



BLUE SOLUTIONS

FROM LATIN AMERICA AND THE WIDER CARIBBEAN



On behalf of:



Federal Ministry
for the Environment, Nature Conservation,
Building and Nuclear Safety

of the Federal Republic of Germany

implemented by:

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

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BLUE SOLUTIONS



BLUE SOLUTIONS FROM LATIN AMERICA AND THE WIDER CARIBBEAN

REGIONAL FORUM ON SOLUTIONS FOR OCEANS, COASTS AND HUMAN WELL-BEING IN LATIN AMERICA AND THE WIDER CARIBBEAN

This Regional Forum was organised by the Blue Solutions Initiative of the German Environment Ministry (BMUB), implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), GRID-Arendal, the International Union for Conservation of Nature (IUCN), and the United Nations Environment Programme (UNEP). It was convened in collaboration with the Sustainable Ocean Initiative (SOI) of the Secretariat of the Convention on Biological Diversity (CBD) and in partnership with the National Commission of Natural Protected Areas (CONANP) of the Secretariat of Environment and Natural Resources (SEMARNAT), United Mexican States.



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Convention on
Biological Diversity



MÉXICO
GOBIERNO DE LA REPÚBLICA



SEMARNAT
SECRETARÍA DE MEDIO AMBIENTE
Y RECURSOS NATURALES



CONANP
COMISIÓN NACIONAL EN MATERIA
DE ÁREAS PROTEGIDAS



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COASTS AND HUMAN WELL-BEING IN LATIN AMERICA
AND THE WIDER CARIBBEAN

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6 INTRODUCTION

Life on earth originates from our oceans and coasts. They play an important role in the food chain and are crucial for the maintenance of the global ecological equilibrium. Human beings also depend on oceans and coasts for their well-being and economic development. Healthy marine and coastal ecosystems are highly productive, providing a multitude of valuable goods and services. These include food, medicine, climate regulation, coastal protection, recreational opportunities and spiritual benefits.

However, marine and coastal ecosystems face a wide array of threats, mainly from humankind. Habitat loss and degradation, overfishing, destructive fishing methods, eutrophication and pollution all deteriorate the state of oceans and coasts. In addition, these unique ecosystems are heavily impacted by climate change. A lack of regulation and enforcement, insufficient management and governance and limited awareness has limited effective responses to these pressures.



BLUE SOLUTIONS

The Blue Solutions Initiative was established by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) in 2013 and is implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), GRID-Arendal, IUCN and UNEP. Blue Solutions provides a global knowledge network

and capacity development platform that brings together innovative marine and coastal management approaches and policy advice, focusing on holistic solutions for the sustainable use of these resources.

SOLUTIONS – APPROACHES THAT WORK

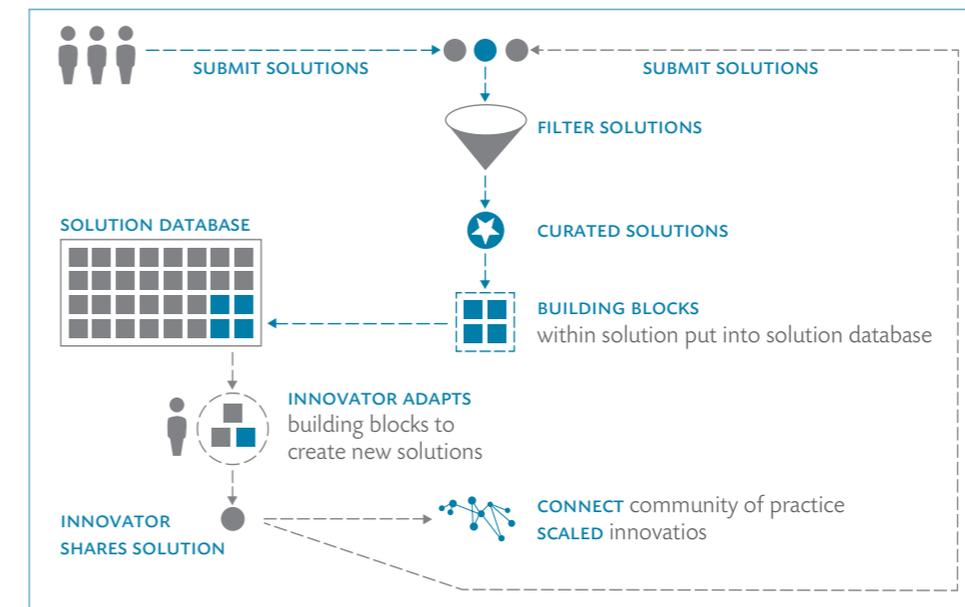
Inspiring solutions from across the globe provide multiple examples of how we can successfully overcome challenges to both sustainable marine and coastal development and human well-being.

Blue Solutions exist at all levels, be it local or global, technical or managerial, and share certain features. Blue Solutions are successful approaches that...

- ...address marine and coastal challenges: They contribute to the maintenance or improvement of ecosystem health.
- ...are effective: They are applied solutions with demonstrated impact
- ...are scalable: Elements of each solution have the potential to be up-scaled and/or replicated in other contexts.

INTRODUCTION

We believe that every solution is composed of essential elements which determine success – we call them building blocks. These building blocks may be adapted and recombined to address new challenges in other socio-cultural and ecological contexts, sectors or geographies. The Blue Solutions Initiative has established building block categories according to their means of action. A glossary of all building blocks, sorted by category, can be found at the back of this publication.



The Blue Solutions approach (adapted from the Resilience Exchange)

The Blue Solutions Initiative identifies, distils and promotes successful solutions and their building blocks for practitioners, decision makers and policy makers. This supports inter-sectoral knowledge transfer and enables mutual learning across borders. Our focus lies on holistic solutions for the sustainable use of marine and coastal ecosystems, because only healthy and productive biodiversity can continue to promote human well-being for generations to come.

SOLUTIONS EXCHANGE

One of our focal areas is the provision of a global knowledge network to collate, share and generate solutions which inspire action towards effective management and equitable governance of our planet's marine and coastal living spaces. Blue Solutions uses different formats to facilitate the exchange of successful approaches. Solutions exchange can take place in face-to-face meetings or through an online platform.

FACE-TO-FACE SOLUTIONS EXCHANGE

The Blue Solutions Initiative held its first Regional Forum for Oceans, Coasts and Human Well-Being in Cebu, Philippines in 2014.



The second Regional Forum took place in Cancún, Mexico in April 2015. Forum participants included practitioners and decision makers from local Latin American and Wider Caribbean communities, civil society and governments involved in marine and coastal development planning, management and governance. More than 100 people from 20 Latin American and Caribbean countries met to exchange experiences.



The four-day forum applied the Blue Solutions approach to facilitating knowledge transfer and exchange with a focus on spatial planning, management and governance, ecosystem-based management, sustainable fisheries, ecosystem-based adaptation and disaster risk reduction. Vibrant discussions took place throughout the event and a positive spirit of sharing and learning united the participants. Attendees had the opportunity to engage with solution implementers and experience how building blocks can be used, recombined and adapted to create new solutions in a solution-ing workshop.

This publication compiles fifty “blue solutions” from Latin America and the Wider Caribbean, most of which were presented in Cancún. It is a kaleidoscope of the diverse approaches implemented to protect valuable marine and coastal ecosystems, increase community resilience in the face of climate change and use natural resources in a sustainable way.

ONLINE SOLUTIONS EXCHANGE

In addition to the face-to-face exchange, the Blue Solutions Initiative joined up with the Panorama initiative of IUCN to create a web-based platform for the exchange of successful solutions.

This web-based and interactive platform allows solution providers to easily submit their experience on the one hand while on the other, users can get inspiration for the challenges they are facing. Our platform aims to foster global exchange between practitioners and policy makers who wish to learn what has proven successful elsewhere.



www.bluesolutions.info/exchange

BUILDING A MARKET FOR LIONFISH REMOVAL

10 SOLUTION



Indo-Pacific lionfish are one of the greatest threats to Caribbean reef systems

The Indo-Pacific lionfish (*Pterois volitans*) is a major threat to Caribbean reefs. First sighted in Belize in 2008, the invader is known to significantly reduce native fish biomass, threatening the ecological integrity of Belize’s world heritage-listed barrier reef. The lionfish invasion thereby undermines fishing and marine tourism industries alike, which support 15,400 livelihoods and contribute 25 per cent to Belize’s gross domestic product (GDP).

Blue Ventures is initiating efforts to build Belize’s lionfish fishery as an economic alternative for fishers and tasty option for consumers. This creates economic incentives to systematically remove the predator, whilst diversifying fisheries and local livelihoods within coastal communities, ultimately reducing pressure on traditionally-targeted native species.

Targeted lionfish fishing is now evolving in Belize, offering ecological and economic benefits. New sources of income for fishing households, e.g. women manufacturing jewellery from discards or new dishes appearing on restaurant menus, further develop the emerging market and help suppress the lionfish population.



Pablito and Aracely own the restaurant Estrella del Mar

Pablito’s and Aracely’s restaurant »Estrella del Mar« has become a pillar in the lionfish market in Sarteneja. As a direct result of Blue Ventures’ regular workshops and taster events in »Estrella del Mar«, in 2013 the keen entrepreneurial couple began serving lionfish prepared in diverse ways. Lionfish is now Pablito’s most popular dish, proudly standing at the top of his menu, with the name hand-painted on his small restaurant’s display. Since 2014, lionfish has been their bestselling dish. They buy 30kg of fillet per week, which is roughly 190 lionfish. Since this February, they process 45kg of fillet–300 lionfish–per week!

Fishermen have benefitted immensely from the couple’s ability to consistently buy lionfish and market it to Belizeans and tourists alike. Their reliability as a sales point is key to entrenching the lionfish fishery at the community level. A modest online presence attracts new customers: »With tourists coming, and their growing appetite for lionfish, we may be able to send our daughter all the way through college and university,« Pablito cheers.

BUILDING BLOCKS Solution components for replication

Emergent lionfish fishery

To build a new market for the fishery, all actors across the supply chain are supported, incentivising fishers to consistently target lionfish. Fishers are trained in lionfish safe-handling and first aid for stings. Buyers are linked to fishers and receive marketing support through posters and menu inserts. A social marketing campaign informs consumers and increases demand and willingness to pay.

Lionfish catch targets

Extensive stock assessments enable development of site-specific threshold densities for lionfish control activities. Exploitation strategies and management implementation plans establish catch targets to optimize nation-wide removal efforts. A combination of commercial harvesting, culling by SCUBA and employing deep-water traps is necessary for long-term population suppression.

Value-added lionfish products

Training women in coastal communities to manufacture jewellery using lionfish spines and fins can add up to 40 per cent of value to catches, and resulting products may access international markets. Other locally processed goods (e.g. lionfish burgers, frozen fillets and animal feed) can generate new skills and alternative employment for community members.



Jewellery made from lionfish fins provide additional income

This solution is being implemented by Blue Ventures Belize.

ECONOMIC VALUATION OF BELIZE'S REEFS AND MANGROVES



Coral reef ecosystem in Belize

Unregulated coastal development, overfishing, climate change and pressures from tourism threaten Belize's world-famous reefs and mangroves. Until 2007, the importance of benefits from these ecosystems and their substantive contribution to the national economy were not adequately reflected in national investment priorities and policy decisions.

The study Coastal Capital: Belize addressed this issue by assessing the contribution of reef- and mangrove-associated tourism, fisheries and shoreline protection services to Belize's economy. In 2007, the estimated value from these three ecosystem services was US\$ 395–559 million—significant when compared to Belize's total gross domestic product (GDP) of just US\$1.3 billion. In the years since, the Belizean government and civil society have taken significant steps to protect coral reefs and mangroves.

Coastal Capital: Belize findings have been used to justify new fishing regulations such as banning parrotfish harvest and spear-fishing in marine protected areas (MPAs), mangrove legislation, a successful damage claim against a ship that ran aground on the Belize Barrier Reef and an offshore oil drilling ban.

Growing into a role model beyond national borders, a replication of this study triggered MPA establishment in St. Maarten in 2010. The Jamaican government was also awarded damages for a ship grounding in 2011, citing the Belize case as precedent.

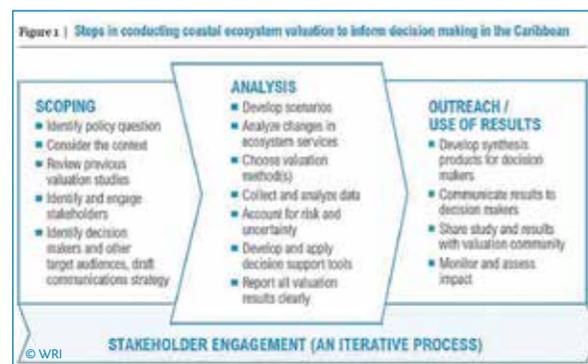


Diagram of the Coastal Capital: Belize process

Meaningful stakeholder engagement

Workshops help develop a comprehensive partnership between relevant NGOs, MPA co-managing organisations, government and academia. Early and frequent contact with knowledgeable partners is crucial to design the study, identify policy applications, collect data and communicate results to decision makers.

Training in valuation

MPA stakeholders are offered multiple training opportunities for application and replication of valuation methods in their MPAs. By developing templates, compiling relevant data (e.g., on MPA uses) and revising monitoring efforts, they are able to produce economic estimates.

Coastline resource use

Data collection on coastline resource use involves a variety of informants, including tourism, fisheries, and forestry sectors; as well as spatial data. The process pulls together the best available ecological and socioeconomic data for the valuation.

Valuation of reefs and mangroves

Valuation focuses on those ecosystem services particularly relevant to local economies that are relatively easy to measure, using largely existing information.

Targeted communication

Study results are strategically packaged into various mediums, e. g. pamphlets, videos, or user manuals to reach key audiences. These materials are highlighted at public events and technical or policy meetings. Participating stakeholders lead dissemination efforts, effectively communicate to decision makers and use results to negotiate new regulations.

This solution was implemented by World Resources Institute (WRI) in collaboration with the Belize office of WWF-Central America. Many other partners in Belize also provided data, reviewed the analytical approach and results, and guided outreach.



WORLD
RESOURCES
INSTITUTE



VALUATING CLIMATE ADAPTATION OPTIONS ON PLACENCIA PENINSULA

14 SOLUTION

In Belize, coral reefs, mangroves and beaches are the cornerstone of the tourism industry. In addition, coastal communities rely on mangrove and reef-based fisheries for food security and income. Tourism industry growth is viewed as inherent to economic development in Belize, but is often accompanied by habitat degradation. Land and mangrove clearance, sedimentation and pollution directly threaten the resources upon which the industry depends. The challenge faced by decision-makers is how best to move forward with tourism development whilst maintaining healthy, functional ecosystems that support the tourism industry, sustain livelihoods and provide resilience to climate change.



Placencia Peninsula in Belize



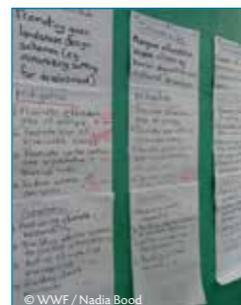
A local mangrove restoration site

To illuminate the trade-offs between different climate adaptation strategies, an ecosystem service and cost-benefit analysis was conducted on Placencia, an emerald peninsula that is now a major Belizean tourist destination, and its adjacent lagoon system. This analysis acknowledges coastal-marine ecosystem services, like protection from storms and sea level rise, to make better informed decisions.

The analysis helped to provide strong social and economic justification for communities and stakeholders to place more emphasis on conserving and restoring the natural ecosystems. Efforts to preserve mangrove stands along the lagoon's banks came alongside endeavours to replant mangroves in cleared areas experiencing notable erosion. Some land developers and shrimp farmers have also requested to donate mangrove-covered areas on their property to the proposed Placencia Lagoon protected areas system. In addition, increased attention was paid to the use of green vs grey infrastructure to stabilise private property shorelines (particularly on the lagoon side), despite land development continuing to alter the face of the peninsula. Overall, the analysis translated climate risks into business-relevant language thereby building an »architecture of participation« (e.g. for corporate engagement and action), climate action, »resilience wedges« and enhanced adaptive capacity.



Stakeholder consultation on climate mitigation and adaptation options and the development of scenarios



BUILDING BLOCKS Solution components for replication

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Characterisation of ecosystem services

Ecosystem services of coral reefs, mangroves and seagrass beds are characterised based on results from stakeholder consultations and available data from relevant authorities. The Marine InVEST analysis tool is used for ecosystem service valuation. Climate impact hypotheses are formulated.

Climate impact hypotheses

Stakeholders are consulted to obtain feedback on relative vulnerabilities. Climate impacts of concern to relevant stakeholder groups are discussed. Further information is compiled via desktop research and review of scientific literature. Direct and indirect influence of climate factors on ecosystem services is analysed.

Climate adaptation scenarios

Climate impact hypotheses are fed into InVEST ecosystem service models. The derived adaptation strategies are prioritised based on reflecting potential cost-effectiveness and triple-wins, and further analysed under three management scenarios.

Cost-benefit analysis

Alternative adaptation options are analysed using InVEST. Costs are incorporated directly into the scenarios and the models, e.g. costs of implementation of adaptation options combined with any associated costs to ecosystem services, and benefits represented by the positive return in ecosystem service values.

Transparent sharing of information

Results of the analysis are shared with relevant government agencies to facilitate replication and uptake of the process as well as recommendations. Local communities and NGOs, land developers and the tourism sector are informed to build capacity, awareness and implementation of greener landscape practices within the coastal zone.

This solution is being implemented by WWF (US and Mesoamerican Reef Ecoregion Offices) in collaboration with the Natural Capital Project, Belize Coastal Zone Management Authority and Institute (CZMAI) and Inter-American Development Bank (IDB).



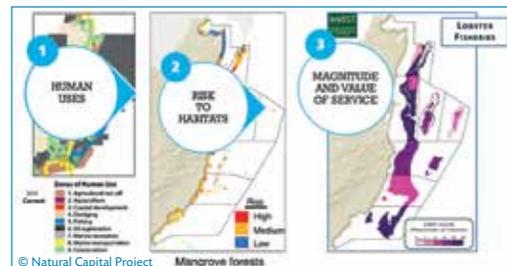
VALUING ECOSYSTEM SERVICES FOR INTEGRATED MANAGEMENT

16 SOLUTION

Belize's highly productive coastal zone is characterised by diverse ecosystems and multiple, competing uses. Coastal population density, broad-range fisheries activities and a flourishing tourism industry are driving construction of new coastal development, urban areas and ports.

Despite the importance of Belize's coastal zone to the national economy and health of its citizens, an integrated plan – to ensure that existing resource uses and expanding human activities do not trigger conflicts among stakeholders or put their wellbeing at risk – has not yet been implemented. Until 2011, relevant information and tools were too widely dispersed across various institutions and ministries, hindering comprehensive coastal management planning.

WWF and the Natural Capital Project supported the Belizean Coastal Zone Management Authority and Institute (CZMAI) to develop an ecosystem-based, scientifically and economically sound management plan. The result balances conservation, sustainable resource use and development needs by integrating available information. This solution maps and values ecosystem services using a stakeholder participation process and elaborating alternative future scenarios. In so doing, the plan predicts and clearly visualises how, under each scenario, changes in ecosystem function will affect returns from ecosystem services. The resulting maps and conclusions are crucial decision-making tools used to inform national management planning.



»As an expert in GIS mapping, I expect my maps to work behind the scenes,« says Gregg Verutes, WWF geographic information system analyst. »The multi-layered depictions I construct – to illustrate the ways we use and value nature – usually inform scientists, practitioners and policy makers. They rarely feature prominently in televised efforts to secure sustainable national energy policy. But exactly that happened in Belize.

A local tour guide urged me to project the 2010 Gulf of Mexico oil spill onto Belize's map, illustrating the potential impacts of a similar disaster there. The resulting image showed how an oil spill of this magnitude would devastate the

entire country. My map was then used for signs and television advocacy against offshore oil exploration, prompting over 90% of Belizeans to vote »no« in a move to protect the ecosystem they depend on. So a simple map I made helped defeat a proposal to intensify offshore oil drilling. What more could a humble mapmaker ask for?«

Visualising ecosystem information helps to inform management decisions

BUILDING BLOCKS Solution components for replication

Multi-sectorial advisory committees

Representing multiple sectors and interests, Coastal Advisory Committees convene regular meetings to collect feedback on regional stakeholder visions, needs and preferences for the process. Broader engagement is reached through a public review of the draft Integrated Coastal Zone Management Plan.

Scenario development

Stakeholders provide input regarding local resource uses, ecosystem values and future preferences in order to create scenarios for alternative development and conservation by the year 2025. Simple tools and exercises showcase how alternative development decisions can affect natural capital.

Communicating ecosystem services

Synthesising the different scenarios illustrates the dynamics between resource use, livelihoods and ecosystem services. This also serves to identify suitable locations to implement ecosystem services incentives and policies in support of a sustainable plan. Clear conclusions and captivating stories transfer outcomes into specific management recommendations.



Belize's coral reefs provide important ecosystem services for coastal protection, fisheries and tourism

This solution is being implemented by the Belize Coastal Zone Management Authority and Institute (CZMAI) in collaboration with the Natural Capital Project (NatCap) and WWF Belize.



NATURE'S CONTRIBUTION TO THE ECONOMY

18 SOLUTION

Healthy ecosystems such as coral reefs and mangroves are critical to small island society. Caribbean island inhabitants have always lived in balance with nature. However, developmental pressures challenge the physical and economic security of these islands. In the current era of financial insecurity and environmental degradation it becomes clear that classical investments in a strong economy are not always contributing to a healthy environment. It is therefore key to understand how nature contributes to a small island economy and human wellbeing. Placing economic value on ecosystem services can justify funding for nature conservation and mobilise political support.

Recent research on the economics of ecosystems and biodiversity (TEEB) in Bonaire drew attention to the economic benefits of biodiversity. It also highlighted the growing cost of biodiversity loss and ecosystem degradation by assigning economic values to Bonaire's main ecosystem services.



Tourists spend around US\$ 125 million annually on Bonaire

Over 1,500 persons, including tourists, fishermen, local residents and citizens of the Netherlands, were interviewed. This data was used to estimate individual's willingness to pay to protect Bonaire's natural resources, as well as mechanisms (e.g. user fees) through which such payments would be transferred. A scenario analysis was conducted and used to inform decision makers about which strategies to protect the ecosystems of Bonaire would be most effective. The current total economic value (TEV) of Bonaire's ecosystem services is US\$ 105 million per annum. As long as present threats are unmanaged, the TEV of Bonairean nature can decrease in just ten years to around US\$ 60 million and to less than US\$ 40 million in 30 years. These results are being used to raise awareness, support decision-making, develop sustainable financing mechanisms and serve as input for integrated spatial planning.



On Bonaire, marine ecosystems are found to be more economically significant than terrestrial ones

»Intuitively, many people were already aware of the fact that nature plays an important role,« says Pieter van Beukering, Associate Professor at VU University Amsterdam.

