this proposal is successful, local companies will be invited to set up pilot plants and participate in the development of technological packages.

## PROJECT SUSTAINABILITY

Project sustainability will be based on three pillars: environmental, economic and social. Environmental and economic sustainability will be achieved by developing and promoting land-based IMTA systems which treat aquaculture effluents (biomitigation) and recycle fish wastes into added marketable products. Social sustainability will be achieved by providing food security, education and career opportunities for local communities.

PROJECT themes	Sustainable aquaculture; improved water quality; food security
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	National Autonomous University of Mexico (UNAM)
BUDGET: USD \$60,000	CO-FINANCING: USD \$9,850 (in-kind)

# Pledging Sustainable Parrotfish Fishing for Reef Patch Areas Protection

12

PROJECT LOCATION: Brazil

## PROJECT DESCRIPTION

In the Northeastern Brazilian Coast, the small-scale fisheries developed inside the limits of a protected area target immature parrotfishes, mainly greenback parrotfish, classified as endangered by IUCN and by the Brazilian Red List of Endangered Species. Fishing of immature individuals results in negative impacts both on its population, and the coral reef ecosystem.

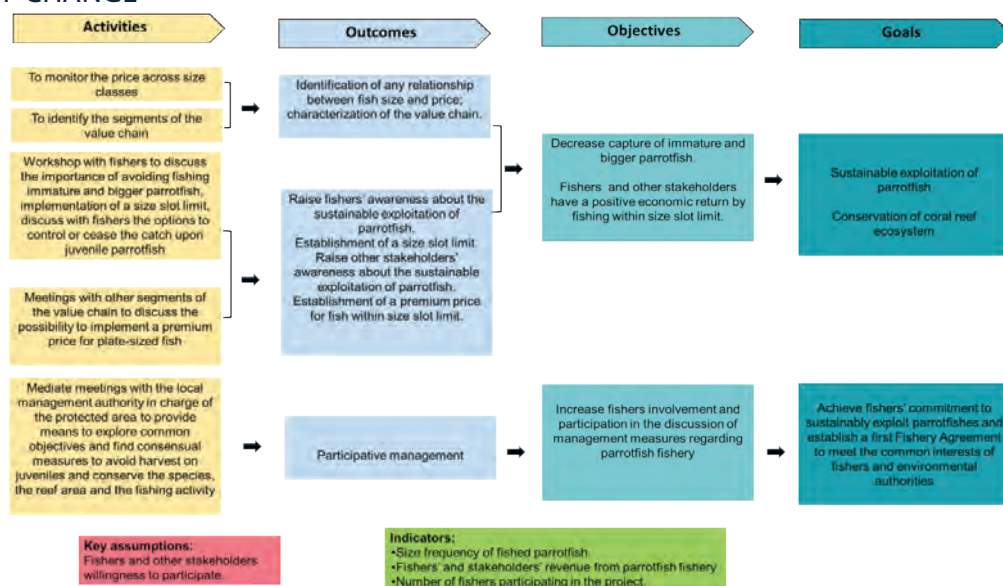
The first project intervention strategy will be to unveil the number of fishers exploiting the species and estimate their earnings to properly assess the economic losses if catches were reduced by regulation. This information will inform compliance and management needs, support possible refund discussions. Beyond price and revenue, the project will investigate the value chain from the fisher to the final consumer, to assess economic benefits and employment provided by species harvesting.

The second intervention strategy aims to organize meetings with fishers and other stakeholders in the value

chain, to find common ground on decisions regarding fish species and reef areas for conservation. These meeting goals are (i) to explore with fishers the effect of juvenile harvesting upon the population and for local economics, (ii) provide understanding on commercial and biological extinction using past events of species disappearing in the region; (iii) enlighten fishers on the importance to avoid the catch of immature and larger fish to preserve parrotfish population, the coral reef ecosystem, and local fishing activity, (iv) discuss with fishers the options to control or cease the juvenile catch, including the implementation of slot size limits; and (v) establish partnership opportunities between fishers and parrotfish's buyers, to pay a premium price for the proper-sized fish, based on the size of maturity.

Once consensual rules are achieved, the management authority in charge of the protected area will be invited to provide the means to support local decisions through a Fishing Agreement (like the ones being implemented for lakes in Brazilian Amazon).

## THEORY OF CHANGE





## IMPACT AND CONTRIBUTION

This project combines economic data from fishers and the parrotfish supply chain (revenues, value chain analysis and economic value produced through segments of the supply chain), with information on the ecological role of parrotfish in the reef ecosystem, to motivate fishers toward more sustainable practices. The project will communicate value at risk from unsustainable catches throughout the whole parrotfish supply chain, to ensure all segments can align on what is needed to support both the reef and their industry. By sharing responsibilities with fishers on decision building and by transferring rights and duties to them through Fishery Agreements, it is hoped that more compliance, commitment and participation can be achieved and sustained.

Reducing fishing pressure on parrotfish, and promoting a sustainable fishing industry and supply chain will support the health and resilience of the coral reef ecosystem which is dependent of the parrotfish population.

## INNOVATION

The innovation of the project lies in three main aspects: anticipation of the law, implementing participative fishing management rules into a protected area, and the use of Fishery Agreement as management and protection instrument, markedly for reef areas.

The project will explore the possibility of cultivating native target species such as *Octopus maya*, *Penaeus brasiliensis*, *Ocyurus chrysurus* and *Lobatus gigas*, that are currently underexploited by the aquaculture industry despite

their high market value and demand. These species may also be reared for repopulating degraded reef ecosystems. The target species will be cultivated in combination with deposit feeders (e.g. sea cucumber, polychaete worms) which can take up settling organic matter (excrements and uneaten feed), and biofilter species like seaweed and mussels which are able to remove inorganic nutrients and suspended organic matter from the water column. A constructed wetland planted with edible halophytes (e.g. *Salicornia bigelovii*) will further purify wastewater, while also providing an additional marketable product.

## STAKEHOLDER ENGAGEMENT

Fishers will be engaged in daily monitoring of size and price of parrotfish fished. In addition, workshops with fishers will be held to discuss the importance of avoiding fishing immature and bigger individuals to sustainably exploit the resource, as well as to search for their solutions on how to conserve parrotfish population, the coral reef ecosystem and the fishing activity. Retailers and restaurants will be engaged with meetings to discuss the importance to sustainably exploit parrotfish by avoiding the buy of juvenile parrotfish.

## PROJECT SUSTAINABILITY

Sustainability would be achieved by the Fishery Agreement build between fishers and the environmental/management authority in charge of the protected area harvested by fishers. By sharing responsibilities with fishers on decision building and by transferring rights and duties to them - compliance, commitment and participation will be enhanced in the long term.

PROJECT themes	Parrotfish preservation; industry supported management arrangements
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Universidade Federal do Rio Grande do Norte
BUDGET: USD \$33,000	CO-FINANCING: None

# OSA Coral Reef Conservation Project

13

PROJECT LOCATION: Costa Rica

## PROJECT DESCRIPTION

The project aims to protect and restore the coral reefs ecosystems around Caño Island Biological Reserve and San Josecito Beach, in the Osa Region, by reducing the impact of anthropogenic threats on marine ecosystems. These ecosystems have been impacted by the negligent behaviour of the local tourism operators and commercial fisheries.

In a prior project implemented by the foundation, a group of local stakeholders (boat captains and tourism guides) helped put together a list of recommendations and best practices for coral reef conservation and marine protection. This project will help continue this effort, improve the mooring systems in these two sites, provide infrastructure

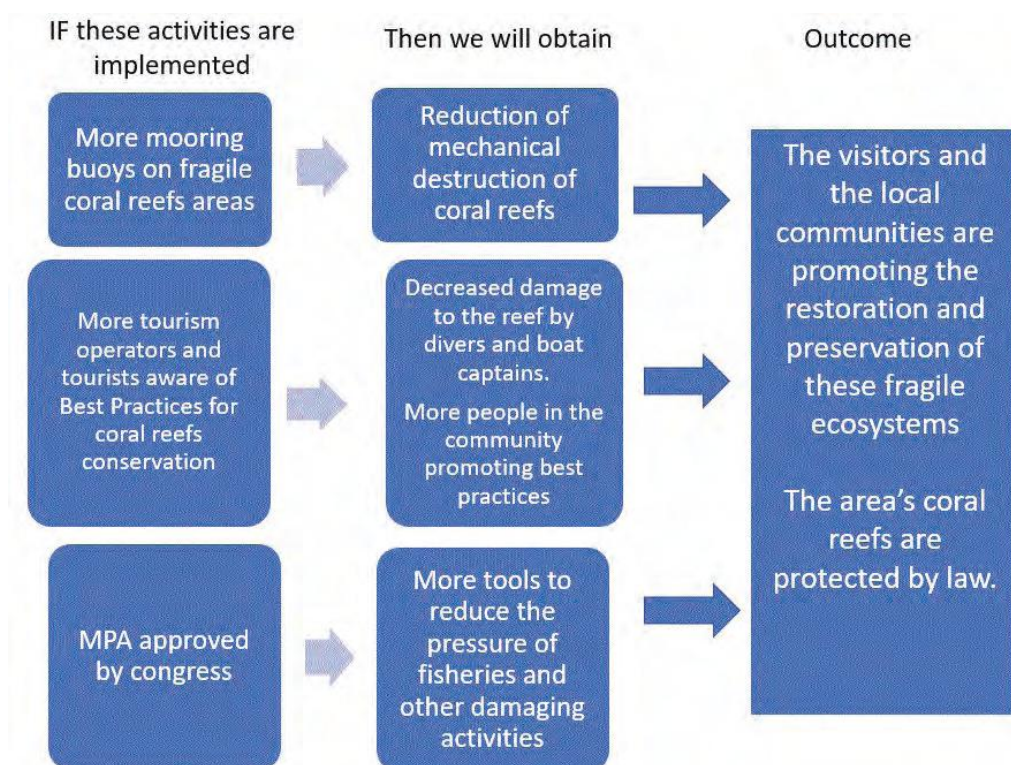
needed and promote Best Practices and environmental education.

A project to create a Marine Protected Area (MPA) that includes these two sites needs to undergo a process of dissemination and consultation with the communities; this could ultimately provide the framework to keep commercial fisheries away from these fragile ecosystems. The foundation will include efforts to promote and disseminate this project.

## IMPACT AND CONTRIBUTION

This project will combine education with the delivery of infrastructure identified by the community and business as necessary to achieve 'best practice' for the protection

## THEORY OF CHANGE



of their marine resources. The combination of continued education to reinforce best practice behaviours, and the realisation of infrastructure (mooring buoys, signage, etc.) identified by local stakeholders as necessary to support these behaviours will reinforce the value of involvement in collaborative management of the reef ecosystem. Capturing the momentum of the local community, businesses and tourists will also support efforts underway to create an MPA that will include Caño Island Biological Reserve and San Josecito Beach.

### INNOVATION

The project is innovative because it has a strong role of local communities integrated in the process of formulation and implementation. It will also promote a more active role between private and public sector, plus engage in promoting a long-term plan for the area. The Foundation will also provide a bridge to connect governmental concerns with those of the private sector and facilitate agreement on future steps.

### STAKEHOLDER ENGAGEMENT

This project has a strong community role. It is the second phase of an initial effort to collect local knowledge about coral reef and marine conservation. Local leaders, boat captains and local guides have already put together a comprehensive guide for Best Practices for marine operations in fragile marine areas, especially coral reefs – this project will use this momentum to implement on ground action including installing mooring buoys, signage and other tools for dissemination of these practices.

The project will also generate awareness among children about the importance of protecting their marine natural resources in the area, especially coral reefs. Several environmental education activities including snorkelling and diving with school children, workshops, festivals and recreational activities, would be being carried out. The idea of this effort is that the future users of the island, are already aware about the importance of coral reefs and its conservation. Workshops related to Best Practices for marine tourism will also be provided to captains, guides, divers and officials of the Conservation Area. To achieve the greatest possible involvement, employers and hotel owners will be asked to sign a commitment to comply with certain guidelines related to responsible practices in maritime activities. These commitments would be published on the website of the Foundation and on the pages of companies and NGOs interested in the subject to promote the effort made.

### PROJECT SUSTAINABILITY

The project will negotiate and commit local companies to contribute to the maintenance and sustainability of the project after funding is over. The idea is to create a more proactive and engaged private sector that will lead the protection of its natural resources, particularly its marine resources. This is an effort that should be replicated all over the country to find middle grounds between private and public sector, and also protect its natural resources.

PROJECT themes	Stakeholder education; collaborative management; community supported MPA creation
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Corcovado Foundation
BUDGET: USD \$55,340	CO-FINANCING: USD \$10,970



## THEMATIC CATEGORY C

# Governance & Compliance

Regulation and legislation are powerful tools to drive change in the behaviour of individuals, businesses, organisations and communities. Equitable and participatory governance can increase community support for rules and regulations, resulting in reduced enforcement costs and greater stewardship. Compliance programs are essential complements to formal governance arrangements (such as Marine Protected Areas or Local Marine Managed Areas), but they should be much more than just enforcement programs. Strategic compliance focuses on minimising infringements, rather than simply catching incidents of non-compliance. Project concepts under the Governance and Compliance thematic category seek to develop the necessary support (data, community engagement, capacity, technical expertise) to deliver more effective management arrangements through enlightened governance processes and strategic compliance and enforcement.

