

CRC POLICY BRIEF

Advancing Coral Reef Interventions in the Caribbean: Overcoming Barriers and Enabling Action

Policy Brief | October 2025

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Key insights

Implementation depends on relationships. Progress turns on trust, dialogue, and knowledge exchange as much as on tools and techniques—especially when weighing risks and trade-offs in place.

Governance needs to match ecological urgency. Slow, fragmented permitting and cross-border hurdles stall timely action; transparent, regionally aligned frameworks are needed.

Treat risk as a catalyst, not a brake. Since delay can be more dangerous than action, risk should be managed through careful trials, shared monitoring, and adaptive roll-out.

Key Terms

Assisted Gene Flow (AGF): The movement of individual corals within species ranges to increase diversity and boost resilience to climate change.

Managed Breeding: A type of AGF where more resilient corals from other places are intentionally crossed with local populations.

Symbiont Manipulation: Helping corals host more heat-tolerant algae or microbes, so they can better survive warming seas.

Emergency Permitting: Pre-authorized approvals that let practitioners act quickly during bleaching or disease events, instead of waiting weeks for paperwork.

One Caribbean: An emerging idea to align national and regional governance, so policies match the ecological connectivity of reefs across the region.

Why now

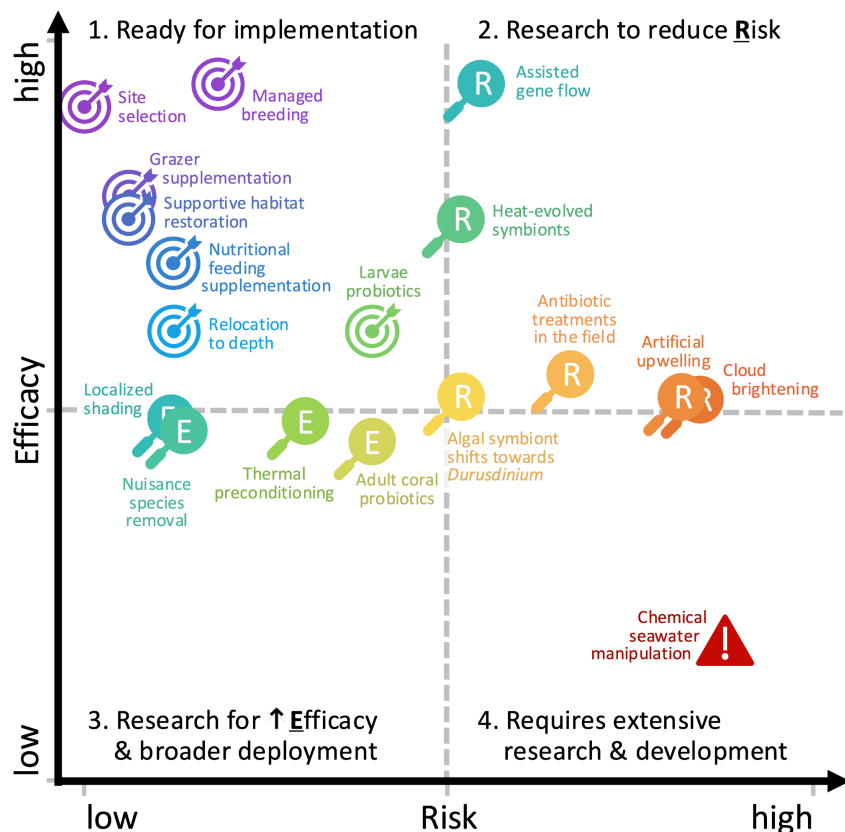
The 2023–2024 mass bleaching made clear that time is short. Current restoration approaches, including outplanting fragments and sexually produced recruits to sustain cover and genetic diversity, remain essential, but cannot on their own keep pace with climate-driven change. Across the Caribbean, practitioners and researchers are testing ways to scale interventions, yet coordination of funding, research, and policy still lags. With scarce time and resources, a shared sense of priorities is crucial.

In December 2024, at the Reef Futures Symposium, a regional workshop brought together researchers, restoration practitioners, and managers to co-design practical pathways for climate-resilient coral reef interventions. Building on the National Academies framework (NAS 2019), participants weighed both **efficacy** (likelihood of achieving intended outcomes) and **risk** (potential for ecological or social harm), then discussed **readiness** - what could move forward responsibly, given current knowledge and institutional realities. This brief distills those discussions into near-term actions and governance shifts that can enable a more adaptive, rapid, and coordinated regional response.

What the workshop surfaced

Over three days of structured dialogue, participants mapped a suite of interventions by perceived risk and efficacy (Figure 1). Several approaches, including managed breeding, grazer supplementation, and feeding supplementation, consistently landed as low-risk, high-efficacy. These can be integrated into existing programs now with minimal technological or regulatory hurdles, with performance improving as monitoring data accumulate. Other strategies, including localized shading during marine heatwaves, thermal preconditioning, and nuisance-species removal, all show encouraging results at smaller scales and are candidates for expansion where protocols and permitting pathways are in place. A third set, including assisted gene flow, evolving heat-tolerant algal symbionts, and exploratory measures such as marine cloud brightening, offer high potential but require stronger safeguards, clearer governance, and deliberate testbeds before widespread use.

