

MAPPING THE GLOBAL FUNDING LANDSCAPE FOR CORAL REEF RESTORATION

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Suggested Citation: Hein MY, Staub F (2021) Mapping the Global Funding Landscape for Coral Reef Restoration. International Coral Reef Initiative. 23pp. Available at icriforum.org

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GLOSSARY

Coral reef restoration

An active intervention that aims to assist the recovery of reef structure, function, and key reef species in the face of rising climate and anthropogenic pressures, therefore promoting reef resilience and the sustainable delivery of reef ecosystem services (Hein et al. 2020)

Types of funding explored in this report

Grant

A sum of money that is awarded by an administrative body to a beneficiary. Use of grant monies are most often restricted to specific actions, goals or projects that were proposed by the beneficiary during the application process and served as the basis for the administrative body's evaluation.

Loan

A sum of money that is lent by one entity (the lender) to another entity (the borrower) that is to be returned or repaid according to specific conditions within a certain period of time, typically with accrued interest. Depending on the conditions of the loan the use of loaned monies may be restricted to specific actions or unrestricted for use(s) determined by the borrower.

Contract-based financing

The payment of monies from one party to another by mutual agreement (e.g., a contract) for the delivery of specific goods or the completion of specific activities.

Prize

A monetary award to a recipient based on the outcome of a competition or in recognition of particular achievements, most often without restrictions on the use of the funds by the recipient.

Fiscal sponsorship

The contribution of monies by an individual or entity toward the overall mission of an organization or the execution of a specific project. Funds obtained through sponsorship may either be unrestricted in their use, or restricted in their use depending on the terms of the agreement.

Co-financing

The aggregation of monetary contributions from multiple sources to execute a specific project. Most often, pledged contributions are not distributed until commitments for the total financing of the project are secured.

In-kind

Non-monetary support for a project, such as the donation of volunteer and staff time, resources or services.

NOTE:

In this report we distinguish "Primary funding" which constitute the main type of funding raised to support the project and "Other funding" which constitutes additional funds (one or more) raised by the project implementer for additional activities that support the project.

The definitions of type of funding and type of funders were not provided to survey respondents. However, the above definitions represent how these terms were interpreted and analysed in the present report.

ACRONYMS

ELP – Endangered Landscapes Programme
FFI – Flora and Fauna International
ICRI – International Coral Reef Initiative
IGO – Inter-Governmental Organization
NGO – Non-Governmental Organization
UNEA – United Nations Environment Assembly

UNEP – United Nations Environment Programme
UNEP-WCMC – United Nations Environment
Programme World Conservation Monitoring Centre



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INTRODUCTION



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Coral reef restoration is increasingly recommended as an active management strategy to address the deterioration of the state and expanse of coral reefs. In 2019, a report from the International Coral Reef Initiative (ICRI)'s Ad-hoc committee on coral restoration revealed that 88% of ICRI* countries are now using coral restoration as a tool to assist the recovery of coral reefs (McLeod et al. 2019). A global review found that coral restoration had been implemented in at least 56 countries as of 2020 (Boström-Einarsson et al. 2020), with most of the projects in low-income or developing nations. Coral reef restoration is now embedded in multilateral environmental agreements such as the Convention on Biological Diversity (CBD) and resolutions from the United Nations Environment Assembly (UNEA Resolution 4/13) and will be part of the post-2020 Global Biodiversity Framework. Furthermore, through Resolution 73/284 and 72/73, the UN General Assembly has declared the UN Decade on Ecosystem Restoration and the UN Decade on Ocean Science for Sustainable Development from 2021 to 2030, both of which will advance the science and practice of coral reef restoration.

However, coral reef restoration is a young field when compared to restoration in terrestrial systems and more traditional reef ecosystem management strategies such as implementing Marine Protected Areas (MPAs) or developing fishing quotas. A greater understanding of the context of coral reef restoration projects and their capacity to be used as an effective management strategy to combat the global deterioration of coral reef is needed.

A major finding from recent reports is that coral reef restoration efforts are monitored for an insufficient amount of time (median monitoring time of 1 year, Boström-Einarsson et al. 2020) to understand resulting social-ecological changes and accurately describe the efficacy of on-going efforts. Data on the costs of coral reef restoration are sparse and more difficult to assess. Recent estimates place the median cost at US\$400,000/ha, however these estimates vary greatly among projects and these costs are often up-scaled from small-scale projects (Bayraktarov et al. 2019). While multi-hectares projects have only recently gotten underway, cost estimates developed

* ICRI - A global partnership for the preservation of the world's coral reefs and associated ecosystems. Today, ICRI counts 93 members, including 44 countries custodians of 75% of the world's coral reefs.

for project planning put the cost for comprehensive restoration in excess of \$1M/ha. Developing accurate costs are further complicated by the fact that the costs of coral reef restoration are seldom reported in published literature affecting the potential for comparability and standardization. A variety of nuanced factor currently impairs comparability of costs among projects including for example differences in the definition of restoration goals, geographic location, methods of restoration used, materials used, duration of project, and the duration and type of monitoring. The way in which costs are calculated are also not currently standardized. For example, the majority of costs for coral restoration are reported in US\$/ha with no indication on area calculation methods. In the Florida Keys, the initial restoration plan for the "Mission Iconic Reef" project spanned across 80ha of reefs when assessed using aerial photography and acoustic remote sensing. However, when more comprehensively assessed by divers, the true «restorable» area (subtracting sand channels, depressions, soft corals and other unrestorable features) was reduced to ~25 ha. The true hectare scale restoration costs can thus differ greatly depending just on the mapping tools used to define the restoration area. Other sources of discrepancy in cost reporting for coral reef restoration include the activities that are costed (e.g., planning process, outplanting process, monitoring process, volunteer hours, boat hours, etc...), and differences between planned costs and the final costs of a fully executed project. This general lack of reporting on expenses affects the ability to report on the "true costs" of coral reef restoration. It also affects the ability to provide guidance on the efficiency of coral reef restoration methods and assist management and funding agencies in determining the level of investment necessary for coral reef restoration efforts to provide a sustainable, positive impact on reef resilience and recovery.

In their 2019 report, ICRI's Ad-hoc Committee on Coral Restoration identified funding and political will as driving forces of restoration implementation; however, specific information on funding for coral restoration is limited. In 2018, a report prepared jointly by ICRI, UNEP, and UNEP-WCMC identified that US\$1.9 billion was allocated towards conservation and sustainable management of coral reefs and associated ecosystems between 2010 and 2016 (UN Environment et al. 2018). Almost half (45%) of the 314 projects reviewed were allocated to conservation and marine protected area management with associated funding of US\$ 1,417.2 million. However, the report did not analyze coral reef restoration projects separately.

