Janine Adams

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Restoration of marine ecosystems
The status of marine ecosystems and their role in sustainable development: new developments, approaches and challenges

Marine ecosystems are under pressure from climate change, habitat degradation, and pollution. Restoration is needed to recover biodiversity, ecosystem functioning, and the ecosystem services that underpin human well-being and sustainable development. While there is some progress on mangrove restoration; salt marsh, seagrass and kelp forest restoration is lagging. Coral reefs are in a critical state and the time for action is now. Importantly one restoration action can result in multiple benefits. An example would be diverting polluted stormwater or wastewater from a marine ecosystem or removing infrastructure i.e. a road to reinstate tidal flow. The restoration of blue carbon ecosystems (mangroves, salt marsh and seagrass) depends on adequate tidal flows as well as freshwater inflow to estuaries. Blue carbon ecosystems capture and store atmospheric CO_2 contributing to climate change mitigation. In arid and semi-arid countries, the implementation of environmental flows to downstream estuaries is an important restoration action and essential for maintaining a functional healthy ecosystem.

Although there is good progress on mangrove restoration; global assessments indicate that mangrove loss cannot be halted by 2030. Community participation and co-management are essential for successful mangrove restoration; this includes participatory approaches that build local capacity and ensure inclusive decision-making. There are examples where local (traditional) ecological knowledge has been integrated in mangrove restoration actions. Restoring natural hydrology and mangrove propagule planting are key restoration actions. Salt marsh restoration is less common but frequently has high success. World Salt marsh day on 11 June was launched in 2025 and creates awareness on the importance of these ecosystems. Targets for salt marsh are to conserve and restore 500 000 hectares and mobilise $5 billion by 2030 for conservation and restoration (Salt marsh Breakthrough). Seagrass restoration is constrained by pressures external to a site such as nutrient enrichment, sediment inputs and algal blooms that cause changes in the light environment. To achieve net gain in seagrass coverage global conservation of what remains is a priority thereafter large-scale active planting is required. Restoration must take a holistic approach i.e. across seascapes (catchment-to-coast, source-to-sea, ridge-to-reef) to ensure connectivity and address pressures beyond restoration site boundaries.

Successful restoration requires more than ecological intervention alone. A socio-ecological systems approach is necessary, recognizing the interconnectedness of ecosystem health, livelihoods, cultural values, social equity and equitable restoration outcomes. The dynamic

nature and complexity of marine ecosystems may pose challenges to effective restoration. Therefore, restoration must take an adaptative “learning by doing” approach. Climate change is resulting in shifting baselines and adaptive management is essential. Restoration efforts must be accompanied by greenhouse gas emission reductions, as ecosystem recovery alone cannot offset the impacts of continued ocean warming, acidification, and deoxygenation. Other challenges include overlapping governance frameworks, property rights, equitable benefit-sharing, and lack of adequate financing. However, global opportunities for capacity building and sharing of best practises from restoration projects are increasing. Restoration provides a transdisciplinary space for innovation and inspires hope for future generations; there are opportunities for skills development, capacity building and job creation. There are many excellent international initiatives ensuring collaboration and sharing lessons learned led by organizations such as Conservation International, Society for Ecological Restoration and the UN Ocean Decade programme for Blue Carbon (GO-BC). Progress has been made to achieving the objectives of The United Nations Decade on Ecosystem Restoration 2021-2030 and Target 2 of the Kunming Montreal Global Biodiversity Framework, (CBD) to ensure that by 2030 at least 30 per cent of areas of degraded marine and coastal ecosystems are under effective restoration. It is important to communicate that 1) restoration is secondary to retaining intact ecosystems 2) restoration is possible and the responsibility of everyone, and 3) that the removal of a single pressure is a first step on the restoration continuum.

Senne Aertbeliën

Abstract

The Greater North Sea Basin Initiative (GNSBI) is a voluntary, non-binding international cooperation platform involving nine countries (Belgium, Denmark, France, Germany, Ireland, the Netherlands, Norway, Sweden, and the United Kingdom) and the European Commission as a strategic partner. Its goal is to strengthen cross-border and cross-sectoral collaboration in the Greater North Sea Basin region to address challenges of spatial and ecological squeeze, with a focus on marine spatial planning, building on work being undertaken through existing frameworks like OSPAR, ICES, the North Sea Energy Cooperation (NSEC) and others.

As one of the five working tracks, the objectives of Nature Track, agreed in 2023 includes to "Promote joint efforts in restoring marine and coastal ecosystems…"

The need to develop optimal design of strategies for restoration and upscale regional cooperation was stated in a 2024 Antwerp Ministerial Declaration, notably in the light of commitments adopted under the OSPAR North-East Atlantic Environment Strategy (NEAES) 2030, the CBD Kunming-Montreal Global Biodiversity Framework (KM-GBF) target 2, as well as EU regulations such as the Nature Restoration Regulation (NRR) and Marine Strategy Framework Directive (MSFD). It is also being driven by marine users including offshore infrastructure development projects.

The presentation will share examples of the how the GNSBI countries are working together on marine ecosystem restoration, sharing the challenges, opportunities and some lessons that have been learned so far.

