A GUIDE TO CORAL REEF RESTORATION FOR THE TOURISM SECTOR

Partnering with Caribbean Tourism Leaders to Accelerate Coral Restoration

The Nature Conservancy Caribbean

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CARIBBEAN HOTEL & TOURISM ASSOCIATION

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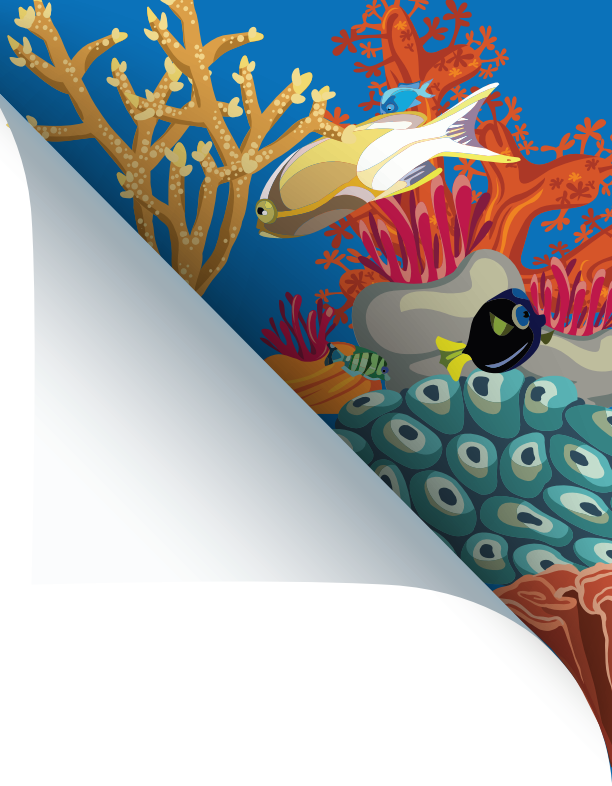

A Guide to Coral Reef Restoration for the Tourism Sector

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Executive Summary

Increased interest in sustainable travel has revealed a window of opportunity for the tourism industry and the conservation community to work together to implement coral reef conservation that addresses both the coral crisis and COVID-19 recovery.

The tourism industry is the most impacted sector in the world by the COVID-19 pandemic and its associated mobility restrictions. Despite the significant impacts, this crisis has also created an unprecedented opportunity for the industry to reinvent operations, offer new services, and generate sustainable tourism experiences that attract new visitors.

The Caribbean region is heavily dependent on goods and services derived from the sea, with more than 100 million people living within 100 km of the coast and more than 25 million tourists per year visiting the region. Tourism contributes to more than 15 percent of the Caribbean's Gross Domestic Product (GDP), with most activities occurring in coastal areas. For instance, reef-associated tourism alone generates more than US$7.9 billion annually from more than 11 million visitors, totaling 23 percent of all tourism expenditures in the region.[1]

Unfortunately, Caribbean coral reefs have declined in recent decades, driven by both global and local factors. As coral reefs degrade, the economic and ecological benefits they provide are compromised, which compounds the impacts of the COVID-19 pandemic on the tourism sector and local communities.

To assess these dual challenges and investigate opportunities to both improve reef health and support COVID-19 pandemic recovery across the tourism industry, The Nature Conservancy (TNC), the Caribbean Hotel & Tourism Association (CHTA), and the United Nations Environment Programme (UNEP) conducted quantitative and qualitative public opinion research among key stakeholders of the tourism industry across the Caribbean. The goal of this coral and tourism research was to capture a wide array of perspectives, expertise, and experiences, as well as to identify positive trends, key barriers, and opportunities for the tourism sector when engaging in coral reef conservation efforts.

Through this research, it is evident that coral reef conservation can be expanded with the engagement of the tourism sector, and that doing so would be a benefit to the tourism industry. However, despite interest from both the tourism and conservation fields, it has been challenging to further secure resources, expertise, and capacity that support coral reef protection and restoration.

These guidelines provide an overview of the tourism sector's engagement with coral reef conservation* efforts in the Caribbean region, including results of the public opinion research, considerations before implementing a coral reef restoration project, and guiding principles and best practices for the tourism sector to implement coral reef protection and restoration efforts more effectively.

* Throughout this document, the term *coral reef conservation* includes both coral reef protection and restoration.

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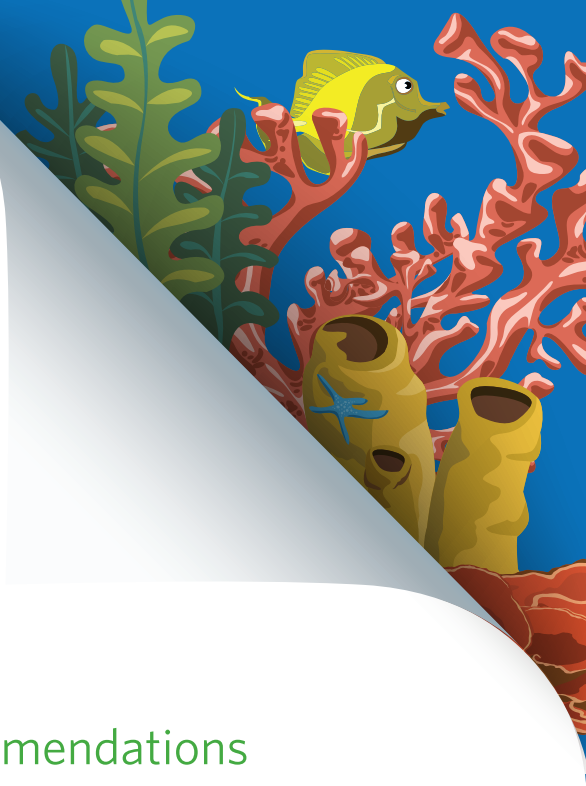
Opportunities and Recommendations



Public opinion research identified specific opportunities and recommendations to engage with the tourism sector to advance coral reef conservation.

Opportunities

Share best practices and case studies from other projects among the tourism sector and conservation practitioners to exchange lessons learned, avoid duplication, and scale efforts.

Develop a recognition program to identify, acknowledge, and incentivize those efforts that are contributing to coral conservation.

Create a network that allows tourism businesses to learn from other programs, seek expertise, and efficiently share resources and experiences.