Another report focused on funding for ecosystem restoration in Europe revealed that a large proportion of projects (85%) focused on terrestrial restoration, highlighting a critical need to focus future investment targets towards marine ecosystems (UNEP-WCMC, FFI and ELP 2020). However, a more in-depth analysis of the funding landscape for coral reef restoration is necessary to identify not only the major type of funders, but also types of funding, target locations of funding, amounts, timelines, and barriers to guide both policymakers and practitioners toward effective funding schemes as commitments for restoration increase globally.

With the launch of the UN Decade on Ecosystem Restoration in 2021, a better understanding of the funding landscape of coral reef restoration is particularly relevant and helps to: 1) identify needs and funding gaps to increase local, regional, and global commitments to restoration; 2) guide future decisions on prioritization for investment and type of efforts; and 3) connect existing funding to coral reef restoration projects.

The aim of this report is to analyze the trends in available funding allocated to coral reef restoration in the last 10 to 15 years, specifically focusing on how funding varied across regions, sectors, and/or type of restoration projects. This analysis reveals needs and funding gaps and draws recommendations for future commitments and investments.

METHODS

Information on project funding was collected through a desktop analysis that focused on the funders' perspective and an online survey that focused on the managers' and practitioners' perspective. The desktop analysis involved surveys of existing databases as well as targeted emails and online meetings with collaborators to identify major funders for coral reef restoration over the last 10 years.

The targeted emails were directed towards known collaborators and funding bodies withing ICRI's and the UNEP's network, while the survey to practitioners was widely distributed through the Coral List (online server and discussion forum), contacts of the ICRI Ad-hoc Committee on Coral Restoration, and

social media (e.g., Twitter, LinkedIn). The online survey consisted of 25 questions targeting coral reef restoration managers and practitioners to gather specific funding information including: type of funders, type of funding, amount estimate, and timeline of funding for primary and other sources of funding; and whether funding was tied to specific requirements or not, as well as perceptions of key barriers to effective funding schemes. The survey also included questions on the location, duration, and goals of the restoration efforts.



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RESULTS

The Funders' Perspective

We identified 61 funding entities. While each funder did not necessarily mention allocations disbursed to restoration efforts, the description of their funding efforts aligned with coral reef restoration. Funders are primarily philanthropic foundations (n=33, 54% of funders), followed by national governments and private investments (n=9, 15% respectively). Funding types were largely dominated by grants (n=40, 65% of funding types were "Grant only").

Most funders did not target specific locations for funding allocation (global, n=35, 57% of funding), though some were focused solely on Least Developed Countries (LDCs) and Small Island Developing States (SIDS). Other funding allocations were regionally-specific (e.g. Asia-Pacific region (n=8), Caribbean and Americas (n=7), and Africa (n=2)). The estimated available funding was dominated by large grants up to ten million USD. However, the duration of funding allocations remained unclear.

Targeted emails and discussions revealed that direct funding for coral reef restoration is limited. Key funders disclosed that their goal is coral reef protection for ecological resilience and restoration is a component of a broader reef conservation and protection strategy. This is a recommended approach but clouds our ability to discern the funding for restoration independently of other management strategies. However, there were eight projects that delineated funding specifically for restoration. From those eight, the average funding amount was US\$2.4 million, ranging from US\$15,000 to US\$6.9 million. The average duration of funding was 3.3 years with a range of two to five years. Note that large funding amounts reported often encompass more than one restoration project and include ecosystems other than coral reefs (e.g., mangroves, seagrass). The definition of what constitutes a "project" in terms of goals, objectives, and scale was not always clear.

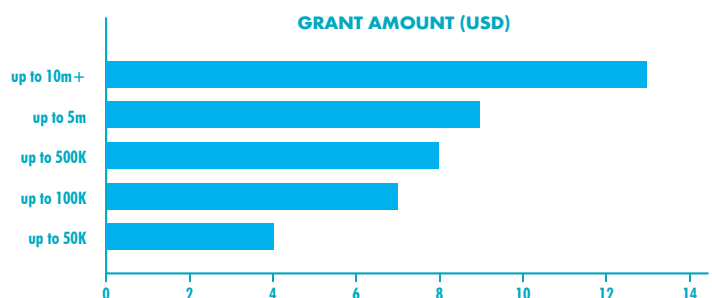
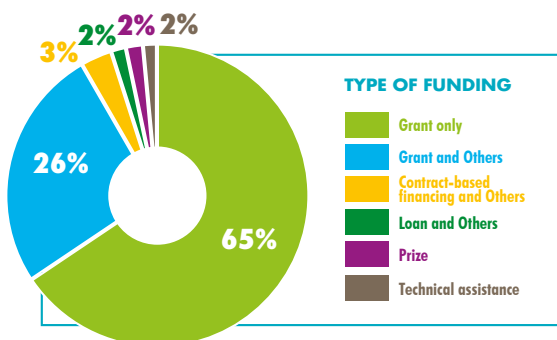
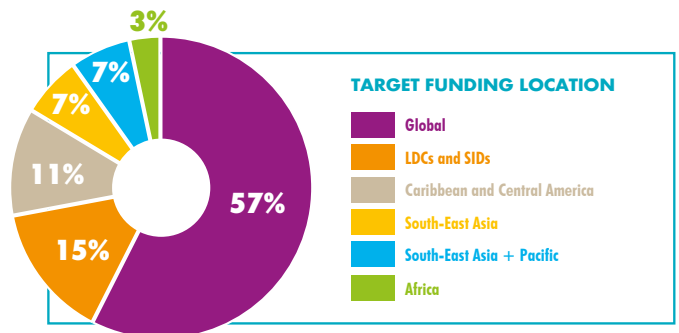
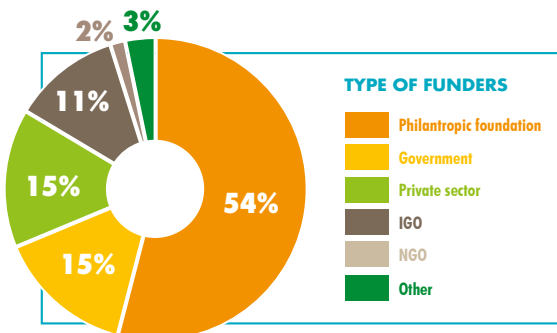


Fig 1. Funders' perspectives key summary figures.

