

Caribbean Ocean Governance Belize



Richard Huber
Department of Sustainable Development
Belize -- March 19, 2018



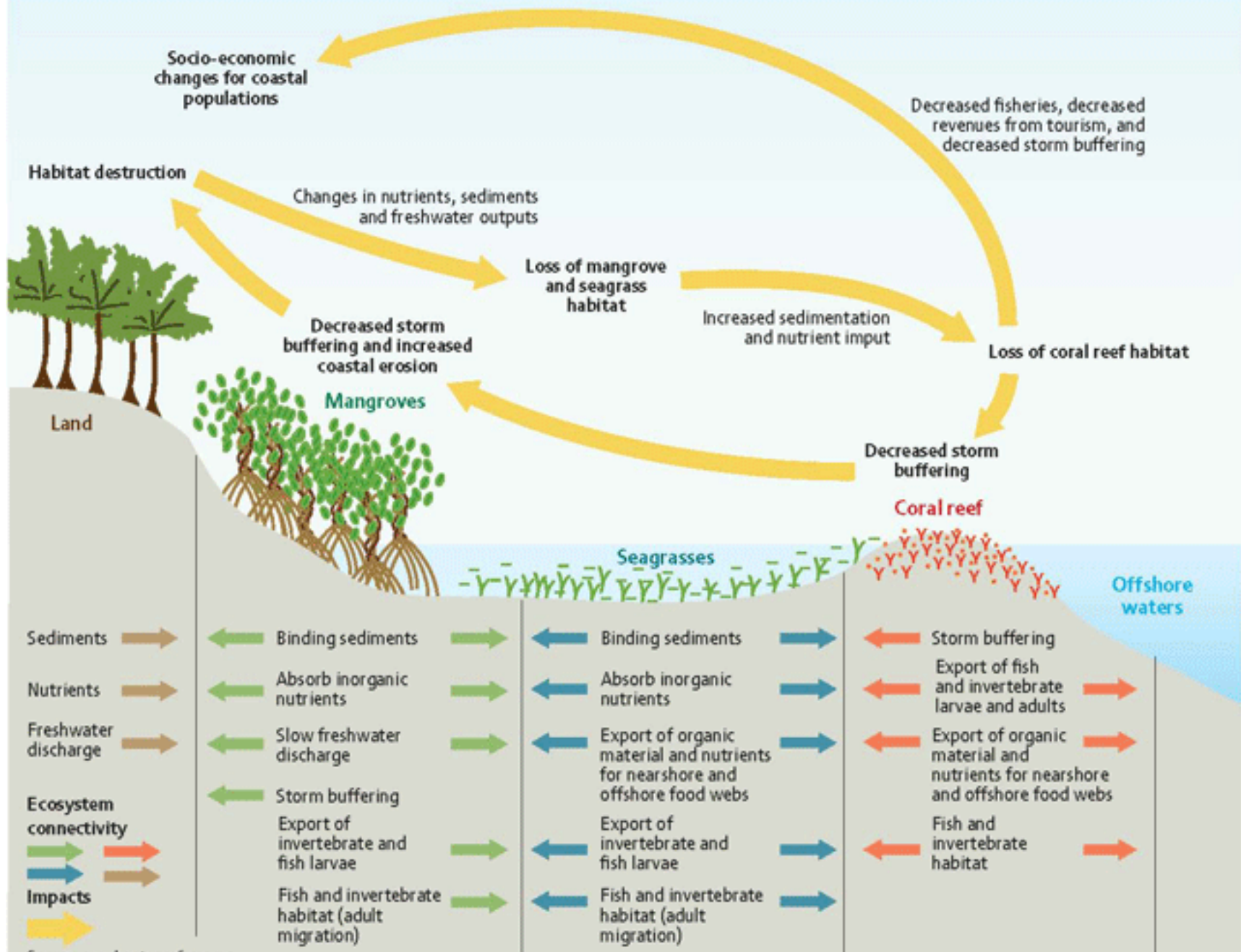
Organization of
American States

1. Natural Capital Project
2. Meso Reef Health Report Card 2018
3. WRI Valuation of Ecosystem Services

Balanced and sustainable use of globally important resource

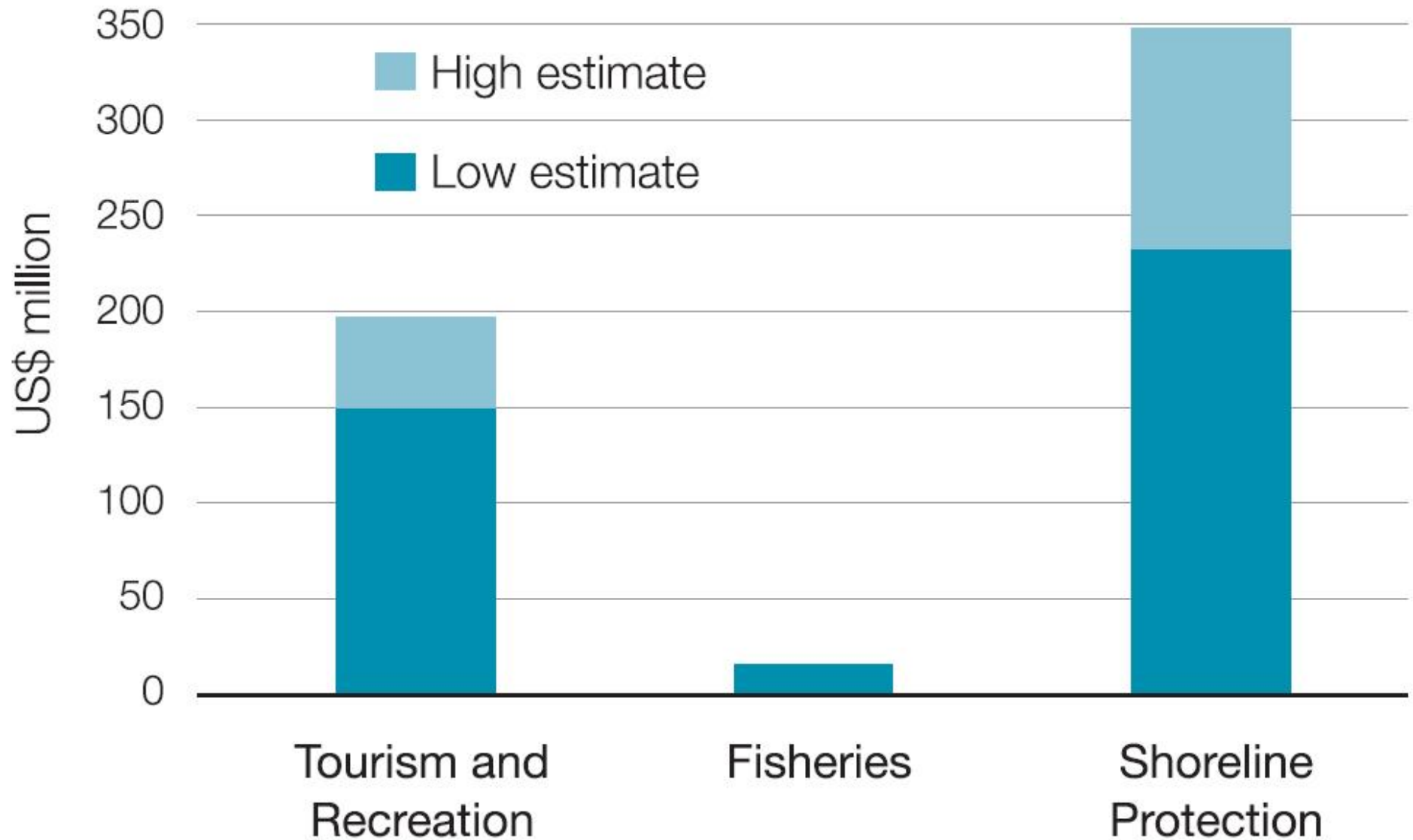
1. Andes-Amazon,
2. Great Barrier Reef,
3. Mesoamerican marine and terrestrial biological corridor (8% of world's biodiversity in 0.5% of area)

Ecosystem connectivity and impacts on ecosystem services from human activities



Source: see chapter references

WRI: Coral Reefs – economically important for Belize



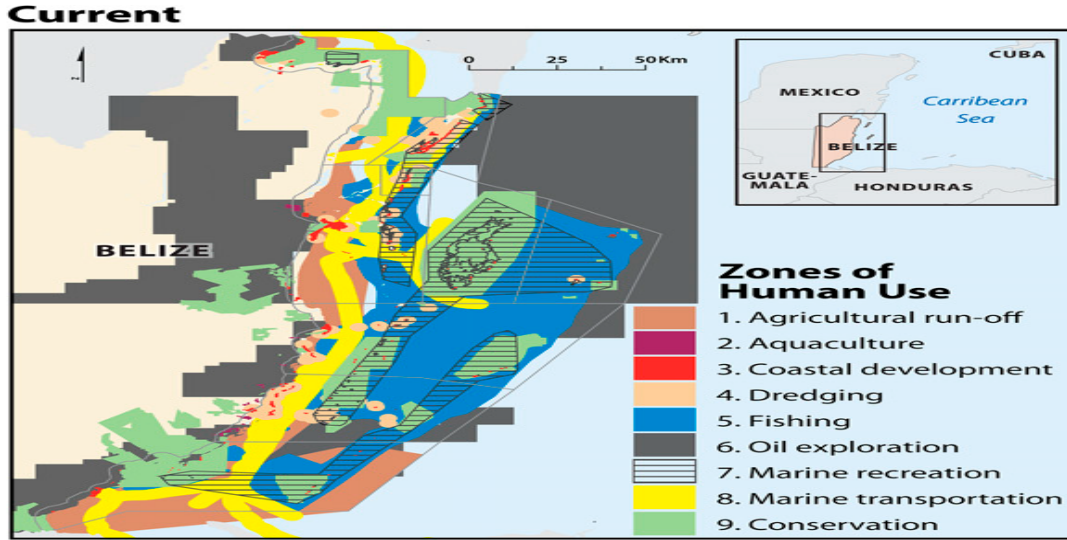
Natural Capital Project

Development scenario ad-hoc
management

Sustainable use of the environment for the
benefit of Belizeans and the global
community