Provide awareness materials to tourism operators who are developing or currently engaged in coral conservation projects.

Promote active engagement from local and national government agencies, the tourism sector, and coastal communities to improve coral reef conservation efficiency and effectiveness.

Promote the use of environmental standards, regulations, and safeguards, including Environmental Impact Assessments.

Recommendations

Build tourism staff capacity on the technical aspects of coral reef conservation, including the specific contributions the tourism sector can make to help improve conservation practices.

Create targeted communication campaigns across the Caribbean on coral reef conservation, designed for both tourist and tourism operator audiences, to increase engagement of diverse stakeholders.

Advise governments on reef ecosystem benefits, highlighting the economic and ecological value of coral reefs, why they must be conserved, and how to protect and restore them.

Expand funding for demonstration projects to show the return on investment for both the tourism sector and coral conservation efforts.

Expand partnerships between government and the tourism sector to build capacity and interest within the public sector to support coral conservation.

OPPOSITE PAGE Marjo Aho

Why Now?

The impact of the COVID-19 pandemic on the tourism industry has created an unprecedented opportunity for tourism-related businesses to significantly contribute to coral conservation by integrating sustainable practices into their operations and services.

COVID-19/Tourism Crisis

The tourism industry is the most impacted sector in the world by the COVID-19 pandemic and its associated mobility restrictions. However, this crisis has created an unprecedented opportunity for the tourism industry to reinvent operations and services offered.

Research conducted by Booking.com in 2021,[2] which gathered insights from more than 29,000 travelers across 30 countries, indicates that the COVID-19 pandemic has been a crucial tipping point for travelers to truly commit to sustainability—with 61 percent of travelers wanting to travel more sustainably in the future, and 83 percent of travelers responding that they are interested in sustainable travel. Nearly 72 percent of travelers want travel companies to do their part and offer more sustainable options, but a gap remains between supply from the tourism sector and meeting consumer demand for sustainable travel.

The ongoing COVID-19 pandemic pushes the need for the tourism industry to explore new, sustainable approaches to diversify tourism experiences and revenue streams and continue to attract visitors.

Coral Reef Crisis

While coral reefs cover less than 1 percent of the world's ocean floor, they provide essential habitat for one-quarter of all known marine species.[3] Nevertheless, coral reef health around the world has suffered a dramatic decline. The amount of living coral cover has decreased by an estimated 50 percent worldwide in the last three decades.[4] Between 2009 and 2018, the world lost about 14 percent of coral reefs, which equates to about 11,700 square kilometers of coral—more than all the living coral in Australia.[5]

This dramatic coral reef decline is the result of both global and local factors. Impacts such as coral bleaching, caused by rising ocean temperatures driven by climate change, can cause widespread decline, affecting entire regions.[5] However, increasing the capacity of reefs to resist and recover from these bleaching events at the local level is possible through the reduction of local threats, such as overfishing, pollution, and habitat destruction. Innovative and scalable coral reef conservation actions are also urgently needed to deliver this increased resilience and to sustain coral reefs and the benefits they provide to communities and economies.

SECURING CORAL HEALTH IN A CHANGING CLIMATE

Through modeling and direct field observations, scientists are able to identify locations where coral reefs have a better chance of surviving future anticipated climate conditions. This includes coral reefs with high probability of persistence in the face of climate change, as well as areas with high capacity to help other reefs recover by seeding them with new coral larvae. Conservation and restoration methods designed to increase diversity and propagate climate-resilient corals are strategies for local coral reef recovery that also address the global challenge of rising ocean temperatures.

These analyses are complemented at the center stage of international dialogues by commitments to tackle global climate change, protect and recover coral reef ecosystem services and functions, and recognize the important contributions of the ocean to human health and well-being. Such commitments include the UN Decade on Ocean Science and Sustainability, UN Decade on Ecosystem Restoration, and UN Sustainable Development Goal 14: "Life Below Water: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development." For instance, in 2021, the International Coral Reef Society presented a science-to-policy paper at the United Nations Climate Change Conference (COP26) in Glasgow called *Rebuilding Coral Reefs: A Decadal Grand Challenge*.[6] The paper summarizes the science regarding the current state of coral reefs and outlines the actions and policies needed to conserve and restore reefs through this century (Figure 1). In that report, coral reef decline is highlighted along with coral reef economic benefits, making clear that the 2020 decade will likely offer the last chance for international, regional, national, and local entities to work synergistically to set a course for arresting coral reef decline and restoring reef function and economic benefits.

How can we achieve robust, science-based targets?

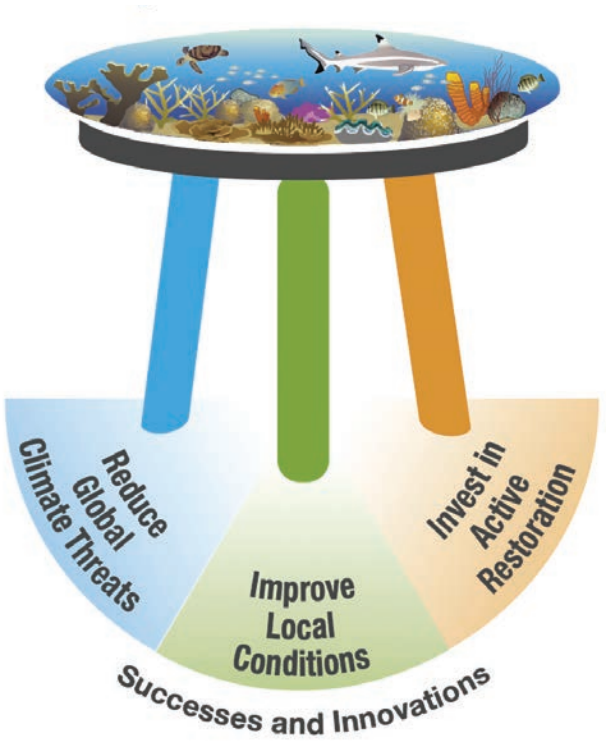


Figure 1. Source: *Rebuilding Coral Reefs: A Decadal Grand Challenge* (Knowlton et al. 2021)[6]

Benefits of Coral Reefs

Coral reefs not only harbor immense biodiversity but also support more than 1 billion people worldwide with food, livelihoods, and coastal protection against hurricanes and other climate events. Coral reefs contribute enormous value to tourism, as they attract foreign and domestic visitors and generate significant revenues, including foreign exchange earnings, in more than 100 countries and territories around the world.