The Managers' and Practitioners' Perspective

Managers' and Practitioners' demographics

The online survey (available in appendix 1) generated 165 responses from 137 managers and/or practitioners. Respondents were asked to provide one response per coral reef restoration project (i.e., type of restoration effort at a given location or country).

NGOs and governmental institutions were the two dominant groups of respondents (n=72 respondents, 42% and n=43 respondents, 25%, respectively), followed by universities (n= 23 respondents, 14%) and private businesses (n=20 respondents, 12%).

Projects were located in all coral reef regions across the world with the majority of respondents from the Caribbean (n=38 respondents, 29%) and South-East Asia regions (n=29 respondents, 22%). Mean project

duration was just over five years ranging from one to 23 years. Most projects (n=95) lasted from one to five years; however, 26 projects lasted over 10 years.

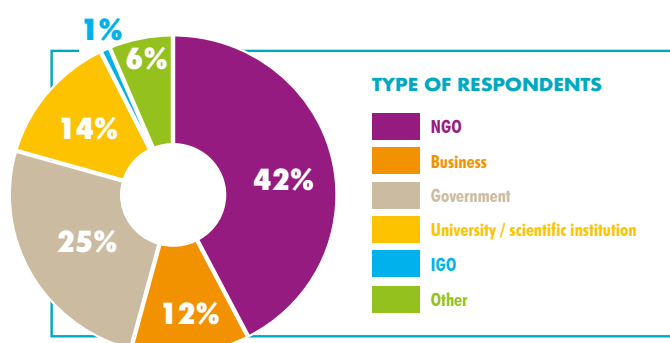


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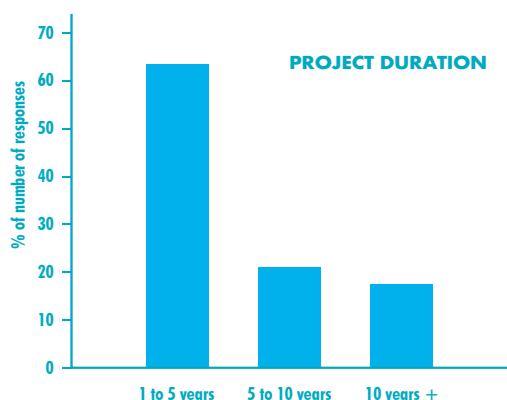
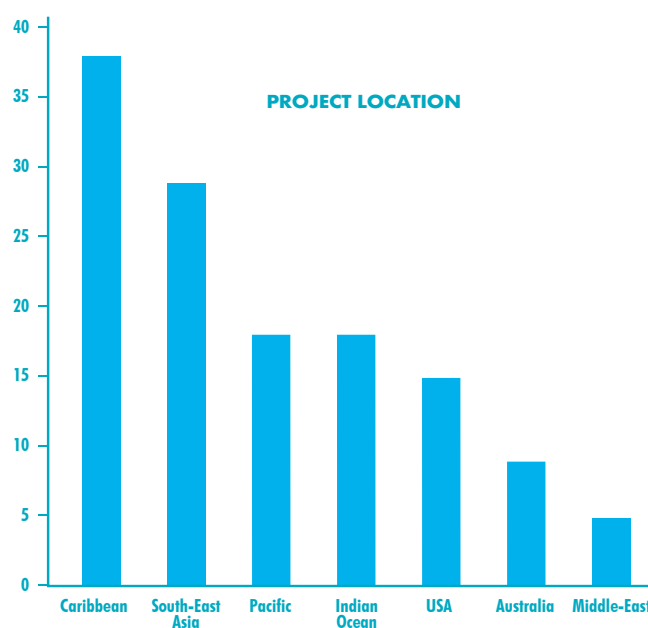


Fig 2. Practitioner's demographics summary figures.

Funding Characteristics

Governments and the private sector were the most prevalent types of funders identified as primary funding sources (26% and 25%, respectively). Other types of funders (one or more other major source of funding) were primarily from the private sector (37%).

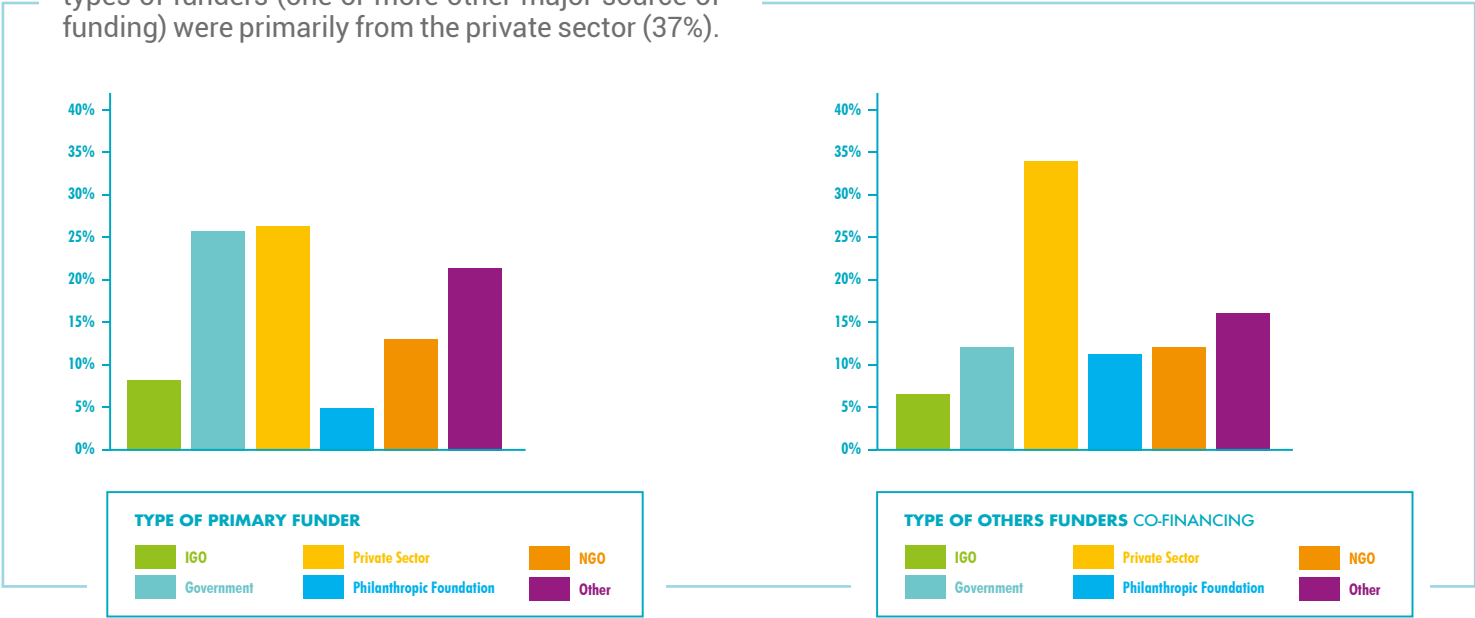


Fig 3. Types of funders Primary (left) and Others (right) reported by practitioners and managers.