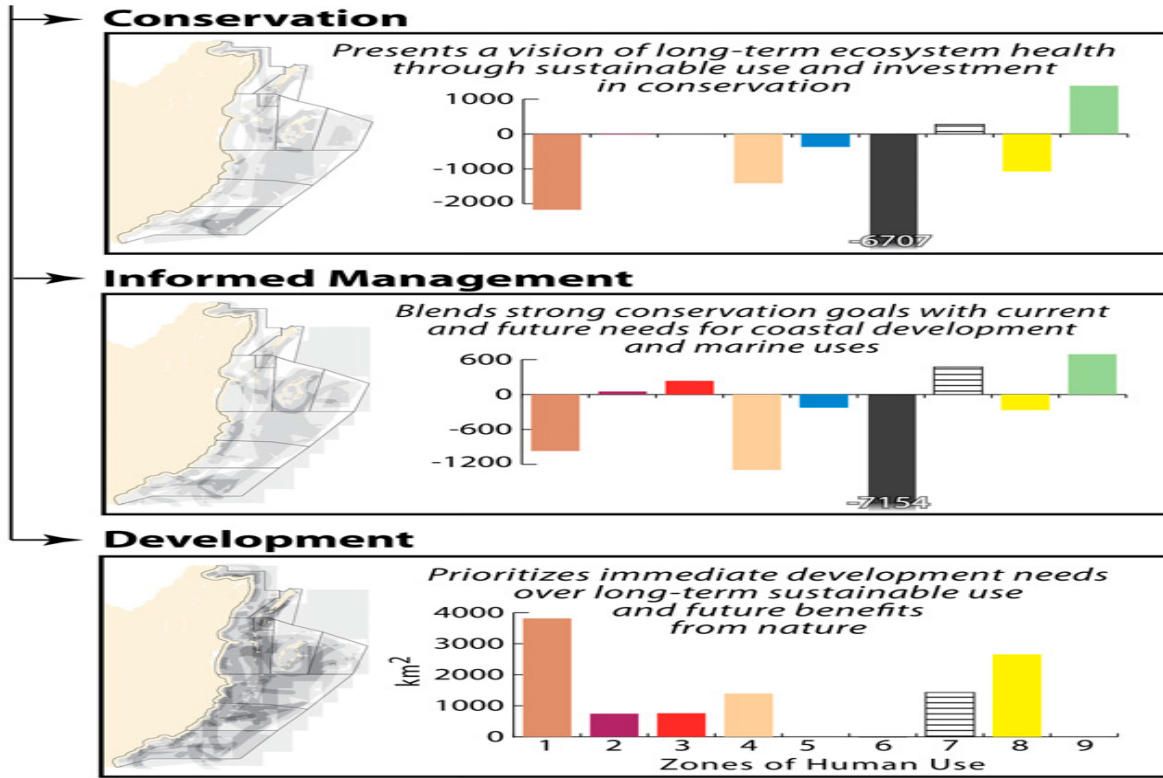
Conservation scenario lacked any future
coastal development—a poor strategy for
growing an economy based on tourism.

2010



The Natural Capital Project

2025



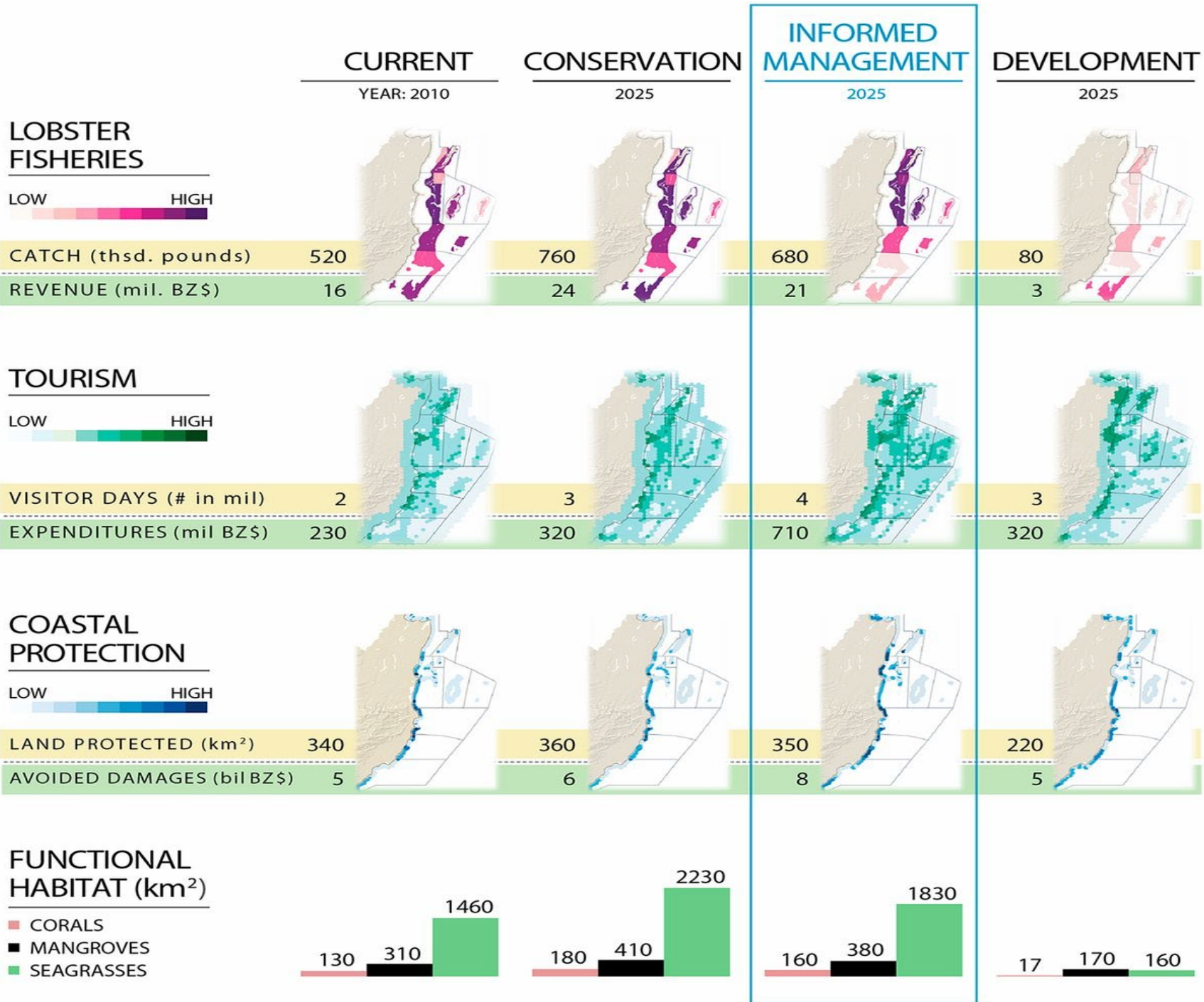
Ecosystem Goods and Services

Balance trade-offs for better outcomes

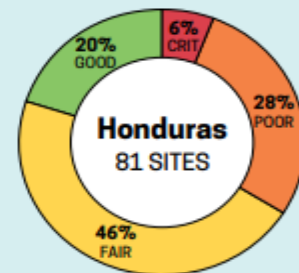
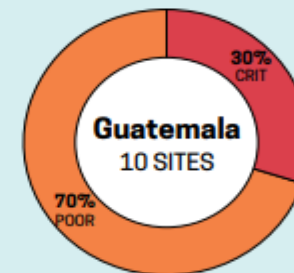
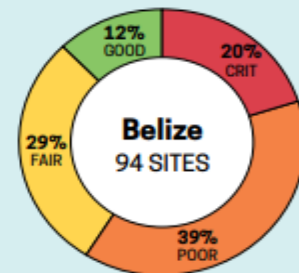
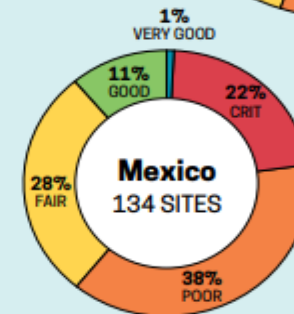
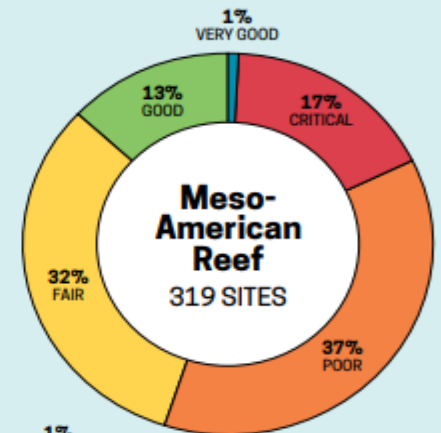
Freq. of Human Use

Low (1) High (7)

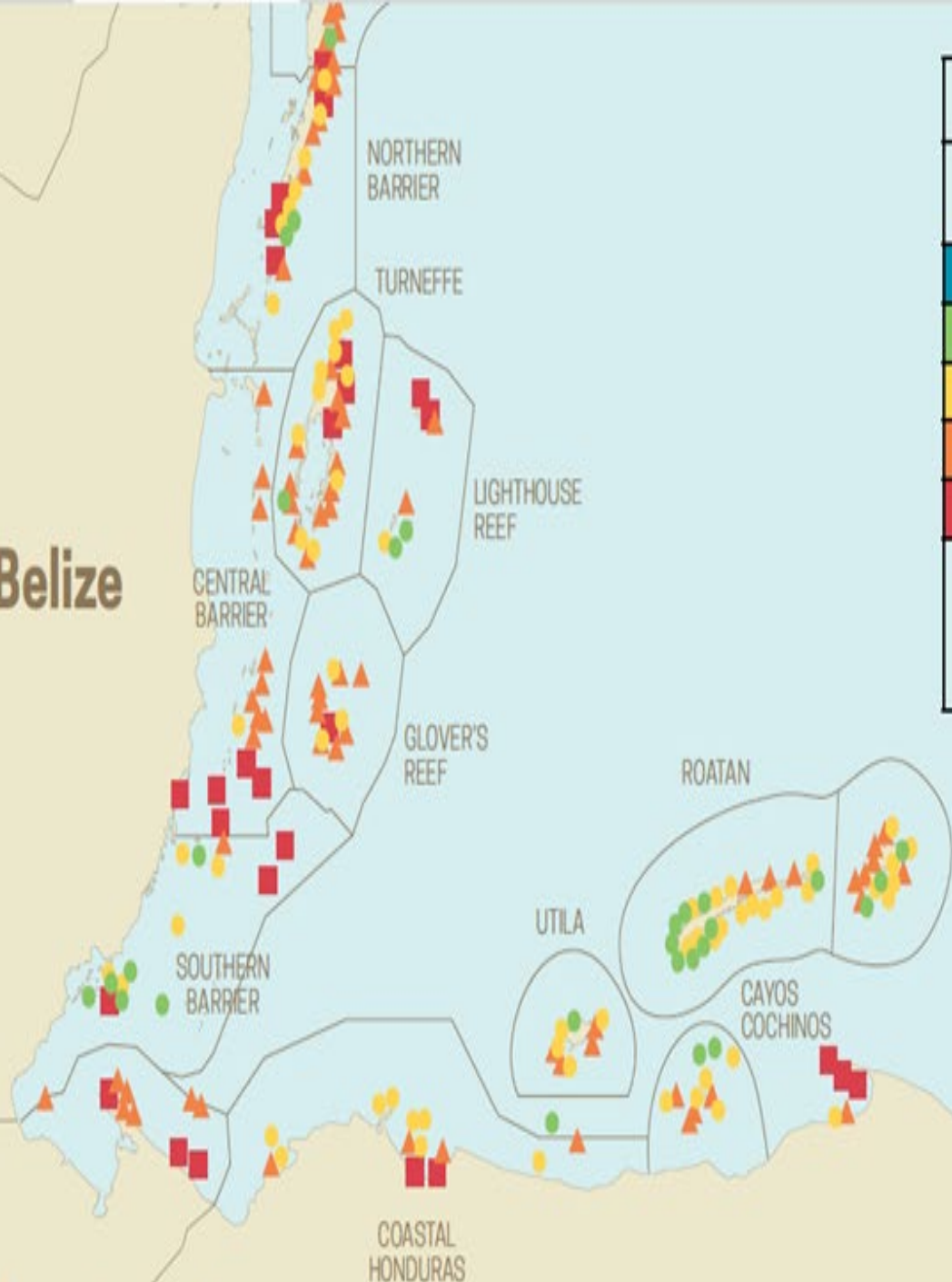
+ Change in area of human use from current



