

CORAL REEF RESTORATION TO IMPROVE ECOSYSTEM SERVICES POLICY BRIEF

JANUARY 2021

Coral reef restoration is becoming a popular tool to assist the recovery of damaged coral reefs. Over the last twenty years, several methods have been developed and applied with varying levels of success. A recent report by the United Nations Environment Programme (UNEP) provides guidelines for optimising the use of coral reef restoration as a tool to maintain reef ecosystem services.

Context

Coral reefs provide ecosystem goods and services worth hundreds of billions of dollars globally every year, but they are rapidly declining in the face of rising climate and anthropogenic disturbances. The 5th Global Biodiversity Outlook by the Convention on Biological Diversity (CBD) recognises failure to achieve previous targets for coral reef conservation and classifies corals as most at risk of extinction of all assessed groups. According to recent IPCC reports, **up to 90% of coral reefs could be lost by 2050**, even if warming is limited to an increase of 1.5°C. Urgent climate action is required along with bold local management to halt declines and support coral reef resilience now and into the future.

Coral reef restoration can be used as part of a broader management **strategy to combat declines in coral health** globally. It can also be used as a mechanism to help countries deliver on national and international commitments under various multilateral environmental agreements. A recent report from the International Coral Reef Initiative (ICRI) revealed that 88% of ICRI members were interested in the development of new international commitments and policies specifically dedicated to coral reef restoration.

In 2019, the United Nations Environment Assembly adopted Resolution 4/13 requesting UNEP and ICRI to define best practices for coral restoration for the maintenance of ecosystem services.

The **UN Decade on Ecosystem Restoration** (2021-2030) and **Ocean Science for Sustainable Development** (2021-2030), provide opportunities to highlight the work already underway and set out a path of future actions.

Challenges

Coral reef restoration faces challenges associated with the relative novelty of the field and the sense of urgency for its applicability. Challenges include lack of integration with threat abatement, limited spatial scale for effective implementation, insufficient monitoring of effectiveness, and lack of long-term stakeholder engagement.

Coral reef restoration can be mislabelled and mis-used as a stand-alone 'fix' for reef declines.

It will not be successful if threats to the reef system are not mitigated prior or concurrently to the restoration effort. Importantly, the potential to restore should **NEVER** be used as an excuse to degrade reefs.

Coral reef restoration and climate change

Coral reef restoration is not designed to reduce climate impacts, but rather, it is intended as a complementary tool to support natural recovery following disturbance in high-value areas. Given the many uncertainties associated with different climate scenarios, the key challenge is to design coral restoration efforts such that the realities of climate change are embedded in the choice of goals, objectives, and methods.

Climate change mitigation should not preclude investment in local management strategies designed to build the resilience and adaptation of the socio-ecological coral reef systems. **It is not an 'either or' situation**; multiple actions need to be implemented concurrently to provide coral reefs with the greatest hope for the future.



What is coral reef restoration

The term 'Coral reef restoration' describes a suite of active interventions aimed at improving reef structure and ecosystem function and increasing populations of key species.

Examples of restoration interventions include:



a. the **direct transplantation** of coral fragments on the reef,



b. **coral gardening** where corals are fragmented, grown in nurseries, and planted back on the reef,