# Empowering the Ghizo Community to Take Charge of Protecting their Coral Reefs, Mangroves & Seagrasses in the Fight Against Climate Change

14

PROJECT LOCATION: Solomon Islands

## PROJECT DESCRIPTION

The ocean surrounding the island of Ghizo, located in the Western Province of the Solomon Islands is home to abundant and diverse coral reef, seagrass and mangrove ecosystems. As reported in the GELCA Resource Management Blueprint 2011, it is widely acknowledged that the reef systems surrounding Ghizo islands are the second most diverse reef system in the world second only to Raja Ampat in Indonesia. While the 5600 inhabitants are generally concerned about environmental damage and the impacts of climate change, they remain largely unaware that their daily activities such as using the ocean as a dumping ground for human and solid waste, overfishing, dropping anchors, unsustainable harvest of coral and mangroves for building materials and firewood are threatening these precious ecosystems. The proposed

project is two pronged. It aims to 1) raise awareness about the specific actions leading to environmental damage and encourage and support practice change, and 2) make management actions for priority areas in current management plans legally binding under the Fisheries Management Act 2015.

## IMPACT AND CONTRIBUTION

Through target workshops, comprehensive understanding of the role played by coral reefs, mangroves and seagrasses in minimising the impact of climate change will be provided to the community. Further education and support will build on traditional knowledge of marine resource management and provide the knowledge and tools required to identify solutions to protect and enhance these vital resources.

## THEORY OF CHANGE

### PROBLEM

No legislative framework for enforcement of management objectives identified in Marine Protected Area Plans

Ghizo community apathetic regarding the role they play in protecting marine ecosystems and minimising the impacts of climate change.

Ghizo community unaware of the importance of climate change and marine ecosystems, the interaction of the two and how they will be impacted.



### INTERVENTION

Review and submission of paperwork for areas identified in Marine Protected Area Plans to be designated Community Fisheries Management Areas under the Fisheries Management Act 2015

Awareness and education program is developed and rolled out that is specific to the Ghizo community, including local scenarios and addressing local constraints.

Work with community to develop and implement local projects which overcome local human based threats.



### OUTCOME

Priority marine ecosystems are protected through appropriate legislative framework.

Ghizo community is engaged and conscious of the interactions between their marine assets and climate change and what they can do to protect and enhance their marine ecosystems in order to minimise the impacts of climate change.

## IMPACT AND CONTRIBUTION (CONT...)

This project will have special appeal to the Ghizo community by providing specific information regarding the real impacts that climate change will have on them and the role they can play in minimising these impacts by managing the coral reef, mangrove and seagrass ecosystems under their influence. In the developing nation of the Solomon Islands, sustaining basic needs is at the forefront of people's minds and therefore this project will appeal to the community by demonstrating how they can take control of their own livelihood and ensure it improves into the future.

This project has a two-pronged approach in that it will not only raise awareness and educate the community but will also ensure a legislative framework is in place for the ongoing protection of priority marine ecosystems surrounding Ghizo Island.

## INNOVATION

The project is innovative because it gives the community the knowledge, understanding and technical and financial support to make change for themselves.

## STAKEHOLDER ENGAGEMENT

GELCA has a committee of 10 members who are community leaders from across Ghizo Island and have

been successfully working together for more than 5 years on projects involving community engagement and resource management, each member will be heavily involved in the project ensuring that their communities are engaged.

The Ghizo Island community is imperative to the success of this project and therefore it will be designed to ensure they are engaged by meeting their needs and appealing to their livelihood. The workshops and projects will be individually designed and located based on the 6 zones of Ghizo Island ensuring that information provided is targeted at their area and the assets and impacts that occur there. This will also ensure ease of participation due to reduced requirements for travel.

## PROJECT SUSTAINABILITY

By equipping local people with the knowledge and skills to implement interventions for the protection and enhancement of their coral reefs, seagrass and mangrove ecosystems they will be able to continue to plan and implement local projects with or without outside support. By giving the local community ownership of the threatening activities as well as the solutions they will understand that the future is in their hands and therefore will continue the work initiated by this project.

PROJECT themes	Community awareness and capacity building; legislative change
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Targeted systems (■ = Project targets ecosystem)

Coral Reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Ghizo Environment Livelihood Conservation Association (GELGA)		
BUDGET: USD \$58,000	CO-FINANCING: None		

# Sorong Regency Marine Protected Area Initiative in the Bird's Head Seascape Papua, Indonesia

15

PROJECT LOCATION: Indonesia

## PROJECT DESCRIPTION

The Sea Partnership Program of West Papua (Konsorsium Mitra Bahari), hosted by the University of West Papua (UNIPA) is a locally driven program that is co-funded by the national Ministry of Marine Affairs to address provincial marine issues. This project is a district government/ Sea Partnership initiative to design and designate an MPA initiated by the local (district) government and its stakeholders, to protect and manage their precious coastal and marine resources sustainably. Sorong is the home of the airport and the services for most visitors to Raja Ampat and Bird's Head Seascape, located in the Coral Triangle, and considered to be the global center of marine biodiversity. The Birds Head Seascape area has been a conservation priority for the last decade or more and many significant conservation efforts, MPAs and indeed, MPA networks are located here. In 2018, the Ministry of Marine Affairs, the Province of West Papua and the USAID Sea Project will

be working together to establish the province-wide MPA network with a system of individually-co-managed MPAs. Sorong has already been identified as a key geographic and ecological "gap" in the MPA network for consideration. Whereas most (all?) of the other MPAs in West Papua have been initiated, led and developed by respected NGO partners such as NGOs such as Conservation International, The Nature Conservancy, and World Wide , this District-level MPA will be initiated and led by the local (district) government utilizing its Sea Partnership Program and therefore, hopefully, institutionalizing stewardship locally.

## IMPACT AND CONTRIBUTION

Locally-initiated MPAs, designed and led by the local government, institutions and community, will better ensure that factors critical to the community are embedded in its designation, management and compliance. In regions where communities rely on

## THEORY OF CHANGE

### PROBLEM

The existing components of the Birds Head Seascape MPA network leave a geographical and ecological gap in Sorong District.

Most W. Papuan MPAs have been initiated and developed with international NGOs in the lead; there have been local consultations, but less than ideal planning input from local stakeholders.

Lack of awareness or engagement, with threats to existing livelihoods, has resulted in continued illegal, destructive and unsustainable activities that stress Sorong's marine ecosystems.



### INTERVENTION

Initiate design and development of new MPA by Sorong district government with UNIPA Sea Partnership Program as advisors.

Focus on coral reef, mangrove and turtle nesting sites for management.

Focus on bottom-up issues of stakeholders with local stewardship planned and committed.

Build capacity to manage locally.

Join provincial MPA Network.



### OUTCOME

New Sorong Regency MPA designated and connected to the BHS Papua MPA Network.

Communities, local government understand the value of conservation for sustaining livelihoods and have the capacity to support the MPA operation and management.

More effective management results in reduced illegal, destructive and unsustainable fishing, reduced ETP collection, reduced impacts from coastal development, and reduced mangrove conversion.

Sorong district's environment, economy and communities are strengthened and sustained.

ecosystem services to support their livelihoods and well-being, having a say in which areas require protection and how they can be managed to nurture both the reef ecosystem and local livelihoods, is critical for sustaining management efforts that reduce stressors on the reef.

When we consider the reef ecosystem to be interdependent with reef communities, this approach promotes sustained management of the whole system. In addition, the role of this MPA in the West Papua/Birds Head Seascape MPA Network will both contribute to and receive benefits from the larger MPA system.

### INNOVATION

a) Under the new Provincial Government Law 23, 2014 that transfer ultimate management of marine resources from the Districts to the Province, this project can demonstrate how districts can initiate, develop and manage their own MPAs in the provincial system. Although much of the future funding may come from provincial budgets, this design and operations can be conducted by and for the local stakeholders.

b) This will be the first district-level MPA to be developed from initiation to establishment, using the provincial Sea Partnership Program as the primary technical advisor and

facilitation platform. It is expected that this initiative can be a model for other Provinces in Indonesia to initiate and designate their own MPAs.

### STAKEHOLDER ENGAGEMENT

This project will be implemented by the West Papua Sea Partnership where Local Universities, Local government units, International NGOs and local institutions collaborate in West Papua Province. The local government will be the institutional governmental lead and the Sea Partnership the technical lead and facilitator in order to include a broader range of stakeholders. The USAID SEA Project has expressed its commitment to support this initiative as part of the provincial MPA Network establishment. The local community will support the communication and engagement with local customary groups in a participatory and voluntary basis.

### PROJECT SUSTAINABILITY

The MPA will be included in the West Papua MPA Network which will be led by the Provincial Marine and Fisheries Office. Currently under the support of USAID SEA Project, a provincial management unit is being developed as mandated by Law 23, 2014 where the Provincial Government is the authorized government unit who manages the MPAs at the Province jurisdiction.

PROJECT themes	Local government (district) led MPA development
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Targeted systems (■ = Project targets ecosystem)

Coral Reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Konsorsium Mitra Bahari Papua Barat (KMB-PB), Univ of Papua, Manokwari			
BUDGET: USD \$60,000	CO-FINANCING: None			



# Deployment of Conservation & Anti-trawling Structures in the Framework of the 2nd MFMA in Cambodia

16

PROJECT LOCATION: Cambodia

## PROJECT DESCRIPTION

A joint proposal from MCC and the Fisheries Administration to create Cambodia's second Marine Fisheries Management Area (MFMA), and Kep Province's first, was approved by the Royal Cambodian Government in 2016 and is included in the 2017 Cambodian National Action Plan for Fisheries. In an ecosystem that has been pushed to the brink of collapse by illegal and destructive fishing, the project's goal is to deploy 54 Conservation and AntiTrawling Structures (CANTS) with four primary functions: (i) prevent illegal and destructive trawling; (ii) improve water quality in the entire Kep Archipelago; (iii) delimit the boundaries of the five different zones of the MFMA; (iv) act as a marine life aggregation device, or artificial reef. The zoning system is designed to protect highly sensitive seagrass meadows and coral reefs from further destruction while preserving the livelihoods of

local fishing communities, all of which are suffering due to illegal and destructive fishing activities.

## IMPACT AND CONTRIBUTION

CANTS ability to provide anti-trawling, demarcation and aquaculture infrastructure will provide practical solutions to the inter-linked problems (often tackled in isolation). They will prevent illegal and highly destructive fishing, such as pair trawling and electric trawling; address poor water quality through enhanced sediment filtration; provide alternative and sustainable income sources of food and income for struggling small-scale fishing communities through an increase in commercial and non-commercial marine species. Additionally, the project will demarcate and protect new marine protected areas encompassing 46ha of coral reefs and at least 2000ha of seagrass meadows, contributing to a healthy and productive marine ecosystem.

## THEORY OF CHANGE

### PROBLEM

Illegal, destructive and over fishing combined with declining water quality and lack of enforcement are threatening to collapse the marine ecosystems in the Kep Archipelago.

Traditional and sustainable fishing livelihoods are disappearing from communities.

### INTERVENTION

Build and deploy 54 anti-trawling structures (CANTS) and assemble these at strategic underwater sites to demarcate MFMA. Seed oysters on CANTS.

Conduct community workshops and training on sustainable fishing and farming, enforcement of marine fisheries laws and develop of natural wild bi-valve aquaculture project (alternate income).

### OUTCOME

Improved income and livelihoods of fishing communities expansion of alternate income streams and reduced conflict over resources.

Strengthened marine biodiversity and recolonisation of destroyed habitats.

Improved water quality.

The biggest problem for the Archipelago's coral reefs is sedimentation (accumulation on corals, spread of disease, turbidity and water quality). This is mostly caused by illegal trawling. The implementation of the MFMA will tackle this problem, as well as the water quality, helped by a wild bivalve aquaculture.

### INNOVATION

This is the second MFMA in Cambodia, and the first local model that can be scaled up to implement Cambodia's existing and future fisheries, coastal and marine conservation policies. CANTS (anti trawling structures) can be built to different heights at various depths, thus avoiding impacts on regular and legal navigation, while having the potential to enhance and reinvent small-scale fisheries via oyster farming on the structures. This system is exclusive to MCC and Cambodia.

### STAKEHOLDER ENGAGEMENT

There are five fishing communities in Kep Province. The final zoning of the MFMA has been established and accepted through consultations with each of its communities. Their acceptance was compulsory for the project to go further. MCC has worked closely with them for almost four years and built a trustful relationship, which will ensure their collaboration and involvement in the ongoing management of the MFMA. The communities already have a feeling of ownership for the Archipelago which will only get stronger with an increase in their decision-making power and responsibilities. MCC has also been patrolling Kep's waters in collaboration with the

Fisheries Administration and marine police for the past 3 years, and this collaboration will be strengthened with the implementation of the MFMA.

