

Troubled Waters: Marine Climate Solutions Outpace Global Governance

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15-04-2025



“As soon as Kingfisher-the-Chief finished speaking, he saw Hawk appear, along with two assistants who already recorded Kingfisher’s words. Hawk glared at Kingfisher, giving him a paper and asked him to sign it to confirm his opinion.

Kingfisher-the-Chief suddenly realized that Hawk was never that stupid. Kingfisher had fallen into Hawk’s trap and self-declared the end of his kindness-based administration.”

In “Kindness Policy”; *Wild Wise Weird* [1]



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As climate change accelerates ocean warming and biodiversity loss, a wave of novel marine-climate interventions is rising to meet the challenge. From coral reef restoration and kelp farming to ocean alkalinity enhancement and assisted evolution, these interventions aim to protect marine ecosystems and support coastal communities [2-4]. Yet, according to a recent global study, governance systems are struggling to keep pace with this surge of innovation [5].

Surveying 332 practitioners across 37 marine regions, researchers identified five categories and 17 subtypes of marine interventions currently deployed or proposed. While 71% of these initiatives focus on enhancing ecosystem resilience, others target carbon removal or social adaptation. However, there is little agreement among practitioners about the climate goals of specific interventions—undermining clarity, accountability, and coordination across projects.

Governance gaps are a critical concern. Most decision-making remains centered on technical feasibility for permitting, with limited consideration of broader ecological, cultural, or social consequences. Ethics assessments, transparency measures, and mechanisms for recognizing unintended social harms are largely absent. For instance, only 14% of interventions included ethics reviews, and just 15% incorporated social impact mitigation frameworks.

This lack of oversight has fostered what the authors call a “pseudo-scientific bubble”—an experimental space where novel technologies are trialed with minimal regulation [6,7]. The result is a significant “pacing problem,” where governance institutions lag far behind innovation. Without stronger regulatory frameworks, there is a risk of ineffective, inequitable, or even harmful interventions.

Nevertheless, the study identifies pathways forward. Strengthening governance through inclusive public engagement, cumulative impact assessment, and ethical evaluation can help align marine interventions with social and environmental justice. Incorporating Indigenous knowledge and rights-based approaches—still rare in current practice—can ensure more equitable and context-sensitive solutions.

This research underscores that technological fixes alone cannot solve climate crises. As humans intervene in ocean systems, governance must evolve with the same urgency and foresight [8,9]. Only through responsible, inclusive frameworks can we ensure that marine climate solutions support both planetary health and human dignity.

References

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