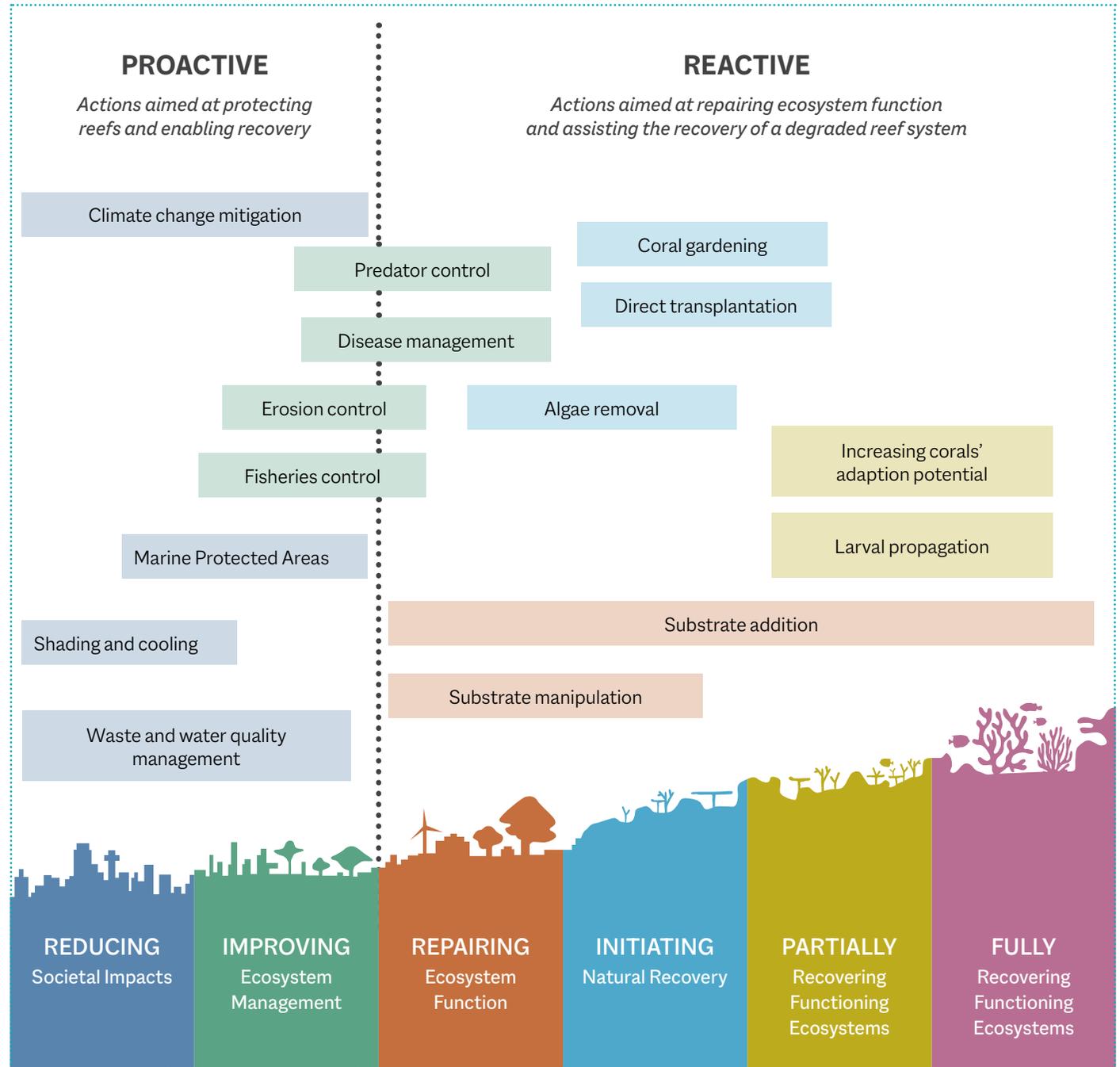
c. **larval propagation** where coral larvae are reared until ready to attach to the reef and released, and



d. the use of **artificial structures with planted coral** with the goal of protecting coastal areas.

If used, coral restoration should be part of a **continuum of activities** including addressing and reducing current threats to coral reefs impacts, remediation, and rehabilitating ecosystem function, following standards developed by the Society for Ecological Restoration.

Actions aimed at protecting and enabling recovery can be broadly categorised as '**proactive**', which support 'reactive' actions, commonly referred to as 'restoration'. '**Reactive**' actions are aimed at repairing ecosystem function and assisting the recovery of a degraded reef system, should it not be able to recover on its own.



Long-term goals aligned with maintaining and supporting reef ecosystem services

These goals are non-exclusive and can complement one another. In planning for coral restoration efforts, **clearly articulating the project goal(s) should be the first point of action.**

Then, objectives can be defined to track and accomplish the goals over shorter time periods, e.g.

1-3 YEARS

followed by long-term monitoring and adaptive management e.g.

5-10 YEARS

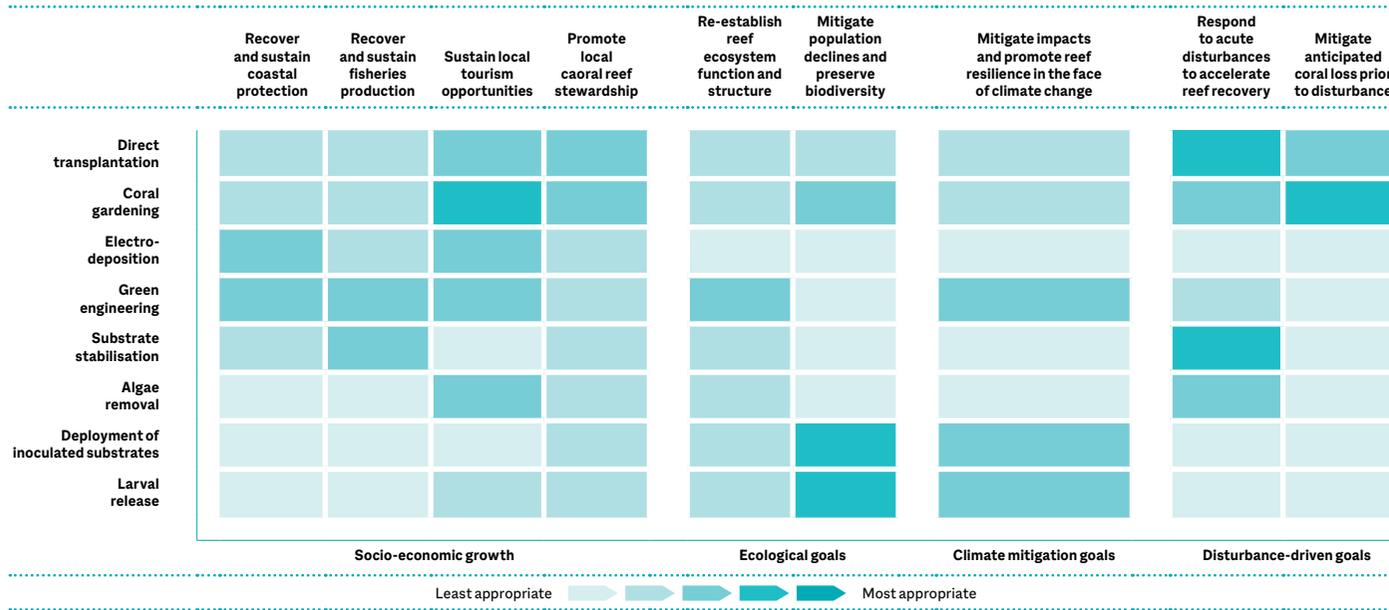
To manage ecosystems effectively, **objectives should be SMART** (Specific, Measurable, Achievable, Relevant, and Time-bound), informed by reference ecosystems, and consider anticipated environmental change.