### PROJECT SUSTAINABILITY

While designing this project, ensuring its sustainability and its potential to be easily replicated by any coastal community or government was a priority. The main beneficiaries of this project will be the coastal communities who clearly understand the benefits to be gained from it. Therefore, they will have a strong will and interest to protect it and make sure it remains sustainable for future generations.

The area's sustainability will also be ensured by regular patrols. The efficiency of those patrols is ensured with the direct support of and collaboration between the communities, the FiA, the marine police and MCC. MCC has deliberately chosen a simple, interlocking design and high strength construction techniques that can deliver effective, robust and affordable CANTS on an industrial scale or at the village level, ensuring easy replication.

Because this project proposes a working example of how new marine conservation commitments by The Royal Government of Cambodia can be implemented and replicated, once the first CANTS project is successful, there is a strong interest from the national authorities to create replicates of the project.

Targeted systems (■ = Project targets ecosystem)

Coral Reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Marine Conservation Cambodia (MCC)			
BUDGET: USD \$151,795.24			CO-FINANCING: USD \$45,931.10	

# Rapid Assessment of Coral Reef Habitats of Barbuda after Hurricane Irma: the Baseline for a Restoration Program

17

PROJECT LOCATION: Puerto Rico

## PROJECT DESCRIPTION

In the past decades, Caribbean coral reefs have been battered by intense and severe hurricanes, which have driven the population decline of several scleractinian corals that provide refuge to thousands of ecologically and commercially-important species. Recently, Hurricane Irma, a Category 5 cyclone, severely impacted the Island of Barbuda causing tremendous damages on land, and potentially devastating marine habitats such as coral reefs. In April 2007, the Waitt Institute surveyed 40 sites across the northern and the southern part of Barbuda inside and outside no-take zones. This project aims to reassess the status of these habitats and their associated fish communities after the passing of Irma, to better understand the consequences of climate change on coral reefs. Furthermore, it will identify potential sites to initiate restoration programs as well as start a manual to guide local stakeholders for future restoration plans.

## IMPACT AND CONTRIBUTION

The opportunity to resurvey 40 sites across Barbuda will provide researchers and managers with a granular understanding of how the reef environment has changed in the wake of a category 5 cyclone. Specifically, understanding the magnitude of ecological change on the reef, how it has impacted areas of high commercial, ecological or cultural value and the accessibility of the site is invaluable for local managers in determining how resources should be directed to maximise returns on restoration investment. Additionally, the project leverages skills within the project team to develop a guide for farming refuge species to aid recovery – providing an avenue for deep stakeholder engagement and value add.

With cyclones predicted to become more intense and frequent even under the most conservative climate change scenarios, this project represents a useful guide to manage

## THEORY OF CHANGE

### PROBLEM

Despite the destruction of reefs globally from climate change relates events such as hurricanes and bleaching - there is still a lack of knowledge regarding how coral reefs are impacted and whether existing protections (MPA's) are effective in increasing resilience (e.g: preserving refuge species such as scleractinian corals).

### INTERVENTION

Re-survey known sites to determine effects of Hurricane Irma, on benthic and fish assemblage - noting differences with areas of different fishing regulations (protected vs unprotected).

Identify sites for potential restoration projects and develop Action Plan.

Prepare a manual to aid local stakeholders farm for scleractinian corals and long-spined sea urchin.

### OUTCOME

Better understanding of the consequences of climate change for coral reefs.

Reef managers understand the condition of their coral reef in the wake of Irma. Restoration actions and locations are guided by the Action Plan and stakeholders have the information and skills required to to breed corals and sea urchins to supporting restoration.

The value of MPAs is known.

post recovery efforts and the creation of more expansive protected marine areas.

### INNOVATION

The innovation of this project relies on the unique opportunity of measuring the potential effects of a hurricane, based on changes since a 2007 survey. This opportunity is also unique because it aims to test the actual role of a MPA of protecting and helping coral reefs recover from the impacts associated to climate change. The project is also innovative because also provides a terrific opportunity for designing and testing restoration plans in which the local community will be directly involved. In addition to what has been extensively done for corals, the idea of designing farms of coral and *Diadema antillarum* to aid restoring an ecosystem potentially devastated by a natural event is recent and early results elsewhere (e.g. Puerto Rico) are very promising.

### STAKEHOLDER ENGAGEMENT

By taking advantage of key alliances already established between the Waitt Institute, the Blue Halo initiative, local government and the people – information on the project and opportunities for involvement in coral and urchin farming will be disseminated. This initiative aims to help local stakeholders in Barbuda to better manage their marine resources.

### PROJECT SUSTAINABILITY

The project team has vast expertise in coral reef monitoring programs in the wider Caribbean and in aquaculture. Key established partnerships on the island or Barbuda, will facilitate communication between local stakeholders and researchers to share information. Dr. Williams has worked directly with reef managers and is a co-author on a manager’s tool kit called, *Towards Reef Resilience and Sustainable Livelihoods: A handbook for Caribbean coral reef managers*. In addition, Dr. Williams is a PI of a coral reef restoration project in Puerto Rico. She has successfully cultured sea urchins (*Diadema antillarum*) and other benthic organisms in a laboratory setting and restocked the organisms to the reef. Dr. Croquer, another PI of this project, has been collaborating directly with the Waitt Institute to do previous surveys in the Island of Barbuda. He played a central role in data collection and analysis during the first survey. He has also contributed with other rapid assessments conducted by the Waitt Institute under the Blue Halo initiative (e.g. Monserrat). Dr. Cruz Motta is the newly appointed executive director of the Caribbean Coral Reef Institute (CCRI), which has a known trajectory in the region related to monitoring and directed research at understanding resilience and resistance of coral reef. CCRI is in the process of renewing operational funds, and if those funds are approved as requested; CCRI will be in the position of supporting this project to ensure continuity.

PROJECT themes	Assessment of MPA value & climate change impacts to coral reefs; improved management
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Targeted systems (■ = Project targets ecosystem)

Coral Reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Institute for Socioecological research
BUDGET: USD \$57,800	CO-FINANCING: Yes

# Building the Resilience of Coral Reefs & Local Communities in Voluntary Marine Conservation Areas in Mauritius

18

PROJECT LOCATION: Mauritius

## PROJECT DESCRIPTION

People, especially those dependant on coastal and marine resources, are negatively impacting coral reefs from daily use and cannot be viewed as external to these ecosystems - they must be integrated into management and resilience strategies for their survival. Community based conservation agreements and actions, can have positive outcomes that help increase the resilience and survival of coral reefs. This project proposes to demonstrate this by increasing coral cover and reef resilience in an already established Voluntary Marine Conservation Area (VMCA) by: increasing the size of the VMCA to include additional coral reef areas; piloting of an artificial reef in the site; interventions to help prevent anchor damage; enhanced monitoring and the creation of a community network for monitoring bleaching and developing appropriate management protocols, during bleaching alerts. Education, sensitisation, local knowledge and local participation will be key components to the project to enhance the involvement from local stakeholders and ensure the long-term success of the project after completion.

## IMPACT AND CONTRIBUTION

The Voluntary Marine Conservation Area was established by Reef Conservation with community and boat operators in Anse La Raie in 2013 - management of the site has been successful to date however physical damage from increased tourism and frequent coral bleaching has created a need for additional intervention. This project responds to this need by increasing the size of the VMCA to include an adjacent coral reef and by implementing fixed mooring buoys in the newly identified sites. These actions will reduce the potential impacts from increased visitors and offer protection from anchor damage to the hard coral and benthos. To help ensure the reefs have the best chance of surviving bleaching events, a network of community observers will be trained to raise the alert when bleaching is observed and identify where recovery is taking place. During a bleaching event, the network will execute management protocols to be developed with direct users and piloted in the VMCA. To support reef recovery post bleaching or storm event, the project will establish an artificial reef

## THEORY OF CHANGE

### PROBLEM

People, especially those dependant on coastal and marine resources, are negatively impacting coral reefs from daily use. Deep education and engagement is required to enhance stewardship amongst local stakeholders to help increase the resilience and survival of coral reefs.



### INTERVENTION

Extend VMCA to include at least one more coral reef designated under voluntary management.  
Implement fixed mooring buoys at new sites.  
Establish network of community observers, who can raise the alert as to where coral bleaching is observed and where reefs are recovering. Train network in response protocols during bleaching alert.  
Place an artificial reef structure near to the healthy coral patches to encourage the settlement of coral larvae and fix opportunistic corals.



### OUTCOME

The long-term viability and resilience of the community based VMCA in Mauritius is improved by extending the area of coral under protection. Management strategies are measurably improving reef resilience to natural stress and benefiting those dependent on the resources for their livelihoods.

structure near to the healthy coral patches to encourage the settlement of coral larvae and fix opportunistic corals..

### INNOVATION

Although conservation for marine resources by communities is not new in the Pacific where traditional rights are recognised and parts of the Western Indian Ocean, it is a new concept in Mauritius where there is; open access to marine resources, no traditional rights and multiple resources users from different sectors. The government is viewed as responsible for the state of the resources, however, the VMCA model changes that, as it is the community and resource users who choose the conservation site, agree to the sustainable actions and adhere to a code of conduct and manage the site with the help of the NGO. The project ensures that resource users are central to the decisions made and actions taken not only help improve coral resilience but can be adapted/ to a changing environmental and social conditions.

### STAKEHOLDER ENGAGEMENT

The experiences gained and relationships built during the establishment of the Voluntary Conservation Area will be the pillar on which the present action is built. The Anse La Raie VMCA Committee is established and active and has met with Reef Conservation to plan future actions needed to ensure that the VMCA is successful and viable in the long term – these are reflected in the project. A communication campaign will also be developed for wider outreach to local communities and capacity building and training for the

committees to ensure the actions are sustained in the long term.

Local users both private boat operators and hotel operators will be involved in the placement of the artificial structure and fixed mooring buoys, monitoring of coral and training sessions. Key persons in the community will be engaged in organising larger sensitisation campaigns for the whole community. The local church and hotel group Attitude Resorts have supported the VMCA in the past by supplying meeting rooms and it is expected that this relationship will continue. To create the network for bleaching monitoring, the project will work with the Mauritius Scuba Diving Association (MSDA) and the Mauritius Underwater Group (MUG) which are well organised associations and with who Reef Conservation has worked with in the past. The Ministry of Fisheries and Mauritius Oceanography Institute are aware and supportive of the VMCA and have given permission in the past for the placement of fixed mooring buoys and the snorkel trail. These government agencies will be engaged early in the project to ensure their further support.

### PROJECT SUSTAINABILITY

This project proposal forms part of the long-term VMCA programme and the activities proposed help strengthen voluntary conservation of marine and coastal resources by communities. Sustainability will be ensured through further capacity building of the already established VMCA committee and improvements through sustainable actions that directly benefit the direct users.

PROJECT themes	Expansion of VMCA's; enhanced management; strengthened livelihoods
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Targeted systems (■ = Project targets ecosystem)

Coral Reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Reef Conservation
BUDGET: USD \$60,000	CO-FINANCING: USD \$5,000 (in-kind)



## THEMATIC CATEGORY D

# Local Management

Effective local management of coral reefs is where the most important gains in reef health and resilience can be made. Formal programs of management (such as MPA Management Plans) and active participation by local communities, are how tangible improvements in reef resilience can be delivered. Local management can become more effective and efficient through more strategic approaches, stronger political support, greater stakeholder engagement, access to information that is pertinent and timely for decisions, and smart planning processes for prioritising funds and resources to best effect. Project concepts under the Local Management thematic category focus on improving and empowering local management actions through: improving spatial and other management-relevant data; integrating resilience concepts into management plans and actions; accelerating efforts to address key local pressures such as water quality and fishing; and building capacity amongst reef managers and their partners.

# Certification of Peer Trainers in Effective Management of Coral Reefs, Seagrass Beds, Mangroves & Beaches in Marine Protected Areas of the Western Indian Ocean

19

PROJECT LOCATION: Seychelles, Kenya, Tanzania

## PROJECT DESCRIPTION

Marine Protected Areas (MPAs) are one of the best strategies to conserve marine habitats and biodiversity, yet, global studies show alarming shortfalls in MPA management effectiveness. Without effective management, poaching, climate change, external fishing, pollution, and overuse destroy MPAs.

The Western Indian Ocean (WIO) has >100 MPAs established to create intact socio-ecological systems in a region with intense small-scale fishing and limited fisheries management capacity. However, management of these MPAs is often not successful and systems for improving MPA management effectiveness are weak (see Wells et al 2012).

Since 2009, the Science for Active Management Program (SAM), has been working with management agencies and stakeholders to improve social and ecological conservation outcomes by mentoring MPAs in science-driven, adaptive management in Kenya, Tanzania, and the Seychelles. The

approach has transformed MPA management, resulted in significant social and ecological change, and there are requests from other WIO nations to join (South Africa, Mozambique and Comoros).