TNC's Mapping Ocean Wealth initiative estimates that about 30 percent of the world's reefs are of value in the tourism sector, with a total value estimated at nearly US$36 billion, or over 9 percent of all coastal tourism value in the world's coral reef countries.[7] In addition to the benefits coral reefs provide for tourism activities, they also reduce wave energy by up to 97 percent, which reduces coastal erosion and buffers coastal communities and infrastructure from the damaging impacts of storms and wave-induced flooding.[8]

The Caribbean region is heavily dependent on goods and services derived from the sea. More than 25 million tourists a year visit the region, with a majority spending most of their time in coastal areas. A TNC-led study quantified the value of coral reefs to the Caribbean economy through tourism. It found that tourism supports more than 15 percent of the Caribbean's GDP and 13.2 percent of jobs in the region.[1] Much of the tourism occurs in coastal areas through beach-based and in-water activities. Reef-associated tourism* generates over US$7.9 billion of expenditures annually from more than 11 million visitors, totaling 23 percent of all tourism expenditures.[1]

Coral reefs protect vital coastal infrastructure in the Caribbean and produce the region's iconic white sands, maintaining healthy beaches that form the foundation for the tourism industry. Fisheries provide a key source of protein and an important source of employment for millions of people in the region. Coral reefs that support fisheries and fisher livelihoods generate roughly US$310 million in the region annually.[9]

Unfortunately, as coral reefs degrade, the benefits they provide to communities and the tourism sector diminish.[4] In fact, degraded ecosystems are shown to reduce tourist willingness to pay to visit or participate in activities on a specific beach or reef site.[10,11,12] Coral reef degradation has significant impacts on tourism and the overall economy in the Caribbean. This presents an urgent need and opportunity to evolve tourism practices in ways that contribute to the protection and restoration of coral reef ecosystems and their benefits.

*The term *reef-associated tourism* refers to both on-reef activities, like diving or snorkeling, and reef-adjacent activities—or those that depend on coral reefs, like beach recreation or boating, but do not make direct use of them in the way that diving or snorkeling do.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Window of Opportunity

Now is the time to develop sustainable tourism practices that support coral conservation, ocean health, and COVID-19 economic recovery.

All sectors that operate in and depend on healthy marine environments are key beneficiaries of efforts to restore and protect marine habitats. Thus, those same sectors have a critical role to play in improving ocean health.[13] Thankfully, there are many ways for the Caribbean tourism industry to contribute to marine and coastal conservation, particularly as the move from sustainable travel to regenerative travel takes root. Sustainable travel promotes the conservation and responsible use of natural resources; regenerative travel aims to actively regenerate or restore natural resources. This marks a paradigm shift in the industry from a "do-no-harm" approach to a more "active engagement" mindset, with the goal of improving a tourism location's environmental health. Expanded investments from the private and public sectors will be key to further incentivize this shift in the tourism industry to support conservation action for Caribbean marine and coastal environments.

Active engagement encompasses a wide range of activities, including but not limited to commitments to reduce waste, protect and restore natural habitats, support local communities, and offset carbon emissions. In addition, increased demand from tourists presents a timely and unique opportunity for tourism operators to adopt more sustainable practices and focus sustainability projects and investments in marine and coastal areas.

There is an exciting window of opportunity for the conservation community to work with the tourism industry to address the coral reef crisis as well as COVID-19 economic recovery. Indeed, Caribbean tourism operators are vital partners in reef conservation efforts. They can provide in-depth knowledge of a local reef system, access to the reef, and communication platforms that target tourists (e.g., hotel brochures, airport signage, employee briefings). They can also establish and strengthen engagement with government, regulatory authorities, and local communities.

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Public Opinion Research

Quantitative and qualitative research allows us to assess challenges and opportunities for tourism and coral reef conservation.

To assess challenges and collective opportunities to improve reef health and support COVID-19 economic recovery, TNC, CHTA, and UNEP conducted quantitative and qualitative public opinion research among key leaders and stakeholders of the tourism industry. The goal of this coral and tourism research was to capture a wide array of perspectives, expertise, and experience.[14] Respondents represented 24 countries and territories from across the Caribbean region and numerous marine-related tourism subsectors, including but not limited to:

- Accommodations investing in sustainability activities
- Accommodations not currently investing in sustainability activities, but interested in doing so
- Marine tourism, recreation, and entertainment
- Tourism services, such as travel/trade associations or those in the public sector

The research informed the co-creation of these coral reef restoration guidelines and recommendations for the tourism industry to engage in protecting and restoring marine and coastal ecosystems in the Caribbean.[14]

In May 2021, an online quantitative survey was distributed to the CHTA membership network, resulting in 94 responses from 24 countries and territories in the Caribbean. In July 2021, a series of interviews was conducted with leaders from across the region to investigate key challenges, opportunities, and lessons learned in the tourism industry. Additionally, TNC and CHTA convened four focus groups with 35 participants, representing 22 Caribbean countries and territories, which provided a wealth of qualitative data.

CREATING OPPORTUNITIES BY IDENTIFYING CHALLENGES

The challenges identified through public opinion research reveal significant opportunities for collaboration between the tourism sector and coral conservation community. In particular, there is great potential to:

- *mobilize private funding to implement and sustain long-term coral conservation efforts*
- *develop programs that allow tourists to take part in hands-on coral conservation activities*
- *connect with millions of people to educate them about the importance of coral reefs and engage them in helping these vital ecosystems*

The coral and tourism research identified the following key enabling conditions for greater collaboration between the tourism sector and conservation groups:

1. Moderate level of awareness of the importance of reefs to the tourism sector

Most participants (80 percent) were aware of the importance of coral conservation to the tourism industry. Similarly, participants were broadly aware of the decline in coral reef health and coral cover in the region, along with the associated negative impacts to tourism businesses and the industry at large. Tourism owners, managers, and operators participating in the research had some level of knowledge about the importance of coral conservation to their own businesses, but overall limited knowledge on the specific environmental, economic, and community benefits that coral reefs provide.