Lorenzo Alvarez-Filip

Coral Reefs: Crisis, Outlook, and the Case for Action

Dr Lorenzo Alvarez Filip

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Abstract

Coral reefs occupy under 1% of the ocean floor but support about 25% of all marine species and underpin food security, livelihoods, and coastal safety for over 500 million people in more than 100 countries. They provide key services such as fisheries, tourism, and shoreline protection, valued at roughly US$9.9 trillion per year, and reefs alone avert about US$4 billion in annual flood damages. Yet Caribbean reefs have lost roughly 80% of their coral cover over the last five decades due to ocean warming, disease, overfishing, and coastal development. As reef communities deteriorate, reefs lose their physical structure: more than 70% of Caribbean reefs are eroding faster than they build, which directly undermines coastal protection and fisheries productivity. If trends continue, annual flood damages would double, and the livelihoods of hundreds of millions would be at risk. Still, opportunity remains. Areas where key reef-building corals persist, often known as reef oases, still exist across the region, underscoring the urgent need to protect these sites, in particular those with low climate exposure, though nearly half remain unprotected. Reversing reef decline requires coordinated political action, including incorporating reef protection into national strategies, reducing local and global stressors, expanding and strengthening marine protected areas, sustaining monitoring, and scaling up restoration. The science, tools, and priority sites are clear. The window to act is still open — but closing.

Karina Barquet

Marine Ecosystem Restoration Beyond Ecology: Lessons from Regional Cooperation in the Baltic Sea

Marine ecosystem restoration is often framed as a scientific and technical challenge. While ecological knowledge, monitoring, and restoration interventions are essential, successful restoration also depends on governance arrangements capable of sustaining cooperation over long periods of time.

This presentation explores how international cooperation can enable and strengthen marine ecosystem restoration, drawing lessons from more than fifty years of regional cooperation in the Baltic Sea through the Helsinki Commission (HELCOM). Despite major political transformations—including the Cold War, the post-Soviet transition, and recent geopolitical tensions—Baltic Sea countries have maintained cooperation around shared environmental objectives and achieved important improvements in marine environmental management.

Using insights from environmental peacemaking research, the presentation examines the conditions that enable durable environmental cooperation, including the recognition of shared challenges, mutual benefits, repeated interaction, trust-building, and institutional continuity. It argues that these factors are not only important for cooperation itself, but also for sustaining long-term restoration efforts in transboundary marine ecosystems.

The Baltic Sea experience highlights that restoration outcomes depend on more than ecological interventions alone. They also require institutions, trust, and mechanisms for collective action across political boundaries. These lessons may provide useful insights for other regions seeking to advance marine ecosystem restoration in an increasingly complex and geopolitically uncertain world.

Ranjeet Bhagooli

Coral reef ecosystems of Mauritius, a SIDS nation:

challenges and promises

RANJEET BHAGOOLI

Abstract:

The islands of the Republic of Mauritius are mainly located in the South Western Indian Ocean and are surrounded with coral reefs similar to many Small Island Developing States. The state of the coral reef ecosystems of Mauritius, Rodrigues, St Brandon and Saya de Malha are presented. Due to increasing frequency and intensity of marine heatwaves coral reefs are declining worldwide and Mauritian reefs are not spared. A comparative study between 2002-2011 indicated a decrease in coral cover of up to 50% at several sites around Mauritius Island, except for one site which had about 90% decrease in 2005 while in 2010 most of the sites had a more severe decrease in coral cover than in 2005. In 2010, some six sites exhibited decline of 96 to 100% of coral cover. Minor 2003/2004 and major 2009 bleaching events resulted in decline of live coral cover from 61% in 2000 to 1% in 2010. Using prediction models based on sea surface temperatures it has been suggested that reefs of Mauritius might face “extinction dates” around the year 2070. Current asexual propagation of corals to rehabilitate reefs tends to show some positive results but provide a ‘nugget’ of hope in the wake of increasing intensity and frequency of mass coral bleaching and mortality events and the limited natural adaptation of corals. Some analyses of barriers and catalysts are presented along with potential of sexual coral propagation and assisted evolution approaches to enhance the thermal tolerance of corals with an aim to help corals cope with the rapid elevated temperatures. The call for actions includes catalysing broad-scale and multi-institutional collaborative field hubs for a broader experimental scope, support for multi-generational corals, and developing methodologies through assisted evolution approaches that protect broodstock and experimental corals from heatwaves events. It is imperative to maintain good and favourable seawater quality and conditions for corals and reefs to come back. These proposals will help scientists and reef managers realize the potential of assisted evolution and help safeguard a future for coral reefs.

Kristina Boerder

Title:

Community Eelgrass Restoration Initiative – Community-based Eelgrass Research and Restoration in Nova Scotia

Abstract:

The Community Eelgrass Restoration Initiative (CERI) is a collaborative partnership between Dalhousie University and the Confederacy of Mainland Mi'kmaq aimed at advancing understanding of the ecological significance of eelgrass ecosystems along Atlantic Canada's coastline. Integrating interdisciplinary research with Indigenous knowledge and applied conservation, CERI bridges science, policy, and community engagement to translate academic knowledge into tangible restoration outcomes. The initiative combines long-term ecosystem monitoring, targeted scientific studies, outreach, and community-led restoration efforts to support the protection and recovery of eelgrass habitats. By fostering collaboration across sectors and empowering local communities, CERI contributes to strengthening coastal resilience and biodiversity conservation. This presentation will provide an overview of CERI's framework, methodologies, and ongoing work in Nova Scotia/Canada.

Laura Bowie

The status of marine ecosystems and their role in sustainable development: new developments, approaches and challenges.

Presentation Abstract by Laura Bowie, Gulf of America Alliance

The Gulf of America is one of the nation's most productive marine ecosystems and a major driver of economic prosperity, supporting nearly 585,000 jobs, generating approximately $133 billion in annual GDP, and hosting six of the nation's ten busiest ports. However, the ecological foundations that sustain this economic vitality are under increasing pressure from coastal development, severe storms, water quality degradation, habitat loss, and long-term environmental change. Challenges such as shoreline erosion, nutrient-driven hypoxia, and shifting species distributions associated with tropicalization are diminishing the capacity of Gulf habitats to protect coastal communities, support fisheries, and sustain tourism and recreation.