However, to sustain science-driven management in the current SAM nations and expand the approach regionally, we need a core group of certified peer-to-peer trainers. Thus, we propose the development of a Certification Program for MPA Managers to become peer trainers in marine monitoring (coral reefs & seagrass beds), beach & mangrove monitoring, data management & analysis, and adaptive management principles. We will bring together 6 regional and global experts to initially certify 24 MPA managers from Kenya, Tanzania, and Seychelles, (2 managers/nation in each of the four training categories) and 6 community members (2/nation). In addition, we will use the gathering of this group as an opportunity to conduct baseline surveys of MPA beaches, coral reefs, and seagrass beds in all four nationally managed MPAs in the Seychelles, thus providing much needed information

## THEORY OF CHANGE

### PROBLEM

Management of MPAs in the WIO is often not successful and systems for improving MPA management effectiveness are weak.



### INTERVENTION

Global experts will be engaged to train & certify MPA managers and community members to be peer to peer trainers - focusing on key skills required to effect change including: mastery of concepts, species identification, public speaking, team building, meeting facilitation, and planning and execution of multi-day training events.



### OUTCOME

Core group of certified peer trainers who are strengthening science-based management in their own nations and expanding the approach regionally. These trainers are serving as peer mentors, supporting transitions toward effective management of MPAs.



for management of Seychelles coral reefs, beaches, and seagrass beds.

### IMPACT AND CONTRIBUTION

The creation of a team of 30 peer to peer trainers from Kenya, Tanzania, and Seychelles, who are highly skilled in the application and training of marine monitoring (coral reefs & seagrass beds), beach & mangrove monitoring, data management & analysis, and adaptive management principles. These Certified trainers have a deep understanding of local cultural needs and management frameworks, enhancing their ability to serve as peer mentors and trainers in the WIO - supporting a transition toward effective management of MPAs.

Additional management capacity, baseline ecosystem health data and access to training and mentors, will enable the existing and emerging MPA and community managers to more effectively and efficiently address key stressors to the marine ecosystem including poaching, external fishing, pollution, and overuse - resulting in material social and ecological change. Improvement of the baseline 'health' of these systems, combined with increased confidence and ability of managers to respond

to systems shocks (such as cyclones and bleaching events), is expected to significantly enhance resilience.

### INNOVATION

The innovation in this project lies in the expansion of a proven approach (SAM), through the certification of peer to peer trainers. Their organic understanding of cultural needs and the nuances of local management frameworks, combined with the provision of consistent and accessible long term training opportunities to their peers, overcomes key barriers to effective capacity building.

### STAKEHOLDER ENGAGEMENT

Involve 6 community stakeholders (2 per nation, in addition to MPA managers) in the certification program to extend approaches to community MPAs and to improve MPA co-management between governments and communities.

### PROJECT SUSTAINABILITY

Certifying trainers in 3 WIO nations will expand effective management regionally to 9 nations and capacity building will be institutionalised.

PROJECT themes	Peer to peer capacity building; improved management of MPAs
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Seychelles National Parks Authority - (ICRI member Seychelles)
BUDGET: USD \$60,000	CO-FINANCING: None

# Status & Recovery Capacities of Coral Communities to Climate Change & Anthropogenic Stresses in Toliara, Southwest Madagascar

20

PROJECT LOCATION: Madagascar

## PROJECT DESCRIPTION

This project will focus on coral communities around Toliara, southwest Madagascar, one of the most impacted area of the southwestern Indian Ocean. The major aim is to determine the status and trends of coral communities, their reproduction and recruitment patterns among various environmental conditions and habitats. These data will be used to generate integrated indicators of resilience and recovery capacities, and to draw a vulnerability map of coral communities in this region. By assessing the health status and replenishment capacities of these coral reefs, our results will address some of the most critical issues of coral reef conservation and management in this region.

In collaboration with local stakeholders, managers and civil society actors (most notably the Vezo, the semi-nomadistic coastal fishermen of this region), the outcomes of this project will help to propose regulatory measures, and

actions to promote the resilience and protection of these coral reefs.

An important part of this project will be dedicated to communication around the vulnerability of coral reefs towards the public, and to education, with teachings and training classes to Undergraduate/Master students of the Marine Ecology course of the University of Toliara. Moreover, a special event will be organized in 2018 for the IYOR.

The sampling strategy will consist of both classical and innovative methods. Classical methods will allow the integration of historically collected data into regional reports as well as regional comparisons, whereas innovative methods such as 3D photogrammetry will help quantifying the structural complexity.

## THEORY OF CHANGE

### PROBLEM

Coral reefs in the project region have been severely degraded by anthropogenic stressors (overfishing, sedimentation, coastal pollution) and natural disturbance from bleaching and storms. To support effective management, an evaluation of health status and replenishment potential is urgently needed.



### INTERVENTION

Assessment of diversity and abundance of reef building corals, 3D photogrammetric quantification of substrate and structural complexity, analysis of temporal changes in reef condition, estimation of the recovery potential of coral communities and variability of coral recruits.



### OUTCOME

Integrated indicators of coral resilience and recovery capacities, specific to the region. Vulnerability map. Baseline data used by authorities to inform regulatory measures and actions that promote resilience and protection of coral reefs. Dissemination of results to the general public and Marine Ecology students.

## IMPACT AND CONTRIBUTION

This project will provide critical information on coral communities, their reproduction and recruitment patterns among various environmental conditions and habitats in formats that will enable managers and communities to better understand the condition of their reef and where resources can be best focused and policies directed to strengthen resilience. This project will also provide baseline data to assess changes and trajectories of coral communities.

## INNOVATION

This project will address, for the first time in this region, reproductive strategies and recruitment patterns of coral communities. The structural complexity of reef habitats (using the innovative 3D underwater photogrammetry techniques), will also be assessed for the first time. These data will provide rigorous baseline to propose regulatory measures and actions to promote the conservation of these vulnerable coral reefs.

## STAKEHOLDER ENGAGEMENT

The presence of the IH.SM, the marine centre of the University of Toliara, and its proximity and regular

exchanges with stakeholders, managers and civil society actors is again a pledge of guarantee that will ensure their implication in this project, and its overall success.

## PROJECT SUSTAINABILITY

This project was built in collaboration with researchers from IH.SM/University of Toliara. In fine, the aim is to include the scientific actions of this project (status and trends in coral communities, reproduction and recruitment patterns of corals) in the monitoring programmes of the IH.SM for the next decade.

PROJECT themes	Resilience and recovery indicator development; enhanced reef management
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	IRD
BUDGET: USD \$45,200	CO-FINANCING: None

# Rocky & Coral Reef Research, Protection & Restoration, through Local Apnea Fisherman Involvement in Machalilla National Park, Ecuador

21

PROJECT LOCATION: Ecuador

## PROJECT DESCRIPTION

Machalilla National Park MPA holds the largest and best-kept coral and rocky reefs in Ecuador. Like many places in the Eastern Tropical Pacific these reefs are very fragmented and suffer impacts from tourism and fisheries. The reefs in the study area are a key habitat for critically and endangered species like hawksbill sea turtles, spondylus shell and green sea turtles. The project area is currently an MPA, but most of its area has no control or proper management due to lack of resources and lack of collaboration from the community – driven by ignorance about the importance reefs play as a potential tourism generator and nursery for most of the commercial species that are fished by artisanal fishers.

Within the reefs there is a group of apnea fishermen who use and fish inside the reefs and inside the MNP using only their body's strength: they free-dive and fish only what they can carry on their hands. Their catch is sustainable as it does not damage the reef physical and has potentially no by-catch.

However, other fishermen that do not fish sustainable such as hookah fishermen and artisanal fishermen are actively fishing within these reefs damaging and depleting them. Added to this there is a constant destruction of the reefs caused by anchors, lack of education and the lack of mooring buoys. Apnea fishermen do not agree with the presence of all these other fishermen in the area - working directly with them, and empowering them to protect the reef could help the National Park directly as means of control and management and can also be a way of raising awareness in the local communities.

The goal of the project is to educate the stakeholders on these issues and to get them involved in the research and care of the reefs. By including the apnea fishermen who depend completely on the health of the reef and use it sustainably - we aim to have allies both in the research and protection of the reefs.

## THEORY OF CHANGE

### PROBLEM

Reef health within MPA is suffering from lack of adequate controls and management. Management initiatives are hindered by lack of collaboration with the community and ignorance about the importance of effective marine management in sustaining livelihoods.



### INTERVENTION

Work with Apnea fishermen and empower them to become the "Protectors of the Reef". Leverage their status within the community to influence other fishers and tourism operators to protect the reef and respect established zoning. Build capacity amongst apnea fisherman to become "para-biologists", collecting rich information of the state of the reefs, fish presence and abundance.



### OUTCOME

The influence of Apnea fishermen are measurably reducing impacts from fishers and tour operators. Their daily presence on the reef providing rich information on reef ecology, biology and health. Awareness amongst community (Apnea fishermen, hookah fishermen, artisanal fishermen, tourism operators) regarding the importance of reefs is increased.

## IMPACT AND CONTRIBUTION

Income in this region is primarily driven by fishing and tourism – two industries whose success directly affects and is affected by the health of the reef which they rely upon. But most of the stakeholders don't know the importance that coral reefs have for their livelihoods. Leveraging the sustainable attitude to fishing, and status of the apnea fishermen within will support education and behaviour change amongst within these industries by drawing attention to unsustainable and damaging actions that impact the whole community, as well as the reef. By involving the community in the project –with education, training and patrolling duties- they will be the main reason for improved reef health and ecosystem services and will become allies with the National Park authorities instead of seeing them as “competition”. The project also aims to benefit one of the most endangered sea turtle populations in the world (Eastern Pacific hawksbill sea turtles) by protecting their key habitats thus using them as an umbrella species.

## INNOVATION

This project is innovative because it seeks to address a problem through the Apnea fishermen who have expressed concern about the use of the reefs by other fishermen, tourism operators and even the National Park's lack of control.

## STAKEHOLDER ENGAGEMENT

For the past 8 years one of the most popular and experienced free-diver of the area and former Apnea fishermen has worked in the Equilibrio Azul's team. Apnea fishermen admire him, and many of them belong to his family - they have expressed interested in being involved in conservation of the reefs. Artisanal fishermen and tourism operator have been engaged and are keen to collaborate in sea turtle conservation – they too have expressed concern over the damages taking place daily on the reefs. Tourism and artisanal fisheries (those who have greatest dependence on reefs) will be targeted for education and training so they become the main actors in protecting their reefs.

## PROJECT SUSTAINABILITY

The project goes directly with OSD 14 and coral reef protection is one of the main commitments that the government of Ecuador has made. This project will act as a pilot project that – if successful - will be replicated in many other areas of the coast of Ecuador.

To ensure sustainability of the project and its objectives, the project will work with the stakeholders that use the reef daily, so that the attitude, knowledge, methodologies and resolutions learned an acquired by them through the project will be used daily, ensuring the conservation of the reefs.

PROJECT themes	Leveraging Apnea fisherman to support and enhance reef management
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Targeted systems ( ■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes ( ■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Equilibrio Azul		
BUDGET: USD \$40,000	CO-FINANCING: USD \$20,000		

# Resilience of the Blue Economy: Sustainable & Inclusive Fisheries in the Coastal Ecosystem of Guimoreto & Bacalar in Northern Honduras

22

PROJECT LOCATION: Honduras

## PROJECT DESCRIPTION

The project will increase the economic and environmental resilience of the small-scale fisheries chain and will facilitate clear and effective governance tools for two mangrove systems located in indigenous and Garifuna territories of the Guimoreto and Bacalar lagoon. Faced with the impact of climate change the governance plans will incorporate a EWRS system along with climate change adaptation and mitigation measures.

## IMPACT AND CONTRIBUTION

GOALS's MiPesca program seeks to develop the small-scale fisheries market system to be more inclusive and resilient to climate hazards and creates economic incentives for responsible practices and sustainable management of marine coastal resources. This project will support actions to consolidate the establishment of catch quotas, operationalizing a traceability system, validating and implementing governance plans and adopting a flood EWRS. The traceability system will incorporate compliance

with responsible fishing practices and facilitate the ongoing management of fish stocks. The programme will improve the management of marine coast resources in the target areas prioritizing mangrove and wetland systems through the development of governance plans administered by local indigenous authorities. These plans will be approved in coordination with Honduras Forestry Conservation Institute (ICF) and Biodiversity and Environment Directorate. The governance plan includes activities for executing a functional EWRS system and for applying climate change adaptation and mitigation measures.

The actions mentioned above will support small scale fisheries who depend on mangroves, considering their capacities and resources. These actions are decisive for altering the current scenario dominated by overfishing, lack of consensus and consideration of local priorities in local norms and policies, and absence of strategies that predict the impact of climate change over natural resources.

## THEORY OF CHANGE

### PROBLEM

The Guimoreto and Bacalar lagoon territories are dominated by overfishing, lack of consensus and consideration of local priorities in policies, and absence of strategies that predict the impact of climate change on natural resources.



### INTERVENTION

Establish sustainable capture quotas for selected species and operationalize a traceability system. Based on the TURF (Territorial Use Rights in Fishing) system, promote operation sustainable practices and governance. Improve the functioning of an Early Warning System (EWS) for floods in 7 communities that incorporates climate change adaptation and mitigation measures.



### OUTCOME

Artisanal fishing organizations have adopted good fishing practices, increased productivity, increased product quality and are using ecosystem resources more sustainably. Stakeholders at a local and national level support and are implementing management plans for mangroves and marine resources that account for climate change and natural disaster preparation.