Types of funding were largely dominated by grants for both primary and other types of funding (42% and 40%, respectively), while in-kind contributions and fiscal sponsorships were more prevalent as alternative types of funding sources.

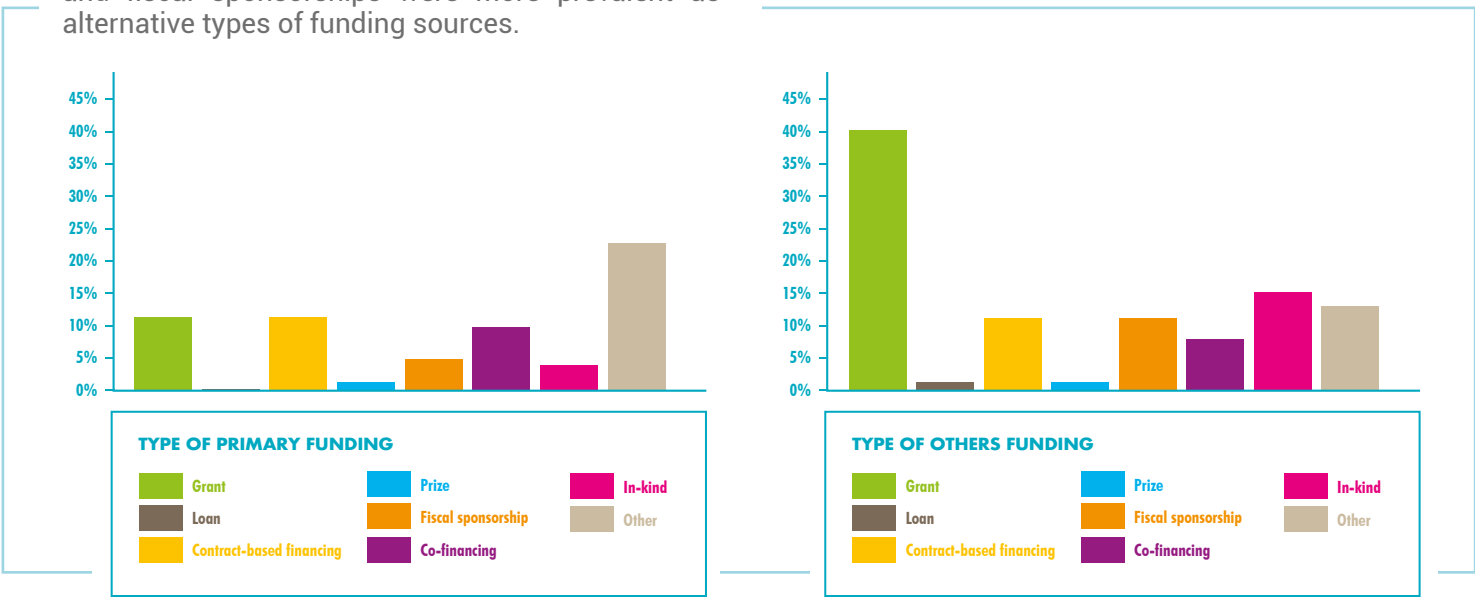


Fig 4. Types of funding Primary (left) and Others (right) reported by practitioners and managers.

The amount of allocated funding reported per project was variable. Almost half of primary funding (47%) exceeded US\$100,000. Other types of funding were generally lower than that of primary funding with over 60% of other funding being under US\$50,000.

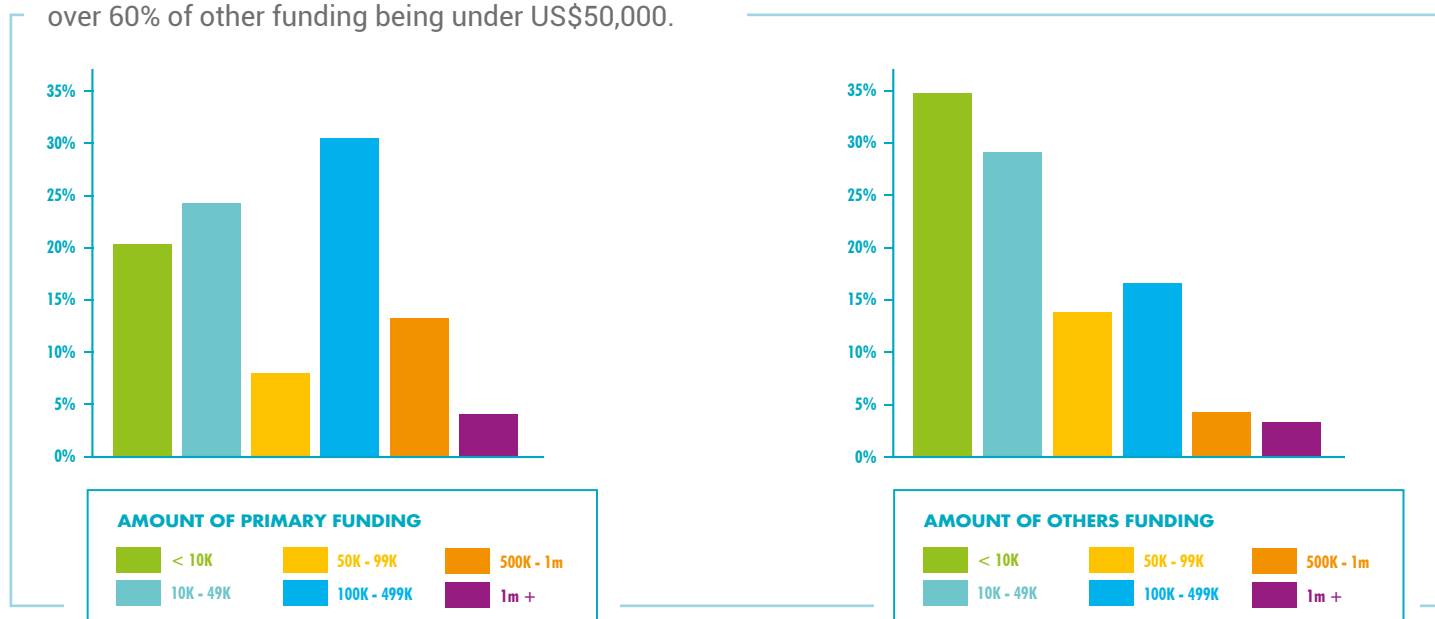


Fig 5. Estimates of amounts of funding Primary (left) and Others (right) reported by practitioners and managers.