Historically, restoration efforts have been implemented at local scales, where projects are designed to address site-specific needs and conditions. While these efforts are essential, many emerging challenges now exceed the capacity of individual communities and jurisdictions to address independently. Limitations in restoration materials, competing regional priorities, and ecosystem changes that span geographic/state and disciplinary boundaries highlight the need for broader, more coordinated approaches.

This presentation explores the case for regional-scale ecosystem restoration in the Gulf of America and highlights how collaborative governance can strengthen restoration outcomes. It will discuss the role of the Gulf of America Alliance, a partnership established by the five Gulf states to address shared environmental and economic priorities through coordinated planning, stakeholder engagement, technical capacity, and strategic investment. By fostering collaboration across state, federal, academic, nonprofit, and private-sector partners, the Alliance is helping develop innovative solutions to complex restoration challenges and advancing a more resilient future for Gulf ecosystems and the communities and economies that depend on them.

Verónica Cáceres

Abstract: Strengthening Marine Ecosystem Restoration - The role of the Inter-American Convention for the Protection and Conservation of Sea Turtles: Cooperation, Coordination, and Collective Action

Presenter: Veronica Caceres, IAC Secretary

Marine ecosystems face unprecedented pressures from habitat loss, climate change, pollution, and unsustainable practices. As keystone species, sea turtles play a critical role in maintaining the health of seagrass beds, coral reefs, sandy beaches, and coastal ecosystems. Their conservation is therefore is connected to sustained efforts to restore and keep the health on marine ecosystem. The Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) provides a unique regional framework that unites 16 countries in the Western Hemisphere in coordinated action to protect sea turtles and their habitats. When we protect sea turtles, we are contributing to restore the ecosystems that sustain them. The Resolutions adopted by IAC Parties address the mitigation of threats to sea turtle survival, many of the mitigation measures help protect marine ecosystems from which sea turtles depend. The presentation highlights the Convention's contributions to marine ecosystem restoration, showcases concrete examples of mitigation of threats to sea turtles implemented by IAC Parties such as the impact of climate change to sea turtle habitats, protection of index nesting beaches from habitat degradation, pollution and excessive use of artificial lights due to uncontrolled coastal development, the use of better practices for handling and release of sea turtles incidentally caught in fishing operations, and fishing technology to reduce sea turtle bycatch. The IAC recognizes the importance of international collaboration, capacity-building, and adequate legal framework that includes the conservation of marine ecosystems. The IAC has a multidisciplinary approach fostering coordination between governments environmental and fisheries agencies guided by science and shared responsibility, this is key to lasting restoration of marine ecosystems that are critical to sustain sea turtle habitats.

ESPANOL

Resumen: Fortaleciendo la Restauración de los Ecosistemas Marinos – El papel de la Convención Interamericana para la Protección y Conservación de las Tortugas Marinas: Cooperación, Coordinación y Acción Colectiva

Presentadora: Verónica Cáceres, Secretaria de la CIT

Los ecosistemas marinos enfrentan presiones y amenazas debido a la pérdida de hábitat, el cambio climático, la contaminación y prácticas no sostenibles. Como especies clave, las tortugas marinas desempeñan un papel fundamental en el mantenimiento de la salud de los pastos marinos, los arrecifes de coral, las playas arenosas y los ecosistemas costeros. Su conservación está, por lo tanto, estrechamente vinculada a los esfuerzos sostenidos para restaurar y mantener la salud de los ecosistemas marinos.

La Convención Interamericana para la Protección y Conservación de las Tortugas Marinas (CIT) proporciona un marco regional único que une a 16 países del Hemisferio Occidental en acciones coordinadas para proteger a las tortugas marinas y sus hábitats. Cuando protegemos a las tortugas marinas, estamos contribuyendo a restaurar los ecosistemas que las sustentan. Las Resoluciones adoptadas por los Países Parte de la CIT abordan la mitigación de las amenazas para la supervivencia de las tortugas marinas, y muchas de estas medidas también ayudan a proteger los ecosistemas marinos de los cuales dependen.

La presentación destaca las contribuciones de la Convención a la restauración de los ecosistemas marinos y muestra ejemplos concretos de mitigación de amenazas a las tortugas marinas implementados por los Países Parte de la CIT, tales como el impacto del cambio climático en los hábitats de tortugas marinas, la protección de playas índice de anidación frente a la degradación del hábitat, la contaminación y el uso excesivo de luces artificiales debido al desarrollo costero no controlado, el uso de mejores prácticas para la manipulación y liberación de tortugas marinas capturadas incidentalmente en operaciones pesqueras, y tecnologías pesqueras para reducir la captura incidental de tortugas marinas. La CIT reconoce la importancia de la colaboración internacional, y fomenta el fortalecimiento de capacidades locales y un marco legal adecuado que incluya la conservación de los ecosistemas marinos. La CIT adopta un enfoque multidisciplinario que incluye la coordinación entre las agencias gubernamentales ambientales y pesqueras, guiada por la ciencia y la responsabilidad compartida; esto es clave para una restauración duradera de los ecosistemas marinos que son esenciales para sostener los hábitats de las tortugas marinas.

Philippe Costeau

Voyacy Regen Summary

In order to secure a hopeful abundant future, we must actively restore the oceans most vital ecosystems. That starts by building physical resilience and economic prosperity along coastlines.

But up until now, we have failed. Our coastal reefs are dying and disintegrating, and while we have made enormous progress in understanding their rich biodiversity and the critical role reefs play in coastal resilience as well as in the Ocean's overall health, over the last 25 years we have in total replanted roughly a square kilometre of coral reefs … and rebuilt none.

In that same period of time, we have lost 50% of our coral reefs globally with 14% loss since 2009. Last year major bleaching events in the Caribbean have all but wiped out the last coral reefs, and even the Great Barrier Reef has suffered unprecedented bleaching and been dramatically impacted.