MESOAMERICAN REEF HEALTH REPORT CARD 2018



Belize



Threshold Values for Indicators

(ASSIGNED THE HIGHEST RANK MEETING THESE MINIMUM VALUES)

Grade	Coral Cover	Fleshy Macroalgae Cover	Herbivorous Fish Biomass	Commercial Fish Biomass
Very Good	40%	1%	3,290	1,620
Good	20%	5%	2,740	1,210
Fair	10%	12%	1,860	800
Poor	5%	25%	990	390
Critical	<5%	>25%	<990	<390

Biomass in g/100m²; Cover in percent benthic cover

Fish biomass modifications based on new a and b values; and adjustments for total vs fork length as described in the online supplement (healthyreefs.org)

Grades assigned to the class meeting these minimum values (maximums for macro algae)



SWAN ISLANDS

Belize Improving – Reefs quality improving? GBR and Belize -50%

SPAWNING FOR SUSTAINABILITY

Belize's Spawning Aggregation (SPAG) Working Group has met and monitored the 13 fully protected SPAG sites since establishment in 2003. Several of these **SPAG sites have active enforcement and show signs of recovery and fairly stable populations (1,000–3,000 fish).**

MANAGING ACCESS TO EMPOWER FISHERS AS STEWARDS

In June 2016, Belize inaugurated its **national managed access system**, ending open access fishing for its 3,000 fishers, now limited to 1 of 9 zones. **Co-manage by elected fishers**, increasing accountability, data availability, and incentives to reduce illegal fishing.

ReefFix – Integrated Coastal Zone Management

ReefFix Saint Kitts Nevis – Nevis a model for effective **co-management** of The Narrows /Newcastle Bay, St. Kitts and Nevis. Support Reef Check assessment of hurricane damage to Coral Reefs and marine ecosystems. Workshop January 11-17, 2018

ReefFix Antigua Barbuda -- Capacity building, **public education and awareness** through swimming, **beach cleaning and knowledge of value of the oceans with a focus on children/youth**, with a pilot project to support an NGO that promotes alternative livelihoods in The North East Marine Management Area (NEMMA)

ReefFix Saint Lucia – St. Lucia National Trust – ICZM and supporting more effective **Marine-Turtle Conservation** within the Pointe Sable Environmental Protection Area

ReefFix Belize -- **Belize Audubon Society and the Ministry of Agriculture, Fisheries, Forestry, Environment and Sustainable Development.** Promote progress on ICZM / MPA / coral reef conservation and to collaborate on **coral reef health monitoring** and outreach.

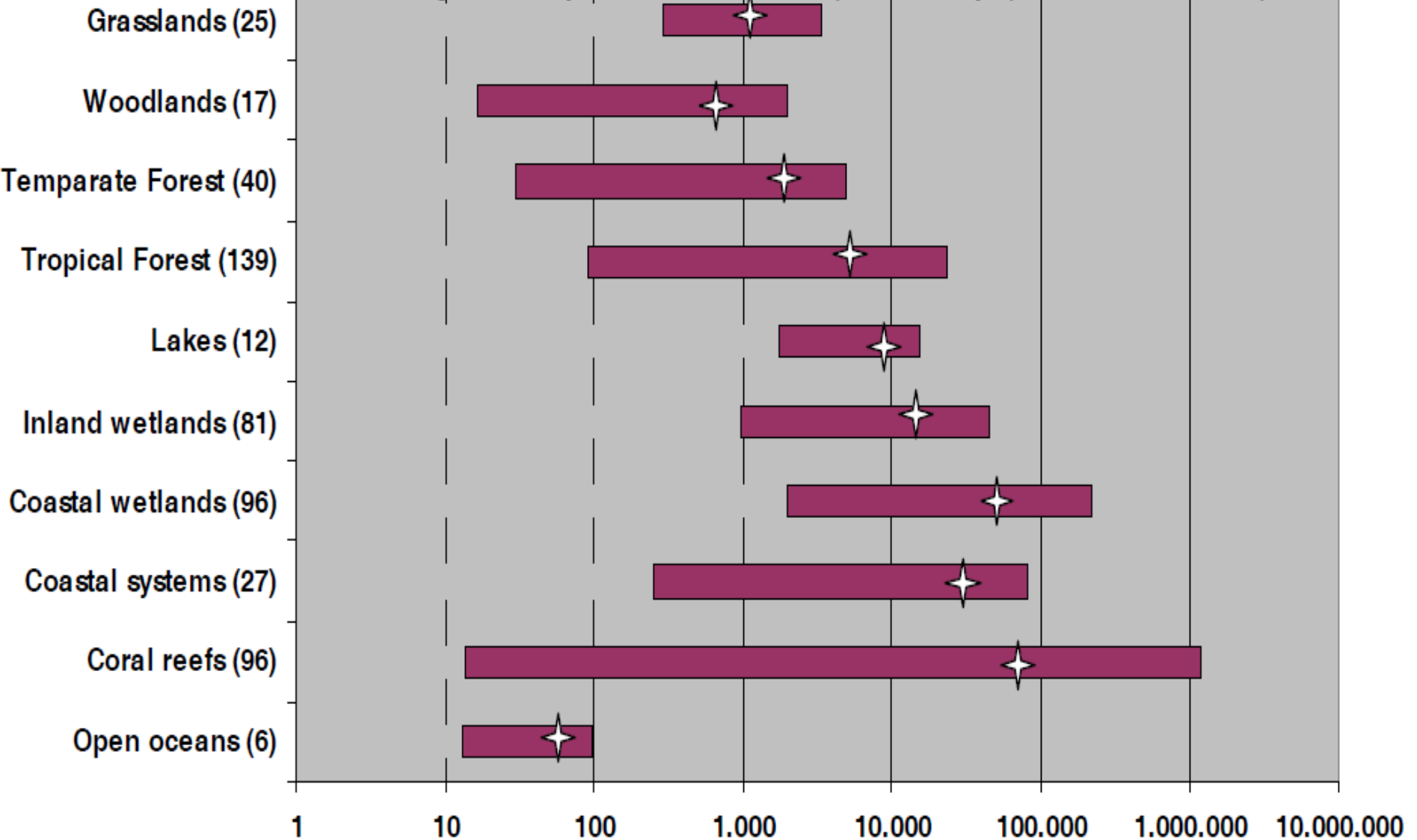
ReefFix Jamaica – Montego Bay Marine Park Trust -- **plant mangroves that includes coastal cleanup**, monitor beach and shoreline, monitor important shallow and dive sites, research and capacity building on invasive lionfish (e.g. cooking and culling competition), to purchase dive and snorkeling equipment and run a summer program for school children including swimming and snorkeling.

ReefFix Dominica –Coral Reef Monitoring, Survey and Evaluation of Hurricane Impact on West Coast of Dominica and collaborate on coral reef health monitoring and outreach.

***2 huge open
ocean parks
Hawaii and
Chile and
Caribbean 2020***

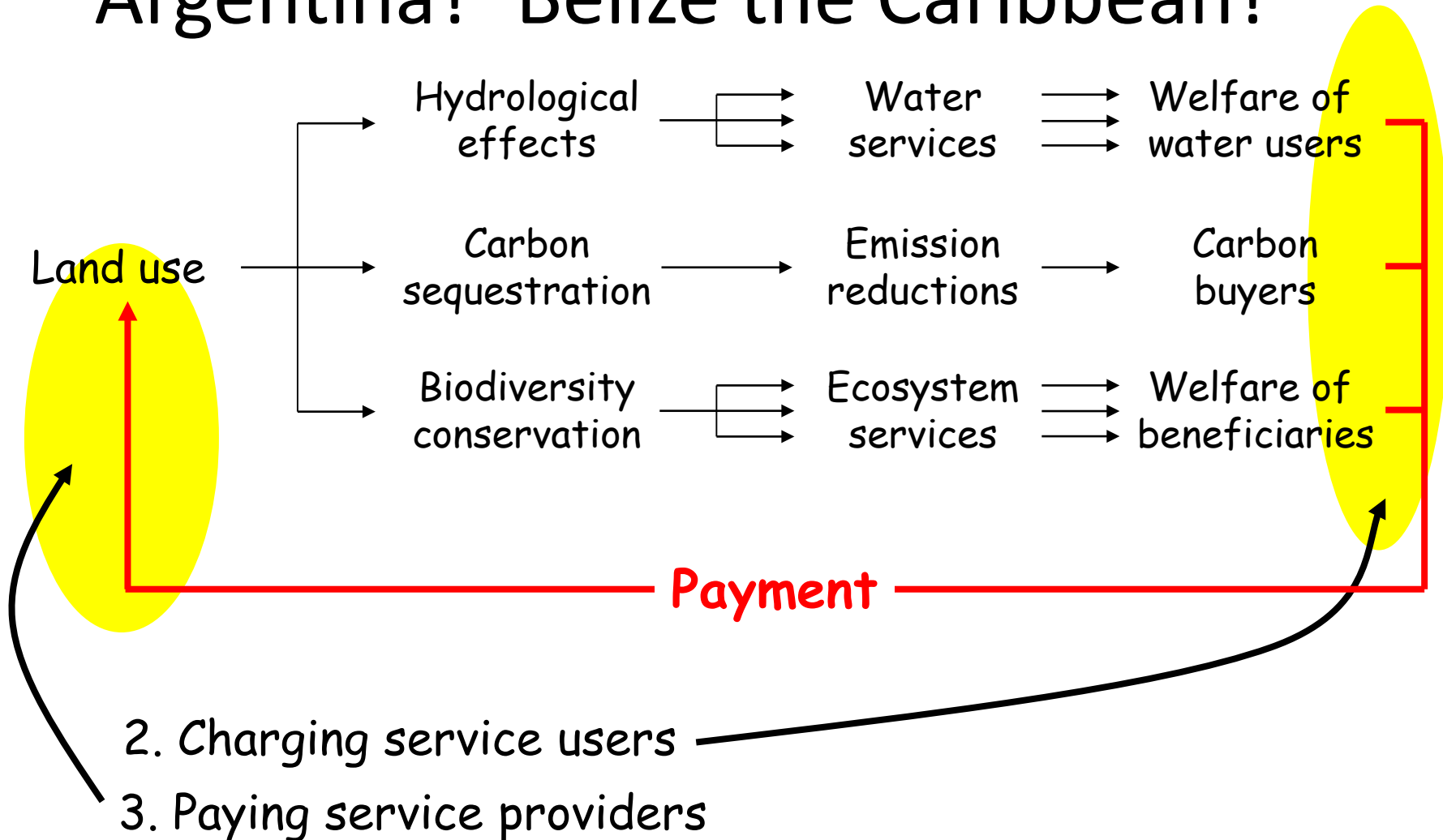


Range of Ecosystem Service Value (in Int.\$/ha/yr (2007/PPP-corrected))



Valuation of Ecosystem

Goods and Services Can Brazil charge Argentina? Belize the Caribbean?