»But now that they see the real number, and they see the real importance, the urgency of doing something – more than we currently do – has increased and people have become more aware of the importance to protect our nature and improve its quality as soon as possible.«

BUILDING BLOCKS Solution components for replication

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Scoping procedure

Considering the context and identifying a clear policy question at the outset of the ecosystem service valuation determine the appropriate level of stakeholder engagement, suitable valuation method, level of accuracy required, data needs, costs, scale and time constraints.

Workshops on ecosystem services

Stakeholders are familiarised with the concept of ecosystem services, their valuation and how this data is used to address relevant policy decisions. Exercises generate information about local ecosystems, ecosystem services, beneficiaries, stakeholders and issues. Participants are trained how to use valuation to create important insights for all-inclusive decision-making.

Ecosystem service valuation

One way to define the value of ecosystem services is by estimating communities' »Willingness-to-Pay« (WTP) to maintain or enhance their natural environment, on which financial mechanisms can be based. Following the TEEB framework, valuations of priority ecosystem services, including by means other than WTP, are combined to arrive at an estimate of the total economic value.

Value scenarios for cost of (in)action

Contrasting value scenarios are developed and used to assess the cost of action or inaction respectively. Stakeholders and local experts help determine the most relevant management issues to be addressed by these value scenarios.

Communication about ecosystem service values

Policy briefs, newspaper and magazine articles, radio broadcasts and documentary films can be targeted to diverse audiences. This helps to garner support for nature conservation and assist stakeholders in making equitable decisions by delivering insight, awareness and transparency on issues related to natural resources.

This solution is being implemented by Wolfs Company in collaboration with VU University Amsterdam and the Ministry of Economic Affairs of The Netherlands.



CLIMATE SENSITIVE PLANNING

20 SOLUTION

Brazil's Discovery Coast boasts the largest remaining forest within the northeast Atlantic Forest biome. It is also home to the biggest and most biologically diverse coral reefs in the southern Atlantic. Nearly 500,000 people are supported by these two ecosystems, yet overfishing, deforestation (for cattle farming), agriculture and human settlement make them vulnerable to climate change.

Regional reefs and forests are highly sensitive in this regard. Forest fragmentation, in conjunction with increased temperatures, impacts already compromised water supplies. Overfishing of herbivorous species is causing macro-algae overgrowth in the Abrolhos reefs, leading to a decrease of reef resilience to climate change and a reduction in fishery productivity. This has negatively impacted both food security and marine biodiversity.



Aerial view of Porto Seguro, Discovery Coast, Brazil

To restore the Porto Seguro area, an Ecosystem-based Adaptation (EbA) approach and coastal-reef connectivity strategies were developed through a participatory process. These will also reduce the vulnerability of coastal communities and the ecosystems they use.

The development of the restoration plan was based on the results of a participatory vulnerability assessment process involving stakeholders from the public and private sectors, including academia, national and state governments, NGOs, private companies, protected area management

and local communities. Adaptation recommendations to address climate change impacts were formulated during multi-stakeholder workshops. This allowed for the capture of the complexity of socio-ecological interactions, while enabling a more focused understanding of climate vulnerability and possible adaptation options.

BUILDING BLOCKS Solution components for replication

Legislation for municipal restoration plans
As part of recent environmental policy, municipalities in the Atlantic Forest biome are required to have municipal plans for the conservation and restoration of the Atlantic Forest. This encourages municipalities to develop new strategies for conservation, climate change adaptation and restoration.

Climate change vulnerability assessment
Climate change, ecosystem services and shoreline erosion experts conduct a series of studies to improve the knowledge base of regional climate change impacts and identify knowledge gaps. Their results form the basis for expert identification of major climate change impacts and adaptation responses.

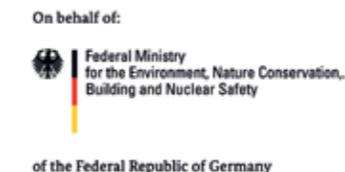
Joint adaptation planning
Participants from various sectors review the available scientific evidence and identify the cascading impacts of climate change. Direct and indirect impacts of and dominant processes affected by climate change within the study area are identified. Adaptation recommendations are formulated based on this data.

Awareness-raising storylines
A storyline outlines the cascading effect of climate change, using simplified explanations and examples to illustrate the multifaceted topic. Stakeholders develop storylines as awareness-raising tools for the planning process, making complex concepts such as EbA and coastal-reef connectivity more accessible.

Illustration from a storyline to explain the impacts of climate change



This solution is being implemented by Conservation International (CI) Brazil on behalf of the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).



A STRATEGY FOR THE CONTROL OF INVASIVE LIONFISH

22 SOLUTION

The invasion and proliferation of the two lionfish species *Pterois volitans* and *Pterois miles* threatens biodiversity in the Wider Caribbean Region. These alien carnivores pose a serious threat to native coral reef-associated marine life, and contribute to the decline of many commercially and ecologically important species.



Indo-pacific lionfish occur in dense populations in Caribbean reef systems

In addition, the invasive lionfish population could have a significant negative impact on economically important activities such as fisheries and tourism. Both industries are impaired by the loss of biodiversity, as it ultimately reduces fisheries catch and the desirability of diving sites. Furthermore, the lionfish's venomous spines are a safety risk to both fishermen and recreational divers.

In 2010, a strategic plan for the control of lionfish in the Wider Caribbean was developed in recognition of the severity of the lionfish invasion, its impact on coral reefs and effect on the local population. The plan provides a framework to address the invasion with a concerted approach across political and geographical boundaries. To minimise the negative impacts of lionfish, cooperation is promoted

among governments, reef-reliant industries, civil society and academia. A transboundary research and monitoring agenda coupled with local action plans, information campaigns and the adaptation of policy guidelines ensure that the lionfish issue is dealt with in the most effective manner.

BUILDING BLOCKS Solution components for replication

Regional and intersectoral collaboration
Collaborative efforts among governments, reef-reliant industries, civil society and academia promote buy-in and enhance extraction resources. Defining roles, responsibilities and strategic priorities of all parties involved aids in increasing the effectiveness of lionfish control programmes.

Research and monitoring
Scientific baseline data of species behaviour and environmental impact is used to design appropriate tools for control. The use of these tools is continuously monitored, enabling their assessment and adjustment in an adaptive management process.



23

Monitoring of lionfish populations is crucial to an adaptive management process

Control of lionfish populations
Lionfish management requires the involvement of all affected parties, coupled with tailored strategies to reflect ecological, cultural and social differences within the region. Legal policies regulate the aquarium trade of lionfish, as well as conditions and gear for lionfish removal.

Awareness raising on invasive species
Education, information and outreach programmes help to enhance public support and participation of local communities in invasive lionfish control programmes.

This solution is being implemented by the International Coral Reef Initiative (ICRI) in collaboration with the Mexican Commission of Natural Protected Areas (CONANP), the US Oceanic and Atmospheric Administration (NOAA), the Reef Environmental Education Foundation (REEF), Reef Check Dominican Republic, University of the West Indies, United Nations Environmental Programme – Caribbean Environment Programme (UNEP–CEP) and its Regional Activity Center for the Protocol on Specially Protected Areas and Wildlife of the Cartagena Convention (SPAW–RAC), and the Centre for Agricultural Bioscience International (CABI).



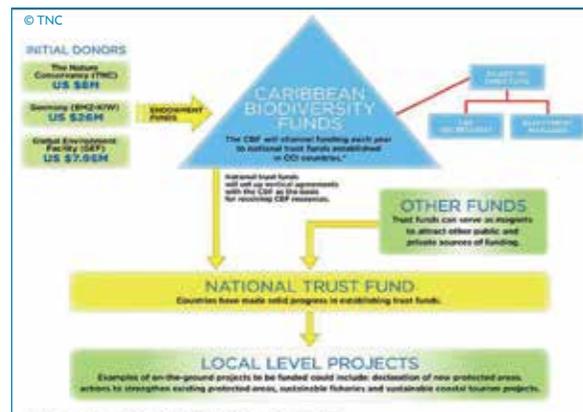
REGIONAL BIODIVERSITY FUND



In Caribbean SIDS, livelihoods directly depend upon healthy marine and coastal resources

With seventy per cent living along the coast, the Caribbean population and their livelihoods directly depend upon healthy marine and coastal resources. Over the past few decades, development, pollution, overfishing and climate change have caused dramatic declines in the condition of regional marine and coastal ecosystems. Limited financial resources for conservation and a lack of long-term sustainable finance mechanisms exacerbate the problem, particularly in Small Island Developing States (SIDS).

The Caribbean Biodiversity Fund (CBF) was established to assist Caribbean SIDS in achieving their conservation goals under the CBD, the Caribbean Challenge Initiative and national conservation priorities. This regional endowment will support multiple National Protected Area Trust Funds (NPATFs). The solution responds to the countries' pledge to create effective finance mechanisms that provide reliable funding to sustainably manage marine and coastal resources over the long term. The aim is to conserve at least twenty per cent of the Caribbean's marine and coastal environment by 2020.



Organisational structure of the Caribbean Biodiversity Fund and flow of funds

With an initial endowment of US\$ 42 million, the CBF provides funding to Antigua and Barbuda, The Bahamas, Dominican Republic, Grenada, Jamaica, Saint Kitts and Nevis, Saint Lucia and Saint Vincent and the Grenadines for addressing environmental challenges while raising the conservation profile in the region. Efforts are underway to establish national level trust funds which would be eligible to receive and disperse CBF funding to local projects. Once fully operational, the CBF is expected to generate US\$ 2–4 million per year in funding and attract additional resources from sectors like finance, tourism and public-private partnerships.

Government commitment
Governments are key in regional and national trust fund design. They participate as observers and/or focal points in regional trust fund board meetings and support national trust fund establishment at the local level.

Independent National Protected Area Trust Fund (NPATFs)
NPATF Boards include non-governmental civil society representatives from respective participating countries and reflect a broad range of sectors and interests. Members are elected independently. Grants can be made to both government and civil society, subject to independent asset control and solid external audit requirements.

Trust fund operationalisation
Skilled personnel, effective governance and functioning technical systems are essential for successful NPATF operation. Key elements to support regional finance architecture include training on individual accounting systems, operations manuals, learning from best practices, mentoring and peer exchange.

Long-term funding strategy
Developed and implemented jointly with donors, countries and partners, a strong strategic funding plan provides a framework for institutional development; engagement with governments and regional actors; thematic and geographic expansion; fundraising; and marketing and communications. Measurable objectives and indicators allow for assessment of its effectiveness.

Common trust fund monitoring
Two compatible monitoring systems track financial resources and conservation impact across regional and national trust funds. They are combined into a robust M&E framework for impact measurement, organisational learning and donor reporting, using applicable regional indicators.

This solution is being implemented by the Caribbean Biodiversity Fund (CBF) in collaboration with the Caribbean Challenge Initiative (CCI), funded by the German Federal Government (KfW/BMZ), the Global Environment Facility, World Bank, UNDP, UNEP and The Nature Conservancy.



STRENGTHENING CARIBBEAN FISHERFOLK

26 SOLUTION

Throughout the Caribbean, more than 182,000 people are directly and indirectly employed in the fisheries sector. Small-scale fisheries are vital to local economies, and ensure food security and good nutrition. Today, fishers are facing various challenges: marginalisation, diminishing access to fish, ocean grabbing by powerful interests and climate change. Furthermore, they are often excluded from active participation in the management of the very marine resources their livelihoods depend on.

To address these issues, the Caribbean Network of Fisherfolk Organisations (CNFO) was founded in 2007. It aims to improve fishers' quality of life and develop a sustainable and profitable fishing industry through networking, representation and capacity building. The CNFO developed an integrated fisheries governance approach that involves small-scale fishers in the region, promotes their participation in fisheries management processes and allows for the inclusion of



Fishers collaborating on suitable gear and fishing techniques

who can not only provide information but assist as well in terms of making recommendations based on good sets of information. The fisher is the one in the field. It is impossible or impractical for scientists to cover the area that fishers cover every day. Fishers, even though they may not have the same academic levels, can be just as intelligent as scientists. Once equitable collaboration between researchers and fisherfolk occurs, relevant information can be generated, such as the extent of the resource base, its diversity and how fisherfolk can best access this diversity to benefit their economic welfare in the long-term.»

fishers' knowledge, experience and interest into fisheries policy and law. The CNFO is now active in fisheries governance at local, regional and global levels.

»Fishers can enforce, and for themselves achieve, a higher level of compliance than by any other means,« says Mitchell Lay, artisanal fisherman and coordinator of the CNFO.

»We are not lawless nor without ethics. In order to fish sustainably, we need to know what we are doing. The scientists are trained to collect data and to do assessments and to make recommendations based on trends, etc. They have a particular area, yes, but we are the people who are in a position,

BUILDING BLOCKS Solution components for replication

27

Strategic partnerships for fisherfolk

National fisherfolk organisations are strengthened through strategic partnerships with fisheries management bodies, NGOs and academia. They facilitate training, advocacy and representation in regional fisheries governance and the sharing of best practices.

Compliance with policy frameworks

Although national policy and legislation often provide for the participation of fishers in fisheries management, the reality is different. Therefore, strong fisherfolk organisations can promote compliance with existing policies and strengthen the involvement of fishers and their organisations in fisheries governance.

Establishment of fisherfolk organisations

National fisherfolk organisations are established through collaborative effort. The organisations ensure the participation of small-scale fishers in fishery governance and management on all political levels.

Use of Information and Communications Technology (ICT)

The use of (open-source) ICT facilitates communication in geographically dispersed regions and at all activity levels. It enables the collective planning that is crucial in an international context.

Promotion of active participation

Training activities in leadership, business, communications, advocacy and representation contribute to strong fisherfolk organisations and their appropriate participation in fisheries governance.



Training Workshop on Management, Communication and Advocacy for fisherfolk organisations

This solution is being implemented by the Caribbean Network of Fisherfolk Organisations (CNFO).



MAR FUND: REGIONAL REEF CONSERVATION

28 SOLUTION

Establishing integrated regional management of the Mesoamerican Reef System (MAR) entails addressing a number of challenges, including: lack of inter-institutional collaboration and experience with regional planning approaches; poor involvement of local communities; fragmented surveillance and enforcement; unreliable monitoring data to inform decision-making; and insufficient integration of climate change impacts.



A park researcher records monitoring data in Sandy Bay West End, Roatan, Honduras

The MAR Fund provides financial stability for regional conservation initiatives. By encouraging effective coordination, the MAR helps to strengthen conservation of the area's ecological functions. The MAR Fund's aim is to develop an interconnected and functional regional network of fourteen coastal and marine protected areas (MPAs). To date, MPAs in Mexico, Belize, Guatemala and Honduras have joined. The regional network strengthens the presence, role and capacity of park administration, initiates participatory planning, strengthens community collaboration and intensifies exchange and synergies between the MPAs to protect and reduce overexploitation of the region's unique heritage.

Declared a wildlife reserve in 1999, a Ramsar Site and Wetland of International Importance, Punta de Manabique peninsula on the east coast of Guatemala is home to a rich diversity of species. The reserve contains both mangrove and rainforest. It is also home to a 2,000-strong community of people who, traditionally, earned their living from fishing.



Park administrators and civil society members gather to plan joint management activities for Punta de Manabique, Izabal, Guatemala

Thanks to MAR Fund's Regional MPA Network initiative, the Guatemalan National Council of Protected Areas (CONAP) established a park management unit inside the MPA, which allowed them to strategically engage locals and assemble a team of partners working together on the conservation, sustainable use and community development of the no-take area.

Ecotourism is now promoted as an economic alternative. The small community of Estero Lagarto, for example, now has a solar-powered visitors centre. Visiting tourists can go bird-watching or manatee-spotting, fish with the locals or watch a demonstration of the local charcoal-making process.

BUILDING BLOCKS Solution components for replication

Participatory management & trainings

Cooperation is established between MPA managers and other stakeholders, ensuring that local expertise supports the management of natural resources. Trainings for park administrators focus on technical topics, conflict management and strategic partnerships.

Viable Economic Alternatives

To promote collaboration and recognise local conservation efforts, several livelihood alternatives are supported that create community income according to area dynamics, local skills and tourism needs, e.g. diving certification, local shops and community restaurants.

Partnership approach to monitoring

Participatory baseline assessments and monitoring of indicator species are used to determine management effectiveness and connectivity within the MPA network, inform adaptive decision-making and build capacity of personnel and community members.

Enforcement programme

Funds are provided to strengthen enforcement plans, sustain patrols and encourage inter-agency-surveillance in all MPAs. Increased presence in the area can enhance management credibility and trigger community collaboration to combat illegal activities.

This solution is being implemented by the Mesoamerican Reef Fund (MAR Fund) and its four member funds: the Mexican Fund for the Conservation of Nature (FMCN), the Protected Areas Conservation Trust (PACT) in Belize, the Foundation for the Conservation and Natural Resources of Guatemala (FCG), and the Biosphere Foundation in Honduras; with the financial support of the German Cooperation through the Kreditanstalt für Wiederaufbau (KfW).



ASSESSING AND MANAGING THE COASTAL SCENERY

30 SOLUTION

The coastal zone is a popular destination for many tourists who are attracted by its scenic beauty, beach-related activities or local entertainments. Scenery is a very important component of beach tourism, which drives the economy of coastal areas. However, many coastlines are threatened by anthropogenic impacts such as uncontrolled development and pollution, resulting in landscape degradation and reduced scenic quality. In order to assess the potential for coastal development in rural and remote areas and improve scenic quality of village and urban areas, an innovative scenic assessment methodology (comprising physical and human parameters) has been developed. It can be used by managers and planners along any type of coastal area. With its strong emphasis on community participation, the technique opens new perspectives for analysis, focusing on the potential for coastal development in natural areas and scenic quality improvement of developed areas. The results of the assessment are fed into the development of a scenery-based management plan and help to define management strategies.



Beach in Tayrona Park, Colombia

»If you want to relax at the beach, you look for a nice beach – remember: beauty lays in the eye of the beholder, in this case a tourist. Recently, fewer tourists visit our beach – why?« asks Roberto, a local fisherman and owner of a small restaurant in Santa Veronica.

The scenic evaluation revealed that the natural beauty of Santa Veronica was constricted by litter, sewage and noise. Since tourism is the area’s main economic activity, beach degradation had far-reaching consequences. To recover the natural beauty of the beaches, a management plan was created to improve those parameters which received bad scores in the scenic evaluation. These improvements included:

- Regularly removing litter and running clean-up campaigns.
- Eliminating visual contamination.
- Reducing noise.
- Improving beach access.
- Upgrading basic utilities (WC, showers, etc.)



Degraded beach in Santa Marta City, Colombia

After three months of applying the plan, Roberto says: »People can enjoy the beauty of the beach again!«

BUILDING BLOCKS Solution components for replication

Scenic evaluation tool

This tool assesses 26 parameters essential in the perception of coastal scenery by users in different parts of the world. It is based on consultation with coastal landscape experts.

Scenic classification survey

A survey of environmental, physical and usage parameters enables the identification and characterisation of those variables that must be managed more effectively in order to promote overall improvement of scenic value. It can be applied by coastal managers, planners, academics, government agencies and the local community.

Scenery management plan

The plan aims to improve overall conditions in the coastal zone and ensure the provision of long-term goods and services for local communities and tourists. It guides littoral managers to anticipate future impacts related to human interventions.

Monitoring of coastal scenery

To ensure that the scenery values of the area are effectively protected, interested community members are trained in monitoring coastal scenery using standardised techniques. Selection of trainees and implementation of continuous monitoring are done in coordination with the community.



Community members are trained in monitoring coastal scenery

This solution is being implemented by the initiative »Assessing and managing scenery of the Caribbean Coast of Colombia«, developed by the Universidad del Atlántico (Colombia), the Universidad de Cadiz (Spain), the University of Wales – Trinity Saint David (UK) and the Middle East Technical University (Turkey).



BRINGING SUSTAINABLE FISH TO YOUR PLATE

32 SOLUTION

In Colombia, local fishing communities generally live in isolated areas far from cities and markets. They have limited infrastructure, means and knowledge of the proper production and handling of fish products and, therefore, cannot meet the high quality and sustainability standards required by big markets. This often results in the use of unsustainable fishing practices, high production costs and low incomes for local communities.

Since 2009, the EcoGourmet programme has enhanced the technical and administrative capacities of artisanal fishermen cooperatives and supported their objectives to achieve responsible fishing. EcoGourmet, financed by Fondo Acción and Conservation International (CI) Colombia, facilitates the signing of trade agreements between suppliers, fishing cooperatives and restaurants and sensitises consumers to the ramifications of their purchasing decisions.

Today, participating restaurants can offer locally sourced fish caught sustainably by fishers that implement best practices for conservation and fisheries management. Negative impacts on ecosystems are reduced while profits for area fisherfolk are increased.



Fisher from Bahia Solano with sustainably caught red snapper

The Bahia Solano cooperative Red de Frío has participated in EcoGourmet since 2012. Members deliver high quality fish products for consumption in Bogotá less than 48 hours after being caught.

The process of joining EcoGourmet has not been effortless. It was a struggle to convince the fishermen of the need to use sustainable and selective fishing gear. Other difficulties included installing a cold room in one of the wettest and hottest areas on the planet, legally securing the tenure of the land where it was installed and implementing a system to ensure the supply of ice to fishermen at sea. Establishing an accounting system and budget and facilitating tax compliance were also challenging.

Responsible fishing practices ensure the purchase of the product by the commercial partner. Failing to implement them would mean fishermen from Red de Frío would have to fish 83 more tons to meet their current level of earnings.

»Today no one in Bahia Solano has **not** heard of responsible fishing,« says a member of Red de Frío, Emilio Medina. It's a good start. Hopefully the word will spread.

BUILDING BLOCKS Solution components for replication

Responsible fisheries
Best practices for fishing, manufacturing, storage and marketing of fish products are implemented together with artisanal fishing communities.

Fair agreements
Restaurants and local organisations sign and implement agreements to sustainably manage coastal and marine ecosystems.

Organisational empowerment
Diagnostic tools identify administrative and accounting weaknesses of local organisations. Investments in infrastructure and equipment and the optimisation of logistic processes ensure high quality standards for handling, processing, and distribution of fish products.

Consumer sensitisation
Customers of the associated EcoGourmet restaurants are sensitised on responsible consumption via workshops and restaurants' placemats containing information about sustainable fishing.

Communication strategy
Results, achievements and learning experiences of the programme were disseminated among different audiences to illustrate the impact of the innovative business model.

This solution was implemented in its first phase by MarViva Foundation in collaboration with Red de Frío and WOK restaurants, funded by Fondo Acción and Conservation International (CI) Colombia. EcoGourmet is currently in its second phase, involving other restaurants and fishing cooperatives.



CLIMATE-SMART CONSERVATION FOR MARINE PROTECTED AREAS

34 SOLUTION

In times of climate-induced stress, coastal ecosystem goods and services can be sustained by strengthening the resilience and adaptation capacity of marine protected areas. Climate-sensitive planning and management measures are necessary in order for MPAs to continue to meet the conservation objectives for which they were created.