We need a radically different approach, a scalable commercial solution to a global problem that affects hundreds of billions of dollars of physical assets and millions of lives, and we need it now.

What is Voyacy Regen?

Founded by Philippe and Ashlan Cousteau Voyacy Regen combines technology and nature to create commercially scalable living marine infrastructure. We build living reef systems s coastal infrastructure to protect shorelines and grow coastal economies.

There is no time … but there is a Solution

Coastlines and coastal communities are under siege, and it's only going to get worse. Without the critical infrastructure of reefs, they're naked to the elements. Coral Reefs are critical barriers against increasingly catastrophic storms that already impact hundreds of billions of dollars in coastal development and tens of millions of lives.

They need a shield and that's exactly what we are building…Shield Reef. This is not a theory or a pipedream, the technology is available and deployable now.

And these regenerated reefs provide a wide range of collateral benefits, including restoring and rebuilding critical biodiversity and fisheries, building local capacity and workforce development, and even providing an economic opportunity that counters transnational crime and illegal migration.

Dao Viet Ha

Coral reef restoration in Vietnam: preliminary results, challenges and opportunities

Dao Viet Ha
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Abstract: Vietnam's coral reefs, covering approximately 1,100 km^2 and harboring over 400 hard coral species, provide critical ecosystem services but face a precipitous decline. Recent monitoring data (2021–2024) reveal a sharp reduction in live hard coral cover, driven by the synergistic impacts of anthropogenic stressors (overfishing and coastal pollution) and escalating climate-induced disturbances such as mass bleaching events (1998, 2010, 2015, 2019 and 2024) and recent severe typhoons (2017, 2021). This study synthesizes preliminary restoration results from major Marine Protected Areas (MPAs) across Vietnam, including Cat Ba, Hai Van-Son Cha, Cu Lao Cham, Ly Son, Quy Nhon, Ninh Van, Nha Trang, Con Dao, and Phu Quoc. Utilizing techniques such as asexual fragmentation, nursery establishment, and the deployment of artificial cement and steel structures, thousands of coral colonies have been successfully transplanted. Lessons learned indicate that while dead coral substrates offer a cost-effective medium for rehabilitation, artificial structures are instrumental in deep-water recovery and biodiversity enhancement. A key success factor has been the transition toward community-based co-management, involving local fishermen and private sector investment. However, significant challenges remain, notably the lack of unified techno-economic standards, fragmented project scales, and insufficient long-term monitoring. To enhance restoration efficacy, we propose shifting toward resilience-based management by integrating micro-fragmentation technologies and heat-resilient genotype selection. Furthermore, aligning restoration efforts with the "Blue Economy" framework and carbon credit systems offers a sustainable pathway for Vietnam to meet its national target of expanding the MPA network to 27 sites by 2030. These findings provide a strategic foundation for scaling up coral reef restoration in the Western East Sea/South China Sea.

Keywords: Coral reef restoration, asexual fragmentation, community-based co-management, Vietnam

Owen Day

Abstract

Enabling and Enhancing Marine Ecosystem Restoration through International Cooperation & Coordination: Challenges and Opportunities — A Caribbean Perspective

Dr. Owen Day, Executive Director, CLEAR Caribbean

Caribbean coral reefs underpin regional livelihoods through tourism, fisheries, and coastal protection, with ecosystem services valued at approximately US$350,000 per hectare per year. Yet these reefs are in collapse. The 2024 mass bleaching event—the worst ever recorded—drove over 95% mortality of Acropora corals in the Eastern Caribbean, leaving key reef-building species functionally extinct across much of the region. Recovery now depends on active restoration in the face of compounding stressors: marine heatwaves, ocean acidification, pollution, and overfishing.

Drawing on ten years of community-based coral restoration in Saint Lucia and Saint Vincent and the Grenadines, CLEAR Caribbean presents a model that links ecosystem recovery with sustainable livelihoods—training and employing coral gardeners, supporting farmers in climate-smart transitions, and developing the first Caribbean Vocational Qualification in Coral Restoration. This experience demonstrates that coral restoration works and can be as effective as reforestation when communities are placed at its center.

The presentation argues that scaling restoration regionally requires two interlinked advances. First, Assisted Gene Flow (AGF)—the deliberate movement of resilient, heat-tolerant genotypes along thermal gradients—offers a scientifically endorsed pathway to genetic rescue, through live broodstock transfer, gamete exchange, and cryopreservation. The science is largely solved; the principal bottleneck is policy. Existing frameworks (CITES, the Nagoya Protocol, biosafety and quarantine regimes) treat coral movement as risk rather than rescue, and no regional agreements exist for routine, low-risk exchange of native genotypes. The presentation calls for a regional protocol through OECS and CARICOM, streamlined science-based permitting, integration of AGF into National Biodiversity Strategies and the SPAW Protocol, and dedicated funding for the shared biobanking, quarantine, and spawning infrastructure the region currently lacks.

Second, reducing local stressors, such as pollution, on reefs targeted for restoration. Preventing sewage discharge from vessels in popular Marine Protected Areas—could be solved with a technological solution to enforce no-discharge zones, illustrated by the Blue Valve monitoring system. Together, these interventions point to four priorities for international cooperation: scaling restoration with resilient genotypes and trans-boundary collaboration; embedding community-based approaches that create coastal livelihoods; enabling Assisted Gene Flow through enabling policy and infrastructure; and deploying technology to prevent pollution in reefs and coral refugia.

Bruna Rodrigues Debastiani

The presentation “Mangrove Restoration and Monitoring in the Western South Atlantic: Challenges, Innovations and Inclusion” explores innovative and inclusive approaches to mangrove restoration and ecosystem monitoring in coastal Brazil, particularly within the Guapimirim Protected Area in Rio de Janeiro state. It addresses key challenges limiting restoration efforts, including operational costs, f ield logistics, limited monitoring capacity, and the exclusion of traditional communities from restoration processes and benefits.