2. Demonstrated interest from the tourism sector to engage in coral reef conservation

Tourism representatives in the Caribbean expressed interest in implementing coral restoration projects, with more than 70 percent of participants indicating some degree of current involvement in sustainability initiatives. In fact, many tourism operators are already involved in a range of programs that might represent an opportunity to integrate or expand coral reef restoration into existing initiatives, rather than starting from zero. Coral conservation presents an opportunity for sustainable tourism to contribute to the health of the reefs the industry depends on, while also responding to tourists' demand for sustainable travel. These results are supported by analyses in other reef regions, such as the Great Barrier Reef in Australia, where tourism operators' involvement in coral restoration was found to be motivated by a desire to improve coral health at a tourism site, public awareness through coral restoration, customer satisfaction during tourism experiences, and protection of the reef from increasing pressures.[15]

The coral and tourism research also identified the following key barriers and opportunities for the tourism sector to engage more substantively in coral reef conservation:

1. Lack of coral reef conservation technical capacity and knowledge sharing

There is a significant knowledge gap regarding what should be done to protect and restore coral reefs. While participants in the research were aware of what coral restoration entails, they were unfamiliar with important details on how to plan, execute, and monitor coral conservation programs, including the many technical aspects of coral restoration projects. Additionally, despite a lack of coral reef conservation knowledge and technical capacity in the tourism industry, about 50 percent of operators participating in the research are already exploring and implementing these types of projects. These efforts present an excellent opportunity to amplify coral conservation, especially if technical capacity is improved. Providing new technical expertise and knowledge can mitigate poorly planned coral reef restoration projects, which can be unsuccessful or even cause harm to the natural ecosystem.

Opportunity: Owners, managers, and operators actively seek guidance on how to plan and implement projects effectively within their existing sustainability and conservation strategies. Additionally, partners leading the development of these guidelines (i.e., TNC, CHTA, and UNEP) have platforms and networks to design and deliver such guidance and build capacity. The establishment of a network can facilitate exchanges, identify and share best practices, design new approaches, and build capacity.

2. Limited awareness and partnerships to deliver coral reef conservation

Although some public–private partnerships exist, more work is needed to expand and improve collaborations across sectors and regions. This can help ensure projects are designed and executed with the best available science and expert guidance.

Opportunity: Create resources and guidance for current tourism operators interested in starting or expanding coral conservation projects. In addition, coral conservation communication campaigns that target both tourists and tourism operators are needed to communicate why coral reefs are important, how they provide many benefits, and why there is a need to conserve and restore them.

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3. Need to expand government support for coral conservation, starting with core knowledge of the benefits coral reefs offer

Although some government agencies in the Caribbean support, through policies and investments, the link between coral reefs and economic well-being, additional information is still lacking on the direct benefits that reefs provide for the tourism sector. More detailed and targeted information is needed—including effective guidance on conservation incentives, regulations, permitting, and policy enforcement—to engage government agencies in coral conservation initiatives.

Opportunity: Local and national education and outreach to government agencies about the importance of coral reefs provides a starting point for a more comprehensive presentation of the latest science, information, and communication materials designed to build capacity and interest in coral conservation. This is also an opportunity for governments to design clear, science-based, and easy-to-access processes for the tourism sector to obtain permits for coral restoration projects.

4. Need for increased marine policy enforcement, in partnership with tourism sector engagement in coral conservation

The tourism sector can play an important role in coral conservation, but it must be accomplished in close partnership with local and national government agencies to help ensure enforcement of policies that protect ecosystem health. Effective policy enforcement is an essential ingredient that reduces threats to coral reefs (e.g., illegal fishing, anchoring, habitat destruction) and supports healthy, thriving ecosystems.

Opportunity: Although marine policy enforcement is ultimately the responsibility of local and national government agencies, expanded partnerships between the tourism sector and coastal communities represent an important opportunity to improve enforcement efficiency and effectiveness. For example, many of the tourism subsectors (e.g., marinas, hotels located on the coast, diving centers) might have the capacity and local expertise to provide support and vigilance to counter illegal activities in coastal zones. In addition, engagement with employees and outreach to local communities can raise awareness of the important economic benefits of coral reefs, creating ambassadors within communities to reduce activities that threaten coral reefs.

5. Limited access to funding

Access to private and public funding presents another challenge to expanding coral reef conservation initiatives within the tourism sector. Projects often require a significant upfront investment to build local capacity, contribute to enforcement, and install onshore and/or underwater facilities and nurseries for coral restoration. In addition, long-term funding is needed to support sustained monitoring, which is necessary to assess the effectiveness of coral conservation efforts and inform management actions.

Opportunity: Currently, management of coral reef ecosystems is primarily funded by the public sector. However, this funding is proving insufficient to respond to the scope of challenges that coral reefs face today. The need for new financial resources is widely recognized, and this is where partnerships between coral conservation organizations and the tourism industry become important opportunities for mobilizing funding.[16]

Although coral conservation projects require significant investment to build capacity and deliver successful, long-term outcomes, these projects can be an attraction to tourists who seek more sustainable travel and engagement in outdoor, hands-on, local activities. This presents an opportunity for the tourism industry to build a circular economy, where benefits of coral conservation projects to the industry itself exceed costs in the long term through profits generated by conservation-centered tourism attractions (e.g., tours to a coral nursery, more frequent visitors to a dive site where restoration efforts have taken place).

Guidance on Coral Reef Conservation for the Tourism Sector

With the support and partnership of the tourism sector, coral reef protection and restoration efforts can be accelerated and scaled up for more meaningful impact.

Resources, expertise, and capacity are scarce, despite high levels of motivation on the part of the tourism and conservation sectors to protect and restore coral reefs. Strong partnerships between the tourism industry, national and local government agencies, marine managers, scientists, and local communities are critical for implementing effective coral reef conservation.

Current Strategies for Improving Reef Health

Interventions to improve coral reef health can be broadly categorized as proactive—aimed at protecting reefs against local and global threats—and reactive—aimed at assisting the recovery of a degraded reef system (Figure 2).[17] For example, implementing a waste management program is a proactive intervention as it focuses on removing a local threat, while coral reef restoration is a reactive intervention as it focuses on repairing damaged reefs. To avoid and mitigate local impacts to coral reefs, proactive interventions should always be the priority and, if needed, accompanied by a reactive approach.[17]

Key Considerations Before Launching Restoration Projects

Coral conservation should be addressed with a holistic approach, which involves a suite of management actions contributing to reef recovery. Coral restoration is not designed to reduce threats to coral reefs, but is instead a complementary tool in the suite of management actions to support natural recovery.[17,18] Therefore, before applying coral restoration, the following questions should be answered:

- What are the main causes of coral reef degradation in the area?
- Are the main causes of reef degradation currently being addressed, or planned to be addressed? If not, is there an opportunity for the tourism sector to contribute to addressing causes of reef degradation?
- How would restoration contribute to other management actions being applied in the area (e.g., marine protected areas, fisheries regulations, pollution control/reduction)?