This solution centres around the development of a framework which combines climate vulnerability analysis of MPA conservation targets, formulation and implementation of priority adaptation actions (e.g. »no go zones«, restoration) and integration of these actions with existing planning tools. This new framework has enabled climate-smart conservation in Gorgona National Park in northeast Colombia.

Based on a better understanding of climate risks, the climate-smart conservation framework allows managers to define the necessary steps to build resilience and adaptation capacity into their MPAs, ultimately supporting ecosystems and their benefits for communities in the face of changing conditions.



Gorgona Island

Gorgona National Park’s updated Management Plan (2015–2019) utilises an ecosystem services approach and reflects climate change considerations. These are used to refine management measures for marine turtles, coral reefs and the pelagic ecosystem – its priority conservation targets.

Vulnerability assessments and adaptation activities have been a concerted effort of the MPA management team. In order to keep pace with ever-changing needs, all actors have acquired new skills in the process.

»Strengthening climate smart conservation teams and knowledge about adaptation, biodiversity, science, GIS tools and modelling techniques will help us to showcase our responsibility to preserve the most valuable resources of the Pacific,« says María Ximena Zorilla, Manager of Gorgona National Park.

BUILDING BLOCKS Solution components for replication

35

Conservation targets

An expert committee identifies those conservation targets – species, habitats, ecosystems and their services – which hold critical functions in the face of rising pressures. These targets feed into technical assessments and adaptation planning for climate-smart conservation.

Vulnerability assessment

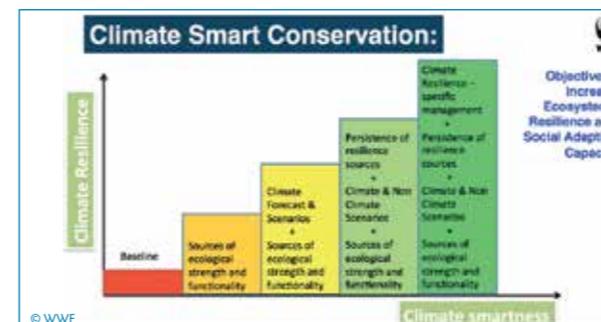
A methodology protocol is defined to rapidly and cost-effectively screen climate vulnerability (risks and resilience) of conservation targets in the MPA, considering local developments and stakeholder knowledge where possible.

Formulation of adaptation actions

Results from the vulnerability analysis are used to identify climate adaptation actions which are easily adaptable to the local conditions and prioritise them by their benefits, opportunities, risks and costs.

Implementation of adaptation actions

Prioritised adaptation actions are implemented with local stakeholders, considering best available information and predictions. Their effectiveness is assessed regularly as part of MPA management.



Successful MPA management combines analysis and adaptation measures to maximise ecosystem resilience and social adaptive capacity

This solution is being implemented by the Colombian National Parks Agency and WWF Colombia as part of the project »Implementing Climate Adaptation Strategies in the World’s Most Outstanding Natural Places,« funded by the EU.



A CONSERVATION MODEL FOR COSTA RICA

36 SOLUTION

Costa Rica aims to become the first developing country to meet the goals set out by the Programme of Work on Protected Areas (PoWPA) under the UN Convention on Biological Diversity (CBD).



Coastal protected area

Despite the great efforts undertaken towards these aims, the country faces enormous challenges in ensuring the sustainability of conservation endeavours. Problems such as the lack of administrative tools, ineffective ecological monitoring, a weak system of control and surveillance and a shortage of sustainable finance continue to exert pressure on protected areas.

To address these issues and ensure the long-term funding of the programme, SINAC, together with several philanthropic foundations, created the public-private conservation initiative, Forever Costa Rica. This non-profit association aims to complement state and private efforts to preserve biodiversity whilst guaranteeing a source of long-term funding.



MPA management team

In coastal areas, Forever Costa Rica assists in the development of properly funded management plans. These provide concrete actions to reduce threats to marine biodiversity, e.g. through improved control and surveillance in Marine Protected Areas (MPAs) or through marine resource regulations. To date, Forever Costa Rica has contributed US \$ 1,600,000 towards the implementation of management plans for fourteen MPAs. It also supports key actors in the conservation of marine resources through the active and effective participation in MPA strategic planning and building of alliances with park managers.

In order to achieve this ambitious objective, the Costa Rican government, through its National System of Conservation Areas (SINAC), has developed a conservation strategy. The conservation goals shall be achieved by creating new marine protected areas, expanding existing terrestrial ones and implementing more effective management and monitoring systems.

BUILDING BLOCKS Solution components for replication

37

Public-private partnership

A cooperation agreement defines the roles and responsibilities of each partner in the public-private partnership and guarantees the enforcement of a timed Implementation and Monitoring Plan to achieve the conservation goals.

Implementation and Monitoring Plan

Besides setting conservation goals, the Implementation and Monitoring Plan also details strategic objectives and activities to be implemented over a set period of time in order to achieve these goals. Furthermore, the plan identifies potential risks and difficulties and provides indicators for monitoring and evaluation.

Trust Fund

A trust fund provides a long-term funding source to finance activities defined in the Implementation and Monitoring Plan. The trust is founded on perpetuity, independence, simplicity, flexibility and transparency. The founding partners serve as trustors, while the country's national protected areas benefit.

This solution is being implemented by the Association Forever Costa Rica and Costa Rica's National System of Conservation Areas (SINAC), with financial support from The Nature Conservancy, Linden Trust for Conservation, Gordon & Betty Moore Foundation and Walton Family Foundation.



BLUE CARBON A–Z: FROM SMALL PROJECTS TO POLICY DEVELOPMENT

38 SOLUTION

Mangroves, seagrasses and salt marshes capture atmospheric CO₂ and store it. This »blue« carbon, found in large quantities in aquatic plants and sediments, is far more effectively stored than in terrestrial forests. The continued loss and degradation of these coastal environments causes the release of carbon back into the atmosphere. Protection and restoration of such coastal ecosystems can provide cost-effective carbon storage relevant for national government policies. These efforts also offer significant benefits to local fisheries and tourism, in addition to other services. However, limited design and implementation guidance is available for blue carbon initiatives that integrate climate mitigation and adaptation actions with improved coastal livelihoods.



© Miguel Cifuentes

Mangrove research helps improve blue carbon project design

Working with national and local institutions, this solution addresses these needs throughout the Americas with a cohesive package of scientific research and political advice. A combination of carbon stock inventories, policy dialogue, capacity building and assessment of livelihoods, land-use dynamics and historical emissions enables project leaders and practitioners to address local development needs and climate commitments alike.



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Carbon assessments of mangrove stands provide valuable data to improve emissions estimates (right) and encourage local involvement and mutual learning (left).

»In the Gulf of Nicoya (see also solution on page 48) we successfully integrated our building blocks: local organisations understand the importance of mangrove resources for climate change mitigation and adaptation and are empowered to conserve them. Our estimate of natural capital loss from mangrove deforestation promoted the discussion of a blue carbon policy elements in Costa Rica,« says Miguel Cifuentes, project coordinator at CATIE’s climate change and watersheds programme.

Showcasing the results in the media has triggered interest in blue carbon elsewhere in Central America. Most countries in the region now recognise the importance of mangrove forests as critical sinks of carbon and explicitly include them in their national forest inventories and climate action plans.

»It is inspiring to see how what started as a small pilot project has fueled dialogues so far beyond its initial scope. It now serves as the basis for much larger scientific and political collaborations across the region.«

BUILDING BLOCKS Solution components for replication

Carbon inventories

Carbon inventories allow for the estimation of historical emissions. Regular assessments produce mangrove area growth and carbon accumulation rates over time and encourage local involvement, ownership and mutual learning.

Vulnerability assessments

A sound vulnerability assessment contributes to a clear understanding of local livelihood dynamics, conflicts, challenges, needs, priorities and perceptions, and their interconnectedness with mangrove ecosystems.

Geospatial and emissions modeling

Geospatial analysis assesses coastal area land use dynamics over time. Emissions are estimated from the conversion of mangrove forests into other land uses. These are modeled to quantify carbon stocks and natural capital losses over time and to identify suitable areas for restoration.

Valuation of ecosystem services

Valuation of mangrove systems informs the design of Payment for Ecosystem Services schemes in blue carbon projects. This provides decision makers with economic terms for mangrove losses.

National policy frameworks

Government consultations are held to share information, map actors and rally support. Design and implementation of blue carbon initiatives are facilitated by robust national policies detailing government backing, institutional roles, and alignment of ideas with other policies.

Blue carbon networks

To scale up blue carbon initiatives and transfer lessons learned, knowledge is disseminated at multiple levels and scales. A growing network of professionals promotes the exchange of experiences, identification of local leaders and ensures common frameworks by linking to global initiatives.

This solution is being implemented by the Tropical Agriculture and Higher Education Center (CATIE) in collaboration with Conservation International (CI).



CERTIFICATION OF ARTISANAL SNAPPER FISHERY

40 SOLUTION

In the nearshore waters of the Costa Rican Pacific coast, fishers from the Coyote and Bejuco communities harvest snapper year-round from small vessels with bottom-longlines and market them domestically. However, the Nicoya Peninsula artisanal snapper fishery is experiencing diminishing returns due to unsustainable and illegal extraction by industrialised shrimp trawlers along with low earnings caused by long chains of custody.



© Andy Bystrom, ARCAE

Spotted rose snapper (*Lutjanus guttatus*)

Villagers have formed artisanal fishing associations. These mandate local regulations and best fishery practices to safeguard coastal community heritage. Pretoma and ARCAE supports these interests by combining a product certification strategy with marine protected area development to create sustainable seafood markets and improve coastal resource governance regimes.

»Since 2008, we have established 35,000 hectares of multiple-use area Marine Protected Areas prohibiting destructive fishing practices but allowing low impact gear types. We also developed a sustainable snapper marketing strategy, implemented Costa Rica's first artisanal fisheries management plan based on environmental sustainability indicators; and increased the project's scope to potentially involve all bottom longline snapper fisheries on the Peninsula,« says Andy Bystrom, ARCAE's co-founder and Executive Director.



© Erick Lopez, PRETOMA

Initial sale of snappers between fishers and Product C, a gourmet seafood restaurant.

»This can boost the fishery's economic development through innovative marketing strategies and better its governance through the use of community based management systems. Already there is growing interest in certified snapper and awareness of its economic potential,« he adds.

BUILDING BLOCKS Solution components for replication

41

Catch composition monitoring
Continuous monitoring of catch composition and collection of fishers' ecological knowledge allows establishing a harvest strategy for snappers and common bycatch species. Successful monitoring is founded on trustful collaboration between observers and fishers.

Fishery management plan
As a local governance tool, the plan details »best practice« fishing methods and measures to maintain a sustainable snapper fishery. It is approved by fishing associations.

International certification
Certifiers evaluate impacts on fish stock and ecosystems alongside the management process. Effective communication and fund-raising efforts by fishers are essential to sustain certification and ensure stakeholders fully understand the process and its benefits.

Multiple-use MPA
Following approval by a fisher-led consultation process, the MPAs' legal frameworks and management plans reflect local resource user interests and protect them against both, industrial and illegal fishing activities.

Alternative markets for certified fish
International certification generates interest in locally-sourced sustainable snapper by tourist resorts, restaurants and upscale fish markets. A chain of custody willing to invest in the certification process will help assure high quality products, attain better prices and increase fishers' earnings.

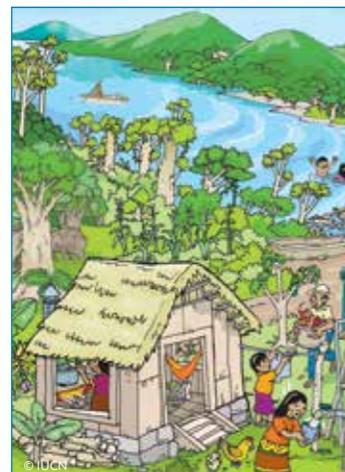
Promotion of fisheries co-management
The certification management plan for certification serves as a tool to promote local governance initiatives by demonstrating fishers' commitment and responsibility to effectively co-manage their resource. It also helps to promote management strategies at the national level.

The solution is being implemented by PRETOMA (Sea Turtle and Shark Restoration Program) and ARCAE, the Costa Rican Environmental and Educational Network.



COASTAL COMMUNITIES COMBAT CLIMATE CHANGE

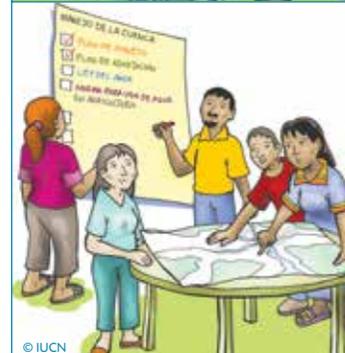
The Gandoca Manzanillo Wildlife Refuge (GMWR) on Costa Rica’s Caribbean coast faces severe environmental threats from climate change and other anthropogenic impacts, such as water pollution and sedimentation from a nearby river flowing into the GMWR. Critical conservation gaps have been identified in its buffer zone, which has both high biodiversity values and high potential for the implementation of ecosystem-based adaptation strategies. If these gaps are not addressed, they can weaken effective management of the entire Refuge.



Ecosystem services are part of an overall strategy in the face of climate change

There are limited human and financial resources to abate these threats, causing environmentalists to call for prioritising actions around »focal management targets«. GMWR is a mixed-use protected area and almost entirely privately owned, implying that the effectiveness of conservation depends heavily on the quality of participation processes. Thus, resources have been channelled towards efforts to better link GMWR buffer zone communities and other stakeholders.

The combination of technical information and decision making, along with boosting social connectivity among local stakeholders, supports the generation of less vulnerable and better prepared communities in the face of climate change.



Interactions among persons and traditions determine the manner in which decisions are taken

»The work around GMWR confirmed that there is an evident relationship between local communities and protected areas. This is most visible when considering the benefits these areas generate, positively affecting local livelihoods and reducing vulnerability to climate change,« says Melissa Marin, Technical Officer at IUCN.

»In coastal zones in particular, the management, rational use and efficient conservation of natural resources is highly dependent on whether or not decision-making mechanisms are inclusive, orderly and able to address the social realities of local communities. What communities have to say and how they link up with one another can make a real difference.«

Focal management targets
Conservation actions in buffer zones are identified and prioritised using both biological data and social perceptions. This process serves as a guide for resource designation while simultaneously integrating local concerns into buffer zone management.

Social indicators
Local and global indicators, derived from the social role of each actor, are developed. These help identify strengths, weaknesses and gaps in the communication and coordination of local networks, both formal and informal.

Communication and coordination networks
Robust and responsive participation strategies consider the quantitative and qualitative analyses of existing communication and coordination networks and propose the means to strengthen and consolidate these relations. This builds social connectivity and thus resiliency.

This solution is being implemented by the International Union for Conservation of Nature (IUCN), the National System of Conservation Areas (SINAC) and the Conservation Area La Amistad-Caribe (ACLAC) in collaboration with Costa Rica’s Marine Protected Areas Consolidation Programme (UNDP and SINAC).



COMMUNITIES LEADING SUSTAINABLE FISHERIES MANAGEMENT

44 SOLUTION

The coastal and small scale fishing population in Costa Rica is closely tied, culturally and economically, to life on the seashore. Rural communities such as Tárcoles, located at the mouth of the Gulf of Nicoya, are strongly dependent on artisanal fisheries for their livelihood.



Small scale fishing in Tárcoles

Yet, over the past several years, rapidly growing real estate development blocked the access of local people to coastal and marine resources. Local fishermen have witnessed declining fish stocks due to pollution, illegal fishing and overfishing. Degraded habitats have reduced important food and revenue sources, increasing local poverty.

Coope Tárcoles, an artisanal fishermen’s cooperative dedicated to sustainable fisheries management, encouraged the community to use local marine resources in a sustainable manner, thus guaranteeing their economic future and cultural way of life.

Members of Coope Tárcoles requested the government to institutionalise a local marine governance conservation scheme, the community-based Responsible Marine Fishing Area of Tárcoles. The community developed zoning regulations and guidelines based on traditional knowledge and the FAO Code of Conduct for Responsible Fisheries. The involvement of local fishers in the development and implementation of sustainable use strategies helps to facilitate natural resource management and ensures better rule compliance.



Women are preparing the fishing lines



Establishment of the responsible fishing area has increased the production of shrimp and lobster

Coope Tárcoles, together with Coope SoLiDar – a Costa Rican group committed to conserving marine resources and improving local livelihoods using a human-rights based approach – launched a sustainable ecotourism venture called Consortium Por La Mar in order to create additional sources of income for fishers and their families. This initiative promotes cultural tourism opportunities such as guided experiential tours. These excursions allow visitors a glimpse into the daily lives of small scale fishers, their fishing methods, daily tasks and the area’s natural resources that are utilised in their work.

BUILDING BLOCKS Solution components for replication

Community-managed marine area

The local fishing cooperative creates a community-managed fishing area. The designation helps to conserve both the marine biodiversity and the cultural identity of the local community.

Legal recognition

Regulations for a Community-based Marine Area for Responsible Artisanal Fishing were established. This form of community governance in marine areas is recognised by Costa Rican law and can be applied in other coastal communities.

Participatory local governance

The local community develops a Fisheries Management Plan based on their traditional knowledge. A commission, composed of members of the fishing cooperative and governmental authorities, is responsible for the further management of the area.

Fishery database

Each fisher records their daily fish catches, methods and site locations and feeds the information into a database. This information aids in monitoring the abundance and diversity of key species and serves as an important management tool.

Responsible fishing Code of Conduct

The fishers adopt voluntary standards for responsible fishing based on FAO recommendations. The Code of Conduct for Responsible Fisheries helps to ensure the conservation and sustainable use of coastal and marine resources.

Sustainable ecotourism

Cultural tourism provides an additional source of income for the local community. Guided tours promote community traditions, art of fishing and wealth of natural resources.

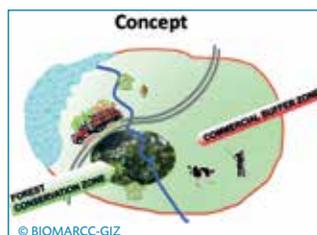
This solution is being implemented by the Cooperativa de Pescadores de Tárcoles (Coope Tarcoles), the Consorcio Por La Mar and the Cooperativa Autogestionaria de Servicios Profesionales para la Solidaridad Social (Coope SoLiDar).



FINANCIAL MECHANISM FOR COASTAL FOREST RESTORATION

46 SOLUTION

Intensive resource use in and around mangrove ecosystems is increasingly leading to their degradation. Adjacent communities, highly dependent on these ecosystems' continued productivity, have limited alternatives for development and lack adequate incentive or compensation to shift to alternative and environmentally sound production.



Zoning of landscapes aids in the implementation of the GCS



Mangroves in the project's buffer zone

Guided by the GIZ Biodiversidad Marino Costera y Adaptación al Cambio Climático (BIOMARCC) project, the Costa Rican Pacific coast non-profit FUNDECODES has established an innovative financial mechanism for forest and mangrove conservation in the Tempisque Conservation Area. The Global Conservation Standard (GCS) is targeted to install a private sector financed system of payments for ecosystem services. Companies buy conservation credits which enable sustainable rural development activities including tourism, farming and the rehabilitation of degraded ecosystems.

The intervention area, approximately 5,000 square kilometres, includes 2,000 square kilometres of private forest and state protected land. This acreage is directly managed and can generate 51 million conservation credit units annually. It is surrounded by a commercial buffer zone where local sustainable production activities for the rehabilitation of mangroves and their services are promoted.

For the next thirty years, the mechanism will empower landowners and rural communities to co-benefit from their conservation efforts through the cooperative management of public and private areas alike. Up to 100 hectares of mangrove and coastal forests are now in the process of rehabilitation.

Doña Francisca is a mollusc gatherer who lives next to the mangroves in the Global Conservation Standard (GCS) project's buffer zone. Like her fellow gatherers, she has been harvesting fewer and smaller molluscs every year, because the mangroves that house them are increasingly degraded. She hopes that the GCS will improve her situation: *»If we replant the forest, take care of mangrove nurseries and re-establish the natural water flow, our mollusc populations may recover.«*

An organic certified German shrimp producer recently invested US\$ 50,000, buying Conservation Credits to restore 10 hectares of mangroves. As a commercial buffer zone, the mangrove area will receive funding for rehabilitation with local support. Doña Francisca and her peers may thus profit from the programme through viable livelihood alternatives, including mollusc gathering, and a more sustainable income in the long term.

BUILDING BLOCKS Solution components for replication

47

Identification of the appropriate standard

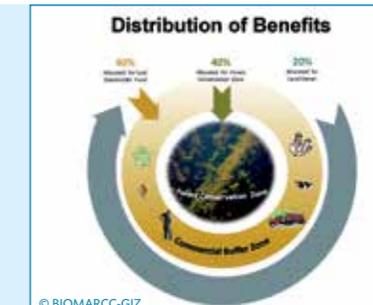
International finance standards are reviewed and their potential carefully evaluated. The Global Conservation Standard (GCS) considers ecosystem services in public and private areas for carbon offsetting and marketing. Acquired conservation credit units (CCU) generate funds for conservation in protected zones and promote sustainable production in the commercial buffer zone.

Feasibility study and benefit validation

Area delimitations, landscape and management plans outlining conservation potential and interventions are defined through participatory planning to calculate credit generation for marketing and international registration.

Conservation credit unit (CCU) marketing

The fund administrator and national or international brokers promote CCUs to investors, who buy them for at least ten years. CCU returns are then distributed accordingly: 40 per cent for planned conservation activities in the core area; 40 per cent for selected sustainable production activities in the commercial buffer zone; and 20 per cent for discretionary use by owners of the credit-generating land.



Distribution of benefits from the conservation credit units in the GCS mechanism

This solution is being implemented by FUNDECODES Costa Rica in collaboration with the Costa Rican Ministry of Environment and Energy (MINAE), National System of Conservation Areas (SINAC) and GIZ's project Biodiversidad Marino Costera y Adaptación al Cambio Climático (BIOMARCC), on behalf of the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).



MANGROVE RESTORATION FOR SECURE LIVELIHOODS AND CARBON STORAGE

48 SOLUTION

Mangroves in the Gulf of Nicoya, Costa Rica's most productive estuary, have been declining since the 1950s due to excessive firewood harvest and conversion into shrimp ponds and salt pans.

Coastal livelihoods rely heavily on fisheries that are directly linked to the health of mangroves. In addition, as they store up to five times more carbon than terrestrial forests, mangroves are of increasing national and international economic importance.



Community members move mangrove seedlings into a degraded forest

Conservation International is empowering local communities on the Gulf island of Chira to lead a science-based mangrove restoration project. It addresses both the root causes of mangrove degradation and resulting threats to local communities.