## INNOVATION

The innovative element of this initiative is the implementation of the Blue Economy Resilience approach aimed at improving the well-being of the indigenous and Afro-descendant population, promoting gender equity and social inclusion, alongside risk reduction and efficient coastal marine resources management to maintain the pace of economic and social development of indigenous and impoverished communities and coastal populations. This approach focuses on avoiding loss of ecosystem services for coastal mangroves and wetlands and biodiversity; low carbon emissions; the inclusive use of resources; and energy efficiency within the framework of the balance of the common good where local entrepreneurs and all living beings linked to these rich but fragile coastal marine ecosystems to create a win-win outcome. This initiative seeks to reverse the economic crisis of fishermen, inequality and environmental degradation caused by the advance of monoculture such as the African palm and pastures for cattle grazing. A key part of this strategy is applying a systems approach which is based on mapping and understanding how these critical socioeconomic systems are functioning, identifying a clear theory of change and facilitating sustainable systemic change through improved collaboration between stakeholders at all levels.

## STAKEHOLDER ENGAGEMENT

The target territories are occupied mainly by indigenous and Garifuna populations. They recognize and make use of

the concepts of consensus-based participation such as the Free Prior and Informed Consultation (FPIC) principles. This is their mechanism for exercising inclusion and effective participation and will be adopted on this project.

## PROJECT SUSTAINABILITY

GOAL through its systemic approach, guarantees engagement with key local stakeholders, public and private sector, to identify avenues for continued technical support, training, financing management, linkage with government agencies and international cooperation, mapping of actors in the fishery chain and the conservation of mangroves and reefs. The approach allows communities and territorial organizations to connect with government agencies (such as National Agri-Food Safety and Health Service, General Directorate of Fisheries and Aquaculture, National Professional Formation Institute, Honduras government agency response for disaster preparedness and response, Microfinance Agents, and other organizations), committed to territorial development. With this approach, the mangrove conservation and restoration system is viewed as a value chain naturally linked to a service platform and a regulatory framework in which key stakeholders coexist with government institutions allowing the system to function properly and uninterrupted.

PROJECT themes	Enhance support & delivery of reef management plans; EWS; climate change resilience planning
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Wetlands	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	GOAL International
BUDGET: USD \$60,000	CO-FINANCING: USD \$141,246

# Ecological Monitoring & Evaluation of a Multi-Habitat Seascape in the Western Indian Ocean to Promote Collaboration Between Conservation Areas & Affected Communities

23

PROJECT LOCATION: Mozambique

## PROJECT DESCRIPTION

The project aims to continue rigorous monitoring of the benthic and fish communities of marine habitats (seagrass, mangroves, reefs) in the under-studied, flourishing seascape of the Bazaruto Archipelago, Mozambique. Baseline ecological data was collected in 2016 and 2017, and by continuing consistent monitoring protocol, ecological changes following new fishery management implementation can be evaluated and the information used to build a database to assess coral habitats for bleaching and recovery. With National Park designation in 1971, the Bazaruto Archipelago reefs have been within marine protected area for nearly half a century and fish biomass on these reefs is some of the highest observed in Eastern Africa. The local population is heavily dependent on marine resources, and with new technology such as motors and freezers, fishing on the reefs is expected to increase soon. It is critical to support early and informed management with robust monitoring to sustain healthy

fisheries and sustain resilient, productive nearshore marine habitats. This project aims to provide data, tools, and science-based recommendations for spatial planning in a multi-habitat seascape.

## IMPACT AND CONTRIBUTION

The Bazaruto Archipelago of Mozambique has a flourishing marine environment, with vibrant coral reefs that support over 150 recorded species of coral, over 350 species of fish, and numerous local communities. However, it is at the threshold of change. With advancing technologies entering the local fishery, and the regions first widely-observed coral bleaching event in 2016, it is apparent that effective marine management must be implemented and supported. This project will provide a consistent ecological database and a better understanding of the habitat linkages within the seascape. A better understanding of these processes will help guide management decisions of two conservation

## THEORY OF CHANGE

### PROBLEM

Local population is heavily dependent on the rich marine resources of the Bazaruto Archipelago - now technology is increasing pressures on this system. Ineffective communication between two management authorities and lack of scientific understanding of the linkages between the jurisdictions is hampering management efforts.



### INTERVENTION

Establish continuous monitoring program and data base on benthic habitats and fish communities.  
Analyse and evaluate the relationship between fish assemblages across different habitats, seascapes and management regimes - identify key variable in structuring fish assemblages.  
Provide information and recommendations on adaptive management to managers and facilitate cooperation between them.



### OUTCOME

Sustained and potentially increased resource levels (i.e. fish abundance, biomass) within the local communities' fishing areas.  
Holistic and cooperative management approach between two management bodies.



entities within the archipelago, and directly impact the sustainability of the local fishery upon which communities depend for their livelihood. These linkages within the ecosystem also impact the system's resilience in the face of changing pressures – understanding and managing these linkages will enable system resilience to be sustained.

## INNOVATION

Despite the impressive productivity and biodiversity of this region, due to recent civil war and lack of infrastructure for research, information on the nature and relationship between the three different habitats characterising the seascape has been lost, or not yet established. With baseline ecological data collected in 2016 and 2017 and strong relationships established with conservation entities in the region, the project team have a unique opportunity to continue building a consistent database of the benthic and fish communities, and explore the processes that link the different habitats, such as ontogenetic fish migrations.

## STAKEHOLDER ENGAGEMENT

The Sanctuary has established close relationships with the local communities of the São Sebastião peninsula, and emphasizes the importance of actively involving the local communities in the management and benefits of The Sanctuary. In the true nature of adaptive management, The Sanctuary will maintain open channels of communication and discussion through its dedicated community, conservation, and Government

liaison managers, to address matters regarding actions and potential future management actions. Results from monitoring in the fishery-closure areas in the seagrass beds will also be shared with the local authorities and fishermen in the nearby town of Vilanculos, to nurture potential interest in similar management actions for nearby locales. Government support and liaison is as important as community participation - All research and monitoring activities have and will be carried out in close collaboration with the BNAP staff. BNAP staff have indicated that since they are not familiar with the underwater environment, it is important that we share material and media for educational purposes. We will provide photographs and videos of marine life and the scientific process to facilitate outreach and education.

## PROJECT SUSTAINABILITY

As this is a unique opportunity to establish long-term monitoring of a marine management area with a database started prior to management implementation, it is essential that monitoring continues long after the 18-month period funded by this grant. As such, we will ensure that all monitoring protocols and databases are thoroughly documented and shared with The Sanctuary, to serve as the foundation for continued monitoring in future years. Furthermore, we as a research group intend to seek continued funding to support sustained, consistent monitoring past this grant's period.

PROJECT themes	Ecosystem monitoring; knowledge building; enhanced management collaboration
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Sanctuary Owners Association
BUDGET: USD \$60,000	CO-FINANCING: USD \$5,000 (in-kind)

# Improving Coral Reef Management by Determining Primary Stressors Responsible for Coral Bleaching at a Remote Caribbean Atoll

24

PROJECT LOCATION: Belize

## PROJECT DESCRIPTION

Coral bleaching, loss of obligate symbiotic algae and associated coral mortality typically associated with periods of intense heat stress, has been increasing in frequency and scope worldwide. Coral reefs are also impacted by several local stressors, including nutrient pollution that mainly enters coastal systems from poorly managed watersheds where unsustainable forestry and agricultural practises as well as lack of adequate sewage treatment are common. Excessive nutrients have also been implicated in coral bleaching and loss of community resilience. The proposed program of work will include targeted actions to determine the causes of coral bleaching and inform broader coral reef conservation in the context of both nutrient and thermal stress at Glover's Reef Marine Reserve, where habitat and fisheries monitoring and management interventions, including the harvest ban on herbivorous fish (2009), have been ongoing for more than 15 years. Causal factors will be identified and communicated through an outreach

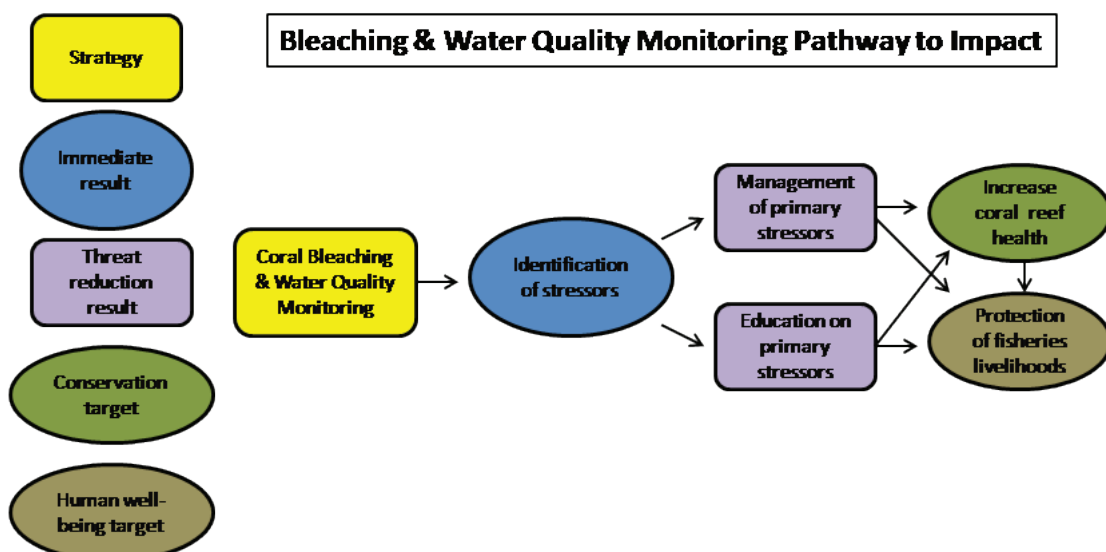
campaign to primary stakeholders (fishers, eco-tourism) and key sectors (forestry, agriculture, urban development) in Belize that are exerting local impacts, with an aim to build a strategy for threat reduction.

## IMPACT AND CONTRIBUTION

The bleaching and water quality monitoring program will allow for the identification of primary stressors to coral reef health to help inform more targeted management strategies and threat reduction actions that will increase resilience of coral reefs and associated biodiversity, essential for fisheries-based livelihoods in Belize and across the Mesoamerican reef.

This information will also help raise awareness among management authorities and the public of how coral reefs provide a number of ecosystem services, including helping to combat climate change (i.e. coastal defence), and how targeted watershed management interventions

## THEORY OF CHANGE



could help reduce the nutrient loads into coastal systems, making corals more resilient to thermal stress and boosting the effectiveness of existing and future investments in long-term biodiversity conservation and fisheries management.

## INNOVATION

The work we propose is innovative in its rigorous focus on understanding the interacting effects of nutrient pollution and climate change on coral bleaching so that conservation and management action can be directly and effectively targeted at reducing those stressors. In the past, scientists and managers have focused on controlling fishing effort, including protection of herbivores. However, that strategy has been ineffective at reducing competing fleshy macroalgae or reversing loss of live coral cover. We argue that even in the context of climate change, loss of coral may be alleviated with local control of nutrient pollution. Glover's Atoll, being a remote but well-studied and managed site at the core of the Mesoamerican Reef, provides an ideal location in which to tease apart the critical stressors affecting coral reefs today. The ongoing damage to coral reef habitats through bleaching will undermine the many positive actions in fisheries and biodiversity conservation that have taken place at Glover's Atoll and applied more broadly. Therefore the main anthropogenic stressors affecting corals need to be clarified for scientists, resource managers, and the general public in order to design and implement timely and

appropriate management and conservation strategies.

## STAKEHOLDER ENGAGEMENT

We will engage with local and regional government agencies (Belize's Fisheries Department, Department of the Environment, Belize National Climate Change Office, Caribbean Community Climate Change Centre) to collect data and provide feedback to affected residents in the form of community meetings, newspaper articles, and appearances on public radio and television to build awareness of the stressors and the implications to critical resources (eco-tourism, fishing, coastal protection) as well as to suggest strategies that can help to manage impacts of nutrient population and climate change.

## PROJECT SUSTAINABILITY

All monitoring and outreach will be integrated into the WCS Belize annual activities by program staff (Marine Conservation Scientist, Research Coordinator, Research Assistant, Communication Coordinator) for the period of the project. In addition, analyses, interpretation, and awareness-raising will involve international experts: Dr. Brian Lapointe, Harbour Branch Oceanographic Institute; Dr. Melanie McField of the Healthy Reefs Initiative; and Dr. Molly Cross, WCS Coordinator for Climate Change Adaptation. A detailed protocol document will be created so that our approach can be replicated throughout the Mesoamerican region.

PROJECT themes	Bleaching & water quality monitoring; improved management; awareness raising
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Wildlife Conservation Society
BUDGET: USD \$60,000	CO-FINANCING: USD \$16,000 (in-kind)



THEMATIC CATEGORY E

## Research & Monitoring

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Coral reefs are extremely complex ecosystems which are rapidly changing under the influence of climate change and local pressures. To improve the resilience of these systems to future shocks and stressors, a deeper understanding of both coral reefs and the factors impacting their health is required. Research and Monitoring projects aim to build this knowledge base through monitoring and assessment and indicator development as well as targeted research to fill critical knowledge gaps.