A decision tree[19] (Figure 3) can also be used to assist in this evaluation. Other resources listed in Table 1 can guide the management efforts to be applied across different areas.

PROACTIVE AND REACTIVE INTERVENTIONS FOR IMPROVING THE HEALTH OF CORAL REEFS

PROACTIVE

Actions aimed at protecting reefs and enabling recovery

REACTIVE

Actions aimed at repairing ecosystem function and assisting the recovery of a degraded reef system

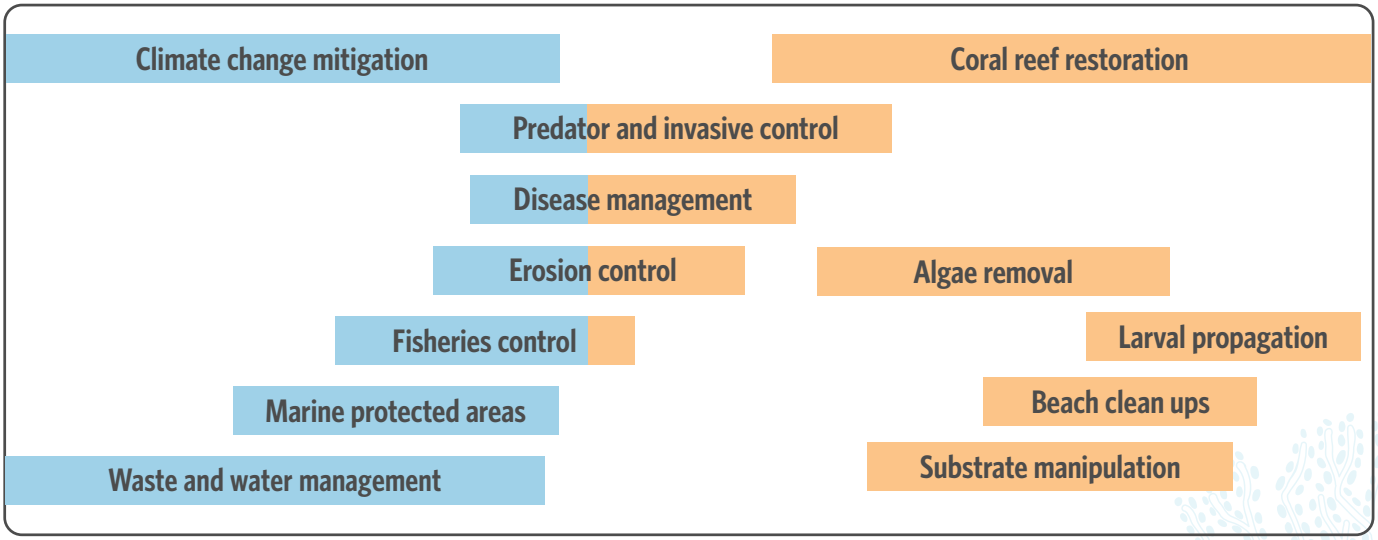

Figure 2. Continuum of actions for coral reef conservation and restoration with examples of proactive and reactive intervention types. Adapted from UNEP guidelines (Hein et al. 2020).[17]

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CORAL RESTORATION DECISION TREE