Payments for Ecological Services

Carbon markets the absorption of carbon dioxide from the atmosphere. Certified tradable offsets.

Water markets (Mexico) provide payments for nature's hydrological services filtering of water through wetlands, creation from cloud forest.

Biodiversity markets (Costa Rica) pay annual fee e.g. \$40/ha/yr for the management and preservation biological processes as well as habitat and species.

Bundled payments (Caribbean?) secure all or a combination of carbon, water, and biodiversity services. Bundled payments also include certified timber or certified agricultural produce.

Main beneficiaries of the ecosystem services produced by the Barbados Marine Managed Area

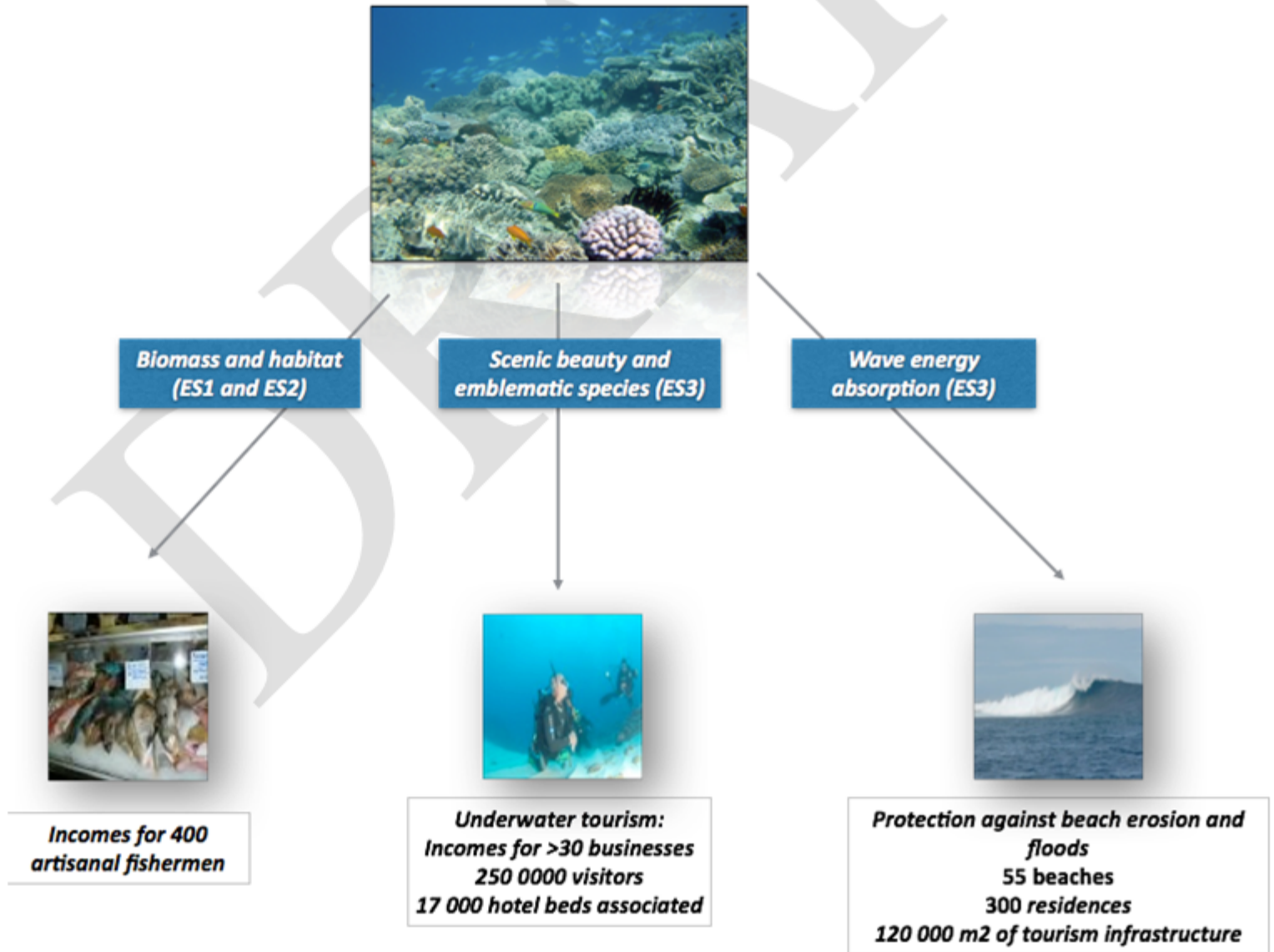


Figure 1: Main beneficiaries of the BMMA (preliminary results)

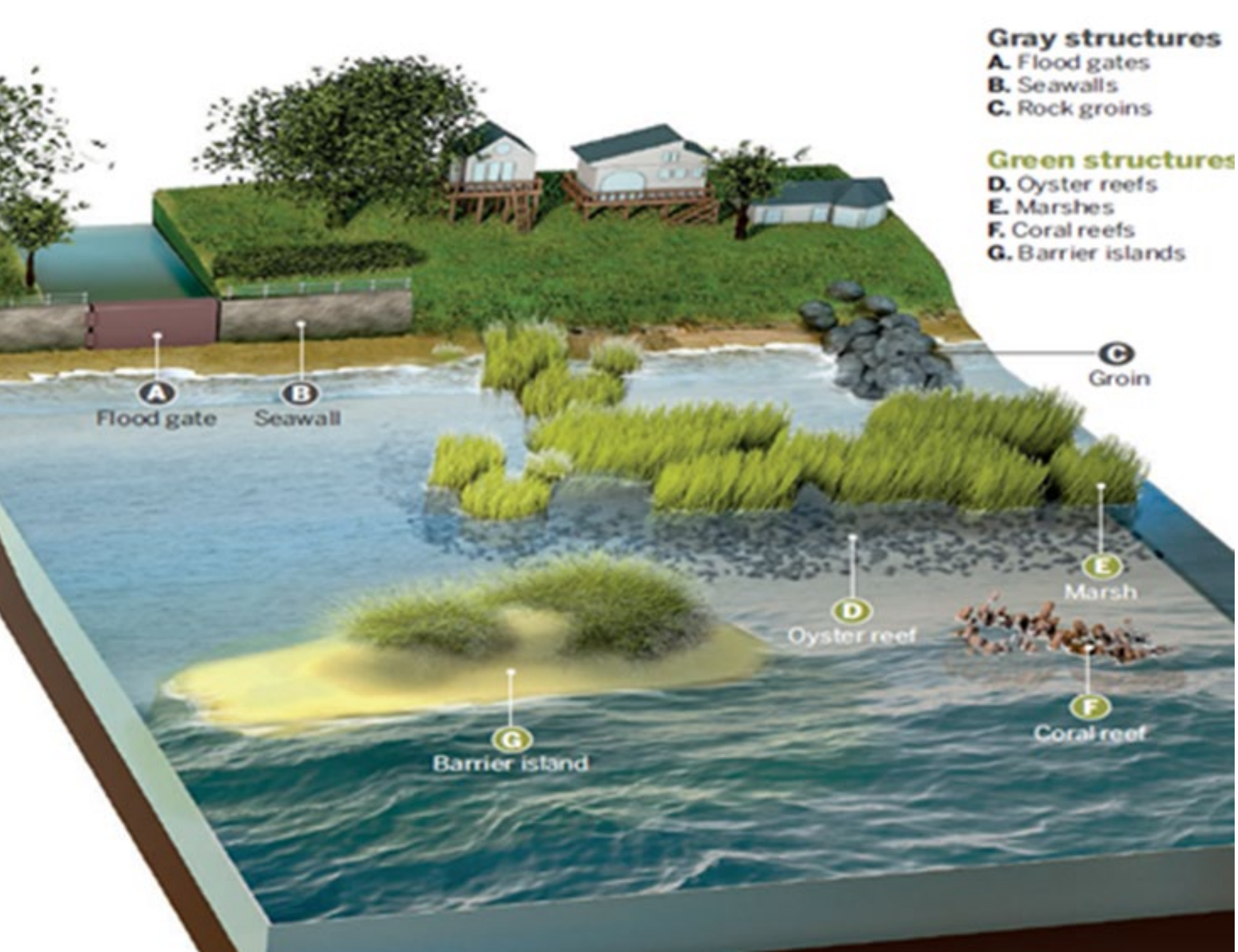
4.1.a. Proposed Parc Marin des Trois Baies (Caracol)



Caracol				
Ecosystem	Total Area	\$/ha/yr rate	Total	Condition
Mangrove	5,260 ha	\$600,000	\$ 3,156,000,000	Good
Coral	900 ha	\$100,000	\$ 90,000,000	Excellent
Seagrass	7,140 ha	--	--	Excellent
Total value of ecosystem services		USS 3,246,000,000 (does not include seagrass beds)		
Total Recommended MPA Site (mangroves/coral reefs/seagrass)		13,300 ha		