The project's scientific assessments (see also solution on page 38) proved instrumental for national policy making—all putting the project at the forefront of innovative blue carbon action. To date, villagers have successfully nursed and replanted +8,000 mangroves, with a successful ninety per cent survival rate. Locals received micro-entrepreneurship training in sustainable mangrove use and livelihood diversification, while area schools provided an education programme to 260 students.

»Twenty-three female volunteers from Chira started our pilot project on mangrove reforestation. For five months they tirelessly cleaned the mangrove area of rubbish, planted seeds in bags and watered them twice a day—while still taking care of their family duties« says Marco Quesada Alpízar, Director of Conservation International Costa Rica.

On an island with few employment opportunities and traditional gender roles, the women recognised the project's potential to attract external attention and hoped it would eventually provide an alternative source of income. Throughout, the women had to overcome opposition by their husbands and community but held onto their vision of bringing home alternative income from tourism and tree nursing.

»We had always known our mangroves were very important,« says Aparicia, their strong and charismatic leader. In just one year, they planted more than 8,000 plants with a survival rate over ninety per cent.

The women's efforts have attracted tourists and government agencies alike. Visitors come to witness their work, understand the community's dependency on mangrove services and learn about the huge carbon sink mangroves represent. Their project even inspired neighbouring communities to start own replantation projects.

BUILDING BLOCKS Solution components for replication

49

Science-based design

Research methods and field activities are based on the latest science and locally adapted with help of resident scientists. Reforestation areas and specimens are identified using national and international expertise. Carbon estimates by local scientists follow international standards, which facilitates uptake by policy makers.

Active stakeholders across levels

Local stakeholders are engaged and empowered throughout the project with high investments of time and relationship-building, resulting in strong commitment, responsibility and knowledge sharing.

Informing policy processes

At the national level, decision makers are informed by blue carbon assessments. They are empowered to develop broader climate change mitigation strategies that target multiple ecosystem services.



Students form a human chain to transport mangrove plants across a dry salt pond

This solution is being implemented by Conservation International Costa Rica.



MULTI-SECTORAL COASTAL AND MARINE MANAGEMENT VISION

50 SOLUTION

On the Pacific coast of Costa Rica, on the Nicoya Peninsula, a consultative multi-stakeholder process built a shared vision for sustainable management of coastal and marine resources. Scientific assessments identified important yet vulnerable sites for conservation. At the same time, multi-sectorial stakeholder dialogues addressed local marine spatial planning. The stakeholders discussed area delimitation, zonation and governance using mediation, collaborative facilitation and alternative dispute resolution. They negotiated a consensus governance model and formulated management rules for future marine protected areas.

Although multi-stakeholder processes can be time demanding and costly, they have proven vital to promote good governance of marine resources in Costa Rica. The dialogues increase clarity, transparency and social cohesion across sectors.



Regulated resource use in the managed area

A legally-binding resolution legitimises the process by promoting local empowerment, and confidence and credibility of communities and authorities. In addition, participants strengthen their negotiating, organising and leadership capabilities. Consequently, the resulting agreements enable further cooperation for negotiation regarding and governance of marine resources.

Every day, fisherfolk from Cabuya on the Nicoya Peninsula have been returning home with progressively smaller catches. Compressor divers and shrimp trawlers in nearby fishing areas have increased pressure on local fish stocks. Fishers, wishing to avoid the hardships caused by scarcity, are eager to create rules that protect their marine resources. Many see the dialogue platform as an opportunity:

»We want to be part of that process, not have someone from outside come and tell us what to do. It has been difficult for everyone involved to understand what we want with the process, but we managed to reach an agreement that benefits all our communities. Now we need more government support from different institutions so our proposal becomes a reality,« says Dianney Chacón, a fisherwoman representing the community of Cabuya.

BUILDING BLOCKS Solution components for replication

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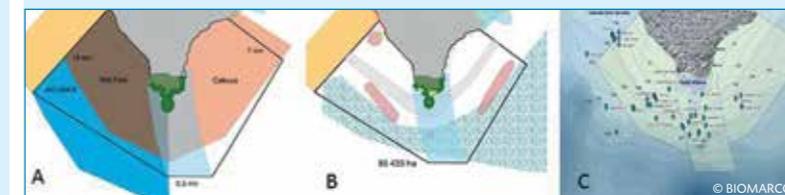
National protected areas coverage analysis
Priority conservation sites are appraised at three levels: a comparative gap analysis (representativeness, biological integrity) of the national MPA system; a regional evaluation of marine ecoregions; and conservation assessments at site level.

Vulnerability and climate risk assessment
Vulnerabilities are identified by examining exposure, potential impacts and community adaptive capacity to climatic threats. These vulnerabilities are used to prioritize adaptation actions for protected areas and local communities.

Multi-sectorial dialogue platform
To build the dialogue platform, stakeholders from multiple sectors are mapped and their representatives accredited. Actors discuss area delimitation, zonation and governance using mediation, collaborative facilitation and alternative dispute resolution.

Legally established participatory process
A legally binding resolution launches the participatory process. A cross-sector dialogue panel assesses MPA implementation at sites of conservation importance and a technical committee is formed to legitimize and institutionalize the process.

Governance model
Written agreements from the dialogues form the basis for implementation plans, rules and enforcement mechanisms of the MPA, while documenting stakeholder understandings of area delimitation, zoning and management categories. They set the stage for future cooperation.



Maps of resource use and conservation interests along Nicoya Peninsula: A) National System of Conservation Areas (SINAC) B) Área de Conservación Tempisque (ACT) C) fish distributions in the project area

This solution is being implemented by five communities on the Nicoya Peninsula, Costa Rica, in collaboration with the Costa Rican Ministry of Environment and Energy (MINAE), National System of Conservation Areas (SINAC) and GIZ's project Biodiversidad Marino Costera y Adaptación al Cambio Climático (BIOMARCC), on behalf of the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).



HAWKSBILL TURTLE RECOVERY

The Eastern Pacific Hawksbill Initiative (ICAPO) promotes the recovery of hawksbill turtles in the eastern Pacific Ocean. The International Union for the Conservation of Nature globally recognises hawksbill turtles as critically endangered with the eastern Pacific population as one of the most at risk. ICAPO’s mission is to protect and recover hawksbills through



Hawksbill turtle hatchlings

collaborations with coastal community members, scientists and policy makers throughout the region, including countries such as Mexico, El Salvador, Nicaragua, Costa Rica, Panama, Colombia, Ecuador and Peru.

With several programmes including education, research, policy advice, monitoring and the development of alternative livelihoods, ICAPO addresses sea turtle conservation in a holistic manner. The findings of ICAPO’s research have been ground-breaking and are being integrated into national and international hawksbill conservation management efforts.

There are only an estimated 500 nesting female hawksbills along the entire Pacific coast of the Americas. ICAPO works directly with traditional egg poachers to find, collect and protect hawksbill eggs at several sites in El Salvador and Nicaragua. The organisation works to protect the species while supporting poverty stricken local communities through an innovative egg incentive collection programme. This programme pays local residents to monitor the



David Melero with a young hawksbill

beaches at several sites in El Salvador and Nicaragua. Once a resident finds a turtle nest, they carefully bring the eggs to hatcheries where they are re-buried and monitored until turtles emerge. Participants are paid for every egg brought to the centre and again for those that hatch. This incentive encourages residents to take special care of the eggs while transporting them. The egg collection programme has allowed coastal residents to earn income for protecting the eggs – as opposed to selling them on the black market. It is a key source of income in areas with high unemployment and low wages.

»Our egg incentive approach contrasts that of most turtle conservation programmes which have historically attempted to push out local poachers, leaving them embittered and with limited options to generate incomes,« says David Melero, ICAPO Alternative Livelihoods Programme Director. »Our innovative, inclusive approach is largely responsible for our unprecedented conservation successes, which include a reduction in egg poaching from 100 percent to almost zero!«

Nesting beach conservation

Employing locals to collect data on nesting female turtles, hatchlings and nesting performance improves residents’ understanding of hawksbill biology and maximises recruitment success. Direct payments for hawksbill egg protection create socio-economic benefits.

Reduction of fisheries bycatch

Working with local fishermen through onboard fisheries observations and data collection of both turtle and non-turtle bycatch leads to knowledge of fishery dynamics and trends to seek alternative, sustainable fishing gear.

Restoration of marine turtle habitats

Direct collaborative work with government institutions, non-profit organisations, and community members improves management and performance of protected areas, enhances and restores habitats, provides greater benefits to marine turtles and advances the natural habitats on which those turtles depend.

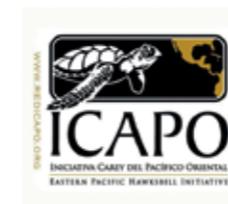
In-water monitoring

Consistent use of tangle-nets, visual surveys and hand captures provide valuable insights to hawksbill turtle biology. These methods also enable greater knowledge of hawksbill turtle life cycle, migration patterns, growth rates, dietary requirements and provide information about the connectivity between nesting and foraging areas.



Hand capture of a hawksbill turtle

This solution is being implemented by The Eastern Pacific Hawksbill Initiative (ICAPO), fiscally sponsored by The Ocean Foundation.



CONCESSIONS FOR MANGROVE CONSERVATION

54 SOLUTION

In Ecuador, mangroves traditionally supplied coastal communities with a variety of goods: fish, molluscs and crustaceans for protein and wood for construction and fuel.

Decades of extensive shrimp farming and weak enforcement of policies, however, have critically depleted mangrove ecosystems, negatively impacting the livelihoods of thousands of subsistence users.



© Daniela Hill Piedra
The crab fishers in the Gulf of Guayaquil consider themselves «guardians of the mangrove»

Recognizing the problems associated with mangrove degradation, the Ministry of Environment (MoE) implemented sustainable use agreements as an innovative coastal management policy. The rights of «ancestral» artisanal fishers are recognised by providing associations of mangrove users with a concession for a 10-year mangrove stewardship.

This government-granted common property arrangement promotes the conservation and restoration of degraded mangrove areas, sustainable use of marine resources, and empowers local communities to guard their mangroves against further destruction.

»I do not only consider myself a crab fisherman, but proudly claim to be the «guardian of the mangrove»,« says Ricardo Carpio, president of the association »21 de Mayo Puerto Roma«. »Like many other crab fishermen of Ecuador, I used to catch crabs with traps. After five years of implementing the activities that are required to obtain a concession, including no longer using traps or chemicals, I see that the state of the resource has improved. We only



© Daniela Hill Piedra
»21 de Mayo Puerto Roma« was issued an incentive for preserving the mangroves

catch males and respect minimum catch sizes in order to allow the crabs to grow and reproduce. I realise the positive changes that the concession has brought to my community. We have benefitted from participating in other government projects, such as a programme for the installation of solar panels on private houses. We gained a monetary incentive of more than \$37,000 issued by the Ministry of Environment for assisting in the control and surveillance of around 2,500 hectares of mangroves. All members of our association jointly take care of the concession, and I am very strict when applying penalties or implementing new standards. Once I even fined my own father for catching crabs in a closed area. In addition, our association cooperates with other communities, guiding them through the process of obtaining a concession and supporting them during the implementation phase.«

BUILDING BLOCKS Solution components for replication

Resource use associations

To obtain a concession, «ancestral users» are required to organise into an association. The association then applies to the government for the special status by submitting names of association officers; a member list; an association agreement; maps of the area; and a management plan detailing the sustainable use of mangrove resources.

Mangrove management plan

Based on official fishing and environmental regulations such as periodic closures, bans and minimum sizes, the management plan contains a detailed programme for resource use, control and surveillance and monitoring and evaluation. Every illegal activity is reported to the overseeing government body.

Capacity building

Government agencies conduct training sessions and disseminate knowledge about the mangrove ecosystem, its resources, economic interests and conservation needs, and build capacity for monitoring and recording of the biodiversity and catch data.

Mangrove reforestation

Shrimp farmers are obligated to develop and implement a mangrove reforestation plan within their production area; they pay community members, often women, to garden the mangroves, including re-planting.

Community-based ecotourism

Mangrove custodial association members are trained as guides for ecotourism activities as a possible alternative source of income. Visitors learn about locals' regular activities such as fishing, catching crabs or collecting molluscs. They are then given the experience of preparing and consuming the mangrove's bounty.

This solution is being implemented by the Under-Secretariat for Marine and Coastal Management of the Ministry of Environment in Ecuador.



SUSTAINABLE FISHERIES IN THE GALERA-SAN FRANCISCO MARINE RESERVE

56 SOLUTION

The Galera-San Francisco Marine Reserve features an outstanding variety of wildlife and is one of the most important zones for biodiversity conservation in coastal Ecuador. Local residents are heavily dependent on natural resources for their subsistence, with artisanal fishing as a core activity. The spiny lobster (*Panulirus gracilis*) is traditionally harvested in this area. However, the use of non-selective fishing gear, resource overexploitation and lack of enforcement of marine regulations have severely depleted this resource.



Fishermen from Arte Langosta in Cabo San Francisco

In cooperation with the fishing association Arte Langosta, the Nazca Institute for Marine Research and Conservation International created a participatory management system which promotes the protection of biodiversity and sustainable local development. In this system, stakeholders and authorities join together to develop a governance model with specific, effective management actions and fair economic alternatives.

Arte Langosta is a Cabo San Francisco community partnership supporting low-impact lobster fishing. In February 2012, a group of fishermen who were not involved in this conservation agreement started harvesting the recovered lobster populations without respecting minimum sizes or area closures. Armed with machetes, sticks, and stones, Arte Langosta members tried to defend the resource they had so carefully managed for more than two years. Despite their efforts to stop the exploitation, they could not prevent the lobster stock from collapsing again.



Community members monitor lobster sizes in the Galera-San Francisco Marine Reserve

»After that conflict, we feared for our personal safety and had to stop the project and leave the area for a while,« said María Cecilia Terán. »However, we were surprised to see that the fishermen who participated in our programme did not return to fish lobster in the meantime.«

In retrospect, the conflict was a good learning opportunity. More area fishermen became engaged in responsible fishing activities, sharing their experiences and knowledge to inspire others. This led to increased interest in joining the initiative. Today, even the fishermen who once caused the armed dispute realise that the sustainable use of marine resources is key to guaranteeing long term socio-economic benefits.

BUILDING BLOCKS Solution components for replication

Participatory fisheries monitoring

A community-based catch-monitoring programme is designed to document the quantities of fish and lobster harvested in the area. This type of data creates (and constantly updates) a reference point, meeting the information requirements of decision-makers and managers of the marine reserve.

Low impact fishing activities

A conservation agreement promotes the application of fisheries and zoning regulations in the marine reserve as well as the implementation of guidelines based on the FAO Code of Conduct for Responsible Fisheries.

Economic incentives

Fishermen who desire to engage in activities with low environmental impact are provided non-destructive, selective gear which reduces the catch of non-target species or undersized fish. Training on product handling and eco labelling schemes help fishermen to assure high quality products, access to markets for sustainably harvested resources and thus better prices for their products.



The use of selective fishing gear helps to conserve the population structure of the spiny lobster.

This solution is being implemented by the Nazca Institute for Marine Research and Conservation International (CI) in collaboration with the Association of Fishermen of Cabo San Francisco »Arte Langosta«.



AT THE WATER'S EDGE: ENHANCING COASTAL RESILIENCE IN GRENADA

58 SOLUTION

Grenada is heavily dependent on limited natural resources to support three of their primary sectors: tourism, agriculture and fishing. Like other small island nations in the Eastern Caribbean and beyond, Grenada is on the front lines of climate change. It is already experiencing hotter temperatures, more frequent and intense storms, flooding, rising sea levels and degraded coral reefs, which in turn threaten lives, property, food, fresh water, livelihoods and overall economic stability.



Erosion on Telescope Beach, Grenada

Faced with these urgent matters, decision makers must make choices that will save lives today and improve livelihoods into the future.

This solution addresses the problem of climate change impacts such as increased coastal erosion threatening coastal communities. The project builds social and ecological resilience with strong community engagement. Implemented solutions include the installation of artificial reef structures to attenuate wave energy, restoration of coastal vegetation and community resilience planning.

»When I was a child I remember going to Grenville and picnicking with my family on the wide sandy beach in the area known locally as Telescope. For generations Telescope Beach was loved as a place for families to bathe, catch some fish and play impromptu games of crickett,« says Nealla Frederick, Project Manager at TNC.

»When I returned to Grenada in 2013, my first visit back to Grenville shocked me. As I walked along the shore in Telescope nothing looked the same. The beach and all coastal vegetation had been lost to the sea.



Building the artificial reef one rock at a time

In January 2015, divers installed reef enhancement structures, designed to break wave energy and provide new habitat. I asked one of them about his feelings about the project. His response made all my months of hard work and frustrations worthwhile; for the first time in many years he had hope for the future of his community. He could see that the structures were already breaking waves as designed and that he was satisfied that

the project was guided by local knowledge and used local labour. He had already seen fish, octopus and lobster moving onto the structure, and said that his community was embracing the project as their own and were now committed to become better stewards of their environment, knowing that by caring for nature, nature would care for them.«

BUILDING BLOCKS Solution components for replication

59

Integrated vulnerability assessment (VA)

A spatially explicit VA includes indicators to capture social, ecological and economic vulnerabilities. Layering the different vulnerabilities highlights critical areas where adaptation and disaster risk reduction interventions are most needed, and where nature-based solutions could be utilised most effectively.

Informed decision making

Access to the best available data is key for informed decision making. To connect agency departments with other local, regional and international organisations, a holistic database is developed. It makes non-confidential data available and helps decision makers access integrated spatial information on ecological, social and economic systems.

Climate change impact visualisation

Participatory 3D Modelling (P3DM) integrates the knowledge and perspectives of community members. It helps communities to understand their vulnerabilities and potential climate change impacts, while considering future scenarios and solutions.



Participatory 3D Modelling helps visualise vulnerabilities

Reef enhancement

Reef enhancement structures, designed to reduce current flows, break wave energy and ultimately reduce coastal erosion and flooding while improving habitat for fish and coral species, are installed. These structures are designed to be easily fabricated and installed with local labour and supplies.

This solution is being implemented by The Nature Conservancy (TNC) in collaboration with Grenada Fund for Conservation and the Grenada Red Cross Society.



TRANSBOUNDARY MARINE SPATIAL PLANNING



The islands of Petit Bateau and Petite Rameau of the Grenada Bank

adapted for the marine realm. This unique information system integrates a variety of social, economic and environmental information (drawn from both scientific and local knowledge) to provide a more complete information base for coastal marine planning and management.



A multi-use zoning design for the Grenadine Islands

Marine resources for fishing, shipping and marine-based tourism, are very important to the people of the Grenadine Islands. A greater understanding of oceanic ecosystems, including the quantity of resources, number of users and patterns of space-use, is critical to planning for their sustainable development and conservation.

The Grenada Bank (which includes both Grenada and St. Vincent and the Grenadines) is the site of the Marine Resource Space-use Information System (MarSIS), a Participatory Geographical Information System (PGIS)

A high level of stakeholder engagement provides useful information and creates a strong sense of ownership in the information produced, increases understanding within and between stakeholder groups and validates the critical role of stakeholder participation in research and governance.

MarSIS, alongside the development of a transboundary marine multi-use zoning plan, strengthened conservation efforts and sustainable livelihood initiatives in the two countries. In addition it enabled the application of the Grenadine Islands for designation as a transboundary UNESCO marine mixed (cultural/ecological) World Heritage Site (WHS). Achieving a WHS designation would provide the two countries international status, inspire ecotourism and provide further legitimacy for endeavours to protect the environment and culture of the Grenadine Islands.

Communication for stakeholder engagement

To allow for transparent, inclusive and equitable cross-scale interactions, stakeholders are engaged through one and two-way communication mechanisms and a dedicated internet e-group.

Participatory GIS applications (PGIS)

The application of a PGIS approach provides a framework for data management and integration of information in order to conduct ecosystem-level GIS spatial analyses. Resulting spatial maps increase stakeholder understanding and thus support marine governance.

Collaborative data gathering

Data and information are compiled in field surveys and through a marine habitat classification scheme. The collaborative approach builds stakeholder capacity and improves the credibility of local knowledge. All data, maps and information are accessible via a public website, supporting transparency and inclusiveness and strengthening the ownership of information by stakeholders.



Stakeholders gathering information on the use of marine ecosystems

Multi-use zoning design

A guided marine spatial planning exercise leads to the development of a multi-use zoning design for the area. This increases the capacity to protect, manage and sustainably use the marine resources. Potential mismatches between the area's existing jurisdictional (legal-institutional) and geographical (social-ecological) scales requires consideration.

This solution was implemented by the Centre for Resource Management and Environmental Studies (CERMES) of the University of the West Indies (UWI) in collaboration with Sustainable Grenadines Inc.



CONNECTING A COASTAL RESERVE WITH ITS SURROUNDINGS

62 SOLUTION

The Monterrico Multiple Use Natural Reserve, located on the Pacific coast of Guatemala, comprises about 2,800 hectares of estuarine and coastal-marine ecosystems. It is one of the last remaining coastal and marine protected areas in the country.



Frequent and severe flooding is a major issue for the inhabitants of Monterrico Reserve

The reserve is highly affected by three main watersheds. Although floods have always been common inside Monterrico Reserve, their frequency and adverse effect on important habitats, agricultural lands and infrastructure have increased during recent years. Often these floods are fueled by activities outside the reserve, including changes in drainage patterns, deforestation of riparian forests and water canalization works. Inhabitants of the reserve therefore asked the Center for Conservation Studies (CECON) of the University of San Carlos, which manages Monterrico Reserve, for new approaches to solve these problems.

In order for relevant stakeholders to understand the causes behind the flooding, CECON organised a series of field trips along the watersheds. It became evident that the current scale of actions taking place inside the Reserve was not enough to address flood issues in the area. Therefore, the existing management scheme was revised towards a more integrated approach, taking into account the ecological, social and economic links between the reserve and its surrounding landscape. During the revision process, new and more stakeholder groups were engaged. The management scope was broadened and a Conceptual Ecological Model was developed to set a new scale for action by linking ecosystems, species and conservation values. Proposed actions include *inter alia* the implementation of an integral watershed monitoring system and the implementation of an early warning system.

The example of Monterrico Reserve is now used as a case study in a training course for Guatemalan municipal planning officers. The course aims to strengthen the territorial planning of coastal and marine areas on the Pacific coast.

BUILDING BLOCKS Solution components for replication

Conceptual Ecological Model (CEM)

The Conceptual Ecological Model (CEM) is a non-quantitative planning tool. It utilises a participatory approach to understanding and communicating the interactions between the reserve and its surroundings, specifically those spatial and temporal processes that link ecosystems, species and conservation values.



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Permanent stakeholder engagement

During the initial phase of the planning process, a permanent stakeholder engagement process is established which includes representatives from inside and outside the reserve. Meetings, workshops and field trips are held to discuss the ecological, social and economic interlinkages to be addressed by the management scheme.



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New management actions

Ecological, social and economic data from the reserve and its surroundings are gathered, updated and further analysed to propose new management actions and strategies to be included in the updated master plan. The master plan is backed up by law and includes elements from Integrated Water and Coastal-Marine Management and Disaster Risk Reduction Management.