| GOALS | RATIONALES - USE RESTORATION TO... |
|---|---|
| SOCIO-ECONOMIC GOALS | |
| a. Sustain or recover coastal protection | Sustain or re-establish the regulating ecosystem services provided by reefs to protect coastal communities and infrastructure by attenuating wave energy and mitigating disturbances such as erosion and coastal flooding |
| b. Sustain or recover fisheries production | Sustain or re-establish the provisioning services delivered by reefs in providing habitat and nursery areas for commercially important fisheries |
| c. Sustain or enhance local tourism opportunities | Maintain reef aesthetics to support local reef tourism and/or provide opportunities for eco-tourism experiences |
| d. Promote local coral reef stewardship | Support local communities and/or Indigenous traditional owners to engage and reconnect with the local reef environment, improve reef custodianship and promote intrinsic value of reefs (spiritual, traditional, worship) |
| ECOLOGICAL GOALS | |
| a. Re-establish reef ecosystem function and structure | Rehabilitate the function, structure, diversity and health of degraded coral reef ecosystems |
| b. Mitigate population declines and preserve biodiversity | Assist the recovery of endangered coral populations, and preserve innate reef biodiversity from genes to phenotypes to ecosystems |
| CLIMATE CHANGE ADAPTATION AND SUPPORT GOALS | |
| a. Mitigate impacts and promote reef resilience in the face of climate change | Support resistance and recovery processes to reduce risks of impact and ensure that reefs persist through current and projected changing climate conditions |
| DISTURBANCE-DRIVEN GOALS | |
| a. Respond to acute disturbance to accelerate reef recovery | Assist natural recovery process when reefs are affected by acute disturbances such as storms, predator outbreaks, ship groundings, and other structural damages |
| b. Mitigate anticipated coral loss prior to disturbance | Adopt an effective 'no net loss' mitigation policy whereby if a disturbance (e.g. coastal development) cannot be avoided, it should be minimised and offset for example by relocating anticipated losses prior to disturbance |



Restoration Methods

The majority of coral reef restoration projects around the world currently use methods such as coral gardening and direct transplantation. Other established methods associated with substrate manipulation or larval seeding are less often used, making them more difficult to assess in terms of effectiveness. **Established methods** widely applied in the field **vary in cost-effectiveness and scalability. Some may be more appropriate than others in meeting specific goals.**



Improved monitoring and communication among practitioners, managers, and researchers is necessary to move the field forward. Groups like the Coral Restoration Consortium are developing comprehensive guides to monitoring and implementing restoration and sharing them broadly.

Much investment in research and development to improve efficiency and scalability is also currently underway.

Recommendations

We recommend, to the maximum extent possible, that coral restoration projects:

1. **INTEGRATE** threat and disturbance abatement strategies,
2. **INCORPORATE** projections of climate change impacts and site vulnerabilities,
3. **CONSIDER** prevalence of disease, physical integrity of the reef, and population connectivity of key species in the choice of sites and methods,
4. **ENGAGE** stakeholders and maximise socio-economic benefits to the local communities,
5. **Are MONITORED** to allow for adaptive management and better communication of outcomes.

Conclusion

As coral reefs have experienced catastrophic losses in cover during recent years, the need for coral reef restoration efforts is accelerating.

Whilst it is not designed to reduce climate impacts, coral reef restoration can be a useful tool to support resilience, especially at local scales where coral recruitment is limited, and disturbances can be mitigated.

Policy, plans, and funding specific to coral reef restoration are needed to assist implementation at global, regional, and local scales. Coral reefs are one of the most highly threatened ecosystems in the world and are critical to the livelihoods of hundreds of millions of people.

We recommend that they should be well represented in restoration targets and investments associated with the UN Decade on Ecosystem Restoration.

Full report: Hein MY, McLeod IM, Shaver EC, Vardi T, Pioch S, Boström-Einarsson L, Ahmed M, Grimsditch G (2020) Coral Reef Restoration as a strategy to improve ecosystem services - A guide to coral restoration methods. United Nations Environment Program, Nairobi, Kenya. Available at icriforum.org/coralrestoration