Can we develop in the coastal zone knowing sea level rise of 1 meter





Gray structures

- A. Flood gates
- B. Seawalls
- C. Rock groins

Green structures

- D. Oyster reefs
- E. Marshes
- F. Coral reefs
- G. Barrier islands

A
Flood gate

B
Seawall

C
Groin

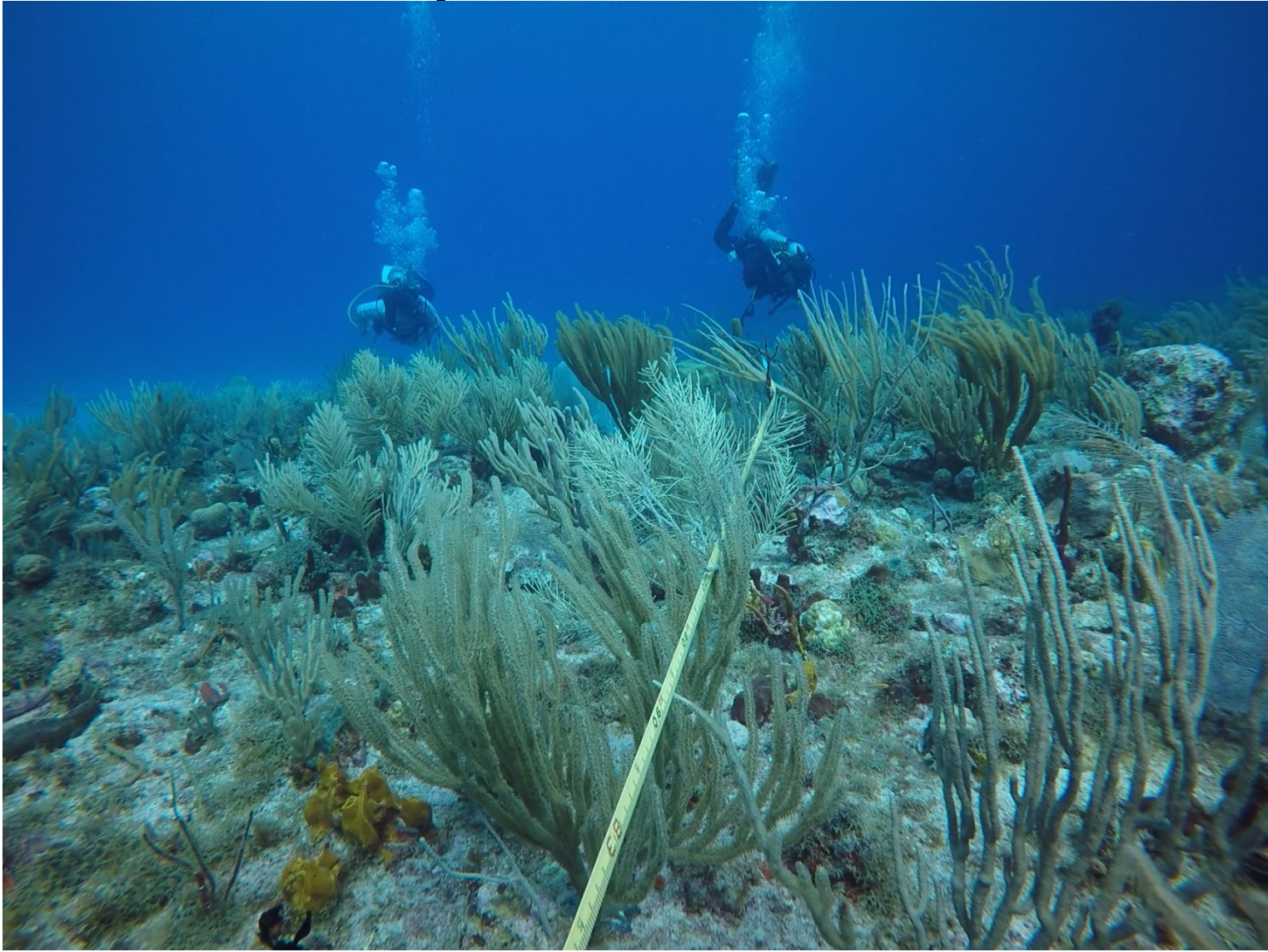
D
Oyster reef

E
Marsh

F
Coral reef

G
Barrier island

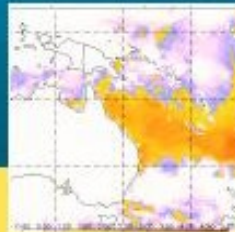
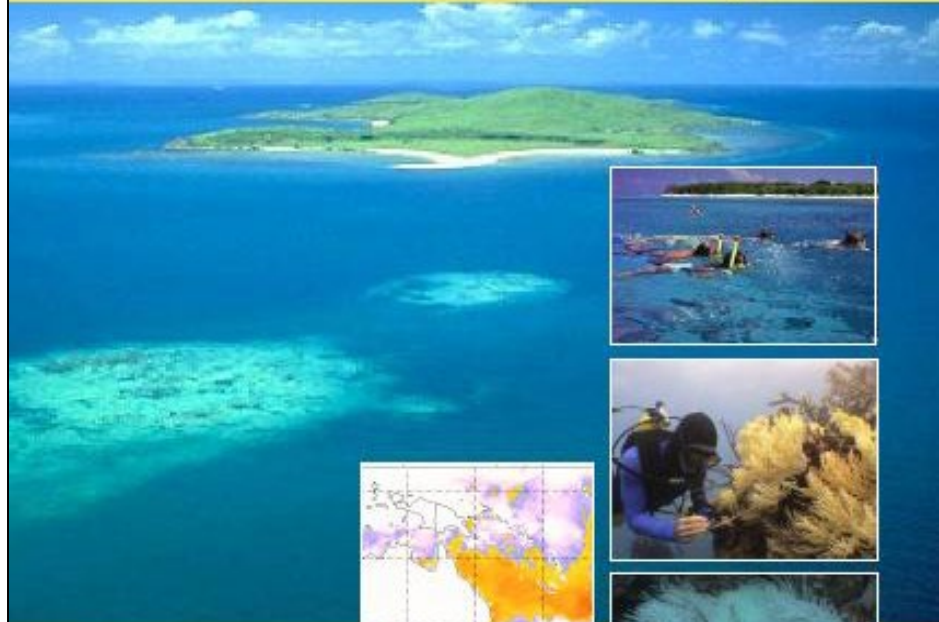
Catastrophic shock: Hurricane analysis -- ReefCheck







A Reef Manager's Guide to Coral Bleaching



Australian Government
Great Barrier Reef
Marine Park Authority



IUCN
The World Conservation Union

Threats to Coral Reefs

- Pollution
- Sedimentation
- Unsustainable fishing
- Habitat destruction
- Disease
- **Coral bleaching**



Sediment Plumes



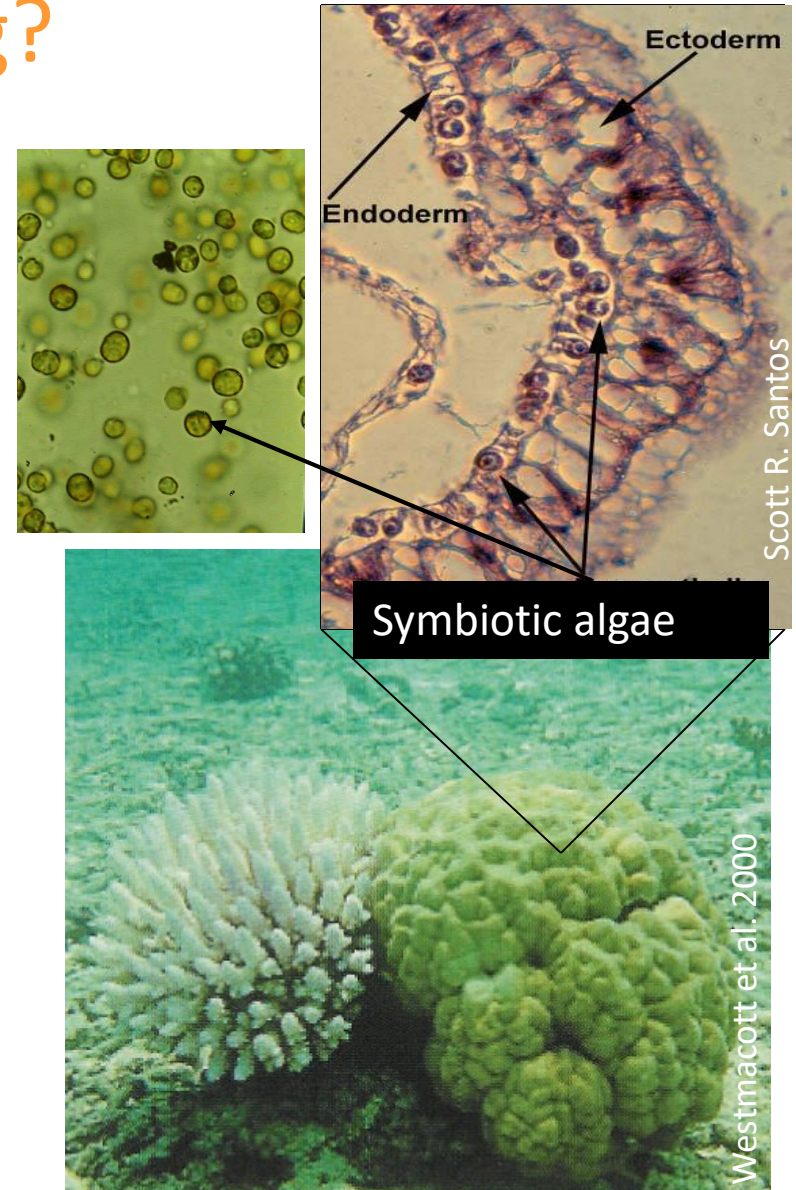
Coral Bleaching



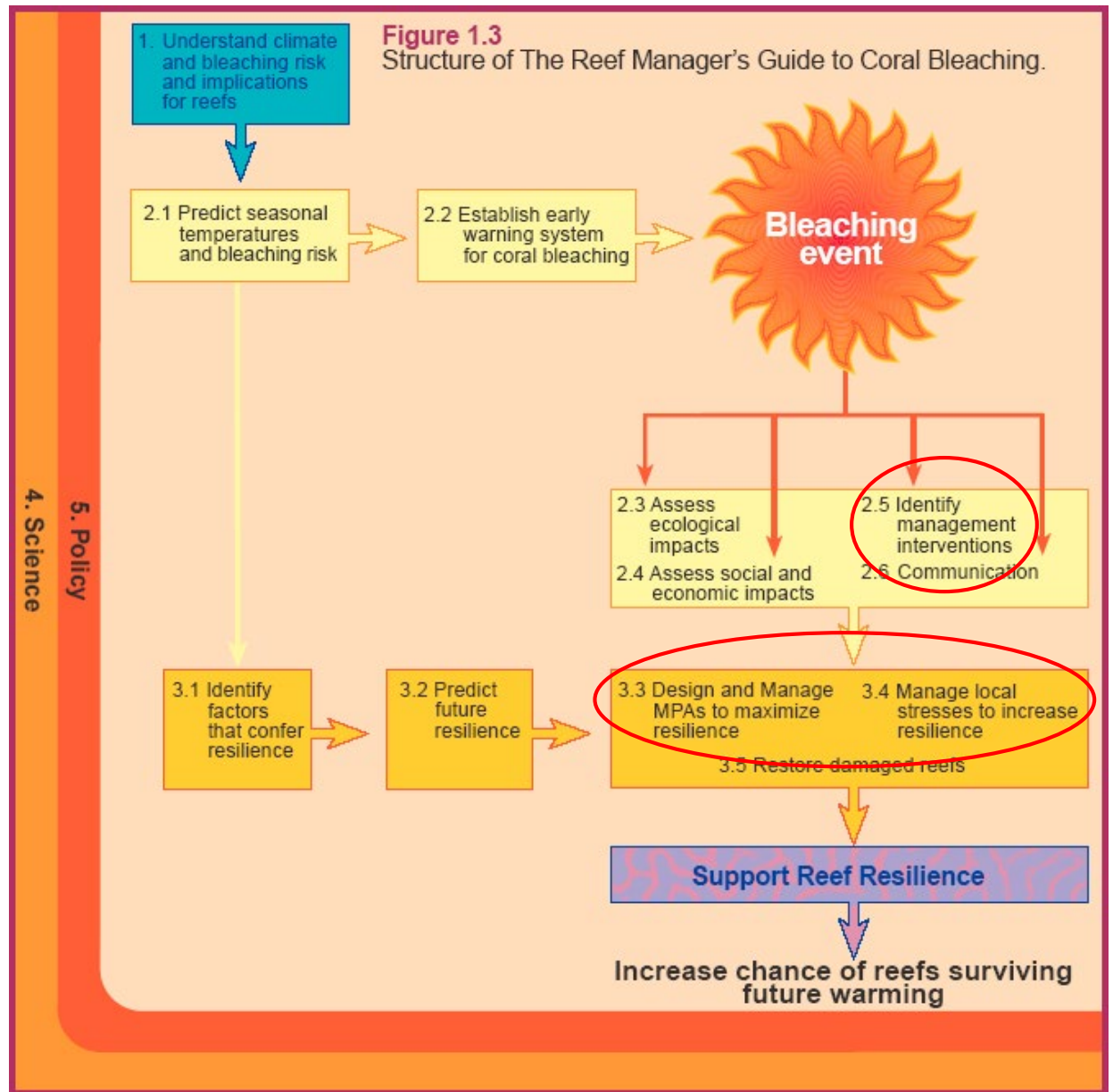
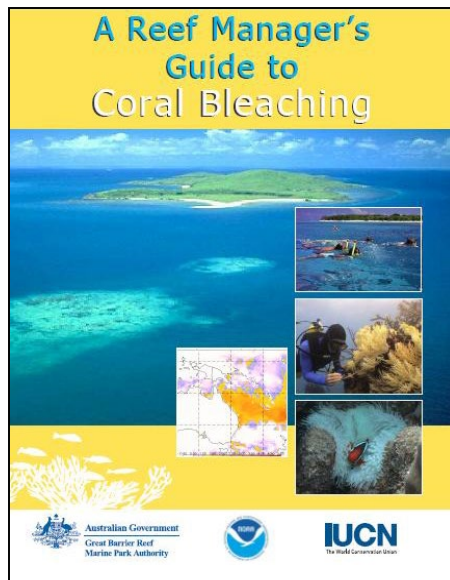
Black Band Disease

What is Mass Bleaching?