Figure 1. Mapping Coral Reef Interventions by Perceived Risk and Efficacy.



This quadrant view reflects collective judgments from the 2024 Reef Futures workshop. It illustrates a subset of interventions, placed according to perceived efficacy and risk. Strategies viewed as “ready now” appear with target icons in the low-risk/high-efficacy quadrant; magnifying-glass icons mark areas where further policy or technical innovation is needed to reduce risk (R) or improve efficacy (E); the warning symbol indicates an approach considered unsuitable at present.

The real constraints are institutional

Participants repeatedly emphasized that feasibility is not solely a technical or infrastructure question. Interventions that look viable on paper slow down in the real world because of fragmented, step-by-step permitting, risk-averse organizational cultures, and thin coordination across governments. These entrenched routines mean decisions rest not only on evidence but also on power, trust, and different views of which risks and actions are acceptable. Because participants came from varied national and organizational contexts, those differences surfaced clearly in how interventions were judged, particularly around feasibility, permitting, and risk.

Two bottlenecks came up repeatedly. First, **emergency action**: during bleaching or disease events, approval processes that take weeks can mean the difference between mitigation and loss. Second, **cross-border work**: sharing genetic material and know-how for regional population management remains cumbersome and unpredictable, even when all parties agree it is warranted. These constraints are grounded in legitimate concerns, such as sovereignty, biosecurity, ethics, and fair benefit-sharing, but they are increasingly out of step with the ecological connectivity of Caribbean reefs.

There are bright spots. A recent milestone, the first cross-border outplanting of “Flonduran” elkhorn corals, bred from Florida and Honduras parents, shows that assisted gene flow is technically feasible and politically possible when enabling policies and partnerships are in place (Baker et al., 2025). Participants endorsed exploring a “One Caribbean” approach, an aspirational framework to align national and regional processes so collaboration better reflects the biology of the system.

Taken together, the obstacles, this concrete milestone, and the call for a shared regional framework point to a clear path forward: pair faster, clearer rules with ways of working that are collaborative by design. Efforts like One Caribbean can serve as a practical testbed, helping countries pilot flexible, adaptive arrangements that build trust and legitimacy across the region (Morrison et al., 2025).

Four opportunities to unlock timely, context-aware action

1) Establish pre-approved pathways for urgent measures

Regulatory agencies can pre-authorize time-sensitive actions, such as nursery shading or temporary relocation to depth, activated by transparent environmental thresholds (e.g.,

heat-stress alerts) and accompanied by short, standard reporting. Pair these with small, rapid-release funds so practitioners can deploy and monitor quickly. Embed review points so thresholds and protocols evolve with evidence and changing priorities.

2) Harmonize cross-border governance for genetic interventions

A regional framework can standardize benefit-sharing, biosecurity, and traceability while streamlining approvals under Nagoya Protocol and CITES. Model agreements, shared facilities (e.g., coral biobanks), and a permit-template library would reduce friction. Early pilot cases, co-designed with national authorities and communities, can serve as templates for wider use to address future climate challenges (Baker et al., 2025).

3) Invest in bridging capacity that ties people, practice, and policy together

Intermediaries like the Coral Restoration Consortium (CRC), especially its Caribbean Regional Working Group, can act as connectors, running a practical helpdesk for implementers, curating simple monitoring templates, and convening short “learning sprints” to refine high-priority interventions. Just as importantly, they can host co-design spaces where scientists, practitioners, and communities work side by side to test ideas, compare risks, and adapt approaches in real time. Building on this role, the CRC is developing a Caribbean-wide emergency response plan to coordinate rapid action during bleaching or disease events, strengthen communication across national programs, and align permitting and funding pathways for time-sensitive interventions. This kind of collaborative learning builds trust and turns different perspectives into a driver of innovation rather than a source of division.

4) Reframe risk around adaptive roll-out, not default precaution

Where reefs are tipping into collapse, waiting often costs more than acting carefully. Risk can be managed through well-designed trials: clear safeguards, joint monitoring, and agreed “off-ramps” if problems emerge. Approached this way, risk becomes a driver of learning and innovation rather than a reason for paralysis. Large-scale, community-based restoration, combined with fair and transparent genetic exchange, could both restore reef ecosystems and create new income streams, an ecological and socio-economic win-win.

A regional invitation

The interventions highlighted as “ready now” are not endpoints but entry points - tools to be integrated into locally adapted strategies through ongoing collaboration with communities,

practitioners, managers, and funders. More ambitious approaches can advance through governed testbeds, with shared safeguards and benefits.

Restoration will not succeed in isolation. Reducing local stressors, including sedimentation, pollution, overfishing, remains foundational, as does addressing global drivers of coral decline. As underscored by the Global Tipping Points Report (Lenton et al., 2025), the planet has already crossed the critical threshold of 1.2 degrees Celsius warming that exposes coral reefs to potentially irreversible change. What this brief offers is a practical path to **move faster together**, aligning governance with ecological urgency while protecting ethical and ecological guardrails.

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