The presentation highlights how technological innovation and traditional ecological knowledge can work together to support more effective and scalable restoration strategies. Different technologies and monitoring tools are presented alongside community-based approaches that recognize local populations as essential partners in conservation and restoration activities.

The presentation also discusses the socioenvironmental challenges faced by many coastal communities living in mangrove regions, where poverty and limited economic opportunities often increase pressure on natural resources. In this context, the initiative promotes sustainable alternative livelihoods that can generate long-term income beyond the duration of restoration projects, while remaining compatible with mangrove conservation and ecosystem health.

Finally, the presentation emphasizes that mangroves should not be viewed only through their carbon sequestration potential, but as complex ecosystems that provide biodiversity support, coastal protection, food security, thermal regulation, and human well-being. In this context, the initiative promotes restoration models that integrate science, innovation, local knowledge, and sustainable livelihood opportunities to support long-term ecosystem resilience and social inclusion.

Nicola Ferri

The presentation showcases how the General Fisheries Commission for the Mediterranean (GFCM) provides a regional model for integrating marine ecosystem restoration into sustainable fisheries and aquaculture management. The GFCM's commitment to an ecosystem-based approach is anchored in its constitutive and strategic texts, thereby underpinning many of its activities and decisions. In the last decade alone, marine ecosystem restoration in the Mediterranean and Black Sea has seen notable progress thanks to science-based and regionally coordinated measures, including multiannual management plans, fisheries restricted areas, restorative aquaculture, pollution mitigation, and the management of non-indigenous species. These results demonstrate how regional cooperation and coordinated action among GFCM contracting parties and cooperating non-contracting parties support healthier ecosystems, more resilient coastal communities, and the long-term sustainability of living marine resources.

Kim Friedman

Dr Kim Friedman's presentation argues for a stronger, people-centred role for fisheries in delivering marine ecosystem restoration under the FAO UNEP Decade of Ecosystem Restoration and in the Kunming–Montreal Global Biodiversity Framework (GBF), particularly Target 2. It highlights growing pressures on biodiversity alongside rising food insecurity and societal responses to restore natures values. Despite this, restoration of the marine realm remains underrepresented in policy, science and investment. The talk outlines FAO actions to advance marine restoration, improve monitoring, and integrate fisheries into K-M GBF implementation. It calls for reframing fisheries as partners in conservation, emphasizing representation, recognition and resourcing, and concludes that meaningful biodiversity gains require working with the people and industries that depend on biodiversity, in addition to exclusionary approaches.

Daniel Friess

Achieving mangrove restoration at scale

Abstract

While global rates of mangrove deforestation have now slowed, substantial areas have been lost historically, creating large incentive for mangrove restoration to offset historical and ongoing declines. Our research suggests that as much as 800,000 hectares may be biophysically suitable for restoration, and dozens of countries have set ambitious mangrove restoration targets as part of their Nationally Determined Contributions or to meet targets under other international initiatives such as the Kunming-Montreal Global Biodiversity Framework. However, top-down mass planting programmes can frequently fail, as they often incentivize planting in areas that ignore the important hydrological requirements of mangroves, alongside fragmented land ownership and contested land tenure. Successful mangrove restoration at scale requires addressing several interlinked technical, community, and economic constraints, that are all ultimately influenced by larger scale governance considerations. Extensive international collaborative initiatives (such as the Global Mangrove Alliance, Mangrove Breakthrough and IUCN Mangrove Specialist Group) and best practice guidelines exist to overcome technical challenges, though moving from well-intentioned planting targets towards effective, large-scale ecological rehabilitation requires clear metrics of success and coordinated governance across landscapes.

Boze Hancock

Dr. Boze Hancock

Oyster reef restoration in the North Sea: Partnering with OSW for marine restoration in the mesophotic zone.

The structuring biogenic habitats of our nearshore marine systems are highly productive, highly diverse and highly impacted. These coastal habitats include the reef systems- the coral and shellfish reefs, as well as the vegetated habitats- the seagrass, kelps, saltmarsh and mangroves. In the North Sea the oyster reefs were a dominant component of the marine ecosystem in the deeper waters to 80m as well as the coastal zone. This is an area where offshore wind (OSW) construction is a priority. Offshore wind infrastructure needs protection from the potential scour caused by waves and currents, and uses rock as scour protection. This is a requirement for OSW infrastructure but also represents the more expensive component of oyster reef restoration. A series of synergies make combining oyster reef restoration with OSW construction the largest potential marine habitat restoration project of our time. These synergies and the proof-of-concept work to date will be introduced.

Sevvandi Jayakody

A Science-Backed, Inclusive Paradigm for Coastal Wetland Restoration

Sevvandi Jayakody

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The Global Wetland Outlook delivers a stark warning: Earth's wetlands are rapidly disappearing, with one-fifth of remaining wetlands projected to vanish by 2050. Within this crisis, the preservation of mangroves, seagrasses, and saltmarshes is a global urgency. This necessity stems not only from their exceptional blue carbon value but also from their provision of vital ecosystem services and livelihood security to vulnerable coastal communities, particularly given the poorly understood impacts of projected sea-level rises. While nations increasingly attempt conservation and restoration, these efforts are frequently hindered by critical scientific oversights. Conservation is impacted by an incomplete understanding of vegetation heterogeneity; for example, sedge, rush, and grass-dominant tropical saltmarshes remain unrecognized compared to known and mostly protected succulent-dominant types. Concurrently, misguided mangrove restoration often leads to the unintended conversion of valuable mudflats and saltmarshes. Proper restoration must begin by accurately identifying genuine historical mangrove losses. Furthermore, it must evaluate established secondary vegetation, recognizing that nature often selects optimal vegetation for post-disturbance conditions. Biodiversity represents another critical gap. Current practices often over-rely on a few plant species—such as Rhizophora spp. in the Indian Ocean—despite the existence of over 60 true mangrove species worldwide. Ecological success demands diversifying floral inputs and broadening recovery indicators to monitor pioneer fauna, including gastropods and early-stage fish. Ultimately, true restoration transcends ecological metrics. It requires well planned governance driven by capacitated peripheral communities and actively engaged youth for both applied and citizen science. Projects must be designed from inception to yield positive economic, social, and spiritual benefits, ensuring a clear exit strategy for funders, restoration managers and scientists, so they can invest on the next site that needs attention. Effective coastal restoration is not fueled by ecological nostalgia or narrow benefits; rather, it must be a data-driven, science-backed, and inclusive exercise.