63

Monterrico Reserve at the Pacific coast of Guatemala includes estuarine and coastal ecosystems

Stakeholders are engaged in the process of updating the Monterrico Reserve master plan

This solution is being implemented by the Center for Conservation Studies (CECON) and the School of Biology of the University of San Carlos, Guatemala.



INTEGRATED APPROACH FOR TURTLE CONSERVATION

64 SOLUTION

In 1993, ARCAS Wildlife Rescue and Conservation Association initiated conservation activities in Hawaii Park, a protected area of 3,400 hectares on the south coast of Guatemala. Primarily an attempt to counteract threats to Leatherback and Olive Ridley turtle populations, these efforts aim to stop over-harvesting of eggs by local collectors. Despite their endangered status, virtually all sea turtle nests in Guatemala were poached and their eggs sold as an alleged aphrodisiac.



Volunteers taking care of the turtle hatchery in Hawaii Park

Nests are monitored and the freshly laid eggs collected and transferred to a hatchery in Hawaii Park to protect them from poachers. ARCAS manages the hatchery with the support of mostly international volunteers who participate in beach patrols, facility maintenance and data collection. To reach conservation goals, the hatchery follows a strict, research-based protocol on the fulfilment of physical parameters and best practices in hatchling release. Turtle reproduction, population status and migration patterns have been continuously monitored since 1997. This long-term data is incredibly valuable for turtle conservation.

Environmental education activities in schools inform the local children of the importance of nature protection, while incentives and alternative livelihood options help to ensure long-term sustainable community development.

» To achieve true success with a conservation programme, we need the support of the local communities and children,« says Lucía García, director of ARCAS' Hawaii project.



Children visit Tikal National Park in Peten, during the Rally Parlama

» Implementing a community development strategy is therefore always the first phase of the project in order to attain the most sustainable, long-term efforts. In 2013 and 2014 one of the most effective and popular educational programmes carried out in the Hawaii and El Rosario hatcheries was the Rally Parlama, named after the targeted species (»Parlama« is the local name for Olive Ridley turtles). This programme encouraged local children to donate Parlama eggs to an ARCAS hatchery. In exchange for eight dozen eggs, we rewarded the children with a four day, all-inclusive cross-country tour to visit other national parks and protected areas. As most residents of the Hawaii region live below the poverty line, many of them have never left their home area. The trip was an incredible opportunity for these children to visit some of Guatemala's most beautiful, natural and iconic sites. The Rally Parlama programme helped to create a lasting impression, boosted the children's sensitivity for the importance of nature conservation and created stronger support for ARCAS' conservation efforts within the local communities.«

BUILDING BLOCKS Solution components for replication

Volunteer engagement

Volunteers from all over the world help to implement the conservation activities, including protection of detected turtle nests, hatchery maintenance, environmental education support, data collection and rehabilitation of injured turtles.

Data-based decision making

Turtle hatchery data, population data (daily GPS crawl counts) and data on strandings are collected, following strict protocols. This information is used to estimate the abundance of turtle populations and their condition and help to create appropriate conservation strategies.

Incentives to share local knowledge

Local people share their traditional knowledge on preferred nesting sites, helping to spot and protect the nests. They are economically compensated for leaving the nests untouched.

Environmental education

A variety of educational activities such as beach clean-ups, hatchling releases, environmental fairs, field trips and presentations in local schools inform the children of the importance of nature protection.

Eggs-for-food exchange

To promote economic alternatives in rural communities and to minimise the unsustainable consumption of natural resources, food supplements from the government and other donors are exchanged for turtle eggs. This improves local food security and nutrition and increases the participation of women and children in turtle conservation.

Sponsor a Nest – Ecotourism

Tourists sponsor a turtle nest through donations. These funds are used to buy food which is then exchanged for turtle eggs. Many sponsors come to the park with family or friends to release hatchlings on the beach together with local guides.

This solution is being implemented by ARCAS Wildlife Rescue and Conservation Association in Guatemala.



GET MUDDY! MANGROVE RESTORATION IN GUANAJA

In October 1998, Hurricane Mitch made its first point of landfall at Guanaja Island, Honduras. Mitch, in a movement pattern very unusual for hurricanes, remained over Guanaja for three and a half days. Local people survived by hiding in the hills and crowding into the few structures that remained standing. An estimated 95 per cent of the once abundant mangroves were destroyed. Due to geographic isolation from other mangrove areas, natural recovery was very slow or even impossible. In 2008, The Bay Islands Conservation Association Guanaja (BICA-Guanaja) started its multi-year restoration project with the goal of planting 400,000 red, black and white mangroves to restore a self-sustaining healthy forest on Guanaja Island.



© BICA-Guanaja
Scott Duncan and 'Baldhead' with mangrove seedlings

»I was sitting on the dock one day in Mangrove Bight looking across the water at the dead mangroves on the far shore,« says Scott Duncan, Director of the Guanaja Mangrove Restoration Project. »A local fisherman and community leader, Ray Powery, known as 'Baldhead', sat down next to me and told a story about how they used to be: The largest trees in the region, abundant with birds and wildlife and full of mangrove snappers and snook living amongst their roots. Young sea turtles used to find shelter; the canopy shaded the bird's nests and provided cover for endangered iguana. He and his family had just gone out and started planting red mangrove seeds one day. Collecting them in an isolated canal where a few trees remained and then trudging through the mud to plant them by the thousands. Right after spending months planting many tens of thousands of seeds, hurricane Wilma brushed by Guanaja with enough force to kill the seeds he had planted which were just sprouting their first leaves.

Hearing Baldhead's story I felt a great inspiration to help out. Together with a volunteer biology student, Toby Jacobs, I returned to Guanaja and began helping Baldhead plant Red Mangrove seeds. We had no funding and no real plan; we just got out there in the knee deep mud and got to work. That was in 2008. Toby and I founded the Guanaja Mangrove Reforestation Project, which is now part of The Bay Islands Conservation Association (BICA Guanaja). In 2011, we established three mangrove nurseries growing white, black and red mangroves, to rear the seedlings up to a specific size, increasing the restoration success. Since then, we have planted more than 200,000 mangroves, assisting the recovery of 100 hectares.«

On-the-ground mangrove planting
On-the-ground hand planting of seedlings from nurseries effectively helps restore the ecological balance when mangroves cannot recover naturally. Considering the right timing, season and location in which the mangroves are planted is crucial for restoration success.

Monitoring restoration success
Mangroves flourish in some micro environments more than others. Monitoring provides insight on species requirements regarding tidal range, water depth, soil, salinity and planting techniques.

Environmental education
The project reaches out to students and local communities in order to teach the importance of mangroves as critical components of the global environment. Volunteers and students plant thousands of mangroves; even school children are encouraged to start peat pot nurseries for black and white mangroves in their classrooms.



© BICA-Guanaja
Edgaro Ortega, municipal environmental manager with students picking seeds from a red mangrove tree planted by 'Baldhead' in 2004 and now grown large enough to produce seeds of its own



© BICA-Guanaja
Community engagement, education and reforestation

This solution is being implemented by BICA-Guanaja in collaboration with The Ocean Foundation.



CATCH SHARES: A FRAMEWORK FOR SUSTAINABLE FISHERIES

68 SOLUTION

The Upper Gulf of California is home to a variety of marine species, one of which is the endemic Gulf corvina (*Cynoscion othonopterus*). This species is the fourth most valuable marine resource in the area, providing a livelihood to more than 9,000 people. However, unsustainable resource use has led to the overexploitation of this species, including market saturation and a critical drop in market prices.



Fishermen of Gulf corvina

Through Catch Shares (*Manejo Compartido por Cuotas (MCC)* in Spanish), a framework for sustainable fisheries management, it has been possible to reduce overfishing while improving the economic wellbeing of those fishing communities dependent on healthy and resilient marine ecosystems. This type of Rights Based Management framework unites fishing communities, fisheries managers, academia and civil society organisations via a quota-based programme in order to maximise economic returns while maintaining the sustainability of the resource.

»Chaos—that is the best way to describe the corvina fishery some years ago,« says Francisco Dominguez, a fisherman for more than 40 years in the Gulf of Santa Clara. Every year, between February and May, corvina gather in the Colorado River Delta to reproduce at the full or new moon. At this time, the sea becomes a hive of fish and boats are in a competitive race to catch them.



Francisco Dominguez, fisherman in the Gulf of Santa Clara.

»Back then we used to fish just for the sake of it«, remembers Francisco. There were no incentives to decrease harvesting, regardless of the market saturation and price breakdown.

Since the implementation of Catch Shares in 2012, those days are gone. Now, fishermen like Francisco have secure access to their resources, allowing them to plan in advance, reduce costs and increase incomes while keeping the fishing harvest at sustainable levels. With Catch Shares, chaos is no longer the reality of the corvina fishery: »Now we have more fish in the water, more food on the plate and a more prosperous community.«

BUILDING BLOCKS Solution components for replication

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Fishing access rights

Access rights, such as individual quotas or territorial use rights (TURFS), delimited based on scientific findings and participatory processes, help to avoid overfishing and recover fish populations. They assure fishermen stable fishing over time and exclusive benefits from sustainable management, increasing their stewardship and compliance.

Collaborative science

Accurate and updated information is crucial for resource management. Forming Technical Groups enables collaborative science for decision making. These groups consist of participants from public and academic institutions who meet regularly to share information relevant to the fishery's management.

Participation and co-management

Fishermen, fishing and environmental authorities, scientists, buyers and NGOs participate throughout the management process, from design to evaluation. Through multi-stakeholder meetings and Advisory Committees, a fishery's objectives are decided, individual quotas are set and common challenges are addressed.

Unconventional strategic partnerships

To promote sustainable fishing, it is necessary to create partnerships that promote behaviour change, even if they are at opposite ends of the market. A partnership of fishermen and buyers brings mutual benefits such as better prices and higher quality products. This incentivises fishermen to respect catch limits and no-take zones.

This solution is being implemented by Environmental Defense Fund (EDF) Mexico.



COMMUNITY-BASED MANAGEMENT FOR ARTISANAL FISHERIES

70 SOLUTION

Rural communities located along the Mexican coast heavily depend on natural resources for their subsistence, with artisanal fishing as one of their main activities. The lack of stable organisational frameworks within the fishing sector, however, has led to the overexploitation of marine resources, causing severe conflicts between local stakeholders.



Fishermen from Puerto Libertad

To effectively address this problem, COBI (Comunidad y Biodiversidad) has developed a participatory approach to strengthen the overall governance of marine ecosystems that includes measures to restore fisheries and marine ecosystems. Techniques range from capacity building and the introduction of international standards for fishing to the establishment of fully protected marine reserves. The method has been implemented in three regions: the Mesoamerican Reef, Baja California and the Gulf of California.

The 250 fishermen of Puerto Libertad, a village located on the north coast of the Gulf of California, have traditionally fished commercially important species such as grouper, snapper and squid to sustain their livelihoods.

Before COBI started its activities in this village, there was no regulatory framework in place to control fishing activities. This led to the unfettered extraction of marine resources, endangering the long-term supply of these assets and causing severe conflicts between licensed fisheries organisations and unlicensed fishermen.



Commercial divers trained to do fisheries and marine ecosystems monitoring

Through the engagement of COBI and the implementation of better regulatory structure and increased stakeholder engagement, the fisheries sector in Puerto Libertad is today well organised. Through the concerted effort of all stakeholders, there has been significant progress in meeting the main goal: sustainable use of common marine goods.

BUILDING BLOCKS Solution components for replication

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Promotion of leadership & collective action

Trust-based capacity building programmes for local leaders build strong leadership, facilitate communication and foster entrepreneurial skills. Measures to strengthen partnerships and management committees facilitate collective action towards sustainable fishing activities.

Fisheries certification

Sustainable fishing activities are promoted according to the guiding principles and conservation ethics established by the Seafood Watch programme (Monterey Bay Aquarium), the Marine Stewardship Council and Fair Trade.

Community-based marine reserves

Local fishermen establish and manage no-take marine reserves. Integrated management plans consider fisheries and ecosystem restoration as well as climate change adaptation measures. The management model includes participatory monitoring and evaluation and the development of sustainable financing mechanisms.



Participatory workshops to develop integrated management plans for marine reserves

Policy advice

Stakeholders are involved in sharing recommendations arising from successful approaches, identification of appropriate policy instruments and support of policy implementation.

This solution is being implemented by Comunidad y Biodiversidad (COBI).



COMMUNITY STEWARDSHIP OF MARINE RESOURCES

72 SOLUTION

Marine pride campaigns inspire people to respect the species and habitats that make their community unique. They promote behaviour adaptations which reduce environmental threats and generate community stewardship of natural resources.

This stewardship might take many forms, such as the voluntary designation of fishers' community reserves, or the endorsement and adoption of specific existing reserves. Other efforts could include the adoption of new or improved log books for better fisheries data collection, establishment of market connections for improved sales of fisheries products and adoption of alternative income activities.



© Ramón Flores, CONANP
The mascot Robalin presides over the «Navigating for Responsible Fishing» festival

Campaigns have also promoted the voluntary use of sustainable and non-damaging fishing practices. They demonstrate the power of community-based marine conservation. Organised fishers are better able to maintain fishing rights, increase their compliance with fishing regulations and gain better access to special markets and value added activities. Besides Mexico, marine pride campaigns have been implemented in Honduras, Guatemala and Ecuador.

In the rural communities of La Encrucijada, Mexico, fishermen are getting organised. The sea provides the main source of income, yet overfishing is a major problem. A pride campaign aimed to bolster the six fishing cooperatives' organisational capacity and help them establish no-take reserves to let fish stocks replenish themselves.



Fishing agreements, one part of fishing for the future, are signed

At one workshop, the conversation grew tense over the zoning of fishery reserves. As the debate seemed to hit an impasse, fishers' families interrupted the dialogue with a flashmob. Children carried signs with messages like, «We have the right to grow big and so do the fish.» When they left, the room was quiet. The fishers were motivated as they not only saw the economic benefits of reserves, but now could connect them to their biggest priority – family.

To date, the fishing cooperatives of La Encrucijada have established six marine reserves. «The zoning of the permanent reserves was an unforgettable day,» says Conrado Molina Santos, a fisherman from La Encrucijada. «Our society understood sustainable fishing and the benefits we could have.»

BUILDING BLOCKS Solution components for replication

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Pride training programme

Local conservation leaders undergo formal two-year university training, combined with periods of field-based research and analyses. Participants learn how to change attitudes and behaviours, mobilise support for conservation and reduce threats to natural resources.

Theory of Change (ToC)

The ToC serves to create a common vision of long-term goals, how to reach them and how to measure progress along the way. It is the basis for strategic planning. As such it clearly articulates how shifting behaviour and social norms will reduce threats to biodiversity.

Formative research

Both quantitative and qualitative data feed into baselines, which enable the assessment of social and conservation impacts following a campaign. Both data sets are used to target audiences and, ultimately, guide campaign objectives, activities and messages.

Social marketing (SM)

SM uses commercial marketing methods and tools to promote voluntary behaviour change that benefits society as well as the target group. By creating a clear and positive identity or brand around conservation, it can resonate with community perceptions, values and traditions.

Technical Assistance (TA)

TA is directed towards building capacity in coastal communities, removing technical barriers and emphasising leadership to improve the management of natural resources. The overarching goal is to promote community support for conservation actions.

Monitoring and Evaluation (M&E)

Monitoring tracks the effectiveness of efforts to build capacities, change behaviour through social marketing and achieve desired conservation outcomes. It is based on pre- and post-campaign surveys and specific protocols validated by experts.

This solution was implemented under the Program for Sustainable Fishing in Latin America by Rare in collaboration with partners from eight sites in four countries. In Mexico, the implementing partners were the National Commission of Protected Areas (CONANP) and Pronatura Noroeste.



COMPLIANCE IN PROTECTED AREAS

74 SOLUTION



Meeting of the Surveillance and Enforcement Committee for the Bahía de los Ángeles Region

Protected Areas (PAs) are a powerful tool for biodiversity conservation. In Mexico, more than 170 federal PAs are to protect over 25.6 million hectares of important habitats and landscapes.

Due to the remote location of many PAs, however, their function as administrative frameworks for local governance is often impaired. Some PAs lack the economic, human and material resources to ensure sufficient and effective surveillance and regulation enforcement. In addition, local communities, e.g. fishing communities in the state of Baja California, observe insufficient presence and low levels of inter-agency coordination which is required to inform users about the current regulations for the area.

A conceptual model to support PA enforcement was developed. This model, currently being implemented in marine and coastal protected areas of north-western Mexico, is designed to increase regulation compliance and facilitate fisheries and biodiversity recovery and conservation. The model includes: diagnosing the current status of the PA's administrative framework; multi-agency coordination; planning and evaluation; personnel, capacity building; financing, equipment/infra-structure; joint operation; data systematisation; and legal follow-up.

The Mexican government established the «Bahía de los Ángeles, Ballenas and Salsipuedes Channels» Biosphere Reserve in 2007. Since then, Pronatura Noroeste has devoted itself to develop tools to guarantee the effectiveness of protection measures.

«Once the Management Plan for the Reserve was published, we signed a set of agreements with PROFEPA to increase the presence of inspectors in the area, acquire equipment, and inform users about the current regulations within the Reserve,» says Gustavo Danemann of Pronatura Noroeste.

«Thanks to these agreements, surveillance in Bahía de los Ángeles was increased by 1580 per cent between 2007 and 2013, and 81 per cent of the boats observed within the Reserve in 2013 were reported to fully comply with the existing legal framework. To date, Pronatura Noroeste, in conjunction with multiple partners, is expanding its surveillance and enforcement experience to 12 MPAs in northwest Mexico.

Now, more than ever, actions are being taken to increase compliance within marine protected areas in the country.»

BUILDING BLOCKS Solution components for replication

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Evaluation of Protected Areas (PAs)

Key social and environmental issues affecting PAs are identified through interviews, surveys and referencing of public information databases to evaluate both the perceptions of users and the effectiveness of authorities.

Interagency working group

An inter-institutional surveillance and enforcement committee creates an interagency work programme which includes overall surveillance, formation of objectives and goals, the legal framework, individual competencies of the agencies, action protocols, institutional commitments and an evaluation matrix.

Implementation of regulations

Capacity building measures include training and related resources for federal inspectors, fisheries officers, naval forces and park rangers. This includes training on and dissemination of PA environmental regulations for both users of and staff monitoring the PA.

Long-term financing of Protected Areas

Mexican PAs are typically financed through the use of public funds. Private or mixed funds can be of particular help when managing resources for projects of short and medium term. Opportunities for new public income sources include the creation of funds from environmental fines and PA access fees.

Surveillance and enforcement

PA authorities conduct surveillance patrols and strategic operations. Actions may be implemented by a single agency or a combined task force and can be divided into three types: surveillance, enforcement and intelligence.



Patrol boats in the Biosphere Reserve Bahía de los Ángeles

This solution is being implemented in several Protected Areas by the National Commission of Natural Protected Areas (CONANP), the Federal Attorney for Environmental Protection (PROFEPA), the National Commission of Aquaculture and Fishing (CONAPESCA), Secretaría de Marina (SEMAR) and the Office of the Mexican Attorney-General (PGR) and other federal and local government agencies in collaboration with Pronatura Noroeste.



COZUMEL REEF MANAGEMENT COOPERATION

Cozumel Island is comprised of a variety of marine, coastal and terrestrial ecosystems. It is home to an abundance of species, with high levels of endemism. Local reef ecosystems are part of the second largest reef system in the world, the Mesoamerican Reef.



Government and civil society representatives evaluate existing environmental policies

Due to its spectacular marine life, Cozumel is also one of Mexico's main tourist destinations for scuba diving and snorkeling. Forty-one per cent of the more than three million tourists visiting Cozumel Island every year are attracted by the area's water sports. The destination relies so heavily on tourist activity that scuba diving and snorkeling are the main source of income on the island. However, poorly planned and managed tourism development has critically damaged Cozumel's coastal and marine habitats.

Strengthened cooperation and coordination among key stakeholder groups in both the private and public sectors are necessary to more effectively implement the environmental management plan for Cozumel Island. In addition, information campaigns raise the local population's awareness and involve them in protection and conservation strategies.

Evaluation of environmental policy

In focal group meetings, government and civil society representatives analyse and evaluate existing environmental policies and land-use planning tools to determine the competencies and responsibilities of each. Special emphasis is given on identifying shared interests and concerns to come up with common goals and objectives.

Awareness raising

The importance of nature conservation is brought out to the local community – including the tourist sector. Awareness raising campaigns are conducted to transform knowledge, values, skills and attitudes towards sustainable tourism development. Information is disseminated via videos, brochures, press releases and organised flash mobs.

Multi-stakeholder workshops

In participatory workshops, common objectives as well as individual roles and responsibilities are identified. This helps to strengthen coordination and cooperation among the key stakeholder groups including government officials, representatives of private enterprise, academia, civil society organisations and tourism service providers.



Awareness campaigns such as beach clean-ups sensitise school children to conservation issues

This solution is being implemented by the Mexican Commission of Natural Protected Areas (CONANP), National Park Arrecifes de Cozumel and Nature Reserve Isla Cozumel.



EMPOWERING FISHERMEN THROUGH CO-MANAGEMENT

78 SOLUTION

Among all Mexican states, Quintana Roo ranks second in terms of marine productivity and fishing yields. However, its marine ecosystems, and therefore the livelihoods of many coastal communities, are threatened by over-fishing. Coastal development has led to the decline of key habitats which sustain a variety of interlinked species. Since artisanal fishermen were not involved in fisheries management, they took little responsibility for marine conservation.

To address these challenges and facilitate collaboration for the management of fishery resources, the Kanan Kay Alliance was founded as a coalition of 41 institutional members and includes governmental agencies, fishing cooperatives, civil society organisations, academia and philanthropic foundations.



A fisher from southern Quintana Roo landing his catch

The Alliance's most important task is the establishment of a network of so-called fish refuges where fishing is banned. Such shelters are a powerful tool to recover the biomass of overfished species within a short time period. Today, these refuges cover 16,000 hectares of the region's coral reefs, seagrass meadows and coastal wetlands.

Recognising the importance of involving local fishermen in responsible fisheries management, the Alliance aims to further empower these stakeholders. Participatory management processes help to strengthen their sense of ownership and support the sustainable use of fishery resources in the long-term.

At one General Assembly, Kanan Kay Alliance members discussed which terminology to use when referring to »fish refuges«. For some governmental representatives, changing to a different term that was both technically correct and easy to understand made a lot of sense. For the fishermen, however, changing the term would have been synonymous with betraying the overall goal of the Alliance.



A voting session during the seventh General Assembly of the Alliance in 2014

The discussion reached a point where the fishermen were prepared to exercise their power of veto and leave the assembly if the term were to be changed. In the end, the Alliance decided to keep the term, as it was of great importance to the fishermen.