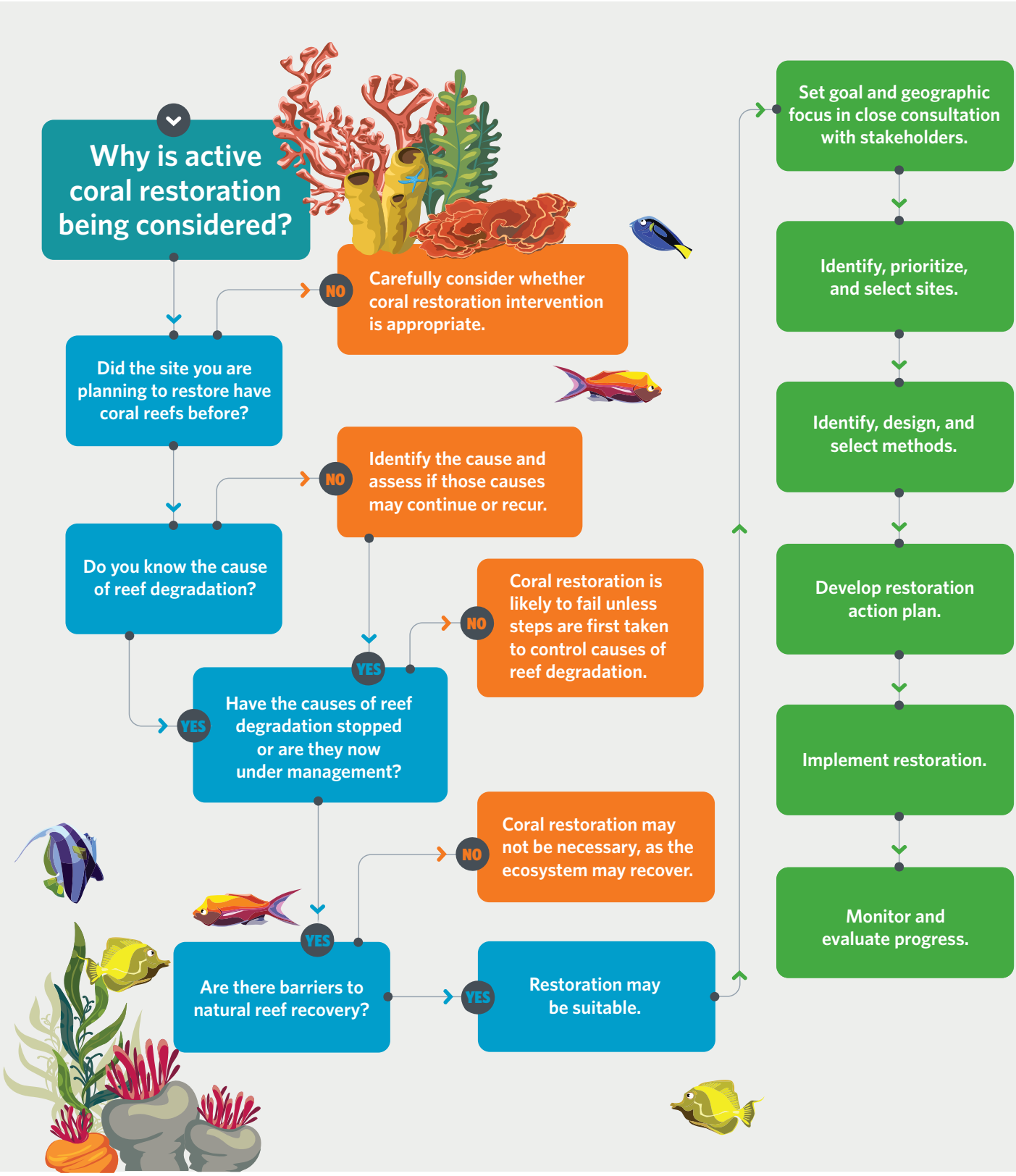
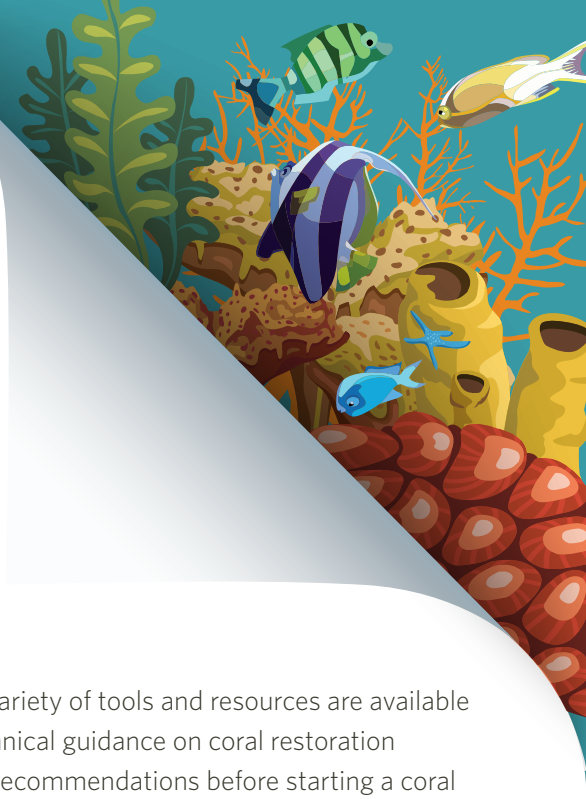


Figure 3. Coral restoration decision tree. Adapted from *Reef Rehabilitation Manual* (Edwards 2010)[18] and *A Manager's Guide to Coral Reef Restoration Planning and Design* (Shaver et al. 2020).[19]

How to Begin a Restoration Project



Thorough evaluation and planning at the start of a coral reef restoration project helps ensure tangible, lasting outcomes.

The Planning Process

A thorough evaluation is advised to assess whether coral reef restoration should be conducted at a specific site, as restoration is not always the most viable management strategy. An ecological assessment of the site should be conducted to answer the questions outlined in the prior section, including the decision tree (Figure 3). Assuming this evaluation has taken place and restoration has been determined to be necessary as a management strategy, a plan should be developed before implementing restoration efforts. Outlined below is a six-step adaptive process for planning and implementing coral restoration that maximizes success and ensures learning and adaptation throughout the process.[19]

1. Set goals and geographic focus.

2. Identify, prioritize, and select sites.

3. Identify, design, and select methods.

4. Develop a restoration action plan.

5. Implement restoration.

6. Monitor and evaluate progress.

In addition, a variety of tools and resources are available to provide technical guidance on coral restoration (Table 1). Key recommendations before starting a coral restoration project include:

- Have a clear goal, a monitoring method, and a long-term sustainability plan.[19]
- Use the goals and objectives of the coral restoration project to drive the choice of method(s) and site(s).[19]
- Do not implement coral restoration in isolation, but as part of a holistic management approach that includes threat reduction and long-term sustainability.[17]

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Table 1. A compilation of some of the most recent guidelines on coral reef restoration. Adapted from https://www.icriforum.org/coralrestoration/.