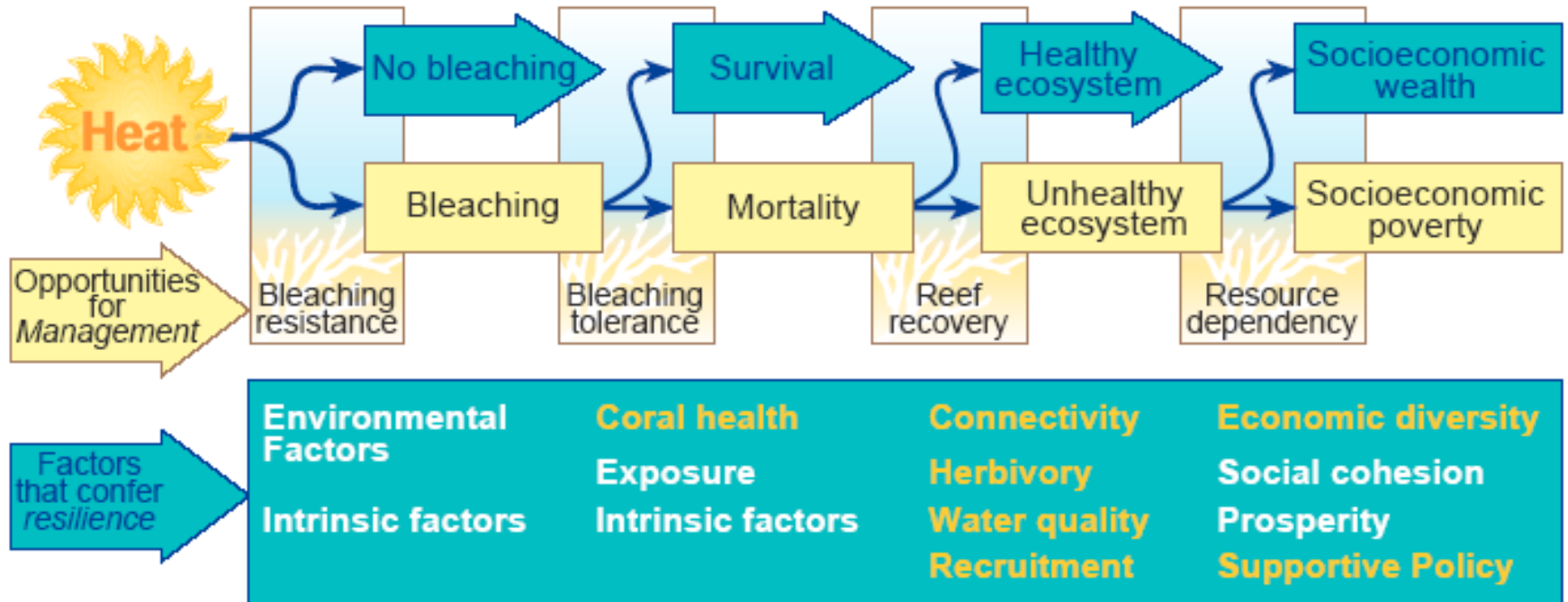
- Coral is exposed to high temperatures and/or high UV radiation, often during ENSOs
- Coral/algal symbiosis is disrupted
- Algae are lost from coral host, coral appears “bleached”
- Bleaching occurs over large spatial scales
- Corals/coral reef either recovers, or suffers mortality



Guide Structure



Opportunities for Coral Bleaching Management



- Immediate-term: Support resilience by reducing local stressors No Take zones
- Longer-term: Use info on natural resilience for planning MPAs

Immediate-Term Management Interventions

Manage Local Stressors

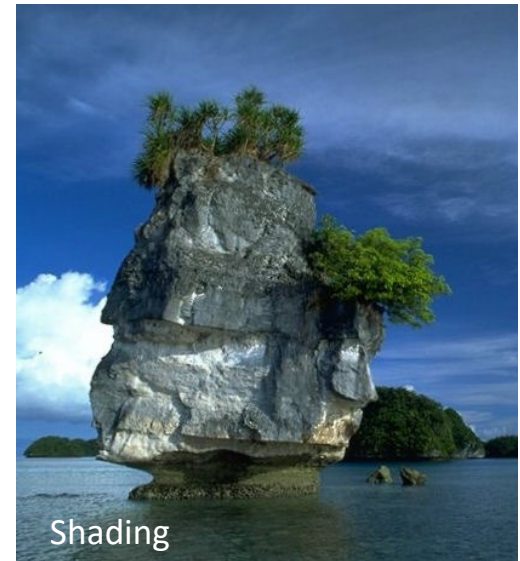
- Fishing
- Recreational use
- Water quality



Longer-Term Planning for Resilience

Resilient reefs are likely to have one or more of the following:

- Cooler water due to upwelling/mixing
- Rapid currents that flush toxins
- Shading of UV by cliffs/shelves
- Turbid waters that screen UV
- Communities that have adapted or acclimated to past fluctuations in temperature/UV
- Conditions that are conducive to coral recolonization



Low Carbon economy -- Goals 2018-2020 -- Cost effective ENERGY EFFICIENCY OPPORTUNITIES FOR SIDS

1

Public Lighting

- Public spaces lighting audit and retrofit program
- Street lighting audit and retrofit program
- Installation of light emitting diode (LED) technology

2

Public Buildings

- Creation of a permanent energy efficiency task force
- Conducting buildings audit and benchmarking
- Implementation of technical measures (lighting controls, appliances, sectional lighting, timers, motion sensors, etc.)

3

Solid Waste

- Optimization of the waste collection routes.
- Vehicle tire replacement, and preventative maintenance
- Recycle fish waste and composting organic waste

4

Water and Wastewater

- Investment in a pressure monitoring system
- Installation of water efficient fixtures
- Individual household metering

5

Transportation

- Trans Millennium Bus Rapid Transit
- Gas and carbon tax
- Traffic restraint measures and duty free import EVs
- Car parking management – variable charging for parking spaces
- Park and ride infrastructure

6

Power

- Continued collaboration with the squatter settlements for improved grid
- Creating an official program to offer a comprehensive package to the squatter settlements



Belize City 2025?





SF Environment

Our home. Our city. Our planet.

A Department of the City and County of San Francisco

San Francisco to Belize On the Road to Zero Waste



Circular Economy Opportunities

- **Grenada** – OAS project on Fish Waste to Poultry Feed.
- **Falmouth, Jamaica** – Vegetable market recycle and composting – purchase carts and brooms to clean up organic waste and compost.
- **Plastic and bottle deposit-refund** – Reduce plastic bottle use. Barbados is evaluating legislation to improve policies and incentives.
- **Caribbean Waste Collective** – Analysis to address economies-of-scale and co-manage Caribbean wide recycle, reduce and retrofit.
- **Antigua & Barbuda, Aruba, Dominica and Trinidad plastic bag ban** - Antigua & Barbuda, Aruba and Dominica have successfully secured the support of a plastic bag ban amongst retailers.
- **Saint Lucia and Grenada used oil-to-energy** - Countries in the region constantly receive unsolicited proposals for Waste 2 Energy technologies that can convert all of their waste to electricity, eliminate the need for landfills.

Market-based Instruments for Environmental Policymaking

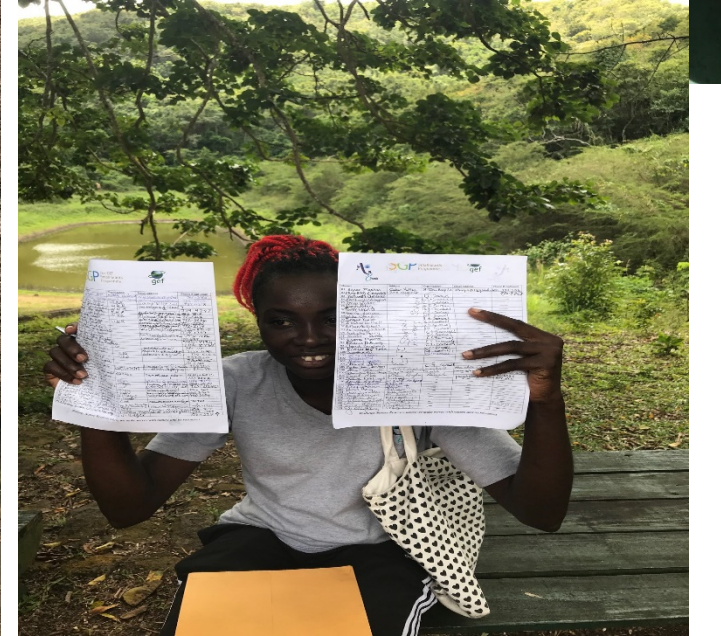
- **Market Creation: Deposit Refund and Monthly User Fees** – Deposit
□ refund for bottles and plastics. Grenada and Nevis have established a mechanism where solid waste management is treated like a utility where customers pay a monthly fee for service.
- **User pays/polluter pays: Facility Tipping Fees** – Islands such as Belize, Aruba and Barbados are charging commercial customers fees to use transfer stations and landfills.
- **Incentives: Tax Credits and Deductions** - to make alternatives to Styrofoam cost equivalent or promote duty free import of waste-to-energy technology, biogas, or solar panels and solar hot water heaters.
- **Environmental Levies** – Value added tax (VAT) and assess an environmental levy on products entering the country. Nevis applies a 1% environmental tax.
- **Managed access system** -- tradable permits for fishing license and sustainable fish catch in Belize.

“Marine Waste is fast becoming one of the BIGGEST environmental catastrophes facing our seas.”