James Kairo

Money Talks: Blue Carbon Trading Drives Mangrove Restoration and Community Benefits in Kenya

Dr James Kairo
Chief Scientist & Pew Fellow
Kenya Marine and Fisheries Research Institute, Kenya

Abstract:
Blue carbon ecosystems such as mangroves play a crucial role in climate mitigation, biodiversity conservation, and supporting coastal communities. However, scaling restoration efforts requires adequate funding and broad stakeholder engagement. Kenya's pioneering blue carbon projects—Mikoko Pamoja and Vanga Blue Forest—illustrate how market-based trading of verified carbon credits can create sustainable financial incentives for ecosystem protection. Together, these projects sequester an estimated 9,600 tCO2-equivalents annually, generating approximately USD 250,000 in carbon credit revenue each year. The funds are reinvested into local community development initiatives including water and sanitation, education, health services, and environmental management. Moreover, these projects have informed national policies, advancing Kenya's agenda for blue carbon ecosystem conservation and climate resilience.

Keywords:

Blue carbon ecosystems, carbon financing, community development, Kenya

Xiaohong Li

United Nations Office on Drugs and Crime

Abstract: Advancing marine ecosystem restoration through enhanced maritime security and crime prevention

Unlawful activities linked to the marine environment not only threaten the health and resilience of our oceans but also increasingly undermine coastal economies, fuel corruption, and create conditions in which further crime, including serious and organized crime, can thrive. At UNODC, we see this as a major threat to advancing marine ecosystem restoration, which depends on secure, well-governed, and effectively protected ocean spaces. To address these challenges, integrated ocean governance must be complemented by a criminal justice approach that enables States to detect, investigate, and prosecute crimes that affect the marine environment. These offences are diverse and interconnected, including crimes in the fisheries sector, pollution, corruption, fraud and forgery in maritime value chains, and trafficking in marine species and other illicit goods. In UNODC's approach, crimes that affect the marine environment span the full maritime value chain and are often distinct from, but closely linked to, IUU fishing. As such, UNODC complements the work of technical and conservation-focused partners by supporting Member States through prevention and awareness-raising, strengthening legal and regulatory frameworks, building law enforcement and prosecutorial capacity, enhancing inter-agency and international cooperation, and promoting the use of data, technology, and innovative tools. By addressing these key areas, international cooperation and coordination against crimes that affect marine ecosystems can be significantly strengthened, thereby directly supporting more effective marine ecosystem restoration through enhanced maritime security and crime prevention.

Margaret Miller

Cooperative Opportunities and Challenges in Coral Seeding

Dr. Margaret W. Miller, SECORE International

Most all coral reefs in the world have now been affected to a greater or lesser degree by human-caused environmental changes, especially increasingly intensive and extensive heatwaves. Growing expert and community consensus suggests that, *in addition* to reversing climate and local stressors, ecosystem resilience in many areas is compromised and active restoration is needed to ensure ecosystem recovery into the future. Indeed, in some coral reef regions, degradation has already reached a level of functional extirpation of foundation coral species requiring population reinforcement.

Coral seeding is a restoration approach that leverages corals' natural reproductive abundance. Based on advancing knowledge, processes, and technology, actively assisting across several coral early life history stages is now feasible, even in less-resourced and field-based settings, enabling the output of hundreds of thousands of new coral recruits per event. Implementation of coral seeding does require extensive training and some simple tools. In the Caribbean region, where coral restoration planning and activities have been a strong focus for over a decade, more than 10 practitioner groups have been capacitized to effectively implement coral seeding on their local reefs. Early phases of development for a similar training network model are under development in both the West Indian Ocean and Pacific Islands regions, where general coral restoration activities and strategies are just emerging. Given this less mature baseline, the training path and resource needs for effective coral seeding implementation are more extensive than the Caribbean, presenting greater challenges in terms of time and funding.

Meanwhile the severely diminished coral populations in the Caribbean also present emerging challenges for coral seeding, especially the need for additional broodstock diversity and more careful breeding plans and genetic management to minimize risks of future inbreeding. Exchanging early life stages (e.g., larvae or cryopreserved sperm) of native coral species among coral seeding practitioners is a tractable, risk-averse strategy to enhance genetic diversity of local breeding stocks. Unfortunately, international conservation regulations such as CITES and the Nagoya Protocol of the CBD present significant barriers. There is great opportunity for streamlining such international permitting for conservation efforts, perhaps around organized networks operating under committed, risk-averse protocols, to facilitate needed genetic exchange among Caribbean corals.

Rory O'Leary

United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea

Enabling and enhancing marine ecosystem restoration through international cooperation and coordination: challenges and opportunities

Abstract

As an island nation on the edge of the Atlantic, Ireland's identity, economy, climate, and culture are inseparable from the sea. Our maritime area is almost ten times the size of our landmass. Yet the marine ecosystems upon which we depend are under immense pressure.