Funding timelines were mostly for periods of 1 to 3 years for both primary and other types of funding. Projects exceeding 10 years were seldom reported (12 out of 121 responses).

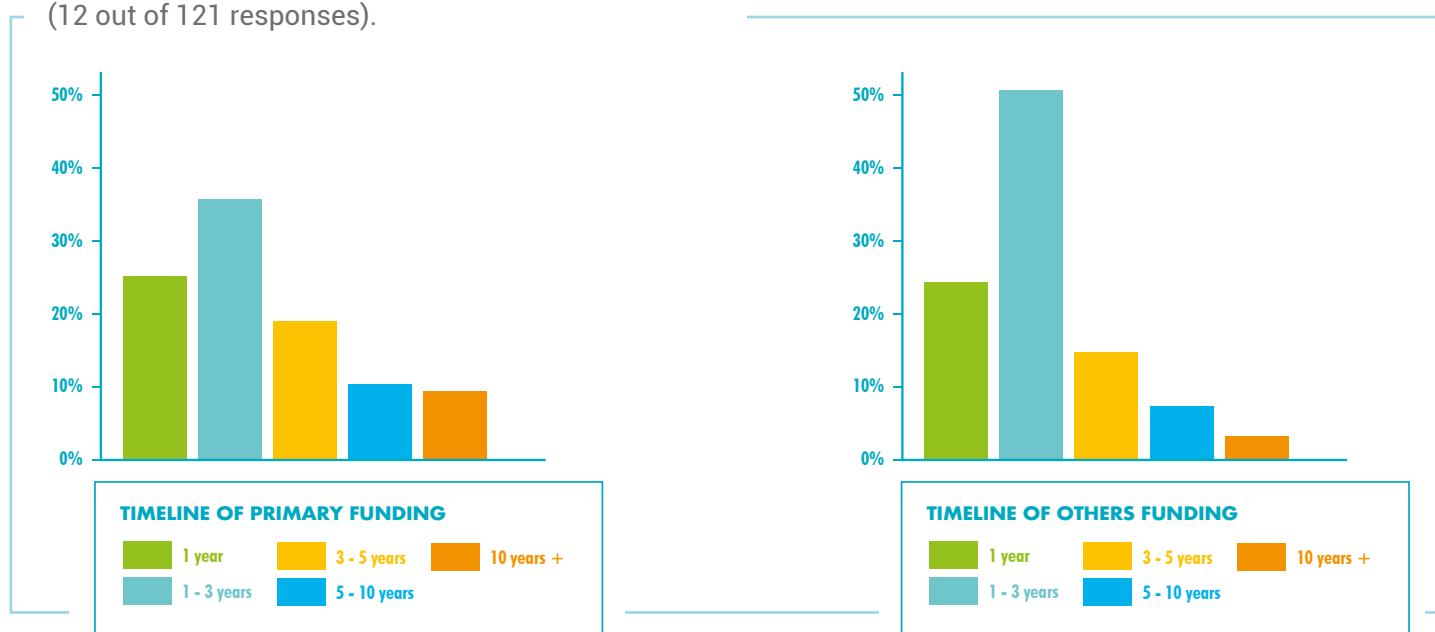


Fig 6. Timelines of funding Primary (left) and Others (right) reported by practitioners and managers.

The costs of coral reef restoration projects reported by managers and practitioners indicated that US\$258 million has been spent on coral reef restoration globally in the last 10 to 15 years. These costs may not fully encompass all investments made towards coral reef restoration in that time-period. Funding varied across regions with the largest amounts

reported for the USA and South-East Asia, and the lowest reported for the Middle East. Funding for coral restoration efforts in Australia and the USA were dominated by large grants (\$100,000 and above), while smaller grants (up to \$100,000) contributed to more than 50% of funding in the other reef regions.