Education and upstream stakeholder input mainstreamed throughout all projects



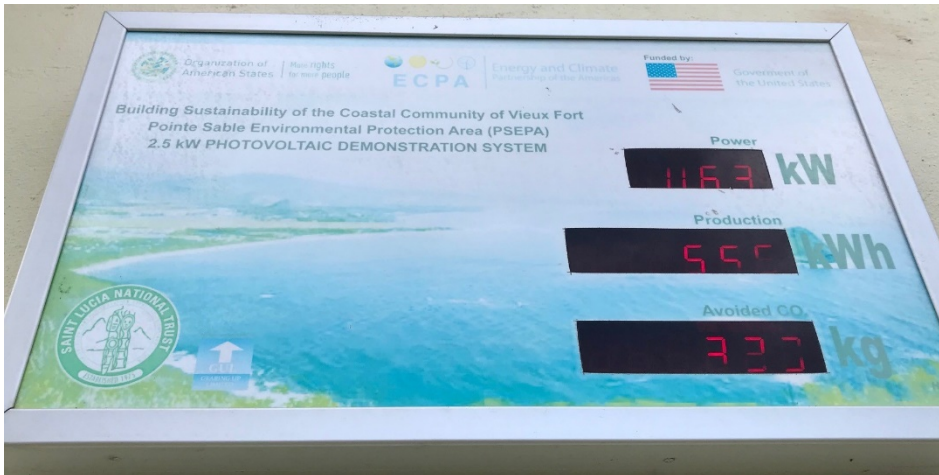


Solar Energy -- widespread public education and awareness leading to empowerment and capacity building.



St Lucia Low carbon economies

- Renewable and efficient energy
- Waste reduction
- Sustainable transport
- Local farming





Grenada

Waste management, Recycling of used engine oil and Improved Water Resource Management





Honduras:

Solid Waste Recycling Entrepreneurship



Organization of American States | More rights for more people



Universidad Galileo

Guatemala: Retrofit diésel engines to reduce air pollution and increase milage



Organization of American States

More rights for more people



Central America

Fotovoltaics in rural communities





Costa Rica Nicoya Peninsula WaterKeepers

Promoting waste management best practices in the coastal communities





Guatemala Fundacion Solar

Clean Energy Production and Resilience to Natural Disasters



Honduras: biogas to save on electricity costs and support clean energy in coffee processing using organic waste derived from production.

Installation of a biogas system optimized wastewater treatment system.





Walkable Caribbean Urban Heritage: Willemstad, Paramaribo, Bridgetown, St. Georges and East Port-of-Spain





Micro Business Entrepreneurship -- Recycling Honduras





Entrepreneurship, employment green jobs, Triple Bottom line

Imagen de la maquina inyectora de plástico, cuando fue colocada planta en el sitio del Motolin





Energy Efficiency in and solar panels in disability hospital



Imagen III-1: Panel secundario breaker principal 400 amperios, foto estándar.

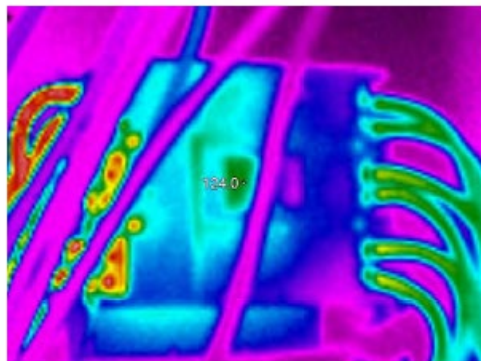
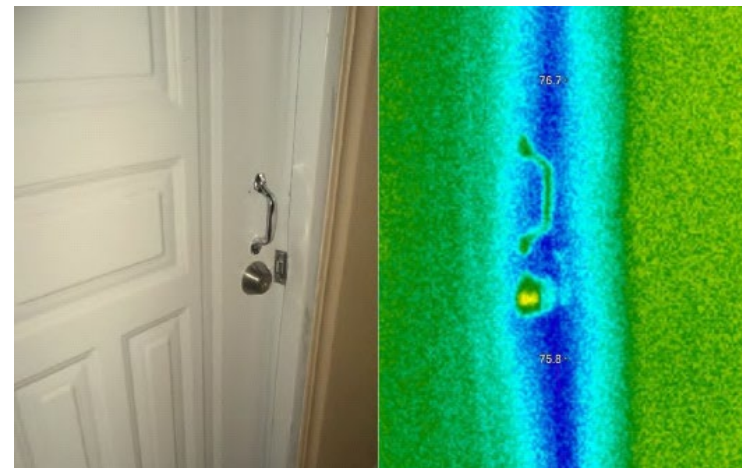


Imagen III-2: Panel secundario breaker principal 400 amperios, foto térmica.



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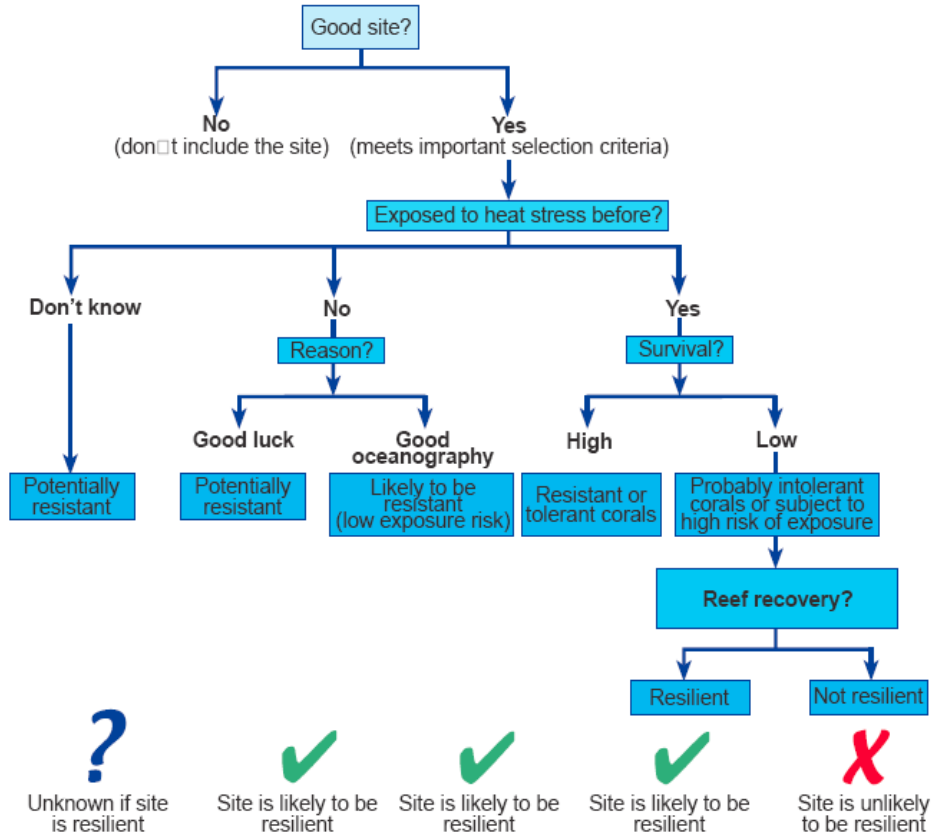
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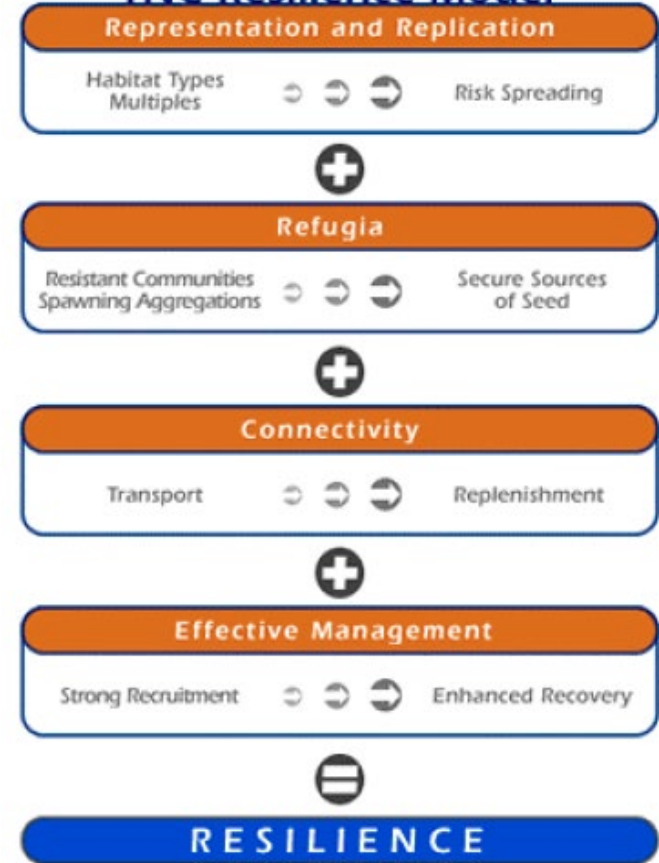
Organization of
American States

Longer-Term Planning for Resilience: MPA Design

Decision Tree (Done et al. 2001)



TNC Resilience Model



Manager's Guide

Editors:

Paul Marshall

Heidi Schuttenberg

Major Contributions:

Jordan West

Rod Salm

Nadine Marshall

Jeff Maynard

Ray Berkelmans

Herman Cesar

Billy Causey

Ove Hoegh-Guldberg

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Chris Hawkins

Peter Mumby

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David Obura

Naneng Setiasih

Shelia Walsh

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Lara Hansen

Richard Aronson

James Innes

Andrew Baird

Laurence McCook

Robert Buddemeier

John Nevill

Nancy Dashbach

Arthur Paterson

Terry Done

Kristin Sherwood

Udo Engelhardt

William Skirving

William Fisher

Al Strong

Andrea Grottoli

David Wachenfeld

Ken Anthony

Rohan Arthur

David Bizot

Steve Coles

Lyndon DeVantier

Mark Eakin

Mark Fenton

Steve Gittings

Lynne Hale

Jim Hendee

Tim McClanahan

Kirsten Michalek-Wagner

Magnus Nystrom

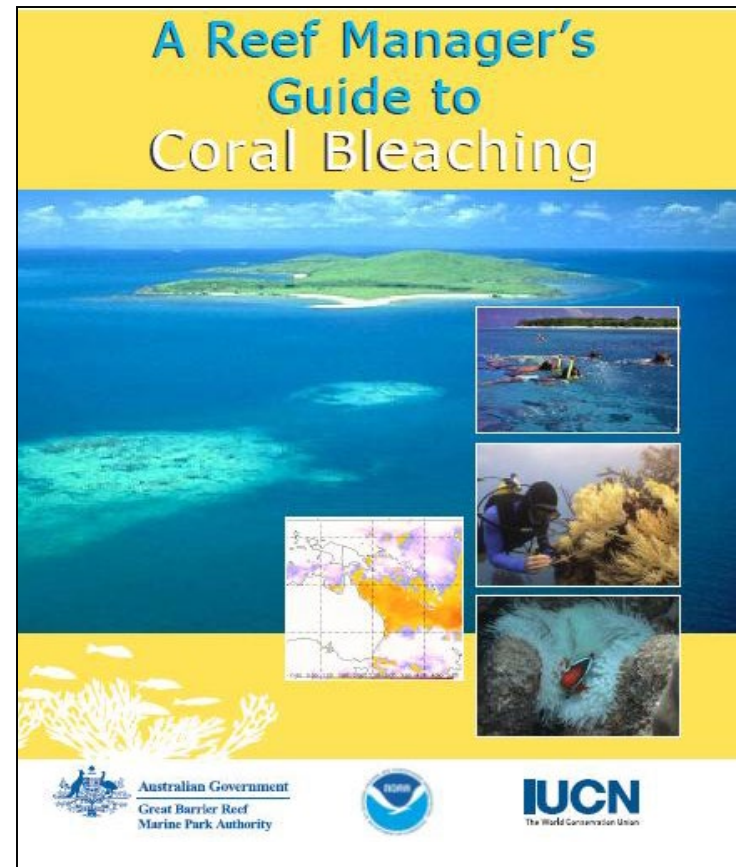
Glenn Ricci

Joe Schittone

Lida Pet-Soede

Kristian Teleki

Sue Wells





ReefFix – Integrated Coastal Zone Management

ReefFix Saint Kitts Nevis – Nevis – Janice Hodges and the Department of Fisheries and the Department of Physical Planning Natural Resources and Environment. Providing a model for effective co-management of The Narrows /Newcastle Bay, St. Kitts and Nevis. Support Reef Check assessment of hurricane damage to Coral Reefs and marine ecosystems. Workshop January 11-17, 2018