Resource Name	Description	Link	Usage
Reef Resilience Network (RRN) Webinar Series	Holds webinars about new management techniques, current events, and publications for coral reef practitioners.	https://reefresilience.org/webinars-online/	• Training
REEFhabilitation Experience Instructional Guide	Provides basic concepts and instructions for a tourism experience with coral restoration.	https://reefresilience.org/wp-content/uploads/REEF-habilitation-Experience-Instructional-Guide.pdf	• Implementation
Coral Reef Restoration Online Course (2020)	Provides coral reef managers and practitioners with information on the latest restoration best practices for coral reef ecosystems, including restoration planning.	https://reefresilience.org/coral-reef-restoration/	• Implementation • Overview of best practices • Training
Coral Reef Restoration as a Strategy to Improve Ecosystem Services (2020)	Provides an overview of the best-available knowledge and realistic recommendations for the use of coral restoration as a management strategy.	www.icriforum.org/wp-content/uploads/2021/01/Hein-et-al.-2020_UNEP-report-1.pdf	• Planning • Implementation • Overview of best practices
A Manager's Guide to Coral Reef Restoration Planning and Design (2020)	Supports the needs of reef managers seeking to begin restoration or assess their current restoration program and provides a suite of tools to help users gather relevant data, ask critical questions, and have conversations about restoration.	www.icriforum.org/a-managers-guide-to-coral-reef-restoration-planning-and-design/	• Planning • Implementation • Overview of best practices • Training
Coral Reef Restoration Monitoring Guide: Methods to Evaluate Restoration Success from Local to Ecosystem Scales (2020)	Helps any restoration group or government–large or small–decide on a monitoring regimen that fits their budget and capacity.	www.icriforum.org/coral-reef-restoration-monitoring-guide-methods-to-evaluate-restoration-success-from-local-to-ecosystem-scales/	• Planning • Implementation • Monitoring
Guide to Ecological Engineering: The Restoration of Coral Reefs and Associated Ecosystems (2020)	Provides an inventory of ecological engineering techniques devoted to the restoration of coral reefs and their associated ecosystems.	www.icriforum.org/guide-to-ecological-engineering-the-restoration-of-coral-reefs-and-associated-ecosystems/	• Planning • Implementation • Training
Training Guide for Coral Reef Restoration (2020)	Offers a practical, complementary tool for coral reef restoration training.	www.icriforum.org/wp-content/uploads/2020/11/Training-Guide-for-Coral-Reef-Restoration.pdf	• Training
Guide for the Restoration of Coral Ecosystems (2020)	A technical document aimed at supporting coral restoration efforts in Costa Rica.	www.icriforum.org/costa-rica-published-its-guide-for-the-restoration-of-coral-ecosystems/	• Planning • Implementation
A Guidebook for Coral Propagation Through Asexual Reproduction (revised version) (2019)	Provides an overview of the characteristics, functions, and current state of corals in Japan, coral propagation plans, and how to implement them.	www.icriforum.org/wp-content/uploads/2020/11/Japanese-coral-restoration-guidebook-2019.pdf	• Planning • Implementation
Early Warning and Rapid Response Protocol (2019)	Presents a step-wise approach to guide first responders and reef managers before, during, and after a tropical cyclone to mitigate the impacts to coral reefs.	www.icriforum.org/wp-content/uploads/2020/12/Post-storm-protocol.pdf	• Planning • Implementation • Overview of best practices
Belize Coral Reef Replenishment Manual (2018)	Shares coral restoration methods that have been working successfully in southern Belize since 2006.	www.icriforum.org/wp-content/uploads/2020/11/Belize-Coral-Reef-Replenishment-Manual.pdf	• Training
Coral Reef Restoration Toolkit: A Field-Oriented Guide Developed in the Seychelles Islands (2018)	Describes how to complete a coral reef restoration project, using the "coral gardening" concept, and provides guidance on using low-cost, field-tested methods.	www.icriforum.org/wp-content/uploads/2020/11/2018-Toolkit-CoralReefRestoration.pdf	• Planning • Implementation • Training
Guidance Document for Reef Management and Restoration to Improve Coastal Protection (2018)	Provides a review of and recommendations on reef management and restoration for risk reduction, and evidence of the role of coral reefs in coastal protection and disaster risk reduction.	www.icriforum.org/wp-content/uploads/2020/11/Zepeda-Centeno-et-al-2018-Guidance-Document.pdf	• Overview of best practices
Practical Guide to Restoration Based on the Production of Coral Sexual Recruits with an Emphasis on *Acropora palmata* (2018)	Offers information on the production and use of coral sex recruits for reef restoration.	www.icriforum.org/wp-content/uploads/2020/11/Banaszak-et-al-2018-Gui%CC%81a-pra%CC%81ctica-cienti%CC%81ficos.pdf	• Planning • Implementation • Training
Coral Restoration Techniques in the Western Pacific Region (2014)	Provides information on farming sexually propagated corals and how to outplant them.	www.icriforum.org/wp-content/uploads/2020/11/coral-restoration-2014-PDF-low.pdf	• Planning • Implementation • Training
Caribbean Acropora Restoration Guide: Best Practices for Propagation and Population Enhancement (2011)	Shares the collective knowledge of a community of scientists and restoration practitioners to restore populations of corals throughout the Caribbean.	www.icriforum.org/wp-content/uploads/2020/12/AcroporaRestorationGuide.pdf	• Planning • Implementation • Training
Reef Rehabilitation Manual (2010)	Provides hands-on advice, based on lessons learned, about how to carry out coral reef rehabilitation in a responsible and cost-effective manner.	https://gefcoral.org/Portals/53/downloads/Reef%20Rehabilitation%20Manual_web.pdf	• Planning • Implementation • Overview of best practices

Guiding Principles

Restoration programs implemented in collaboration with the tourism industry should be designed according to these guiding principles:

Ecology and science | Design science-based restoration programs that can be executed in an environmentally responsible way.

Coordination | Build coordination mechanisms among scientists, local nonprofit organizations, government agencies, tourism-based businesses, and local tourism operators to ensure compliance and efficiency.

Experience | Create a marketable and enjoyable experience for consumers and business owners while executing the task of coral reef restoration at scale.

Financial feasibility | Design an economically beneficial program for tourism-based businesses that specifies a return on investment from both the human capacity and financial capital investment point of view.

Laws and regulations | Adhere to all local laws and regulations that might govern coral restoration and marine-based activities.

Identifying Key Stakeholders

Coral restoration projects should be supported by a network of stakeholders and partners to build coordination and leverage resources across regulatory agencies, tourism-based businesses, community leaders, scientists, and nonprofit organizations. Roles and responsibilities among public and private partners should be identified in advance to ensure coordination and expectations across stakeholders. Every project might have a different group of stakeholders (see Figure 4 for an example of how stakeholders can work together to implement coral restoration); however, in general terms, project planning should assess the involvement of the following key groups:

Local nonprofit organization | an organization with local experience and community relationships that can help implement and coordinate activities on the ground; in some cases, this entity is the permit holder, capable of handling endangered species, such as corals

Community association | a group of local individuals that might not always be formalized via a nonprofit entity but are key for local buy-in and grassroots engagement

Regional and/or international nonprofit organization | an organization that can bring capacity, knowledge, and network to the local project, providing expertise, cutting-edge technology, and innovation, as well as raising visibility for the project

Regulatory agency | an agency within the government that regulates the site of the project, the activities, and/or the target coral species

Tourism ministry and/or destination management organization | usually a government agency or ministry managing and/or marketing tourism activities

Tourism-based businesses | tourism operators—including diving centers, hotels, marinas, tours, and other attractions—that can provide experiences through which tourists engage in coral restoration

Local for-profit organization | an organization or consulting firm that provides services related to coral reproduction and responding to the demand of coral reef restoration

HOW CAN STAKEHOLDERS WORK TOGETHER TO IMPLEMENT CORAL RESTORATION PROJECTS?