# High-resolution Assessment of the Economic Risk Reduction Benefits Provided by the Mesoamerican Reef in Quintana Roo, Mexico, & Identification of Priorities for Coral Reef Management

25

PROJECT LOCATION: Mexico

## PROJECT DESCRIPTION

No other region is more threatened by natural perils than coasts. The recent catastrophic hurricane season that affected millions of people, causing losses to life and property and decimating economies, was the latest reminder of current coastal risks. The degradation of coral reefs increases these risks by exposing communities and coastal development to more intense flooding. While coral reefs and other coastal ecosystems provide one of our most powerful defences against coastal storms and hurricanes, such coastal protection service is widely unrecognized by both governments and the private sector due to a lack of quantification.

The value of the protection services offered by coastal ecosystems needs to be assessed in economic terms to inform investments and restoration management. To date, there have been few attempts to provide rigorous, high resolution, spatially-explicit estimates of ocean benefits that may guide investment decisions by conservation organizations, governments, and other stakeholders who

may benefit from the sustainable management of ocean ecosystems. Scientific evidence that pinpoints where ecosystems benefit people and property can catalyse large-scale investments in the conservation of these ecosystems to achieve adaptation and risk reduction goals.

This project addresses the urgent need to map and assess the value of the coastal protection benefits provided by the Mesoamerican Reef, the largest barrier reef in the Western Hemisphere. This work will combine cutting edge social, economic, ecological, and engineering tools to provide a high-resolution, spatially explicit, quantitative economic valuation of the coastal protection and risk reduction services provided by the Mesoamerican reef and its related ecosystems (e.g. beaches and dunes) across Quintana Roo, Mexico. The results will identify how and where coral reefs provide the most flood reduction benefits to inform reef conservation and management priorities.

A risk-based valuation will (1) quantify current values; (2) identify the best places where restoration may reduce coastal

## THEORY OF CHANGE

### PROBLEM

Governments and the private sector do not recognise the risks to communities and coastal development from flooding due to degradation of coastal coral reef habitats - the protective services these ecosystems play has not yet been quantified.



### INTERVENTION

Hydrodynamic and economic exposure models used to provide a high-resolution, spatially explicit, quantitative economic valuation of the coastal protection and risk reduction services provided by the Mesoamerican reef and its related ecosystems across Quintana Roo, Mexico.



### OUTCOME

Value of the risk reduction provided by coral reefs and related ecosystems is known.  
Maps identifying reef restoration priority areas created.  
Local climate adaptation and coastal management strategies developed.

risks; and (3) provide new opportunities for climate resilience and adaptation - for example through innovative risk reduction financing for coral reefs - in this region and beyond.

### IMPACT AND CONTRIBUTION

Quantifying the protection value of coastal ecosystems play for both communities and infrastructure will provide a critical tool to incentivise regulators and developers to recognise the economic value of these systems and drive investment in their conservation and restoration.

### INNOVATION

This project advances the analysis of ecosystems for risk reduction; overcomes limitations in existing modelling approaches by combining risk science with state of the art reef modelling; helps understand cascading effects in ecological connectivity and the impacts of climate change and storms in coastal zones; informs reef management quantitatively and spatially; and enables the development of innovative management tools, for example by providing the basis for a model to develop reef restoration protocols

for post-storm recovery in the project region.

### STAKEHOLDER ENGAGEMENT

The project will conduct workshops and regular meetings with the different stakeholders in the region, including: the local hotel association, representatives from the National Park, local and national Governments, local communities, insurers and local scientists and restoration experts – inputs from these parties will inform the project to better integrate the results with existing programs and management efforts.

### PROJECT SUSTAINABILITY

The methodology, once developed and applied in Quintana Roo, can be easily expanded to other regions where coastal ecosystems provide a natural storm barrier and where restoration and conservation could provide significant risk reduction to communities. The proposed approach will develop data and tools that can be used elsewhere.

PROJECT themes	Valuation of reef ecosystem services, community & reef resilience
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	University of California Santa Cruz & The Nature Conservancy	
BUDGET: USD \$50,000	CO-FINANCING: \$20,000	

# First Acoustic Monitoring of Coral Reef's Biodiversity

26

PROJECT LOCATION: French Polynesia

## PROJECT DESCRIPTION

The project will create a standardized passive acoustic monitoring (PAM) protocol to evaluate the environmental status of coral reefs based on fish vocal activity, invertebrate sounds and peculiar soundscape features (e.g. sound intensities, spectral richness) recorded within and outside Marine Protected Areas. We will work towards a goal of species identification (especially of key species of coral reefs) combined with measures of sound variability at the community level (correlated to environmental fluxes). The project will involve a combination of acoustic data and traditional visual census data of fish communities and substrate covers.

land based stressors are causing unprecedented rates of change in coral reefs – driving the need for more efficient and fast methods to monitor changes on the reef so that interventions can occur in timeframes that optimise reef recovery. By linking coral reef quality (in terms of biodiversity and substratum cover) with soundscape patterns, PAM has the potential to quickly appraise the biodiversity and health status of coral reefs. It will create a standardized method and field protocols for acoustic monitoring and environmental diagnosis of coral reefs using robust indicators capable of detecting change in habitat quality.

## IMPACT AND CONTRIBUTION

A key part of biodiversity assessment and monitoring is the tracking of changes in species composition, abundance and activity of animal communities. Impacts on coral reef globally from bleaching, storm damage and

## THEORY OF CHANGE

### PROBLEM

Critical to reef resilience, is the ability to track changes in key health indicators (species composition & abundance, animal activity etc). Rapid methods for assessment exist, but are resource intensive, restricted by daylight and weather and cannot be conducted continuously.



### INTERVENTION

Create a standardized passive acoustic monitoring (PAM) protocol to evaluate the environmental status of coral reefs - the detection of vocal organisms and variations in acoustic features of the environment (the soundscape) will provide data allowing the development of reliable indices to quickly appraise the biodiversity and health status of coral reefs.



### OUTCOME

A pioneering tool allowing unobtrusive, non-invasive, continuous and long-term acoustic surveys of coral reef health that is used by decision makers for resilience planning and interventions.

## INNOVATION

PAM is a promising new tool being used to uncover both broad and fine-scale ecological patterns and simultaneously capture biogenic & anthropogenic sounds. The link between coral reef biodiversity, substratum cover and soundscape patterns remain unclear and lack standardization in the way data are collected and processed. This project will build the first marine passive acoustic monitoring system to quickly appraise the biodiversity and health status of coral reefs. It will set a standardized method for acoustic monitoring and environmental diagnosis of coral reefs allowing implementation of informative and robust indicators capable of detecting habitat quality differences and formulation of standardized field protocols.

## STAKEHOLDER ENGAGEMENT

This monitoring is conducted in close collaboration with SPC in New Caledonia and with the South Pacific University (USP) at Fiji. The project will also collaborate with the Gump station based in Moorea's established "Coral Reef Environmental Observatory Network" providing a new dimension to existing data with acoustic monitoring. Additionally, data collected during the project

will allow reef and fish sounds to be added to a 3D movie on coral reefs that will be showcased at Eco-museum of Moorea and at the Aquarium de la Porte Dorée in Paris in 2019.

## PROJECT SUSTAINABILITY

The set of acoustic descriptors and field protocol set up in Polynesian Islands will be tested to see if they are generalizable to other reefs and thus appropriate to appraise coral reef quality and biodiversity irrespective of the recording location. If not, efforts will be produced to adapt acoustic descriptors to sites' specificities. The involvement of GCRMN and LTER monitoring networks will guarantee acoustic recordings to be repeated in the future by staff members of the IRCP/CRIOBE when monitoring coral reefs in the South Pacific.

PROJECT themes	Novel reef health assessment approach; indicator development
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	IRCP
BUDGET: USD \$60,000	CO-FINANCING: USD \$35,000 (in-kind)



# Deep Lionfish Populations & Associated Unexplored Mesophotic Habitats of Martinique, French West Indies

27

PROJECT LOCATION: Martinique Island, French West Indies

## PROJECT DESCRIPTION

A major threat to coral reef biodiversity in the Caribbean is posed by the expansion of the lionfish populations. While shallow population dynamics are quite well known, deep population data remains sparse. Aboard the Yersin (Monaco Expedition), a team of scientists will explore the deep mesophotic environment of Martinique and associated lionfish population. Genomics on deep and shallow lionfish individuals will highlight connectivity between depth layers. Population dynamic will help revise lionfish regional control strategies.

being sustained, enabling management interventions and professional fisherman to alter their catch strategies to manage populations.

## IMPACT AND CONTRIBUTION

Lionfish are amongst the most invasive marine species in the western Atlantic. Their carnivorous diet depletes young reef fish stocks, they have no natural predators in these waters, are becoming overpopulated and out-compete native fish. This project will provide vital information on where and how lionfish populations are

## THEORY OF CHANGE

### PROBLEM

Lionfish have the potential to alter the structure and functioning of many marine communities. Population control programs target shallow habitats (<20m) - however, lionfish are present in mesophotic habitats with densities 10 x higher than shallow reefs.



### INTERVENTION

Conduct surveys to characterise deep-water lionfish populations and associated habitats to determine if they have similar structures to euphotic areas and whether they are genetically connected. Use survey to determine if habitat interconnection would allow organisms in areas subjected to strong anthropogenic pressures to find deep refuge and lionfish to colonize coastal habitats from deep areas.



### OUTCOME

Data on deep lionfish population dynamics informs where and how management of the highly invasive species should be directed (i.e.: strategies revised to target mesophotic habitats).

## INNOVATION

Deep lionfish populations are poorly studied, especially in volcanic island coastal environment, principally because of limited equipment and logistics to conduct such surveys. The « Explorations de Monaco » expedition offers a unique opportunity to conduct research aboard a large vessel equipped with ROV, labs, etc. Deep marine environment will be explored during several days in January 2017 over 12 sites around Martinique. Specialists of Caribbean marine ecosystems, invasive lionfish species, deep fish species will be gathered to contribute to the description of unexplored mesophotic marine habitats in Martinique.

## STAKEHOLDER ENGAGEMENT

Local NGO OMMM will be the coordinator of the project, in collaboration with international (University of Wageningen, IMARES Netherlands) and national (National Museum of Natural History, University of Nice) partners. Communication on deep lionfish population will be directed toward professional fishermen, to increase catch effort for control strategy. The ecological information and new knowledge on deep lionfish populations in Martinique will be very valuable to the new Martinique Marine Park recently created (2017).

## PROJECT SUSTAINABILITY

This project is possible because of the unique presence of the Yersin ship in Martinique in January 2018. The project objective is to explore deep marine environment around Martinique to gather new knowledge both on deep lionfish population and their environment in the mesophotic zone and beyond. The results will be included in the revision of the regional lionfish control strategy. The logistic involved limits the potential for replication.

PROJECT themes	Enhanced understanding of deep lionfish population dynamics; lionfish management
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	OMMM
BUDGET: USD \$58,930	CO-FINANCING: USD \$143,998

# “HIDDENCORALS”. We protect what we know: Unravelling the Hidden World of Polynesian Coral Reefs in the Twilight Zone to Enhance their Protection