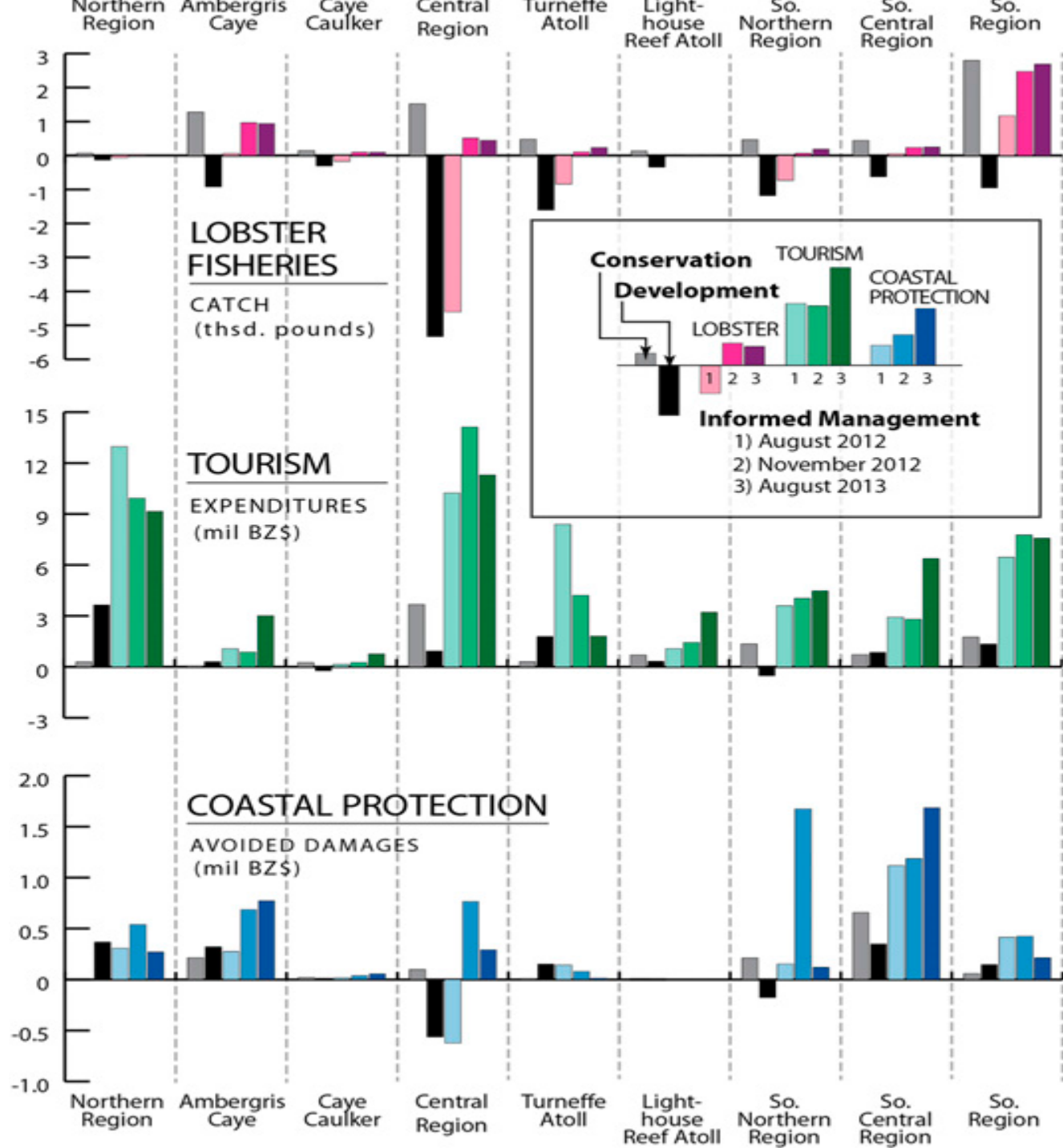
ReefFix Antigua Barbuda – Ruth Spencer and the Ministry of Environment -- Capacity building, public education and awareness through swimming, beach cleaning and knowledge of value of the oceans with a focus on children/youth, with a pilot project to support an NGO that promotes alternative livelihoods in The North East Marine Management Area (NEMMA) and Barbuda. Workshop February 20-22, 2018.

ReefFix Saint Lucia – St. Lucia National Trust – ICZM and supporting more effective Marine-Turtle Conservation within the Pointe Sable Environmental Protection Area Workshop: March 5-9, 2018

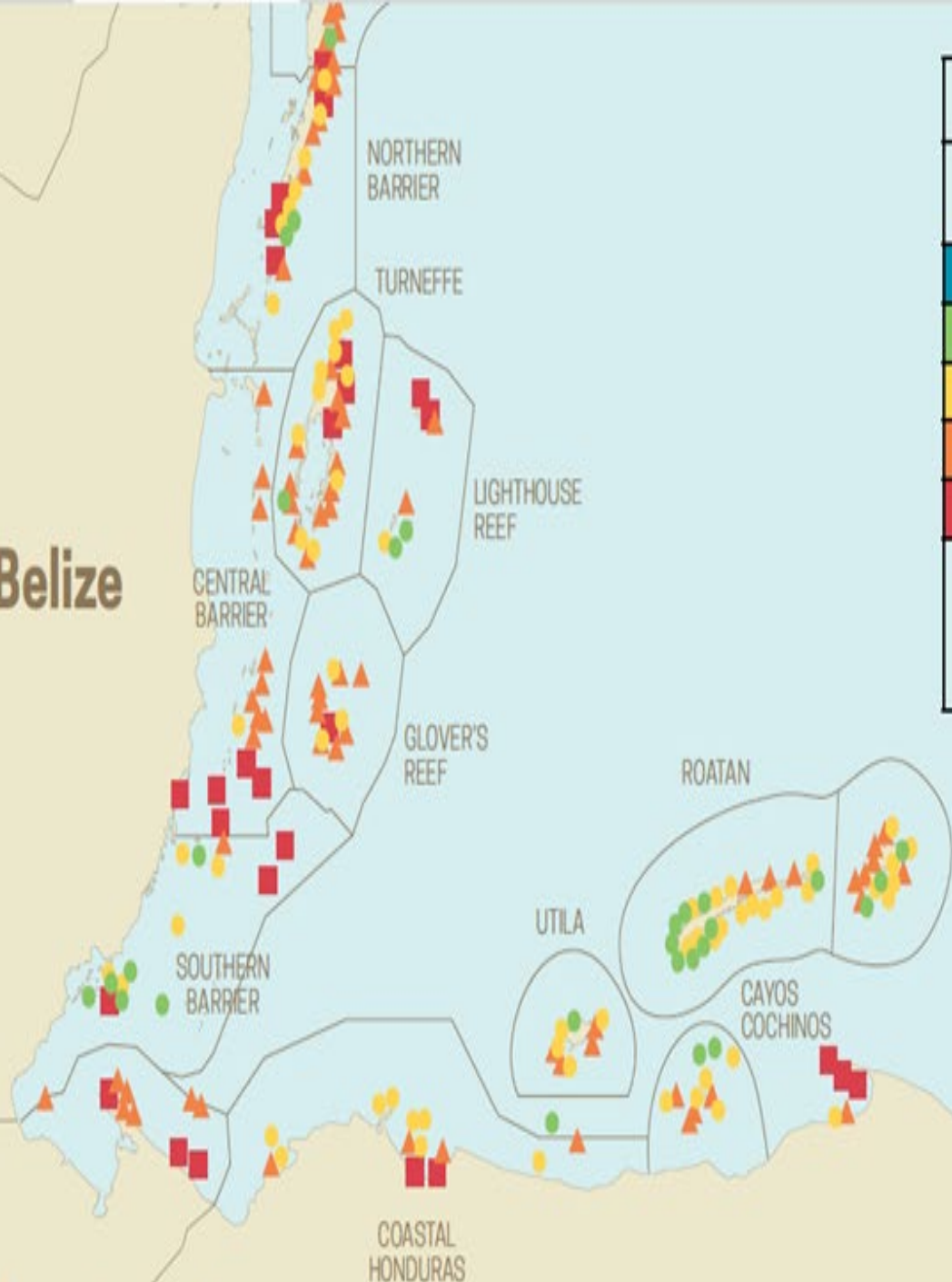
ReefFix Belize -- Belize Audubon Society and the Ministry of Agriculture, Fisheries, Forestry, Environment and Sustainable Development. Promote progress on ICZM / MPA / coral reef conservation and to collaborate on coral reef health monitoring and outreach. The objective is to assist BAS to integrate their existing biophysical monitoring data on coral reef ecosystem health into targeted communications for fishers, rangers, and participants of the Reef Protector program and other educational efforts. Workshop: March 19-23, 2018

ReefFix Jamaica – Montego Bay Marine Park Trust -- promote Marine Management, Coral Reef and Wetlands (April 17-19, 2018), plant mangroves that includes coastal cleanup, monitor beach and shoreline, monitor important shallow and dive sites, research and capacity building on invasive lionfish (e.g. cooking and culling competition), to purchase dive and snorkeling equipment and run a summer program for school children including swimming and snorkeling.

ReefFix Dominica – Arun Mandisetti and the Fisheries Division (The Chief Fisheries Officer (CFO) under the Ministry of Agriculture and Fisheries) conduct a Coral Reef Monitoring, Survey and Evaluation of Hurricane Impact on West Coast of Dominica and collaborate on coral reef health monitoring and outreach. Based on request from Tourism Minister at your Meeting last Monday: Requesting forestry student interns from Yale University and the U of the South (both have huge forests to maintain in their forestry programs) to help maintain 115 miles of trails on Dominica. Workshop July 1-7, 2018



Belize



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