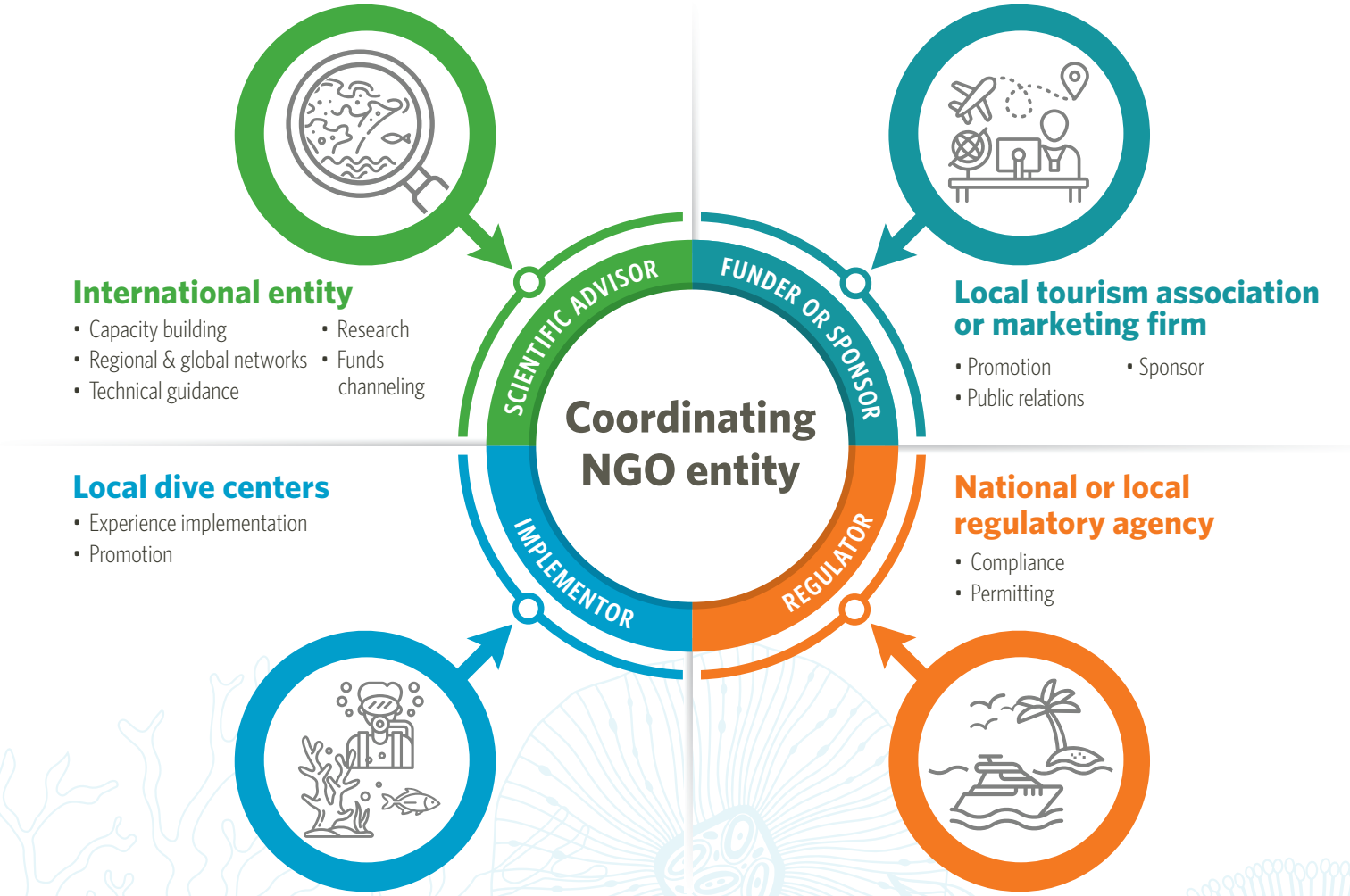

Figure 4. Example coordination structure of stakeholders in a coral restoration program, in partnership with the tourism industry.

Checklist of Best Practices

Build these practices into coral restoration projects to create more meaningful impact for coral reefs and the communities and economies they sustain.

Ecological assessment
Complete a thorough ecological assessment to determine whether restoration should be conducted at a specific site, and collect data to inform the coral restoration plan.

Local threats
Determine causes of reef degradation and potential solutions that can be implemented by both public and private stakeholders.

Local management
Identify management actions being applied in the area to ensure that restoration efforts align with current management actions.

Local context
Identify local factors to be considered before starting a restoration project, including local partners, livelihoods, and potential challenges.

Permitting
Identify local government agencies, regulations, and permitting needed to work with and handle marine or endangered species.

Stakeholder engagement
Identify key stakeholders to engage in the project, based on restoration goals and local historical and cultural contexts.

Coral restoration plan
Design coral restoration plans with a specific goal that informs localized participants, actions, methods, timeline, monitoring, and funding.

Guidelines and resources
Use guidelines created by reputable sources (including those in Table 1) to identify best practice approaches and ensure restoration is improving (and not harming) reef condition.

Capacity
Provide trainings that build the capacity of local staff and communities to execute coral restoration efforts.

Local communities
Work closely with local communities to identify and advance sustainable livelihood opportunities.

Outreach
Raise awareness about the importance of coral reefs and how communities can play a part in keeping them healthy.

Learning
Research, read guidelines, and engage with networks to learn from others' experiences.

Monitoring
Monitor, evaluate, and learn from the project to assess and improve outcomes, and adapt methods based on the original restoration goal.

Proposed Next Steps

The coral and tourism research identified critical next steps to catalyze greater partnerships between the tourism and conservation sectors for improved coral reef conservation across the Caribbean.

Build capacity

Develop long-term training to implement coral conservation efforts with public–private partnerships.

Share best practices

Share case studies and lessons learned from other projects across the Caribbean region and the world.

Recognize successful programs

Recognize programs that successfully implement best practices and can serve as replicable examples, adapted to the local context.

Create peer-to-peer networks

Create networks to learn from other programs and geographies. Reach out to others around the world to share expertise, resources, and experiences.

Support economic analysis

Incentivize tourism sector engagement in coral reef conservation by quantifying the returns on investment generated from reef-positive tourism experiences.

Secure funding

Identify new public and private funding sources; through successful demonstration projects, highlight the powerful potential to conserve coral reefs in partnership with the tourism sector.

Engage governments

Increase capacity and accessibility of government agencies to support the tourism sector in leading and/or participating in coral restoration efforts.

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