This incident helped increase the fishermen's confidence in a joint management approach and its successful implementation. The fishermen realised that members were equal partners, all committed to the same mission of developing responsible fisheries.

BUILDING BLOCKS Solution components for replication

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Inter-sectorial collaboration

The Alliance unites a diverse group of stakeholders and serves as a dialogue board and facilitates the exchange of ideas, capacities and experiences, generating synergies and mutually beneficial solutions.

Empowerment of fishermen

Training programmes, organisational strengthening and improvement of leadership skills help to build the fishermen's management capacities. Training is provided by members of the Alliance, such as civil society organisations, academia and governmental agencies

Financial compensation

A combination of public and private funds helps to partially compensate fishermen for their participation in, e.g. biological monitoring activities or general assemblies.



Fishermen showing their diplomas after successfully completing a biological monitoring training

Legal and institutional framework

The existing legal framework for the formation of fish refuges is analysed and revised. Tools for participatory managed fish refuges are identified, as well as for inspection and surveillance activities.

Design and implementation of fish refuges

Through a participatory process, an effective, legally recognised and locally respected network of fish refuges is established. The network comprises critical functional and representative habitats where fishing activity is banned.

This solution is being implemented by the Kanan Kay Alliance.



FUNCTIONING WATERSHEDS IN THE FACE OF CLIMATE CHANGE



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Coastal watersheds provide ecosystem services essential to people and the environment

Cross-sector collaboration can be crucial for the success of nature conservation. Thus, in Mexico, the integrated management of coastal watersheds, especially those which drain into the Gulfs of Mexico and California, is promoted and implemented as a means to achieve biodiversity conservation benefits, increase climate change resilience and enhance sustainable land use.

Through coordination between key institutions and the application of a landscape approach to watershed management, the effectiveness of protected areas is ensured. In addition, conservation and sustainable management increases the connectivity of area watersheds.

These efforts are financed by encouraging and aligning investments of public and private agencies, especially to address the severe impacts of climate change in vulnerable coastal environments (such as hurricanes and persistent droughts leading to wildfires). Specific strategies for each watershed are identified with the participation of public, private and local stakeholders, in order to contribute to their recovery or maintain their functionality. The maintenance and recovery of watershed functions benefits cities and rural communities alike.



Stakeholders looking at restoration activities in a coastal watershed in Sinaloa

»Coastal watersheds management requires multi-stakeholder collaboration and support,« says Paola Bauche Petersen, project coordinator at Fondo Noroeste (FONNOR).

»Our coastal watershed conservation project encourages public institutions and civil society organisations to implement the project at the state and local levels by joining together to form working groups. Public agencies hold dialogues about how to better invest within the watersheds, and local civil society organisations work together with public institutions. It also encourages collaboration between different branches of the public sector. For example, the National Institute of Ecology and Climate Change (INECC), a federal institution responsible for conducting scientific research and shaping public policy, requested that the National Forestry Commission (CONAFOR) redesigns its soil conservation strategy, based on scientific evidence of erosion impact. A public fund was created to support the resulting watershed conservation actions.«

Public-private collaboration

Federal agencies and private organisations are joining efforts for the state-level conservation of watersheds through the creation of a Technical Committee. The Committee includes representatives of those institutions and ensures transparency and adequate implementation. This is replicated at the local level in every watershed, engaging diverse local stakeholders to make decisions regarding activities.

Diverse financing mechanisms

Financing stems from a combination of endowment funds, public sinking funds and grants for specific activities as well as innovative finance options such as payment for ecosystem services schemes. An Integrated Action Plan aligns these investments at a broader level.

Integrated watershed action plan

The action plan includes specific strategies for each watershed. It is adaptive, based on scientific analysis and collectively developed and enacted by local stakeholders.



© FMCN

Adequate watershed planning is of key importance in the climate change context

This solution is being implemented by the Fondo Noroeste (FONNOR) and the Mexican Fund for Nature Conservation (FMCN), in collaboration with the Secretariat of Environment and Natural Resources (SEMARNAT), the National Commission of Natural Protected Areas (CONANP), the National Forestry Commission (CONAFOR) and the National Institute of Ecology and Climate Change (INECC).



GOOD PRACTICES FOR CLIMATE CHANGE ADAPTATION

Coastal Quintana Roo is one of Mexico’s main tourist destinations. Eighty per cent of its population lives within six meters of sea level. It is an area characterised by a high vulnerability to sea level rise, erosion, flooding and intensifying weather events. From 2000 to 2010, hurricanes alone caused more than US\$ 2 million in losses to the state economy.



The catalogue of good practices compiles information on climate-sensitive coastal development

There is an urgent need to reduce the vulnerability of people and infrastructure to the effects of climate change and extreme weather events.

Climate change adaptation plans identify a variety of strategies to minimise vulnerabilities. However, municipalities, communities and resource managers need to identify which specific land use, construction and ecosystem management practices they should implement. Measures such as building on poles, behind the dunes or using traditional construction methods; maintaining healthy coral reefs as natural barriers; and leaving natural flows undisturbed have all been proven to successfully prevent or reduce climate change-related damage to coastal areas.

A core team of experts from Instituto Tecnológico de Chetumal, Mesoamerica Reef Tourism Initiative, the Amigos de Sian Ka’an and The Nature Conservancy reviewed and systematised relevant experiences of Mexican Caribbean hotel



Building on stilts may reduce vulnerability of infrastructure

staff, coastal dwellers, architects and engineers. They identified over 35 climate change adaptation measures, resulting in a comprehensive catalogue of good practices. This catalogue lists climate phenomena and corresponding impacts; measures which can address those impacts and what is needed for their implementation; and how relevant components of the selected practice interact. While dissemination of this information to and training of coastal development professionals and related business sectors is underway, the approach is already proving popular. The methodology has attracted attention in and outside Mexico, with states like Baja California Sur and countries such as Belize and Honduras planning similar initiatives.

Alliances for innovation

A core team of well-established, recognised and experienced partners – each with a distinct capacity, role and niche – is formed to address climate change challenges. The process is guided by a Team Charter detailing each partner’s role and responsibilities and a governing body, which provides transparency, organisation and clear goals.

Engagement of interest groups

Stakeholders from municipalities, academia, hotel owners, architects, engineers and their associations are engaged in project planning and thorough revision of each adaptation practice. This active involvement facilitates the dissemination of results and ensures the adoption of new procedures by relevant stakeholders.

Systematisation of good practices

A carefully planned data collection and review process enables a comprehensive compilation of practices. A technical team develops the methodologies, instruments and guidance documents while partners and university students are trained to conduct the surveys. All results are compiled, systematised and revised by local experts.

Regional & sectoral knowledge transfer

Project partners reach out to new sectors (e.g. urban development, construction chambers and risk mitigation) at the national level to encourage the use of these climate adaptation practices beyond the immediate area. There is also strong interest to replicate the catalogue in adjacent areas and countries.

This solution is being implemented by The Nature Conservancy (TNC) in collaboration with the Instituto Tecnológico de Chetumal (ITCH), the Mesoamerica Reef Tourism Initiative and the Amigos de Sian Ka’an (ASK).



HELPING FISHERMEN REDUCE THEIR IMPACT

84 SOLUTION

Panorama of Isla Isabel



Isla Isabel, a picturesque volcanic island situated off Mexico’s west coast, is one of the main nesting islands for seabirds in the Pacific, including large colonies of frigatebirds, boobies and terns. Due to its rich biological diversity, in 1980 the island was designated as a National Park.

High levels of marine productivity in the surrounding waters have attracted fishermen, who have been using the island as a temporary camp site for almost one hundred years. However, a steadily growing number of fishermen camping on the island and a lack of organisation have tremendously increased the pressure on the island’s natural resources.



Fishing camp on Isla Isabel

In 2000, the National Commission of Natural Protected Areas (CONANP) initiated a participatory process to improve the management of the fishing camp of Isla Isabel. Local fishermen were involved in a concerted approach to ensure that all activities taking place on the island meet the environmental regulations protecting its natural resources.

The project established a regulatory system tackling environmental threats caused by the unregulated construction of fishing huts, waste disposal, uncontrolled clearing of vegetation, illegal consumption of turtle and bird eggs, introduction of invasive species and lack of proper sanitation facilities.



Juan Devora, fisherman

»With the new management approach, things have become better regulated,« says Juan Devora, fisherman in Isla Isabel. »There is no longer such an uncontrolled arrival of fishermen. This was achieved by the hard work of the staff of the park, of Universidad Nacional Autónoma de México (UNAM), and of the government, who were engaged in fostering our compliance to the new rules, which turned out to be really beneficial.

When the management plan was being discussed, we did not want to miss that opportunity. Now we try to give something back—to the extent that we supported them, we also support ourselves. Today the park is already being revived with all the jobs that are being created.«

BUILDING BLOCKS Solution components for replication

Consensus on natural resource use

Regular meetings with relevant stakeholders, including representatives from academia, governmental agencies, national park staff and local fishermen, promote consensus regarding directives for the use and protection of natural resources.

Management plan for the National Park

The conservation and management programme formalises jointly agreed regulations. It contains various sub-programmes with defined objectives, actions and guidelines to improve the state of conservation and management.

Education campaigns

Environmental education campaigns raise awareness of issues associated with the fishing camp. Special emphasis is placed on the control of introduced species, waste management and outdoor defecation. Information is disseminated via various media.

Roles and responsibilities within National Parks

Roles and responsibilities are defined for all stakeholders. To achieve the required compliance with administrative rules, stakeholders are actively involved in inspection and surveillance activities. The violation of an agreement can result in temporary denial of access to the island.

Thematic workshops for fishermen

Workshops are conducted to increase local fishermen’s capacities. These focus on conservation, sustainable fishing techniques, biosafety measures and solid waste management. Meetings with fishermen from other protected areas in the region, NGOs and research centres facilitate knowledge transfer.

This solution was implemented by the National Commission of Natural Protected Areas (CONANP) in collaboration with the National Autonomous University of Mexico (UNAM).



LEADERS FOR REEF CONSERVATION



The Mesoamerican Reef System

The Mesoamerican Reef System (MAR) is the second most biologically significant system of its kind in the world, supporting local communities all across the region. It stretches over 1,000 km along the coasts of Mexico, Belize, Guatemala and Honduras. Its ecosystems are in a critical condition due to a combination of local and global threats: land-based pollution, severe overfishing, unsustainable coastal and tourism development and climate change.

To accelerate the conservation of the MAR in its entirety, the MAR Leadership Program (MAR-L) is supporting high-impact replicable projects while boosting the expertise and leadership skills of young practitioners in these four countries. To date, 60 interdisciplinary fellows have been trained to develop, lead and scale up innovative conservation activities which can turn into models for sustainable resource management and development in the region.



Marine biologist Gabriela Nava

»My project set up a coral nursery for transplantation of *Acropora palmata* to degraded reef areas, so I could promote recovery of reef ecosystems across the MAR,« says 2011 MAR Fellow Gabriela Nava from Mexico. »The MAR-L Program enabled me to leverage support from one of the world's foremost research centers for coral reef restoration at the University of Miami, and now we are engaging local communities to replicate the project model in two other important national parks in Mexico. We strive to soon amplify its impact across the entire region.

As MAR Fellow I got the opportunity to present my innovation at various conferences, such as the International Coral Reef Symposium in Australia. Having access to results of recent research and discussing my passion and ideas, e.g. on sustainable financing for coral restoration, with the world's top coral reef researchers has allowed me to become recognized as an authority in my field in Mexico and, importantly, it has helped me to grow personally.«

New skills and knowledge for local leaders
Local practitioners are equipped with technical expertise in project design and leadership skills: individually tailored trainings and mentoring are customised to fellows' needs and ambitions, while group workshops focus on effective communication strategies, public speaking, negotiation and conflict resolution, advocacy and personal development.

Pilot projects for upscaling
Applying their local expertise and supported by individual mentoring, fellows develop pilot projects with the potential for replication and scaling up in other areas. Projects are designed to show clear and measurable conservation impacts within 3–5 years.

Life-long networking opportunities
Coming from a variety of sectors and backgrounds, MAR Fellows are encouraged to interact, share experiences towards long-lasting regional collaboration and develop a vibrant network for life-long learning, continuous inspiration and a common vision of MAR conservation.



Acropora palmata nursery in Xcalak National Park, Mexico



MAR Fellows in a workshop during a group exercise

This solution is being implemented by the Mexican Fund for the Conservation of Nature (FMCN), with the support of the Summit Foundation.



MAKING MONEY FROM SCRAPS

88 SOLUTION

Fish harvesting and processing is a significant economic activity in rural coastal communities across Mexico. In many cases, however, improper disposal of fisheries waste pollutes the surrounding environment and presents hazards to human health.



Equipment and raw material for the production of fish meal

To address the need for proper management of fisheries waste, members of the fishing community El Caracol in Guasave, Sinaloa state, founded Grupo Crustil, a small-scale processing enterprise, in 2007.

Grupo Crustil utilises discards from artisanal fisheries to produce fish meal. The process creates opportunities for alternative income generation, maximises product utilisation and mitigates environmental impacts. To date, approximately 600 metric tons of fisheries waste are processed per month, producing up to 35 metric tons of fish meal for sale in local and regional markets.



Project staff and a representative of the Mexican National Commission of Natural Protected Areas (CONANP)

The commitment of the staff is crucial for the success of this enterprise. The staff dedicates themselves to reducing costs, further improving their products and diversifying the product range. For example, they plan to further reduce waste by converting protein-rich water (a by-product of the production process) to an organic liquid fertiliser which will be marketed to the regional agricultural industry.

The small factory thereby contributes to an improved quality of life in the local community, creates jobs and helps to raise awareness on the need for proper management of fisheries waste.

BUILDING BLOCKS Solution components for replication

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Business plan for fishmeal production

A business plan for processing fish and shrimp waste into fish meal is developed, defining the enterprise's design and determining its costs. The plan incorporates the concept of operations, organisational structure, system design, production processes, training modules, marketing and sales as well as a feasibility analysis.

Government seed funding

To receive federal government funding, the enterprise must demonstrate its environmental and social benefits alongside the ability to be self-sustaining within a given period of time. The grant is used to purchase necessary equipment and train staff.

Dissemination and training

The enterprise helps to raise community awareness on the need for proper management of fisheries waste. Training is provided to increase staff competency. The enterprise is also presented to other communities in the area to facilitate its replication.

Processing enterprise

The small-scale processing factory produces fish and shrimp meal. The product is used as animal feed for poultry, pigs, cattle or farmed fish or shrimp, and as organic fertiliser. It is sold in local and regional markets.



Grupo Crustil staff member presents fish meal products at a local fair

This solution is being implemented by the Mexican National Commission of Natural Protected Areas (CONANP).



MITIGATING HUMAN IMPACTS ON CORAL REEFS

With over 750,000 visitors each year, the National Marine Park of Cancún and Isla Mujeres is one of the most visited aquatic tourist attractions in the world. Such high visitor numbers, however, are placing immense pressure on the natural coral reefs in the area. For instance, they have suffered critical damage from inexperienced divers or people kicking or touching corals and reef formations.



Sculptures in the underwater museum attract fish of various sizes

In order to alleviate pressure on the reefs and allow them recovery time, an underwater art museum called MUSA (Museo Subacuático de Arte) was established in 2009. The museum is world-renowned for two reasons: it is one of the largest underwater artificial art attractions in the world and it draws visitors away from the natural reefs while creating new artificial habitats. MUSA currently consists of more than 500 life-sized sculptures by various artists. Installed on the sea floor off Isla Mujeres and Punta Nizuc, the museum consists of about 420 square meters of sculptures made from specialised materials which promote the colonization of marine life. The evolving interaction of art and sea creatures helps to increase both the ecological awareness of visitors and the overall biomass of the reef system.

The National Park Authorities also run coral nursery and propagation projects. These support regeneration of the natural reefs in the Mexican Caribbean and help increase fish and invertebrate populations find refuge among the reef structures. The nursery consists of coral fragments attached to vertically positioned PVC tubes secured to a concrete base. The upright position keeps the coral colonies safe from predators and prevents smothering. The nurseries are located in a safe location known only to the park wardens, in shallow, clear water that lets the sunlight reach the coral colonies. When the coral colonies have reached a certain size, they are carefully transplanted onto the original reef structure. The restoration success is regularly monitored.

Mentoring national park staff

Local practitioners are equipped with technical expertise in project design and leadership skills: individually tailored trainings and mentoring are customised to fellows' needs and ambitions, while group workshops focus on effective communication strategies, public speaking, negotiation and conflict resolution, advocacy and personal development.

Underwater art museum

Life-sized concrete sculptures form an artificial reef structure for marine life to colonise and inhabit. The museum helps to reduce pressure on natural reefs by redirecting visitors to alternative sites. The museum is divided into two galleries: the first is eight meters deep and suitable for both divers and snorkelers and the second is four meters deep and only for snorkelers.

Restoration of coral reefs

Coral nursery and coral propagation projects are implemented to reduce the time of recruitment and growth and to mitigate anthropogenic and naturally induced impacts. This helps to increase the diversity of coral species and overall coral cover, as well as the variety and abundance of fish and other reef-associated organisms.



Coral nursery in the National Marine Park of Cancún

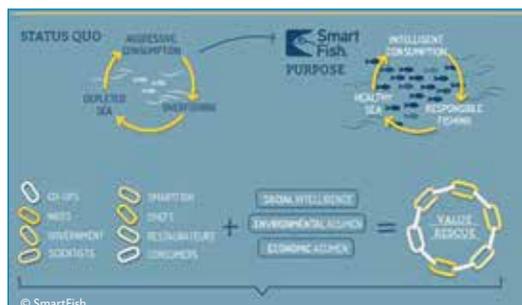
This solution is being implemented in the Federal National Park Isla Mujeres-Cancún-Nizuc (PNCOIMPCPN) by the Mexican National Commission of Natural Protected Areas (CONANP).



RESCUING VALUE IN THE FISH MARKET

92 SOLUTION

Eighty per cent of Mexican fisheries have been pushed to or beyond their biological limits. Strict management plans are necessary to restore these fisheries to sustainable levels.



SmartFish International is a for-profit social enterprise based in La Paz, Mexico. It supports fishermen in their efforts to deliver and sell better-quality fish to the docks and in premium markets, respectively. SmartFish establishes relationships with and between reputable co-ops, NGOs, fisheries and fishermen who promote sustainable fishing practices. To support and protect the efforts of fishermen, SmartFish connects them with interested markets and assists in the design and implementation of proper fishery management. These efforts promote ecosystem conservation and help end the vicious cycle of overfishing while sustaining livelihoods and ensuring food security.

SmartFish's shared vision integrates diverse intelligences

»In 2009, we began experimenting with entrepreneurial approaches to incentivising higher sustainability fishing in Mexico,« says S. Hoyt Peckham, founding director of SmartFish International.»Certain visionary fishermen wanted to try switching to more selective gear to reduce megafauna bycatch, as long as they could find a way to do so more profitably. We realised that we could probably align fishing with sustainability objectives and thus overcome the cycle of overfishing.

In 2010 we conducted a market study and plan with leading fishermen, in partnership with five fishing cooperatives of the Bahia Magdalena region which form the social venture Productos Marinos Sustentables (ProMar). Local fishermen don't have the capital or the capacity to bring their fish to market, which puts them at the mercy of aggressive buyers. They end up receiving very poor prices for their fish, so every time they fish they have to make up for the low prices with higher quantities. We piloted how we could rescue the value lost in some of their undervalued fisheries.

Strong demand for ProMar's zero bycatch, higher sustainability seafood enabled ProMar to generate impressive social, environmental and economic outcomes. However, that same demand also presented ProMar's greatest challenge: maintaining catch rates which are high and consistent enough to meet that demand.

In 2013 we launched SmartFish to incentivise higher sustainability artisanal fishing by empowering fishermen to rescue value in their undervalued fisheries. To make their sustainable fishing practices more profitable, we have begun building preferential markets for their fish, creating both supply and demand.«

BUILDING BLOCKS Solution components for replication

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Social intelligence

We integrate the stakeholders of each fishery, growing social capital and economic value to improve the wellbeing of fishermen and their livelihoods. It is important to hold stakeholder-driven conversations and attract diverse representation.

Environmental acumen

We only establish commercial relationships with co-ops that implement fisheries management policies like closed seasons, fishing quotas and marine protected areas. Building a strong local network with a high degree of peer and regulatory oversight is crucial.

Economic acumen

We rescue value in fisheries in order to make fishing more profitable based on quality rather than volume. Each fisherman has adopted at least one of a range of sustainability measures including selective fishing gear, fisheries reserves, catch quotas and size limits.



Artisanal fishermen in Mexico catching spiny lobster

Responsible seafood production co-ops

We partner with cooperatives and NGOs to empower fishermen and their families to catch and produce the best quality sustainable seafood. This cultivates demand for exquisite seafood among distinguished customers.

International fishing improvement projects

We design and implement international fishing improvement projects (FIP) in the region with an all-encompassing multi-stakeholder group to identify, assess and improve fishing practices.

This solution is being implemented by SmartFish in collaboration with The Ocean Foundation.



RESTORATION OF DEGRADED MANGROVE ECOSYSTEMS



© CONABIO

The mangroves of Nichupté

Located on the Yucatán Peninsula in Cancún City, Nichupté Lagoon was once surrounded by dense mangrove forest. The mangrove trees function as a natural coastal protection barrier, a biological water filtration system and a refuge for wildlife. They thereby help buffer natural or human impacts on adjacent ecosystems while sustaining diverse marine and coastal life, supporting subsistence and commercial fisheries and providing recreational opportunities.

These mangrove stands have been chronically stressed due to degradation and pollution associated with coastal development and tourism infrastructure, reducing the resilience of the mangrove

ecosystem to disturbances such as hurricanes. The devastating effects became obvious in 2005 when category-five hurricane Wilma hit the area, degrading large areas of mangrove bordering the lagoon and adjacent reef formations.

To support the recovery of the mangrove ecosystem, in 2008 the National Commission of Natural Protected Areas (CONANP) began to implement restoration and conservation activities including hydrology, restoration and reforestation and invasive species elimination projects.



© Teresa Patricia Santos González

Teresa Patricia Santos González

»The restoration of degraded mangrove areas demands personnel and professional commitment. Working under extreme conditions in the mud while trying to achieve not only the technical project objectives but also to inspire others to do so was not an easy task,« states Teresa Patricia Santos González, Head of Department at the Área de Protección de Flora y Fauna Manglares de Nichupté.

»The results, however, have made our efforts worthwhile. Databases and graphs of the monitoring results and pictures taken before and after the project's implementation phase indicate the recovery of the mangrove cover – and the survival and growth of reforested individuals with an average survival of more than 89 per cent, as well as returning local mangrove fauna. And I can conclude that even though the field work was hard, I fell in love with this muddy ecosystem.«

Determination of stressors

Experts determine the type and degree of damage and identify the causes of mangrove loss such as changes in temperature, water pollution, hydrological modifications and sedimentation. This helps decision makers develop site specific restoration and reforestation plans.