Restoration is no longer a niche environmental aspiration. It is becoming central to climate policy, food security, economic resilience, and global sustainability. But marine ecosystem restoration cannot succeed through isolated national action. The ocean is interconnected by nature.

Restoration requires international cooperation as a fundamental condition for success and not an optional extra. Ireland is a committed partner to this multilateral approach for resolution.

Through international, regional and national collaboration Ireland is stiving to meet its obligations. Some key challenges identified are (i) governance complexity; (ii) complexity of the problem; (iii) competing demands and (iv) financing and scale

As with every situation, opportunities present themselves to address the challenges faced. Four key opportunities are identified; these are (i) Leadership (iv) Ocean literacy & public engagement (iii) Integration of policies and (iv) Implementation

Building towards success will embrace support for marine ecosystem restoration; enhanced capacity to deliver restoration at scale and equitable sharing of that capacity.

Rory O'Leary
Principal,
Marine Strategic Policy

Ellen Pikitch

Restoration of an Ecosystem: The Shinnecock Bay Global Hope Spot

Ellen K. Pikitch,
Endowed Professor of Ocean Conservation Science, School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, New York

Shinnecock Bay, the ancestral home of the Shinnecock Indian Nation, is an ecologically, culturally and economically important water body on the South Shore of Long Island. The bay suffered from harmful algal blooms, depleted eelgrass and overfished clam populations for several decades. The Shinnecock Bay Restoration Program (ShiRP) was initiated in 2012 to address these problems, with the goal of improving water quality and restoring the ecological integrity of the bay. Methods used to restore the bay included creating hard clam sanctuaries, reseeding eelgrass and building oyster reefs. The restoration of water quality became clear within a decade, and in part, because of this successful restoration, Shinnecock Bay was named New York's first Global Hope Spot by Mission Blue in 2022. Given the varied, and in some cases, long life history of fishes, it was expected that improvements in the fish community would lag behind enhancement of water quality. Fish biodiversity and abundance have been monitored extensively each year since the inception of ShiRP. Fish survey methodologies have evolved over the years, with eDNA coming into use in 2020. In recent environmental DNA has been deployed by novel integrated autonomous technologies. Improvements in fish abundance and diversity began to appear after several years, with forage species being the first category of species to show increases in abundance. In more recent years, upper trophic level species exhibited gains in abundance and biodiversity has greatly increased. It is now clear that Shinnecock Bay Shinnecock Bay is transitioning from a degraded simplified ecosystem, to a more diverse, productive, structurally complex and economically valuable estuary.

Chanel Raynor

Enabling and Enhancing Marine Ecosystem Restoration Through International Cooperation and Coordination: Challenges and Opportunities

By: Chanel Raynor, Coordinator, Ecosystems Management Branch, National Environment and Planning Agency, Jamaica.

Abstract

Marine ecosystems are central to biodiversity conservation, fisheries productivity, coastal protection, climate regulation and livelihoods, yet they are increasingly affected by climate change, habitat degradation, pollution, unsustainable resource use and coastal development. In this context, ecosystem restoration has become an important tool for reversing degradation and strengthening resilience, particularly in Small Island Developing States where marine and coastal resources are highly vulnerable and economically significant.

This presentation examines how international cooperation and coordination can enable and enhance marine ecosystem restoration, drawing on Jamaica's experience in coral reef and coastal ecosystem management. It considers restoration as a necessary complement to conservation and sustainable management, while recognizing that local restoration actions alone cannot address the global drivers of marine ecosystem decline. Using evidence from Jamaica's national coral reef monitoring programme, including the Coral Reef Health Index and long-term sea surface temperature monitoring, the presentation highlights the growing impacts of climate change, particularly coral bleaching associated with rising sea temperatures.

The presentation explores the role of international cooperation in supporting knowledge exchange, scientific collaboration, technology transfer, capacity-building, financing and coordinated monitoring. It also considers the contribution of global, regional and national frameworks, including the Convention on Biological Diversity, the Kunming-Montreal Global Biodiversity Framework, Sustainable Development Goal 14, the United Nations Decade on Ecosystem Restoration, Jamaica's Natural Resources Conservation Authority Act, the Action Plan for Corals and Reefs, and the National Mangrove and Swamp Forest Management Plan.

Key challenges include limited long-term financing, technical capacity gaps, insufficient monitoring data, fragmented project-based interventions and the escalating impacts of climate change. Drawing on examples such as the CoralCarib Project and the Caribbean Biological Corridor, the presentation demonstrates the value of multi-stakeholder partnerships involving governments, academia, civil society, local communities,

development partners and the private sector. It concludes that restoration at scale requires collaboration at scale, supported by coordinated governance, sustained financing and inclusive participation.

Greg Reynolds

"Building climate and community resilience through coordinated marine restoration"

Australia

Abstract

A sustainable ocean economy depends on healthy, resilient marine ecosystems that can support biodiversity, productive industries and equitable benefits for all Australians—and, in our shared Blue Pacific, for our Pacific neighbours whose livelihoods and cultures are deeply tied to the ocean. Globally recognised for its unique and diverse ocean environments, Australia has made strong international and domestic commitments to protect and restore marine ecosystems through legislation, programs and international engagement, including through regional partnerships. However, mounting pressures – from climate change and extreme weather events to coastal development and pollution – are placing unprecedented stress on our coasts and ocean, underscoring the need to accelerate restoration and adaptation efforts at scale.

Marine and coastal ecosystem restoration can be pursued through active interventions, such as building reefs (including coral reef restoration) or planting mangroves and seagrass, and passive approaches that focus on removing pressures and allowing natural recovery processes to operate. These approaches must be carefully considered in the context of shifting environmental baselines, knowledge gaps and the increasing influence of climate change on ecosystem structure and function. Recent events, including large-scale harmful algal blooms and coral bleaching, highlight the growing frequency of extreme impacts—particularly for coral reefs—and the need for improved monitoring, preparedness and coordinated responses across jurisdictions.