28

PROJECT LOCATION: French Polynesia

## PROJECT DESCRIPTION

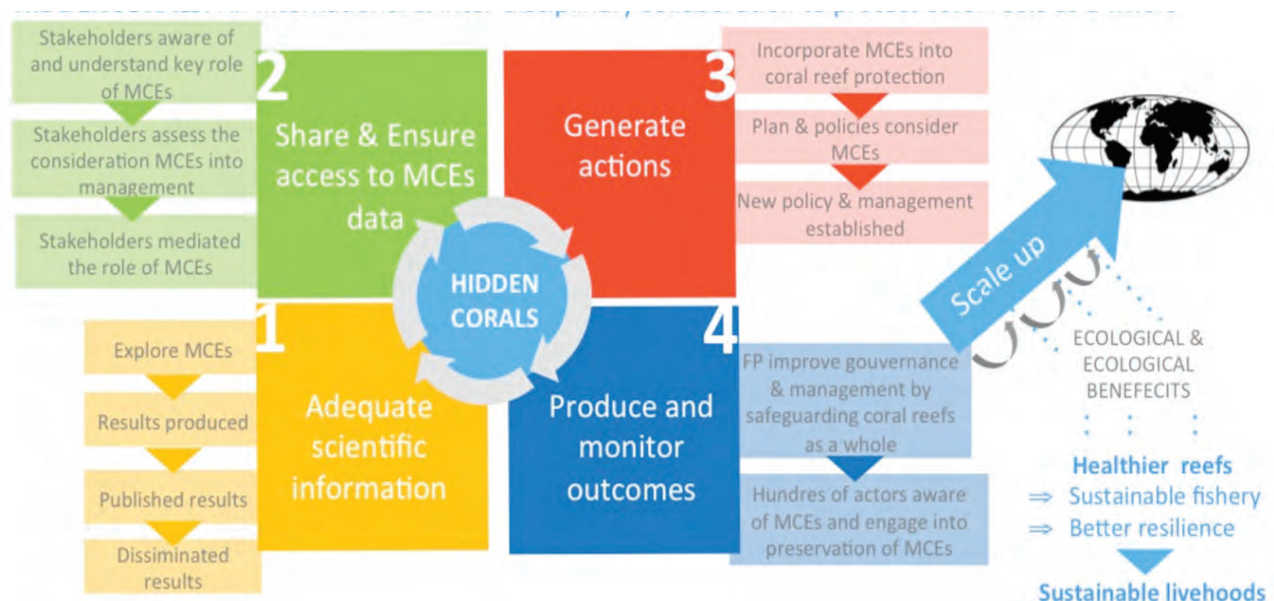
Compared to Shallow Coral Ecosystems (SCEs), what is below 30m, the so-called Mesophotic Coral Ecosystems (MCEs), characterized by the presence of light-dependant corals, remain quite a mystery. The legal and logistical constraints to access the MCEs are the most important hurdles that researchers are currently facing, which explains why 2/3 of MCEs remains understudied and their poor state of conservation. The Deep Reef Refugia Hypothesis (DRRH), postulates that MCEs may serve as environmental refuge for SCEs replenishment. Ensuring that MCEs are well preserved and effectively and sustainably managed is critical but requires adequate scientific information on MCEs. The unique partnership created with “Under the Pole Expedition” (UTP) team (providing the cutting-edge diving technology with experimented deep divers, access to ROV and the boat “Why”) will allow exploring MCEs of French Polynesia (FP) for 10 months. We will address several critical goals

relevant to MCEs: (1) identify MCEs in French Polynesia (FP); (2) assess their coral diversity and abundance; (3) raise awareness on MCEs at an international, national and local scale and (4) improve management and conservation planning of corals by including MCEs. HIDDENCORALS represents a unique opportunity to undertake cutting-edge sciences on MCEs with global significance, that will hopefully, draw attention to the urgent need to consider MCEs in conservation planning and convince of the needs to protect reefs as a whole, and not only the first 30m.

## IMPACT AND CONTRIBUTION

HIDDENCORALS re-examines conventional conservation strategies aims to secure a sustainable future for the entire coral reef ecosystem, inclusive of MCEs. HIDDENCORALS will fill current gaps in the understanding of coral reef ecosystem by establishing baseline information, the location and extent, biodiversity, environmental factors that control MCE distribution. This information will raise

## THEORY OF CHANGE



awareness of the existence and fragility and provide an evidence base to include MCEs into monitoring of coral reefs as well as management and conservation planning decisions.

## INNOVATION

By their greater depths and remote locations, the MCEs are challenging environments for research. To explore the MCEs we rely, as scientists, on people and businesses that have the knowledge, expertise and technologies to explore such atypical zones. In that context, the unique partnership launched with the UTP team is the first allowing scientists to explore the deep zones of FP for 10 months.

HIDDENCORALS will be the first-of-its kind large-scale project in French Polynesia to explore coral reefs in a new way by adding depth into the ecological and conservation questions. The concept is entirely original, as it will promote an innovative, efficient and sustainable scheme where protection goes from shallow to deep reef areas. We don't know yet what we will discover in the MCEs of FP, because no one has yet explored this area of coral reefs. However, we expect to unravel hidden coral reef areas of FP and unexpected coral diversity for scientists, managers, politicians and local communities, and placed MCEs on the International scene.

## STAKEHOLDER ENGAGEMENT

The project has established partnership with the

“Délégation à la Recherche”, the French Agency for Biodiversity implemented in FB, research institutes (e.g. CNRS, IRD) and the Institute of Coral Reefs of Pacific. Knowledge transfer will occur between the project teams and coral reef managers as well as civil society through presentations to Polynesian government staff in Papeete/ Moorea; workshops with policy makers, managers, businesses, and associations to define a strategy to further protect and conserve MCEs; interventions in various schools to raise awareness of this secret world; TV documentary in collaboration with UTP and an itinerant photo exhibition called “The secret of Deep” that will be presented in schools, associations, institutes.

## PROJECT SUSTAINABILITY

HIDDENCORALS is committed to finding ways to continue collaboration beyond this project. To this end, the following avenues will be pursued to ensure sustainability: Exhaustively review all opportunities for securing funding to explore and monitor MCEs in FP, other French and European Overseas Territories and small Pacific islands; Strengthen the partnership with UTP and/or raise concerns or interests on MCEs from other marine expeditions (e.g. Tara, Monaco Expeditions; Waitt Foundation) and creating plans for enduring cooperation in the research areas of MCEs and; Promote the development of a ROV with robotic arms to monitor MCEs and collect coral fragments allowing the exploration of MCEs, without depending on deep divers.

PROJECT themes	Mesophotic coral ecosystems; legislative change; public awareness
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Centre de Recherches Insulaires et Observatoire de l'Environnement (CRIOBE)
BUDGET: USD \$58,570.60	CO-FINANCING: USD \$2,500 (in-kind)

# Developing Coral Reef Indicators to Evaluate Recovery Potential after Catastrophic Coral Mortality

29

PROJECT LOCATION: Palau

## PROJECT DESCRIPTION

Climate change is driving extreme weather events that cause catastrophic coral mortality, impacting the resilience and functioning of tropical reefs worldwide. Following coral mortality, some reefs in the Indo-Pacific undergo shifts to macroalgal dominance, affecting recovery back to a coral dominated state. For coral reefs in Palau, two unprecedented super-typhoons in 2012 and 2013 reduced live coral from ~80% to <1%, followed by a macroalgal bloom that has persisted for the last 3-4 years. These reefs represent a unique opportunity to explore processes of recovery and resilience following catastrophic disturbance and act as a 'model system' for understanding phase shifts on Indo-Pacific reefs. Using field data collected over the past 5 years and new data collected as part of the ICRI grant proposal, we plan to assess primary indicators of reef resilience and recovery that can then be applied to reefs throughout the Indo-Pacific region. Specifically, we will target indicators associated with the early life-stages of corals and quantify coral recovery scenarios

using a simulation model of coral-algal demographics. The outcome of the assessment will be communicated to local agencies for natural resource management planning in Micronesia as well as local stakeholders through public forums.

## IMPACT AND CONTRIBUTION

Phase shifting from coral to macroalgal dominance following a mass coral mortality event is a global problem impacting reef recovery and health, livelihoods, and presents a major problem for reef managers. This project fills a critical knowledge gap – understanding how the phase shift from coral to macroalgae occurs and more importantly how it can be reversed.

By conducting sampling using predetermined and novel indicators of reef health, in conjunction with simulation modelling of coral recovery, the project will be able to quantify recovery capacity and help isolate the drivers of reef resilience for management. Critically, the technical

## THEORY OF CHANGE

### PROBLEM

Lack of indicators to assess the recovery potential of reefs that have undergone phase-shifts from corals to macroalgae - hindering restoration and resilience actions in the Indo-Pacific.



### INTERVENTION

Collection of resilience indicator data.  
Use data to parameterise early life stages of coral demographics & input into existing ecosystem model. Use model to quantify recovery potential of impacted reefs under different scenarios of coral recruitment, herbivory and disturbance.  
Present data outcomes to management authority, public and provide mentoring workshops on how to use model.



### OUTCOME

Researchers and management authorities understand the key processes involved in reversing the phase shift from macroalgal, back to coral dominance and are using indicators to predict the success of coral recovery interventions after mass mortality.

managers to support management and recovery of local resources. The uptake of management recommendations by local authorities will contribute to improving the resilience of reef ecosystems impacted by climate change.

## INNOVATION

Under future climate change scenarios, coral reefs throughout the Pacific are likely to experience increasing mass mortality events. Recent research suggests that phase shifts to macroalgal dominance following coral mortality are likely to impede the recovery to coral dominated states, yet the processes affecting this phase shift reversal are poorly understood. The proposed project is innovative in that it aims to provide new indicators for coral reef monitoring programs that can be used to assess the recovery potential of coral reefs following disturbance. This information can be used by local managers in Pacific island nations to identify areas of reef that require management intervention (e.g. targeted macroalgal removals) or enforcements (e.g. temporary bans on fishing herbivores).

## STAKEHOLDER ENGAGEMENT

PICRC is a key stakeholder engaged in the project with a mission to support coral reef stewardship through research and applications for the people of Palau and Micronesia. PICRC uses the knowledge gained through science to advise state management agencies the best conservation practices of marine resources. PICRC is frequently contracted by the States of Palau to assess the state of environmental

resources and provide recommendations based on assessments. The primary objective of this project is based in Koror, the most populated state in Palau. Koror State will be engaged with the project at the initiation of the work and by providing them with results of the modelling assessments through presentation and report. In addition, PICRC will engage local stakeholders, including school-groups and interested parties, through the Communications and Outreach Officer. Outreach includes educational visits to the aquarium, media outreach, evening seminar series, and meetings with relevant State chiefs. The visiting partners working with PICRC will conduct a public seminar about reef ecology and resilience in the evening night series. Media communication will be conducted through local newspapers and relevant online outlets.

## PROJECT SUSTAINABILITY

PICRC conduct routine monitoring throughout the island archipelago every second year. By assisting researchers at PICRC in the analysis and modelling of coral reef dynamics, the capacity of personnel at the Center to assess ecosystem state and resilience will increase and be retained with the primary organisation conducting reef assessment in Palau. The indicators used in this project can be incorporated into future monitoring efforts if found to be critical for resilience assessments and recovery potential following major disturbances.

PROJECT themes	Understanding & reversing phase shift to macroalgae dominance; coral recovery
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Palau International Coral Reef Centre (PICRC)
BUDGET: USD \$53,345	CO-FINANCING: USD \$28,600 (in-kind)

# Mesophotic Ecosystem Coral Investigation in Mayotte & Mozambique (MECIM)

30

PROJECT LOCATION: France (Mayotte) & Mozambique

## PROJECT DESCRIPTION

The Mozambique Channel is an extremely financially poor region where the sea is the primary source of protein for local populations. However, with increasing coral bleaching threat and increase human pressures on these ecosystems, the region faces difficult conservation challenges. Some solutions could arise from deeper waters. Indeed, a recent study conducted in this region showed that deep lagoons shelter isolated coral formations “patch reefs” that appear to be “hotspots of biodiversity”. Such formations belong to the Mesophotic Corals Ecosystem (MCE) and could be a refuge or a source of propagules to enhance shallow corals ecosystems and thus resilience. Such environment is starting to be commercially exploited but are still mainly unknown; this international project will use innovative instruments and approaches (RUV: Remote Underwater Video, Semi-autonomous robot, RADSeq DNA sequencing and coral band structure and isotopic composition), study these hard to access environments in a new way – opening the possibility for novel conservation measures to arise (temporal fisheries restriction, calibrated fishing hook size).

A mapping project for marine habitats in Mayotte is already underway and includes deep habitat mapping. This project will highlight mesophotic zones locations.

## IMPACT AND CONTRIBUTION

One of the projects is already underway within the marine park of Mayotte mapping marine habitats of the lagoon including the deep zones. This project is therefore the logical continuation of the in-depth study of these new protected areas. The refuge hypothesis indicates that mesophotic zone propagate coral larvae for surface areas and provide refuge for fish species – making them critical systems for the recovery and resilience of shallower coral reefs. This project will strengthen understanding of the role of, character and location of mesophotic zones, enabling them to be considered for protection by site managers.

The use of semiautonomous robots, video and species recognition software in this project allows deeper regions to be explored at a lower cost – in the past, cost has been

## THEORY OF CHANGE

### PROBLEM

MCE's are potential biodiversity hotspots, providing refuge and a source of propagules for shallower reefs impacted by climate change. Yet little is known about these environments and they are rarely considered in management planning - with evidence emerging that MCE resources are starting to be exploited.



### INTERVENTION

Estimate biological connectivity between MCEs and shallow reefs.  
Evaluate the capacity of refuges of the mesophotic zones based on their state of health  
Study the halieutic resources of MCE  
Assess if the MCE are subject to coral bleaching.  
Increase awareness among the local people to the impacts of global warming and the preservation of coral reefs.



### OUTCOME

Researchers, managers and the community understanding the function of MCEs and are able to anticipate their future evolution under current management scenarios - driving new management solutions.

a major barrier for research in these areas. Additionally, a collaborative project between students of the University of Mayotte and the University of Lúrio will use video from this project to construct a documentary film raising awareness and explaining the benefit to protect deep coral reefs. The film will be translated into 4 languages (English, French, Shimaore, and Portuguese) to broadcast widely in schools and among the population.

## INNOVATION

The concept that MCEs are refuges from bleaching events and support the resilience of shallow reef environments is a novel idea that was recently formulated. Several observations indicate that many MCEs largely escaped from mass bleaching events. Biological composition with depth, the stability of MCE relative to bleaching event and above all the biological connectivity along this depth gradient are still unknown, yet fundamental characteristics to understand whether MCE ecosystem could help the resilience of shallower ones. This project is innovative as it will help to answer this question for the Western Indian coral reef ecosystems.