Stakeholder engagement

A diverse array of stakeholders is engaged: academia provides scientific baseline data, civil society organisations contribute private funds, and government facilitates implementation and evaluation processes and local communities pitch in by conducting field work.

Dissemination and training

The results of the monitoring programme are presented to the relevant local communities and through academic channels. Environmental education campaigns focus on local populations and address people with different levels of education. Information is shared via presentations, courses, trainings and workshops.

Mangrove ecotourism

In »jungle tours«, tourists are guided through the channels of the mangrove forest by boat. The trip includes environmental education and allows visitors to experience the interconnectedness of adjacent ecosystems such as mangroves and coral reefs.

Mangrove restoration and monitoring

Restoration measures – including the reforestation of degraded mangrove areas with native species, the restoration of hydrological conditions and the removal of invasive exotic species – are implemented and the effects of these efforts continuously monitored.



© Teresa Patricia Santos González

Mangrove seedlings are collected for restoration measures

This solution is being implemented by the National Commission of Natural Protected Areas (CONANP), in collaboration with Fauna y Cultura de México and the Center of Investigation and Advanced Studies, Mérida Unit (CINVESTAV).



RESTORATION OF MANGROVES IN THE SIAN KA'AN BIOSPHERE RESERVE



Sian Ka'an Biosphere Reserve

The Sian Ka'an biosphere reserve, located on the east coast of the Yucatán peninsula, features a range of distinct coastal habitats such as mangroves and marshland. Mangroves act as a buffer, mitigating the effects of climate change. Their absence places local communities at risk.

The once extensive stands in the reserve have, however, been severely depleted. Forty years ago a road was constructed across the reserve near El Playón. It improved access to the reserve but hindered water flow within the mangrove stands, changing the hydrology and hydrogeochemistry of the area and leading to a large scale degradation of mangroves.



The El Playón road separates pristine and degraded mangrove stands

This solution promotes the restoration of Sian Ka'an mangroves using the framework of an ecosystem-based approach to climate change adaptation. A programme to restore the original state of ecological conditions in mangrove ecosystems is implemented. Appropriate adaptation measures are identified to ultimately strengthen the resilience of the reserve's coastal ecosystems and reduce the vulnerability of dependent communities to climate change.

Study on healthy ecological conditions

A study provides information about the ecological structure of healthy mangrove stands and the original conditions of hydrological flow at the site.

Monitoring and evaluation

A science-based monitoring protocol for hydrological, chemical and biological parameters enables the detection of changes over time, thereby increasing the effectiveness of restoration actions.

Mangrove restoration

Following the restoration of the hydrological flow, mangroves species able to cope with the altered hydrological conditions are planted. This increases the chances that restoration activities will be successful.

Involvement of stakeholders

Workshops involving representatives of government agencies, academia and local communities contribute to an increased awareness of the programme and its management practices. The feedback provided by stakeholders helps to improve adaptation measures.

Communication and dissemination

Information on the project activities is disseminated to promote best management practices and facilitate their replication in other reserves.

This solution is being implemented by the Biosphere Reserve Sian Ka'an, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV-IPN), Instituto Nacional de Ecología y Cambio Climático (INECC) and Instituto Mexicano de Tecnología del Agua (IMTA), with financial support of the World Bank.



SUSTAINABLE FINANCING OF MARINE PROTECTED AREAS

98 SOLUTION

Over the last two decades, Mexico has made great progress in meeting its Aichi Target commitments by consolidating the country's national marine protected area (MPA) system. In order to generate the desired conservation outcomes and social benefits, however, this network of MPAs must be adequately staffed and managed.

Unfortunately, the budget growth of the National Commission for Protected Areas (CONANP) has not kept pace with the expansion of the protected area system and as a result the MPAs are chronically underfunded. Thus, supplementary funding from private, bilateral and multilateral donors is crucial for their effective operation.

In order to address these needs and to ensure long-term and sustained funding, a public-private partnership between CONANP and the Mexican Fund for the Conservation of Nature (FMCN) was created.

FMCN, in close collaboration with the Mexican government, has financially strengthened 24 federal protected areas. These funds provide sustainable financing and help to ensure that MPAs have the financial and human resources necessary to guarantee the long-term conservation of the coastal and marine ecosystems network.



Bahía de los Ángeles Biosphere Reserve and San Lorenzo Archipelago National Park cover more than 446,000 hectares and protect marine and coastal species such as the brown pelican

Bahía de Los Ángeles Biosphere Reserve and San Lorenzo Archipelago National Park are MPAs located in the Midriff Islands region of the Gulf of California. Four foundations donated US\$ 2.5 million towards a trust fund for the management of these MPAs. Trust fund revenue has enabled protected area staff to triple the number of marine patrols and reduce illegal fishing. It has also permitted the hiring of a staff member to work with local fishermen, the primary users of the protected area.

Without this financial support, CONANP would not have the resources or flexibility to address fisheries management challenges. As the area is very remote and the procedures for obtaining fishing permits onerous, most traditional fishermen in the region operate without permits. Thanks to the support from the newly hired CONANP staff, traditional fishermen are finally obtaining fishing permits – giving them rights over their resources and more incentive to protect them.

99 BUILDING BLOCKS Solution components for replication

Flexible and transparent fund administration
FMCN's flexible and transparent decision-making structure, strict financial controls and experienced and highly trained staff enable the fund to assist organisations with technical and financial support in carrying out efficient, results-based conservation projects.

Public-private partnership for MPA financing
The cooperation agreement is signed between FMCN and CONANP. FMCN is responsible for the management of the trust funds. Where inter-agency collaboration is essential for effective MPA management, FMCN is also collaborating with other governmental agencies.



The trust fund revenue has enabled the protected area staff to triple the number of marine patrols and reduce illegal fishing

This solution is being implemented by the Mexican Fund for Nature Conservation (FMCN) in collaboration with the Mexican Commission of Natural Protected Areas (CONANP).



TOURISM AS DRIVER FOR CHANGE

100 SOLUTION

Cabo Pulmo National Marine Park at the southern tip of Mexico's Baja California peninsula comprises about 7,500 hectares of coastal waters and is home to the only living hard coral reef in the Gulf of California.



© Octavio Aburto-Oropeza, Marine Photobank

Cabo Pulmo National Marine Park, with its spectacular marine life, is a main tourist attraction in southern Baja California

Due to its rich marine biodiversity, the park has become a main tourist destination. Coral damage and loss resulting from inexperienced divers and snorkelers, anchoring boats, tourism coastal development and pollution from recreational craft, however, seriously threaten Cabo Pulmo's fragile ecosystem.

To minimise the impact of unregulated recreational activities on the park and its marine life, a collaborative partnership has united local citizens, conservation groups, tourism service providers and park staff in developing and implementing a Public Use and Recreation Programme (PURP).

The first step of this process was to determine the actual level of touristic use and carrying capacity of the environment. Based on the results of this study, the stakeholder group limited water sports in the park. The related public use guide-

lines help regulate visitors more effectively and involve local tour operators in low-impact tourism activities. In addition, permanent surveillance and monitoring programmes have been implemented. They allow for constant assessment of the state of the park and thus enable improved decision making and timely adaptive management actions.

The programme has shown to promote long-term economic benefits for the local community while, at the same time, increasing the satisfaction of visitors and preserving park habitats.

Among the local population, the PURP has created a joint understanding of the importance of an organised and regulated use of natural resources. Today, Cabo Pulmo's inhabitants and tourism service providers are proud of their achievements and the success of the park. Consequently, they are eager to show tourists from all over the world its beauty. Tourism operators have understood that they can better boost their business by providing higher quality services and richer experiences instead of increasing tourist volume.

BUILDING BLOCKS Solution components for replication

101

Determination of the carrying capacity

Scientists, experts from NGOs and tourism service providers collect technical data on recreational marine activities to determine the actual levels of use and tourism carrying capacity of the local ecosystem.

Participatory monitoring

The local community, tourism operators and park rangers are involved in monitoring ecological, biophysical and economic data to ensure that the limits of sustainability are not surpassed. Academia and NGOs build the monitoring capacity of the locals and provide necessary equipment such as boats and diving equipment.

Local stakeholder engagement

The development of rules and regulations set out in the programme involves all local stakeholders. Consultations and meetings help to extract local experience and knowledge, and find mutual beneficial agreements. Local operators who accept and implement the guidelines are given priority regarding tourism permits.



© CONANP archive

Cabo Pulmo's dive operators educate tourists about the reef

This solution is implemented by the National Commission of Natural Protected Areas (CONANP).



EMPOWERING ARTISANAL FISHERMEN IN MANTA RAY ECOTOURISM

102 SOLUTION



Slaughtered manta ray in Peru

In the waters of Tumbes district, northern Peru, giant manta ray (*Manta birostris*) populations are captured for local consumption or as non-intentional bycatch during unregulated and unreported fishing. Lacking legal protection, harvested individuals are often pregnant females suggesting this region being an important reproduction area. A growing demand in Asian markets for manta gill plates increases the population's vulnerability to decline and extinction.

The NGO Planeta Océano is empowering local fishermen in Tumbes to develop community-based manta ray ecotourism businesses. This provides a source of alternative income and counter further manta declines. Following targeted training, financial and technical support and an awareness campaign, fishermen offer guided swims to tourists. In this way, visitors can learn about the manta ray habitat and life cycle.

The new ecotourism services render several benefits for the community.

- Tourist trips offer an alternate source of income, rivaling revenues from ray fishery (up to US\$ 20,000 annually).
- New business opportunities may arise and contribute to the diversification of community livelihoods, such as restaurants or souvenir shops.
- Local awareness and knowledge of manta ray conservation spreads throughout the region, spearheaded by villagers.
- Community monitoring can generate ecological knowledge of national and global interest and can be used to guide further conservation measures (e.g. population size, critical habitats).



Tourist snorkeling with giant manta rays

Wilmer Purizaca, artisanal fisherman from northern Peru and now Planeta Océano's field coordinator, states:

»During one of our first tourist trips, the fishers and I saw over a dozen huge mantas jumping out of the water and swimming all around. Our visitors jumped into the water and were surrounded by the curious creatures. We hardly trusted our eyes! Seeing such excitement from our guests was enough to prove to anyone how this threatened species can provide a greater benefit to all if conserved alive. Back home we proudly shared the experience in our village.«

BUILDING BLOCKS Solution components for replication

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Workshops for artisanal fishermen

Introductory workshops with a wide audience raise awareness for species conservation, its economic potential for ecotourism and the project. Through the workshops, motivated fishermen can be identified and engaged in further training. They can also initiate cooperation with local fisher organisations.

Business development training for fishers

Monthly trainings in business development and tourism management, carried out by local professionals from relevant sectors, empower fishermen to develop own business plans and ecotourism strategies. Highly committed fishermen are selected to become local environmental leaders.

Tourism infrastructure and mentorship

Selected groups of local environmental leaders receive financial and technical support to become licensed ecotourism providers: interest-free micro loans for equipment and boat improvements; personal mentorship on ecotourism development; and conservation leadership training through regular meetings.

Science-based ecotourism

Project collaborators accompany fishermen on initial ecotourism trips to continue training, for instance regarding data recording and photo identification. They also identify critical manta sites for sustainable low-impact activities and encourage involvement and regular feedback from tourists. Fishers eventually run the trips by themselves.

Ecotourism marketing Marketing strategies for ecotourism services are implemented through partnerships with local tourism agencies and district or provincial governments. Through diverse awareness raising formats, national authorities and corporate sectors help showcase the evolving new services.

This solution is being implemented by Planeta Océano in collaboration with The Manta Trust and WildAid.



SUSTAINABLE MACROALGAE HARVESTING IN A RESERVE



Sceneries of San Fernando National Reserve with scenic vistas and sea lions surfing

The San Fernando National Reserve, a conservation corridor that unites the Peruvian coast with the Andes, offers one of the country's most scenic vistas. The waters off the coast of San Fernando are among the most productive marine areas in the Humboldt Current Large Marine Ecosystem, home to Humboldt penguins, sea lions and a multitude of marine and shorebirds. The extensive kelp forests along the rocky shore are of great ecological and economic importance. These huge macroalgae are harvested by local artisanal fishermen, so-called «algueros», for the commercial production of alginate.

In 2009, when the price for kelp increased, macroalgae harvesting intensified and San Fernando was declared a protected area at the same time. Local fishermen were initially against giving the area protected status because they feared restrictions on their use of coastal resources.

These artisanal fishermen banded together through Comunidad Pesquera de Marcona (COPMAR), an umbrella organisation of sixteen area fishermen associations. Using a participatory process, COPMAR and its members were able to be involved in the establishment and zoning of the National Reserve. Both the association and fishermen themselves became active partners in the Reserve's Management

Committee. During the process, the importance of macroalgae harvesting for the fishers' livelihood security was acknowledged. Today, the fishermen help avoid macroalgae overexploitation through control and surveillance of its harvesting, and the minimising of uncontrolled and illegal activities.

The co-management approach brought together different associations of fishermen and other stakeholders. The dialogues created a formal channel for sharing protected area management information and incorporating different perspectives. Thanks to this inclusive method, area fishermen started to look at the protected area with new eyes. They now see regulating the use of natural resources as an opportunity to ensure that the coastal zone of San Fernando maintains its productivity.

Dialogue between fishermen and MPA officials

Local fishermen are included in creating resource use areas in the national reserve which acknowledge their existing fishing rights. In this participatory process, both local knowledge and scientific data are considered. Both contribute to future protected area management scheme decisions.

Management committee

The national protected area (PA) authority invites relevant stakeholders to become registered members of the management committee. The committee's General Assembly elects a steering structure. The management committee is a space for dialogue, allowing for discussion of issues before tensions turn into conflicts.

Legal resource use rights

Resource use within the protected area is regulated legally through a zonation scheme. To sustainably use the reserve's resources, local management groups commit to support surveillance and enforcement.

Macroalgae quotas

Fishermen groups harvest macroalgae within the reserve and are responsible for controlling illegal activities. Quotas for macroalgae harvesting are established based on scientific and technical data ensure their sustainable use.



Macroalgae are processed before being sent to the alginate industry

This solution is being implemented by the National Service for Protected Areas of Peru (SERNANP) and the Comunidad Pesquera de Marcona (COPMAR), in collaboration with Conservamos por Naturaleza, Sociedad Peruana de Derecho Ambiental (SPDA) and The Nature Conservancy (TNC).



CORAL REEF VALUATION SUPPORTS THE ESTABLISHMENT OF A MARINE PROTECTED AREA

106 SOLUTION

Coral reefs support a rich diversity of marine life. Yet in the Caribbean small island states, as in many places around the world, they face threats from overfishing, pollution, human development and climate change.



The coral reefs of St. Maarten host diverse invertebrate fauna

The government of St. Maarten recently advanced conservation of these ecosystems when it established the country's first national park in 2010. Until then, the benefits and services provided by the coral reef – and the importance of its health for the local economy – were not sufficiently acknowledged.

An ecosystem valuation analysis quantified the economic value of the proposed park's tourism and fishery. Alongside broad stakeholder involvement, this study demonstrated the strong link between ecosystem conservation, sustainable management of resources and economic benefits to the community.

The results of this analysis were used to identify the significance of individual species and implement or enforce management actions for their conservation. Furthermore, a resiliency programme was set up to respond to climate change impacts.

»Our reefs face serious threats by the expansion of the tourism sector and climate change impacts. We needed sustainable management of the reefs and its resources and not another paper park,« says Tadzio Bervoets, marine park manager at Nature Foundation St. Maarten.

In 2010, the Foundation was asked to establish a well-managed marine park with a strict no-take zone to address those threats. The Foundation surveyed St. Maarten's reefs and identified high priority areas for conservation. An economic valuation analysis of the marine ecosystem, using the Coastal Capital methodology (see also solution page 12), revealed the importance of a healthy marine ecosystem to St. Maarten's economy. Based on the results of both the ecological assessment and economic valuation, the Man of War Shoal National Marine Park was established.

A mooring system for dive boats was designed, preventing further damage from anchoring directly on the reef. Prior to and during the establishment of the marine park, the Foundation conducted wide-scale outreach to explain how anchors damage coral reefs. Small businesses in St. Maarten paid for the construction of a mooring system drilled into the substrate once the park was inaugurated.

BUILDING BLOCKS Solution components for replication

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Economic valuation study

A stakeholder survey, based on the Coastal Capital methodology, collects relevant data for a valuation which determines ecosystems value. Awareness building is supported and a societal dialogue initiated.

Integration of ecosystem valuation into management

A valuation can be a powerful argument to reach and eventually influence political agendas by presenting how both healthy marine ecosystems and the inclusion of relevant stakeholders are important to economic efforts.



Endangered green turtles live and feed on St. Maarten's coral reefs

This solution is being implemented by the Nature Foundation St. Maarten in collaboration with the Dutch Caribbean Nature Alliance.



PARTICIPATORY VULNERABILITY ASSESSMENTS

In the Caribbean, responses to climate change impacts have been sought mainly at the policy level, with few specific actions to build resilience at the landscape or site level. Local traditional knowledge must be considered in order to »climate proof« key sectors such as tourism and agriculture, and communities engaged to implement policies on the ground. In the absence of location-specific scientific data, insights from diverse stakeholders can provide sound information to advise land use development planning.



A 3D relief model was produced in a participatory process

The solution uses Information Communication Tools to effectively engage residents of Tobago. It captures their inputs regarding site-based vulnerabilities and helps to identify those needs and opportunities which can increase the community's resilience to climate change. Stakeholders produce an impressive three-dimensional model of the island, depicting sites and resources that are at risk, analysing impacts on people and crafting simple yet effective solutions to specific local problems.

Participatory tools such as three-dimensional modeling and video bring crucial local knowledge into decision-making while increasing community capacity, cross-sectoral coordination and collaboration for joint action on climate change.

»Our vision is a world-class protected area that is well managed by the community. Our community organisation actively advocates, educates, monitors and co-manages the natural resources that support our local livelihoods,« says Smokey, a local community leader and member of Eco Marine Park Rangers from Speyside, Tobago.

When invited to the modeling session, Smokey used every opportunity to share his experiences and raise passionate discussions on how fishermen like him cope with the impacts of climate change. His inputs were key in refining and validating information submitted by various stakeholders.

Selected by his peers to represent them at the ceremony where the model was handed over to the local government, Smokey highlighted the key issues that need to be addressed to build climate change resilience in Tobago.

Participatory three-dimensional modeling (P3DM)
Local peoples' spatial knowledge is integrated with topographic data to produce a scaled and geo-referenced relief model of land and sea. Stakeholders populate it with their local user inputs using pushpins, yarns and paint. Once data is extracted, digitised and plotted, the model remains with the community. P3DM combines information gathering with analysis and communication for awareness and action.



Production of a 3D relief model

Participatory video (PV)
Stakeholders can directly convey their message, story and ideas through the medium of video. Participants have complete autonomy over the issues they chose to present and the manner in which they present them. It can be used for advocacy, participatory research, planning and monitoring. The videos are shared via (social) media and presented to policy makers and other audiences.



Community members share their stories and ideas about the impacts of climate change

This solution is being implemented by the Caribbean Natural Resources Institute (CANARI).



»Building blocks« we call the core components of a solution. They may be adapted and/or recombined with building blocks from other solutions to address new challenges in different contexts, sectors, or geographies.

Below, over 200 building blocks of the fifty solutions from Latin America and Caribbean included in this brochure are categorised according to their means of action.

ALTERNATIVE LIVELIHOODS:

includes income diversification, skills training

- 54 Community-based ecotourism | [CONCESSIONS FOR MANGROVE CONSERVATION](#)
- 64 Eggs-for-food exchange | [INTEGRATED APPROACH FOR TURTLE CONSERVATION](#)
- 94 Mangrove ecotourism | [RESTORATION OF DEGRADED MANGROVE ECOSYSTEMS](#)
- 88 Production and sales | [MAKING MONEY FROM SCRAPS](#)
- 102 Science-based tourism | [EMPOWERING ARTISANAL FISHERMEN IN MANTA RAY ECOTOURISM](#)
- 44 Sustainable ecotourism | [COMMUNITIES LEADING SUSTAINABLE FISHERIES MANAGEMENT](#)
- 10 Value-added lionfish products | [BUILDING A MARKET FOR LIONFISH REMOVAL](#)
- 28 Viable economic alternatives | [MAR FUND: REGIONAL REEF CONSERVATION](#)

CAPACITY DEVELOPMENT:

the process of strengthening the abilities of individuals, organisations and societies to make effective use of the resources, in order to achieve their own goals on a sustainable basis, e.g. through trainings, e-learning, strengthening institutions

- 102 Business development training for fishers | [EMPOWERING ARTISANAL FISHERMEN IN MANTA RAY ECOTOURISM](#)
- 54 Capacity building for communities | [CONCESSIONS FOR MANGROVE CONSERVATION](#)
- 88 Dissemination and training | [MAKING MONEY FROM SCRAPS](#)
- 94 Dissemination and training | [RESTORATION OF DEGRADED MANGROVE ECOSYSTEMS](#)
- 78 Empowerment of fishermen | [EMPOWERING FISHERMEN THROUGH CO-MANAGEMENT](#)
- 74 Implementation of regulations | [COMPLIANCE IN PROTECTED AREAS](#)
- 86 New skills and knowledge for local leaders | [LEADERS FOR REEF CONSERVATION](#)
- 72 Pride training programme | [COMMUNITY STEWARDSHIP OF MARINE RESOURCES](#)

- 26 Promotion of active participation | [STRENGTHENING CARIBBEAN FISHERFOLK](#)
- 70 Promotion of leadership and collective action | [COMMUNITY-BASED MANAGEMENT FOR ARTISANAL FISHERIES](#)
- 72 Technical assistance (TA) | [COMMUNITY STEWARDSHIP OF MARINE RESOURCES](#)
- 84 Thematic workshops | [HELPING FISHERMEN REDUCE THEIR IMPACT](#)
- 12 Training in valuation | [ECONOMIC VALUATION OF BELIZE'S REEFS AND MANGROVES](#)
- 24 Trust fund operationalisation | [REGIONAL BIODIVERSITY FUND](#)

COLLECTION OF DATA AND INFORMATION:

tools, surveys, assessments or research applied in the inception phase of project/intervention, can include biodiversity & socioeconomic information; used in order to create baseline, define intervention area, generate information on gaps/needs