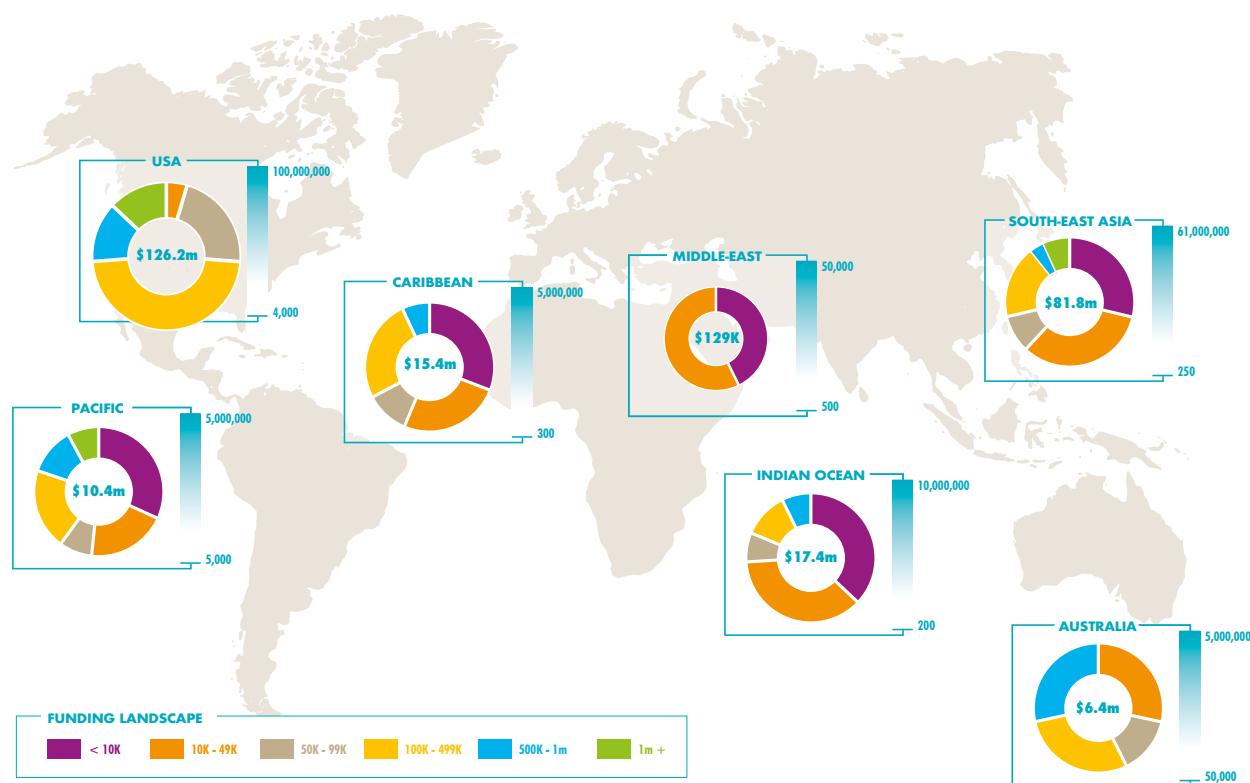
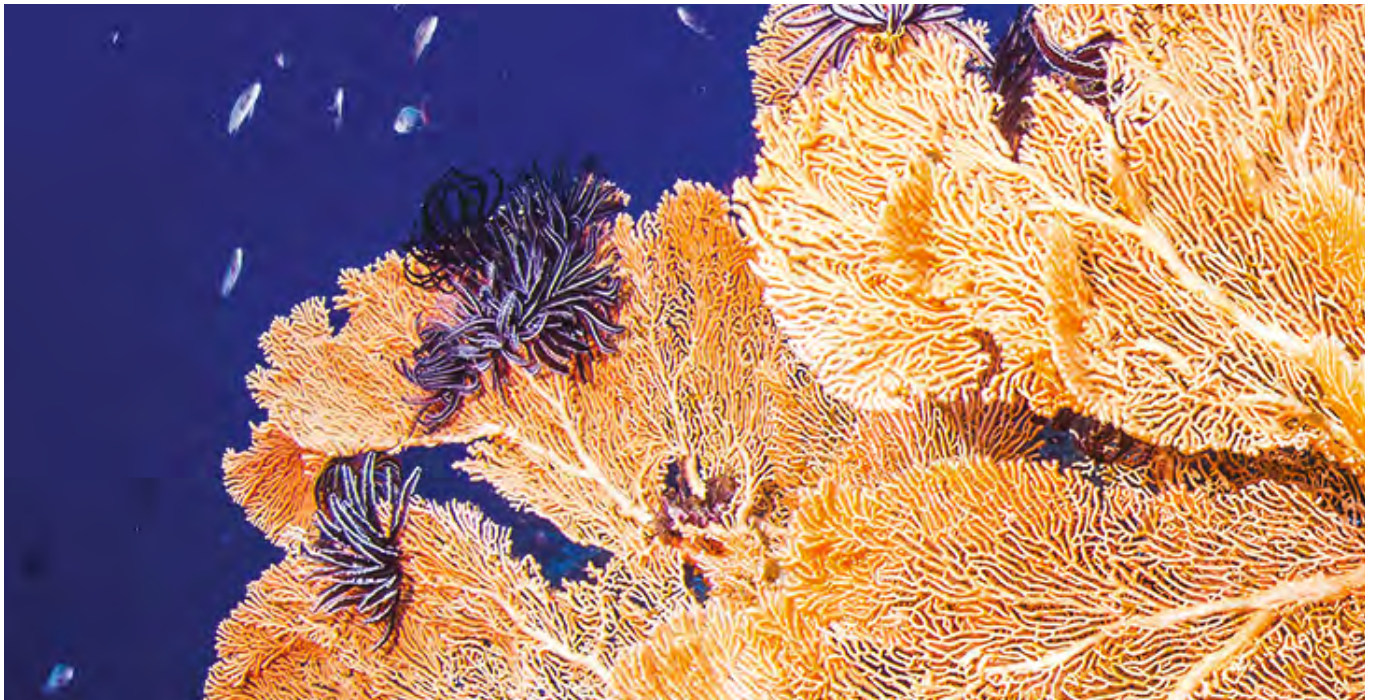


Fig 7. The funding landscape for coral reef restoration highlighting reported funding in different regions as a) total cost estimates reported by managers and practitioners, b) estimated funding amounts by category, and c) min and max costs reported in each reef region in the last 10 to 15 years.



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Funding and Restoration methods

Direct transplantation and coral gardening were the most widely reported methods across the different reef regions. Methods of substrate addition (e.g., artificial reefs) and substrate manipulation (e.g., algae removal, substrate stabilization) were the most

common practices in South-East Asia, the Middle East, and the Indian Ocean. Methods of larval-based restoration were most common in Australia and the USA.