Additionally, this project is innovative due to the investigation techniques it uses. The project will benefit from its collaboration with computer and robotic laboratory that allows the use of new semi-automatic robots to access depths and artificial intelligence algorithm to automatize fish assemblage quantification. Finally state of the art approaches in

genetic (RADSeq) and sclerotechnology (isotopic analysis) will be used to address connectivity and past bleaching.

## STAKEHOLDER ENGAGEMENT

This project will help facilitate engagement among regional institutions and people around the subject of reef conservation. The number of collaborators involved in the project and the media tools (movie, posters, conference) resulting from this project, will ensure the commitment of project partners and local communities.

## PROJECT SUSTAINABILITY

The location and understanding of the ecological functions of the MCE is the first step in this project. This will be followed by a proposal to set up monitoring, develop management indicators, define locations of interest for conservation and develop a strategy to build data acquisition on the result of the present project.

Furthermore, this project proposes to test the use of inexpensive video equipment for assessment of deep sea environments. Video will allow large areas to be surveyed at depth range inaccessible to divers, with the guarantees of information traceability. This, coupled with automatic recognition software sets a precedent to reduce the cost of future deep sea research and remove bias of human observation.

PROJECT themes	Understanding the role of mesophotic coral ecosystems; enhanced management
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	CUFR
BUDGET: USD \$60,000	CO-FINANCING: USD \$112,700



# Effects of Depth on Coral Reef Communities: Testing Insights of a “Deep Refuge Hypotheses” in the South Atlantic for the First Time

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PROJECT LOCATION: Brazil

## PROJECT DESCRIPTION

The importance of deeper reefs in maintaining coral reefs health and function has been grown considerable around the world. However, the deep refuge hypothesis has been poorly studied and never suggested for Brazilian reefs. Our study attempts to understand if coral and fish populations could be buffered from shallow waters impacts such as overfishing and climate change. The study will originally combine field surveys/experiments and laboratory analyses to test the effects of depth on coral and reef fish communities - analyzing abundance, species richness, size classes and habitat specialization. To correlate community data with habitat features, we will access benthic communities comparing shallow and deeper reefs on Brazilian reefs. Lastly, cellular and genetic diagnostic parameters (also known as biomarkers) will be applied in two important scleractinian coral species, to assess cellular-physiological condition of corals according to depth. Use of biomarkers enables the identification of stressors or environmentally different conditions based on

an understanding of cellular-level processes. Specifically, we will test the hypotheses that deeper reefs could be acting as a refuge from shallow reefs for coral and fish populations in terms of biomass, behaviour as well as genetic diversity, cellular and diagnostic biochemical parameters. Understanding the ecology of deeper reefs will corroborate the idea that shallow areas are currently receiving support from deeper reefs and that those areas must be urgently protected.

## IMPACT AND CONTRIBUTION

This project will directly provide information regarding Brazil's deeper reefs to support the expansion of an MPA to include deeper reefs. Our initiative will also engage with a series of different stakeholders such as fishermen's, academia and decision makers that will be all included during deeper reefs analyses as well as highlighting the importance of those habitats in maintaining coral reefs health and function on a time of changes.

## THEORY OF CHANGE

### PROBLEM

Deep reefs are thought to act as a refuges from shallow reefs impacted by climate change for coral and fish populations. However this, hypothesis is poorly studied and never considered for the South Atlantic Ocean and Brazil. More information on whether these ecosystems can provide this buffer is needed to support the expansion of MPAs to deeper reefs.



### INTERVENTION

Produce detailed maps of deep reefs for northern Brazil. Collect data on fish and coral distribution comparing deep and shallow reefs. Analyse cellular and genetic parameters of two key coral species to understand depth influence. Share information to support inclusion of deep reefs in MPA.



### OUTCOME

Researchers and managers understanding the function of deep reefs as a refuge, recognise its importance and include it within MPA borders to ensure its protection.

## INNOVATION

Deeper reefs are extremely scientific relevant, yet poorly investigated. Few ecological hypotheses have been tested on those ecosystems and this study will add a large set of information on this issue. Furthermore, research on Brazilian waters is normally focused on the description of patterns, rather than process. This research will analyse the deep refuge hypothesis and how this ecological process is related to biodiversity distribution, behaviour and genetic on coral reefs. Additionally, deeper reefs are rarely included on MPA boards and conservation projects. The project aims to be the first to included deeper reefs in coral conservation in Brazil and will produce the first maps of those reefs to be included in the MPA boards in the next re-zoning process (end of 2018).

## STAKEHOLDER ENGAGEMENT

The project conservation NGO partner has been working in the area for almost a decade with many successful projects and has created strong relationship with many local stakeholders such as fishermen's and boat drivers - <http://conservacaorecifal.com/>. Additionally, project is currently supervising many students at the Federal University of Pernambuco (project site) with a great relationship with the scientific community that could support activities. Lastly, support from Brazilian Government and MPA managers is secured and the

stakeholders have indicated their willingness for this vital collaborative initiative to begin as soon as possible.

## PROJECT SUSTAINABILITY

As previously mentioned, the project has strong stakeholder engagement and several collaborations that will result in project replication across Brazilian waters, increasing the protection of deeper reefs in many different areas. If the project is successful the MPA will include the deeper reefs and federal resources will be allocated for monitoring and assessment in the near future.

PROJECT themes	Enhance understanding of deep reef ecology; inclusion of deep reefs in MPAs
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Reef Conservation Project (Projeto Conservação Recifal) – PCR
BUDGET: USD \$26,993.76	CO-FINANCING: Other funds secured

# From Ridge to Reef: An Ecosystem Based Approach to Biodiversity Conservation in East Africa

32

PROJECT LOCATION: Tanzania & Kenya

## PROJECT DESCRIPTION

The livelihoods of millions of people are currently dependent on coral reefs for their income and subsistence, but these are increasingly threatened by human impacts and climate change. The proposed research addresses a critical management strategy for effective coral reef management: that of enhancing coral reef resilience by reducing land-sourced pollution. Currently, the primary barrier to the implementation of this strategy is information gaps that are of critical importance to resource managers. For example, under the pressure of increasing sediment loads from catchment runoff, how do the changes in land use and climate affect sediment supply? Where are the most vulnerable or tolerant catchments to these impacts to target management actions? Where are the most cost-effective priorities for management intervention on land and sea, to secure fisheries and livelihoods? This information is currently non-existent for most tropical coastal catchments, making it simply impossible to prescribe specific actions and to set

catchment targets, which, if achieved, can demonstrably lead to reductions in pollution and secured livelihoods. This project will address this vital information gap by informing and equipping stakeholders in Kenya's Tana basin and Tanzania's Rufiji Basin, with necessary tools for developing an integrated solution for alleviating pressures on coral reefs, and threats to livelihoods that emanate from land-use change in two of East Africa's largest agricultural expansion corridors. This will be achieved through the following four objectives: (i) to generate knowledge on sediment transfer from catchments to adjacent near-shore coral reef areas; (ii) to generate knowledge on impact pathways of sediment and nutrient pollution on coral reefs; (iii) to enhance the adaptive capacity of institutions for coastal zone management; and (iv) to identify areas of high conservation priority on land and sea.

## IMPACT AND CONTRIBUTION

The multi stakeholder partnership for integrated coastal zone management will be adequately informed and

## THEORY OF CHANGE

### PROBLEM

Ongoing large-scale agricultural expansion on coastal catchments in Kenya and Tanzania is posing a threat to adjacent coral reefs, yet critical information gap exists on spatially explicit actions required to achieve reduced land-sourced pollution and

### INTERVENTION

(i) Knowledge on sediment transfer from catchments to adjacent near-shore coral reef areas is generated (ii) Knowledge on impact pathways of sediment and nutrient pollution on coral reefs is generated (iii) Adaptive capacity of institutions for coastal zone management is enhanced (iv) Assess trade-offs between agriculture, conservation, fisheries management, and livelihoods, for prioritization of management actions using the systematic conservation-planning

### OUTCOME

The multi stakeholder partnership for integrated coastal zone management is adequately informed on spatially explicit actions required to achieve reduced land-sourced pollution. When implemented, the spatially adaptive management actions will improve management outcomes for coral reefs adjacent to Kenya's Tana basin and Tanzania's Rufiji Basin in two of East Africa's largest agricultural

equipped with the tools necessary to implement effective actions that will reduce land-sourced pollution on coral reefs.

Moreover, outputs of this work will contribute to achieving policy statements outlined in Kenya’s integrated coastal zone management (ICZM) policy of 2014, and inform decisions on the green growth strategy of the Southern Agricultural Growth Corridor of Tanzania (SAGCOT). At a national level, this project will contribute to achieving sustainable development goals 14.1, 14.2 and 14.5, which hinges on generating knowledge and tools on pollution sources, sinks and the impacts on ecosystems, and on mainstreaming these knowledge and tools to enhance institutional adaptive capacity. The proposed work will be applicable to other places, including in coastal catchments in Mozambique where similar large-scale agricultural intensification is planned in the Beira region. Outputs will be presented in training workshops with managers and stakeholders, as part of building capacity on how the information may be utilized to support management interventions. It is expected that through strategic partnership with key government agencies, project outputs will be mainstreamed to influence decisions on sustainable land development in coastal catchments, to achieve a strategy outcome of reduction of sediment and nutrient threats on reefs and to promote resilience.

## INNOVATION

While Ridge to Reef is not a new concept, applying reef to ridge strategies adaptively at local scale requires innovating cross disciplinary approaches of gathering relevant information to inform decisions. By integrating geo-information science technology with eco-hydrology, ecology and socio-economics, this project innovates a multidisciplinary framework for generating key information that can be used to enhance the resilience of coral reefs.

## STAKEHOLDER ENGAGEMENT

The Kenya Wildlife Service (Kenya), Mafia Marine park (Tanzania), National Environmental Management Authority (Kenya), The Nature Conservancy (TNC), the Wildlife Conservation Society (WCS), and Rufiji Water Basin Office (Tanzania) will be key partners in the project. These key stakeholders have indicated their support for the project.

## PROJECT SUSTAINABILITY

Working with key stakeholders, capacity building, and dissemination of the project outputs will ensure sustainability of the project. The methodologies and analytical frameworks developed would be applicable to other tropical catchments.

PROJECT themes	Enhanced understanding of sediment & nutrient pollution; land-to-sea water quality management
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Targeted systems (■ = Project targets ecosystem)

Coral reefs	Mangroves	Seagrasses	Deep reefs	Beaches
Estuaries	Reef catchments	Social	Economic	

ICRI Plan of Action themes (■ = Project addresses theme)

Awareness	International Requirements	Harm reduction via regulatory tools	Monitoring reef state	Education
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APPLICANT	Macquarie University
BUDGET: USD \$150,000 (Requested \$60,000)	CO-FINANCING: USD \$90,000

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## ABOUT THE PROJECT PARTNERS



**ICRI** - The International Coral Reef Initiative (ICRI) is an informal partnership among governments, international organisations and non-government organisations. It strives to preserve coral reefs and related ecosystems around the world by implementing Chapter 17 of Agenda 21, which was adopted by the international community at the Rio Earth Summit in 1992 and calls for the protection and rational use of oceans, seas and coastal areas. The initiative contributes to raising awareness on the importance of and threats to coral reefs and related ecosystems, recognising that they are facing serious degradation mainly due to anthropogenic stresses. The French government is hosting ICRI for the 2016-18 biennium. More information can be found at [www.icriforum.org](http://www.icriforum.org)



**UN ENVIRONMENT** - UN Environment is the leading global environmental authority that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and serves as an authoritative advocate for the global environment. Our mission is to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations. The coral reef work of UN Environment is implemented through the Global Coral Reef Partnership, coordinated by the Coral Reef Unit, which also represents UN Environment in ICRI. The overall goal of the partnership is to promote and demonstrate ecosystem-based marine management in coral reef areas, in line with UN Environment Governing Council and United Nations Environment Assembly decisions, and as a contribution towards international targets such as Sustainable Development Goal 14 and Aichi Target 10.



**THE FOUNDATION FOR RESEARCH ON BIODIVERSITY** - The Foundation for Research on Biodiversity (FRB) promotes research to preserve, enhance and sustainably use biodiversity. The FRB was created in 2008 by eight public research institutions following the 'Grenelle de l'environnement'; an initiative of the ministries of research and ecology. The eight institutions have since been joined by LVMH, INERIS and the University of Montpellier. The originality of the FRB lies within its role as an interface between the scientific community, civil society and the business world. To date, more than 235 associations, companies, managers and local communities have collaborated with the FRB to meet its goal: meeting the scientific challenges of biodiversity. The FRB collaborates with the International Coral Reef Initiative (ICRI) to implement of the 2016-2018 ICRI action plan with the aim to transfer knowledge about marine biodiversity. More information can be found at : <http://www.fondationbiodiversite.fr>



**REEF ECOLOGIC** - Reef Ecologic is an environmental practice that delivers solutions for coral reef management and conservation through an internationally renowned team of marine experts. We work closely with clients and stakeholders to understand challenges and design and implement realistic and sustainable solutions. We use creative and insightful approaches and our rich experience to translate and apply latest science, develop strategic responses, build leadership and capacity, and engage stakeholders in enduring partnerships for a better planet. [www.reefecologic.org](http://www.reefecologic.org)