- 38 Carbon inventories | [BLUE CARBON A-Z: FROM SMALL PROJECTS TO POLICY DEVELOPMENT](#)
- 40 Catch composition monitoring | [CERTIFICATION OF ARTISANAL SNAPPER FISHERY](#)
- 14 Characterisation of ecosystem services | [VALUATING CLIMATE ADAPTATION OPTIONS ON PLACENCIA PENINSULA](#)
- 58 Climate change impact visualisation | [AT THE WATER'S EDGE: ENHANCING COASTAL RESILIENCE IN GRENADA](#)
- 20 Climate change vulnerability assessment | [CLIMATE SENSITIVE PLANNING](#)
- 14 Climate impact hypotheses | [VALUATING CLIMATE ADAPTATION OPTIONS ON PLACENCIA PENINSULA](#)
- 12 Coastline resource use | [ECONOMIC VALUATION OF BELIZE'S REEFS AND MANGROVES](#)
- 60 Collaborative data gathering | [TRANSBOUNDARY MARINE SPATIAL PLANNING](#)
- 68 Collaborative science | [CATCH SHARES: A FRAMEWORK FOR SUSTAINABLE FISHERIES](#)
- 64 Data-based decision making | [INTEGRATED APPROACH FOR TURTLE CONSERVATION](#)
- 94 Determination of stressors | [RESTORATION OF DEGRADED MANGROVE ECOSYSTEMS](#)
- 100 Determination of the carrying capacity | [TOURISM AS DRIVER FOR CHANGE](#)
- 106 Economic valuation study | [CORAL REEF VALUATION SUPPORTS THE ESTABLISHMENT OF A MARINE PROTECTED AREA](#)
- 74 Evaluation of protected area effectiveness | [COMPLIANCE IN PROTECTED AREAS](#)
- 42 Focal management targets | [COASTAL COMMUNITIES COMBAT CLIMATE CHANGE](#)
- 72 Formative research | [COMMUNITY STEWARDSHIP OF MARINE RESOURCES](#)
- 46 Identification of the appropriate standard | [FINANCIAL MECHANISM FOR COASTAL FOREST RESTORATION](#)
- 58 Informed decision making | [AT THE WATER'S EDGE: ENHANCING COASTAL RESILIENCE IN GRENADA](#)
- 50 National protected areas coverage analysis | [MULTI-SECTORAL COASTAL AND MARINE MANAGEMENT VISION](#)

- 52 Nesting beach conservation | [HAWKSBILL TURTLE RECOVERY](#)
- 108 Participatory three-dimensional modeling (P3DM) | [PARTICIPATORY VULNERABILITY ASSESSMENTS](#)
- 52 Reduction of fisheries bycatch | [HAWKSBILL TURTLE RECOVERY](#)
- 22 Research and monitoring | [A STRATEGY FOR THE CONTROL OF INVASIVE LIONFISH](#)
- 30 Scenic classification survey | [ASSESSING AND MANAGING THE COASTAL SCENERY](#)
- 48 Science-based design | [MANGROVE RESTORATION FOR SECURE LIVELIHOODS AND CARBON STORAGE](#)
- 96 Study on healthy ecological conditions | [RESTORATION OF MANGROVES IN THE SIAN KA'AN BIOSPHERE RESERVE](#)
- 82 Systematisation of good practices | [GOOD PRACTICES FOR CLIMATE CHANGE ADAPTATION](#)
- 38 Valuation of ecosystem services | [BLUE CARBON A-Z: FROM SMALL PROJECTS TO POLICY DEVELOPMENT](#)
- 38 Vulnerability assessments | [BLUE CARBON A-Z: FROM SMALL PROJECTS TO POLICY DEVELOPMENT](#)

CO-MANAGEMENT BUILDING:

development of institutional, legal, operational and administrative components for effective co-management, including community members and groups, governmental authorities at levels concerned, non-governmental organisations and partners, private sector and any other stakeholder

- 48 Active stakeholders across levels | [MANGROVE RESTORATION FOR SECURE LIVELIHOODS AND CARBON STORAGE](#)
- 70 Community-based marine reserves | [COMMUNITY-BASED MANAGEMENT FOR ARTISANAL FISHERIES](#)
- 44 Community-managed marine areas | [COMMUNITIES LEADING SUSTAINABLE FISHERIES MANAGEMENT](#)
- 104 Management committee | [SUSTAINABLE MACROALGAE HARVESTING IN A RESERVE](#)
- 16 Multi-sectorial advisory committees | [VALUING ECOSYSTEM SERVICES FOR INTEGRATED MANAGEMENT](#)
- 32 Organisational empowerment | [BRINGING SUSTAINABLE FISH TO YOUR PLATE](#)
- 68 Participation and co-management | [CATCH SHARES: A FRAMEWORK FOR SUSTAINABLE FISHERIES](#)
- 44 Participatory local governance | [COMMUNITIES LEADING SUSTAINABLE FISHERIES MANAGEMENT](#)
- 28 Participatory management | [MAR FUND: REGIONAL REEF CONSERVATION](#)
- 40 Promotion of fisheries co-management | [CERTIFICATION OF ARTISANAL SNAPPER FISHERY](#)
- 54 Resource-use associations | [CONCESSIONS FOR MANGROVE CONSERVATION](#)
- 84 Roles and responsibilities | [HELPING FISHERMEN REDUCE THEIR IMPACT](#)
- 102 Tourism infrastructure and mentorship | [EMPOWERING ARTISANAL FISHERMEN IN MANTA RAY ECOTOURISM](#)

COMMUNICATION, OUTREACH AND AWARENESS BUILDING:

includes resource documents as knowledge products for stakeholders' reference, translation of resource documents into other languages, sharing of experiences to disseminate best practices; cross visits to exchange experiences; specific events tailored to inform and change behaviour

- 38 Blue carbon networks | [BLUE CARBON A-Z: FROM SMALL PROJECTS TO POLICY DEVELOPMENT](#)
- 76 Awareness raising | [COZUMEL REEF MANAGEMENT COOPERATION](#)
- 22 Awareness raising on invasive species | [A STRATEGY FOR THE CONTROL OF INVASIVE LIONFISH](#)
- 20 Awareness-raising storylines | [CLIMATE SENSITIVE PLANNING](#)
- 16 Communicating ecosystem services | [VALUING ECOSYSTEM SERVICES FOR INTEGRATED MANAGEMENT](#)
- 18 Communication about ecosystem service values | [NATURE'S CONTRIBUTION TO THE ECONOMY](#)
- 96 Communication and dissemination | [RESTORATION OF MANGROVES IN THE SIAN KA'AN BIOSPHERE RESERVE](#)
- 32 Communication strategy | [BRINGING SUSTAINABLE FISH TO YOUR PLATE](#)
- 32 Consumer sensitisation | [BRINGING SUSTAINABLE FISH TO YOUR PLATE](#)
- 108 Participatory video (PV) | [PARTICIPATORY VULNERABILITY ASSESSMENTS](#)
- 82 Regional knowledge transfer | [GOOD PRACTICES FOR CLIMATE CHANGE ADAPTATION](#)
- 12 Targeted communication | [ECONOMIC VALUATION OF BELIZE'S REEFS AND MANGROVES](#)
- 14 Transparent sharing of information | [VALUATING CLIMATE ADAPTATION OPTIONS ON PLACENCIA PENINSULA](#)
- 26 Use of Information and Communications Technology (ICT) | [STRENGTHENING CARIBBEAN FISHERFOLK](#)
- 102 Workshops for artisanal fishermen | [EMPOWERING ARTISANAL FISHERMEN IN MANTA RAY ECOTOURISM](#)

ENFORCEMENT:

efforts leading to enforcement of laws, regulations and activities

- 28 Enforcement programme | [MAR FUND: REGIONAL REEF CONSERVATION](#)
- 74 Surveillance and Enforcement | [COMPLIANCE IN PROTECTED AREAS](#)

FINANCE SCHEME:

includes micro finance plans and institutions, payment for ecosystem services schemes, other sustainable financing options such as entrance fees, funding support, financial incentives and offsets, diversification of funding sources, development of financial plan

- 46 Conservation credit unit (CCU) marketing | [FINANCIAL MECHANISM FOR COASTAL FOREST RESTORATION](#)
- 80 Diverse financing mechanisms | [FUNCTIONING WATERSHEDS IN THE FACE OF CLIMATE CHANGE](#)
- 56 Economic incentives | [SUSTAINABLE FISHERIES IN THE GALERA-SAN FRANCISCO MARINE RESERVE](#)
- 78 Financial compensation | [EMPOWERING FISHERMEN THROUGH CO-MANAGEMENT](#)
- 98 Flexible and transparent fund administration | [SUSTAINABLE FINANCING OF MARINE PROTECTED AREA](#)
- 88 Government seed funding | [MAKING MONEY FROM SCRAPS](#)
- 64 Incentives to share local knowledge | [INTEGRATED APPROACH FOR TURTLE CONSERVATION](#)
- 24 Independent Conservation Trust Funds | [REGIONAL BIODIVERSITY FUND](#)
- 74 Long-term financing | [COMPLIANCE IN PROTECTED AREAS](#)
- 24 Long-term funding strategy | [REGIONAL BIODIVERSITY FUND](#)
- 64 Sponsor a Nest – Ecotourism | [INTEGRATED APPROACH FOR TURTLE CONSERVATION](#)
- 36 Trust fund | [A CONSERVATION MODEL FOR COSTA RICA](#)

LAW AND REGULATIONS:

includes codes of conduct, definition of user rights, drawing up legislation

- 56 Conservation agreement | [SUSTAINABLE FISHERIES IN THE GALERA-SAN FRANCISCO MARINE RESERVE](#)
- 70 Fisheries certification | [COMMUNITY-BASED MANAGEMENT FOR ARTISANAL FISHERIES](#)
- 40 Fishery management plan | [CERTIFICATION OF ARTISANAL SNAPPER FISHERY](#)
- 68 Fishing access rights | [CATCH SHARES: A FRAMEWORK FOR SUSTAINABLE FISHERIES](#)
- 50 Governance model | [MULTI-SECTORAL COASTAL AND MARINE MANAGEMENT VISION](#)
- 78 Legal and institutional framework analysis | [EMPOWERING FISHERMEN THROUGH CO-MANAGEMENT](#)
- 44 Legal recognition | [COMMUNITIES LEADING SUSTAINABLE FISHERIES MANAGEMENT](#)
- 104 Legal resource use rights | [SUSTAINABLE MACROALGAE HARVESTING IN A RESERVE](#)
- 20 Legislation for municipal restoration plan | [CLIMATE SENSITIVE PLANNING](#)
- 104 Macroalgae quotas | [SUSTAINABLE MACROALGAE HARVESTING IN A RESERVE](#)

- 54 Mangrove management plan | [CONCESSIONS FOR MANGROVE CONSERVATION](#)
- 44 Responsible fishing Code of Conduct | [COMMUNITIES LEADING SUSTAINABLE FISHERIES MANAGEMENT](#)

LEARNING & EDUCATION:

includes pilot projects and sites that serve as demonstration and learning platforms for multiplying successful solutions, addressing a wide range of beneficiaries from managers, community groups, tourists, students, governmental and policy makers to persons involved in research and science

- 84 Education campaigns | [HELPING FISHERMEN REDUCE THEIR IMPACT](#)
- 66 Environmental education | [GET MUDDY! MANGROVE RESTORATION IN GUANAJA](#)
- 64 Environmental education | [INTEGRATED APPROACH FOR TURTLE CONSERVATION](#)
- 86 Pilot projects for upscaling | [LEADERS FOR REEF CONSERVATION](#)

MONITORING/EVALUATION/OVERSEERING IMPLEMENTATION:

used to understand long-term development of interventions; used to measure progress and impact of project/activity

- 24 Common trust fund monitoring | [REGIONAL BIODIVERSITY FUND](#)
- 44 Fishery database | [COMMUNITIES LEADING SUSTAINABLE FISHERIES MANAGEMENT](#)
- 34 Implementation of adaptation actions | [CLIMATE-SMART CONSERVATION FOR MARINE PROTECTED AREAS](#)
- 92 International fishing improvement projects | [RESCUING VALUE IN THE FISH MARKET](#)
- 52 In-water monitoring | [HAWKSBILL TURTLE RECOVERY](#)
- 10 Lionfish catch targets | [BUILDING A MARKET FOR LIONFISH REMOVAL](#)
- 72 Monitoring & evaluation | [COMMUNITY STEWARDSHIP OF MARINE RESOURCES](#)
- 96 Monitoring and evaluation | [RESTORATION OF MANGROVES IN THE SIAN KA'AN BIOSPHERE RESERVE](#)
- 30 Monitoring of coastal scenery | [ASSESSING AND MANAGING THE COASTAL SCENERY](#)
- 66 Monitoring restoration success | [GET MUDDY! MANGROVE RESTORATION IN GUANAJA](#)
- 56 Participatory fisheries monitoring | [SUSTAINABLE FISHERIES IN THE GALERA-SAN FRANCISCO MARINE RESERVE](#)
- 100 Participatory monitoring | [TOURISM AS DRIVER FOR CHANGE](#)
- 28 Partnership approach to monitoring | [MAR FUND: REGIONAL REEF CONSERVATION](#)
- 64 Volunteer engagement | [INTEGRATED APPROACH FOR TURTLE CONSERVATION](#)

PARTNERSHIP:

develop and/or strengthen (multi-stakeholder) partnerships and cooperation

- 82 Alliances for innovation | [GOOD PRACTICES FOR CLIMATE CHANGE ADAPTATION](#)
- 40 Alternative markets for certified fish | [CERTIFICATION OF ARTISANAL SNAPPER FISHERY](#)
- 102 Ecotourism marketing | [EMPOWERING ARTISANAL FISHERMEN IN MANTA RAY ECOTOURISM](#)
- 10 Emergent lionfish fishery | [BUILDING A MARKET FOR LIONFISH REMOVAL](#)
- 92 Environmental acumen | [RESCUING VALUE IN THE FISH MARKET](#)
- 26 Establishment of fisherfolk organisations | [STRENGTHENING CARIBBEAN FISHERFOLK](#)
- 32 Fair agreements | [BRINGING SUSTAINABLE FISH TO YOUR PLATE](#)
- 40 International certification | [CERTIFICATION OF ARTISANAL SNAPPER FISHERY](#)
- 86 Life-long networking opportunities | [LEADERS FOR REEF CONSERVATION](#)
- 76 Multi-stakeholder workshops | [COZUMEL REEF MANAGEMENT COOPERATION](#)
- 80 Public-private collaboration | [FUNCTIONING WATERSHEDS IN THE FACE OF CLIMATE CHANGE](#)
- 36 Public-private partnership | [A CONSERVATION MODEL FOR COSTA RICA](#)
- 98 Public-private partnership for MPA financing | [SUSTAINABLE FINANCING OF MARINE PROTECTED AREAS](#)
- 22 Regional and intersectoral collaboration | [A STRATEGY FOR THE CONTROL OF INVASIVE LIONFISH](#)
- 92 Responsible seafood production co-ops | [RESCUING VALUE IN THE FISH MARKET](#)
- 52 Restoration of marine turtle habitats | [HAWKSBILL TURTLE RECOVERY](#)
- 94 Stakeholder engagement | [RESTORATION OF DEGRADED MANGROVE ECOSYSTEMS](#)
- 26 Strategic partnerships for fisherfolk | [STRENGTHENING CARIBBEAN FISHERFOLK](#)
- 68 Unconventional strategic partnerships | [CATCH SHARES: A FRAMEWORK FOR SUSTAINABLE FISHERIES](#)

POLICY ADVOCACY:

includes campaigns to get support from influential people; gain political support; identify and “use” champions

- 26 Compliance with policy frameworks | [STRENGTHENING CARIBBEAN FISHERFOLK](#)
- 40 Fishery management guide | [CERTIFICATION OF ARTISANAL SNAPPER FISHERY](#)
- 24 Government commitment | [REGIONAL BIODIVERSITY FUND](#)
- 48 Informing policy processes | [MANGROVE RESTORATION FOR SECURE LIVELIHOODS AND CARBON STORAGE](#)

- 38 National policy frameworks | [BLUE CARBON A-Z: FROM SMALL PROJECTS TO POLICY DEVELOPMENT](#)
- 70 Policy advice | [COMMUNITY-BASED MANAGEMENT FOR ARTISANAL FISHERIES](#)

REVIEW:

includes revisions of processes, management plans etc.; management cycles to adapt to changing circumstances and influences

- 76 Evaluation of environmental policy | [COZUMEL REEF MANAGEMENT COOPERATION](#)
- 62 New management actions | [CONNECTING A COASTAL RESERVE WITH ITS SURROUNDINGS](#)

STAKEHOLDER DIALOGUE:

details various approaches to stakeholder consultation and involvement, including community engagement

- 60 Communication for stakeholder engagement | [TRANSBOUNDARY MARINE SPATIAL PLANNING](#)
- 84 Consensus on natural resource use | [HELPING FISHERMEN REDUCE THEIR IMPACT](#)
- 104 Dialogue between fishermen and MPA officials | [SUSTAINABLE MACROALGAE HARVESTING IN A RESERVE](#)
- 82 Engagement of interest groups | [GOOD PRACTICES FOR CLIMATE CHANGE ADAPTATION](#)
- 78 Inter-sectoral collaboration | [EMPOWERING FISHERMEN THROUGH CO-MANAGEMENT](#)
- 96 Involvement of stakeholders | [RESTORATION OF MANGROVES IN THE SIAN KA’AN BIOSPHERE RESERVE](#)
- 100 Local stakeholder engagement | [TOURISM AS DRIVER FOR CHANGE](#)
- 12 Meaningful stakeholder engagement | [ECONOMIC VALUATION OF BELIZE’S REEFS AND MANGROVES](#)
- 90 Mentoring national park staff | [MITIGATING HUMAN IMPACTS ON CORAL REEFS](#)
- 50 Multi-sectoral dialogue platform | [MULTI-SECTORAL COASTAL AND MARINE MANAGEMENT VISION](#)
- 62 Permanent stakeholder engagement | [CONNECTING A COASTAL RESERVE WITH ITS SURROUNDINGS](#)
- 42 Social indicators | [COASTAL COMMUNITIES COMBAT CLIMATE CHANGE](#)
- 92 Social intelligence | [RESCUING VALUE IN THE FISH MARKET](#)
- 18 Workshops on ecosystem services | [NATURE’S CONTRIBUTION TO THE ECONOMY](#)

STRATEGY AND PLAN:

process of developing reference / guiding documents; combines information from various sources, e.g. local & scientific knowledge

- 88 Business plan for fishmeal production | [MAKING MONEY FROM SCRAPS](#)
- 42 Communication and coordination networks | [COASTAL COMMUNITIES COMBAT CLIMATE CHANGE](#)
- 34 Conservation targets | [CLIMATE-SMART CONSERVATION FOR MARINE PROTECTED AREAS](#)
- 22 Control of lionfish populations | [A STRATEGY FOR THE CONTROL OF INVASIVE LIONFISH](#)
- 78 Design and implementation of fish refuges | [EMPOWERING FISHERMEN THROUGH CO-MANAGEMENT](#)
- 34 Formulation of adaptation actions | [CLIMATE-SMART CONSERVATION FOR MARINE PROTECTED AREAS](#)
- 36 Implementation and Monitoring Plan | [A CONSERVATION MODEL FOR COSTA RICA](#)
- 80 Integrated watershed action plan | [FUNCTIONING WATERSHEDS IN THE FACE OF CLIMATE CHANGE](#)
- 106 Integration of ecosystem services into management | [CORAL REEF VALUATION SUPPORTS THE ESTABLISHMENT OF A MARINE PROTECTED AREA](#)
- 74 Interagency working group | [COMPLIANCE IN PROTECTED AREAS](#)
- 20 Joint adaptation planning | [CLIMATE SENSITIVE PLANNING](#)
- 50 Legally established participatory process | [MULTI-SECTORAL COASTAL AND MARINE MANAGEMENT VISION](#)
- 84 Management plan for the National Park | [HELPING FISHERMEN REDUCE THEIR IMPACT](#)
- 60 Multi-use zoning design | [TRANSBOUNDARY MARINE SPATIAL PLANNING](#)
- 30 Scenery management plan | [ASSESSING AND MANAGING THE COASTAL SCENERY](#)
- 18 Scoping procedure | [NATURE'S CONTRIBUTION TO THE ECONOMY](#)
- 72 Theory of Change (ToC) | [COMMUNITY STEWARDSHIP OF MARINE RESOURCES](#)

TECHNICAL METHOD, TECHNIQUE AND TOOL:

related to technical efforts; can be used for different purposes throughout projects/efforts

- 14 Climate adaptation scenarios | [VALUATING CLIMATE ADAPTATION OPTIONS ON PLACENCIA PENINSULA](#)
- 62 Conceptual Ecological Model | [CONNECTING A COASTAL RESERVE WITH ITS SURROUNDINGS](#)
- 14 Cost-benefit analysis | [VALUATING CLIMATE ADAPTATION OPTIONS ON PLACENCIA PENINSULA](#)
- 92 Economic acumen | [RESCUING VALUE IN THE FISH MARKET](#)
- 18 Ecosystem service valuation | [NATURE'S CONTRIBUTION TO THE ECONOMY](#)

- 46 Feasibility study and benefit validation | [FINANCIAL MECHANISM FOR COASTAL FOREST RESTORATION](#)
- 38 Geospatial and emissions modeling | [BLUE CARBON A-Z: FROM SMALL PROJECTS TO POLICY DEVELOPMENT](#)
- 58 Integrated vulnerability enhancement | [AT THE WATER'S EDGE: ENHANCING COASTAL RESILIENCE IN GRENADA](#)
- 54 Mangrove restoration | [CONCESSIONS FOR MANGROVE CONSERVATION](#)
- 96 Mangrove restoration | [RESTORATION OF MANGROVES IN THE SIAN KA'AN BIOSPHERE RESERVE](#)
- 94 Mangrove restoration and monitoring | [RESTORATION OF DEGRADED MANGROVE ECOSYSTEMS](#)
- 66 On-the-ground mangrove planting | [GET MUDDY! MANGROVE RESTORATION IN GUANAJA](#)
- 60 Participatory GIS applications (PGIS) | [TRANSBOUNDARY MARINE SPATIAL PLANNING](#)
- 58 Reef enhancement | [AT THE WATER'S EDGE: ENHANCING COASTAL RESILIENCE IN GRENADA](#)
- 32 Responsible fisheries | [BRINGING SUSTAINABLE FISH TO YOUR PLATE](#)
- 90 Restoration of coral reefs | [MITIGATING HUMAN IMPACTS ON CORAL REEFS](#)
- 16 Scenario development | [VALUING ECOSYSTEM SERVICES FOR INTEGRATED MANAGEMENT](#)
- 30 Scenic evaluation tool | [ASSESSING AND MANAGING THE COASTAL SCENERY](#)
- 72 Social marketing (SM) | [COMMUNITY STEWARDSHIP OF MARINE RESOURCES](#)
- 12 Valuation of reefs and mangroves | [ECONOMIC VALUATION OF BELIZE'S REEFS AND MANGROVES](#)
- 18 Value scenarios for cost of (in)action | [NATURE'S CONTRIBUTION TO THE ECONOMY](#)
- 50 Vulnerability and climate risk assessment | [MULTI-SECTORAL COASTAL AND MARINE MANAGEMENT VISION](#)
- 34 Vulnerability assessments | [CLIMATE-SMART CONSERVATION FOR MARINE PROTECTED AREAS](#)

OTHER

- 90 Underwater Art Museum | [MITIGATING HUMAN IMPACTS ON CORAL REEFS](#)



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