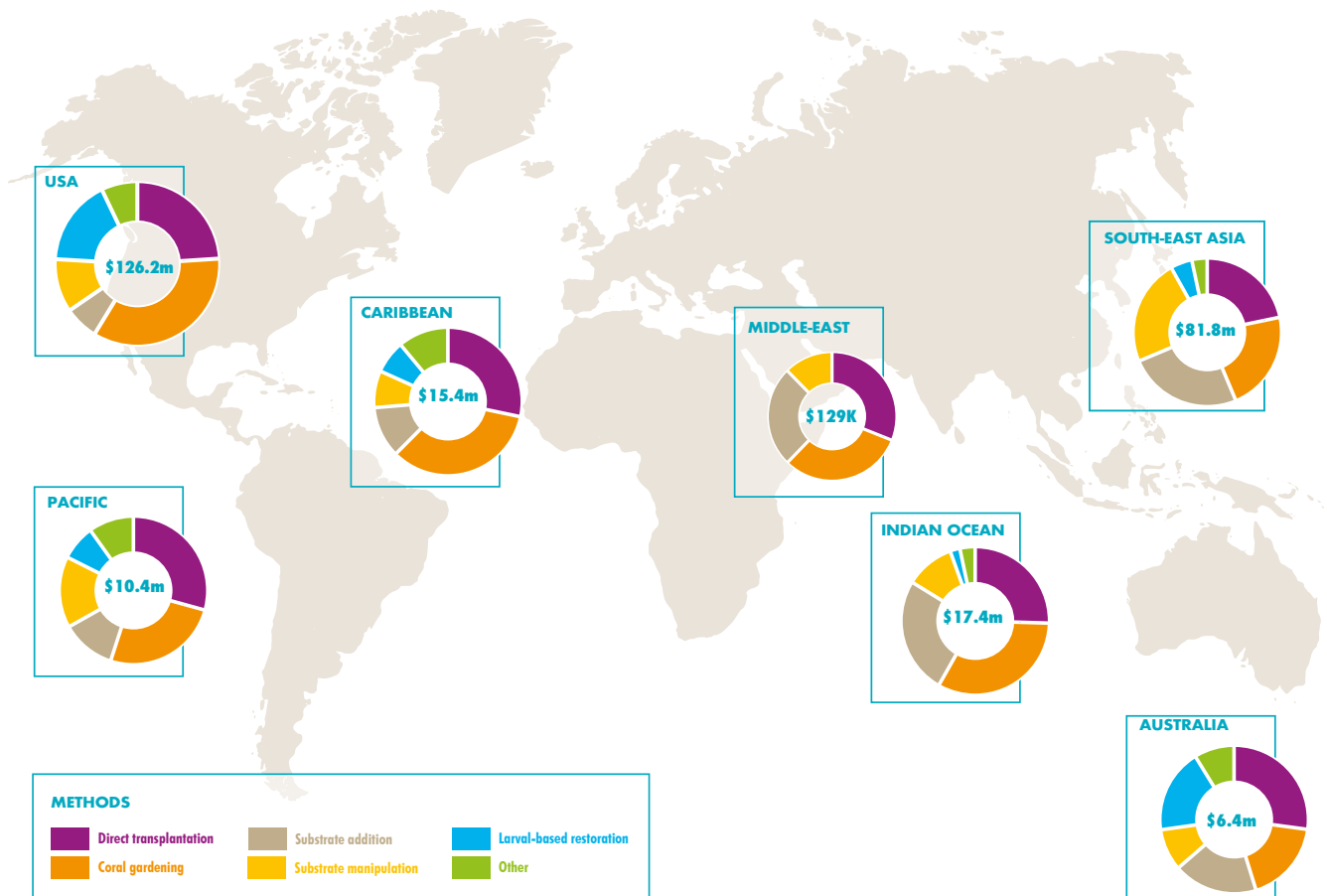


Fig 8. Funding and methods used for coral reef restoration as reported by managers and practitioners.



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Funding and Monitoring

Monitoring requirements were common with over 60% of managers and practitioners stating that the funding for their projects was associated with specific monitoring requirements. Of the projects primarily funded by governments, 80% of respondents indicated monitoring requirements, compared with 70% for projects funded by intergovernmental organisations, and 67% for projects funded by NGOs.

Projects funded primarily by the private sector or philanthropic foundations had a smaller proportion of respondents citing monitoring requirements (52% and 40% respectively). Interestingly, most respondents viewed these requirements as “positive” to “very positive”, and only 2% of respondents viewing monitoring requirements as a negative.

Barriers to Effective Funding

Managers and practitioners were also asked to list what they believed were the most common barriers to effectively funding coral reef restoration.

1. The most prevalent concern among managers and practitioners was that **funding was often tied to specific outplanting requirements** such as reporting on the number of corals or number of hectares restored, rather than long-term goals associated with restoration success (e.g., socio-ecological goals, climate mitigation goals). As a result, it was argued that the focus of funders can be too narrow in scope and focused on outputs that are not always useful for evaluating and supporting the long-term, ecosystem-scale success of restoration efforts.
2. Associated with this narrow scope, criticisms of **inadequate timelines for funding allocations were also reported**, with timelines being too short (1 to 3 years) to appropriately plan, monitor, and manage coral restoration projects in the long term.
3. Managers and practitioners also noted **issues related to the administrative costs of funding applications**. While this issue is not necessarily specific to the field of coral reef restoration, respondents argued that the general lack of funding visibility and the time (including staff hours) necessary to apply and report for grants, affects funding accessibility and efficiency.
4. Finally, some managers and practitioners also noted a **disconnect between funders' expectations of coral reef restoration and the reality of projects in practice**. It was argued that many funders are biased against the role of coral restoration efforts due to a lack of understanding of the methods and effort required, including a lack of evidence of long-term success.

SUMMARY AND RECOMMENDATIONS

Overview of Results

This report provides a first global baseline of the funding landscape for coral reef restoration by examining both funders, and managers and practitioners' perspectives. Overall, the estimated

funding reported is US\$258 million, which is a small fraction of funding reported for coral reefs and associated ecosystems: US\$1.9 billion between 2010 and 2016 (UN Environment et al. 2018).

Types of Funding

Over the last 10-15 years, funding for coral reef restoration has been dominated by grants from governments and investments from the private sector. Lower levels of funding from NGOs, IGOs, and philanthropic foundations may be linked to funders' preferences towards investing in more holistic coral reef conservation and protection projects than focusing purely on coral reef restoration efforts. However, the high proportion of private investments (through funding and contributions) in coral reef restoration is unique when compared to investments in other reef management strategies, which are typically dominated by multilateral and intergovernmental agencies and funds (UNEP 2018). The drive behind private investments could be tourism interest in the hands-on approach of restoration (Hein et al. 2020 NESP report).

Another source of innovative funding may also come from risk management in the form of reef insurance schemes or emergency management strategies as the value of reefs for coastal protection is increasingly recognised (Storlazzi et al. 2021). Investment by the private sector in coral reef restoration may constitute an avenue for innovative funding in the future and their contribution to global investments in coral reef restoration merits further investigation. It is also important to note that the potential for new global and regional funding opportunities and initiatives such as the Global Coral Reef Fund (GCRF) and the Reef Restoration and Adaptation Program (RRAP) (See Box) were not reflected in this analysis.

However, any type of investment should ensure that restoration is not used as an offset or excuse for permitting damage to coral reefs, and instead embedded in threat mitigation strategies (Hein et al. 2021).

Major new coral reef restoration initiatives:

- **The Reef Restoration and Adaptation Program (RRAP)** brings together Australia's leading experts to create an innovative suite of safe, acceptable interventions to help the Great Barrier Reef resist, adapt to, and recover from the impacts of climate change. Partners include the Australian Institute of Marine Science, CSIRO, the Great Barrier Reef Foundation, the University of Queensland, QUT, Southern Cross University and James Cook University. The Program is funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation.
- **The Global Fund for Coral Reefs (GFCR)** is a blended finance instrument to mobilise action and resources to protect and restore coral reef ecosystems.
- **Global Coral R&D Accelerator Platform** - Founded by 11 nations, The Global Coral R&D Accelerator Platform will advance the next generation of science and technology needed to secure a future for coral reefs in the face of climate change and other pressures.
- **Mission: Iconic Reefs** is an effort to restore seven ecologically and culturally significant coral reefs within Florida Keys National Marine Sanctuary; informed by years of research, successful trials, and expertise, the mission represents one of the largest investments ever undertaken in coral restoration. The partners will restore nearly three million square feet of the Florida Reef Tract, about the size of 52 football fields, at seven key reef sites.

Location of Funding

Projects and funding span across all reef regions of the world, confirming that coral reef restoration is being utilised wherever coral reefs are found (> 56 countries, Boström-Einarsson et al. 2020). However, funding does vary across these regions. Large amounts of funding in the USA may be explained by a longer history of coral reef restoration in the Caribbean region (Johnson et al. 2011) but is also an example of funding disparity and political will from developed to less developed nations. Given the massive deterioration in the extent and health of coral reefs globally in the last ten years (Souter et al. 2021, 2014-2017 heat waves (Hughes et al. 2017)) and future projections (Bindoff et al. 2019), targeted investment in efficient interventions along-side

traditional management is essential for reefs and reef communities to adapt to changing conditions (Kaufman et al. 2021).

This is particularly important for those regions most at risk from the direct impacts of climate change and/or those where restoration can support resilience by delivering critical ecological and socio-economic benefits. For example, increasing funding in developing countries and least developed countries (LDCs) to support and implement research and development could help promote the use of methods beyond coral gardening and transplantation and improve the cost-effectiveness and benefits of restoration efforts.

Timeline of Funding

The timeline of funding is one of the major issues uncovered in this report. **Funding for coral reef restoration was largely dominated by short-term grants**, which may be explained by:

1. Funding cycles and budgetary requirements that are not set up for long-term funding schemes, particularly government funding; and
2. Coral reef restoration being often ill-perceived as a short-term coral planting exercise rather than a long-term process with goals associated with ecosystem services. Better communication on the goals and objectives of coral reef restoration projects is necessary so funding schemes can be developed over more adequate timelines.

Encouraging Trends

Among the issues and barriers identified in this report, there are also encouraging trends. First, **US\$258 million has been invested in coral reef restoration in the last 10 to 15 years supporting projects in 56 countries**. With 137 managers/practitioners engaged in this analysis and 61 potential funders identified, this report highlights substantial growing interest and support for coral reef restoration as we start the UN Decade on Ecosystem Restoration.

Second, the **coral reef restoration methods reported by managers and practitioners are diverse** suggesting that projects around the world are moving beyond sole coral planting exercises (e.g., coral gardening and transplantation) and are starting to integrate larger scale methods such as larval-based restoration and substrate manipulations and enhancement. The diversification of coral reef restoration methods aligns with recent pushes to scale-up and diversify the portfolio of interventions for adaption and restoration of coral reefs (NAS 2019, Vardi et al. 2021).

Lastly, the **strong support towards funding being associated with field-based monitoring requirements** highlights the willingness of practitioners and managers to document success over time and improve the efficiency of efforts. However, it is important that these monitoring requirements are properly planned for and tied to specific long-term goals rather than short-term objectives (Shaver et al. 2020, Hein et al. 2020, Goergen et al. 2020).

Improving Funding

A key to improving funding for coral reef restoration globally will be to integrate more research into the costs and return on investment for a range of coral protection and restoration tools. At present, methods of coral gardening and direct transplantation are already showing positive cost-benefit ratios (Stewart-Sinclair et al. 2021). However, comparing these to other types of proactive (e.g., MPAs, water quality management) and reactive (e.g., algae removal, larval-based restoration) interventions will be valuable to assist future funding for coral reef management.

In addition, investments will need to move beyond funding discrete restoration projects to integrate large-scale infrastructure and capability. For example, as current R&D (e.g., RRAP in Australia, Bay et al. 2019) creates the opportunity for reduced costs (e.g. the cost per coral) and increased feasible deployment scales through automation and mass manufacturing, new methods of investments will be required to fund restoration operations beyond the scope of individual projects.

Recommendations

- 1. An increase in the amount and availability of dedicated funding for coral reef restoration is required as we begin the UN Decade on Ecosystem Restoration.** Coral reefs are one of the most threatened ecosystems on earth (CBD 2020, IPCC 2018), and yet coral reef restoration projects represent a small percentage of investments in ocean-based conservation and are largely under-funded compared to their terrestrial ecosystem counterparts. More funding for coral reef restoration will drive further investments in research and development to address the urgency to solve the coral reef crisis. This, in turn, may also generate innovations transferable to other systems (Kleypas et al. 2021).
- 2. Funders need to account for both short and long-term goals of coral reef restoration.** Short-term pulse funding (i.e., one to three years) may assist the development of pilot projects, while long-term sustainable funding (i.e., five to ten years) can increase the impact and efficiency of more established restoration efforts (UNEP-WCMC 2020).
- 3. More research into sustainable funding for coral reef restoration is required.** This will generate a diversification of funding options that integrate conservation finance tools. These may involve, harnessing private investments for tourism and insurance purposes, developing innovative blue economy funding mechanisms through the valuation of coral reef ecosystem services (See McFarland 2021), and merging with the industry to incentivise commercial operations.
- 4. Funding accessibility needs to be improved.** This can be achieved through increasing the visibility of various funding opportunities enabling all coral reef restoration actors including managers, practitioners, and funders to better identify opportunities for funding and collaborations. Improved communication on financing mechanisms could also be improved as part of the UN Decade through groups such as the UN Decade Finance Taskforce.
- 5. Funding for coral reef restoration should support greater capacity building.** Developing and supporting training and education programs is necessary to enhance engagement in coral reef restoration and adaptation while furthering the understanding of the role restoration can, and cannot, play in the face of local and global threats to coral reefs.
- 6. Better communication on the realities of coral reef restoration is necessary.** Funders need to be better educated on realistic costs, funding timelines and feasibilities for coral reef restoration. This may require more communication on goals and expectation from managers and practitioners.

Limitations

This report presents an overview of the global funding landscape for coral reef restoration but does not present an exhaustive list of coral reef restoration projects around the world nor is it associated with a database of funding opportunities. For more details on global coral reef restoration efforts, please refer to the [“Coral restoration database”](#) available on the [ICRI Restoration Hub](#).

The types of funding explored in this report were not defined as part of the survey to managers and practitioners to not influence their responses. As a result, however, reported funding types were left to the respondents' interpretation undermining some of

the analysis power. For example, if funders identified philanthropic organisations as a prominent source of funding for coral reef restoration, these were not listed as prevalent sources of funding by practitioners and managers. Such a discrepancy may highlight a gap of untapped funding opportunities, or it could be due to philanthropy not being distinguished from private investments in the survey responses.

In any cases, further research on costs and funding for coral reef restoration is necessary to inform the discipline as we move ahead in the UN Decade on Ecosystem Restoration.

Acknowledgments

This report was prepared thanks to support from the Government of Monaco, Government Offices of Sweden, the Prince Albert II of Monaco Foundation, and ICRI's ad-hoc committee on coral reef restoration.



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