Effective restoration must incorporate climate adaptation by prioritising interventions, species and ecosystems, and designs that enhance resilience under future conditions. While scientific uncertainty remains – particularly around ecosystem thresholds and long-term climate trajectories – advancing our understanding of ecosystem resilience, improving monitoring and applying adaptive management will be critical. Restoration also presents opportunities to strengthen ecosystem resistance to marine heatwaves and other disturbances, and to support recovery following extreme events.

Marine protected areas play a vital, complementary role in these efforts. With one of the world's largest marine protected area networks, Australia is well positioned to leverage protection alongside restoration to reduce cumulative pressures, enhance ecosystem

resilience, and deliver wide-ranging environmental, cultural, social and economic benefits. Together, coordinated restoration, adaptive management and effective protection offer a pathway to safeguard Australia's ocean ecosystems in a changing climate and secure the foundations of a sustainable ocean economy.

Elizabeth Sinclair

Presentation at the 26th meeting of the UN Informal Consultative Process on Oceans and the Law of the Sea, 22-26 June 2026, UN Headquarters, New York

Panelist: “Enabling and enhancing marine ecosystem restoration through international cooperation and coordination: challenges and opportunities”

Marine Ecosystem Restoration in Australia: building capacity from R&D

Dr Elizabeth Sinclair

Abstract

Ecological restoration is a key part of the global solution to help repair damaged ecosystems and moderate climate change. However, it should not replace conservation efforts, as restoration comes with enormous challenges. Marine ecosystem restoration is evolving from restoration in response to coastal developments to the need for large scale responses to extreme climate events, such as marine heat waves. Climate change is impacting all ecosystems on the planet, yet nature is imperative for sustained business. Despite significant underfunding, widespread R&D efforts continue to restore Australia’s diverse coastal and marine ecosystems. An active network is connecting researchers, restoration practitioners and community groups to scale up action. Solutions that integrate western science and traditional ecological knowledge offer great opportunities. Such partnerships can assist with solutions, as managing and caring for a living and dynamic Country is at the heart of wellbeing for all Indigenous Peoples. Australia is well-positioned with marine restoration science and a national road map to scale up restoration. Incentives such as a Nature Repair market and carbon accounting are, however, poorly developed for marine and coastal ecosystems. Significant barriers remain around funding, fit-for-purpose governance, and political will to encourage incentives to truly meet global restoration and biodiversity conservation goals. There is an ongoing need to strengthen global networks for restoration of marine and coastal ecosystems through goal setting and incentivising nature-based solutions on climate change.

David Smith

SIDS, Climate Risk & Blue Economics

David C. Smith

Institute for Sustainable Development, The University of the West Indies

Abstract

Small Island Developing States (SIDS) are characterised by remoteness that negatively affects their connection to mainland economies. They often have narrowly based economies based on natural re-sources, and may have a large exclusive economic zone, leading to a dependence on Blue economy activities. This affects development since blue economy resources may be highly exposed to climate-related hazards. This presentation examines how climate change disproportionately affects tropical SIDS, where unprecedented climate regimes are projected to emerge years ahead of temperate regions. The loss of low-latitude coral reefs is a tipping point, for Caribbean SIDS, whose economies are among the most tourism-dependent in the world, this is an existential concern: beach tourism de-pends on coral reefs, mangroves, and seagrass ecosystems that are highly vulnerable to ocean warming, acidification, and intensifying hurricanes. Caribbean blue economies depend heavily on coral reefs, mangroves, seagrass, fisheries, tourism, and limited freshwater resources, so climate-driven ecosystem degradation has direct consequences for livelihoods, infrastructure, and macroeconomic resilience.

Hurricane Melissa (2025) was illustrative: a record-setting Category 5 storm whose wind speed, and economic damage were amplified by climate change by 7%, and 34% caused over US$12 billion in damage and loss. Mangroves ameliorated damage, but as indicated in the MVI, low-elevation coastal zones where critical economic assets—hotels, coastal roads, and airport runways—are concentrated, suffered losses.

A paper from Barbados indicated that nature-based and hybrid coastal protection approaches may outperform infrastructure in some cases, but they require higher investment. The solution is to adapt, however, access to funds to create resilient structures and to assist in transforming SIDS economies to be less dependent on vulnerable natural resources is highly limited. In the meantime, increased hazards continue to affect the islands. Possible policy responses are discussed including beach-use levies, hybrid coral reef restoration, effective coastal defence, reformed concessional finance, and investment in natural and human capital to build resilient island economies.

Mark Spalding

ABSTRACT

Cooperation as the Engine of Restoration: *From Shared Seas to the High Seas*

29 May 2026

Mark J. Spalding

Marine ecosystem restoration in shared and international waters cannot be achieved by any State acting alone; it depends on sustained international cooperation and coordination. Since 2007, The Ocean Foundation's (TOF) Trinational Initiative for Marine Science and Conservation in the Gulf of Mexico and Western Caribbean has created the space for Cuba, Mexico, and the United States to collaborate — enabling the Gulf of Mexico Marine Protected Area Network (RedGolfo) and U.S.–Cuba sister-sanctuary cooperation. Building on that space, TOF concluded its own 2023 memorandum of understanding with the Government of Cuba — the first such agreement Cuba has signed with a U.S.-based non-governmental organization — demonstrating that ecosystem-scale cooperation can endure even where diplomatic ties are limited.

The presentation then turns to how TOF advances restoration through cooperation more broadly — restoring coastal blue-carbon ecosystems, closing ocean-science capacity gaps for developing and small-island States, and mobilizing blue-economy finance — before closing on the high seas, where the BBNJ Agreement, in force since January 2026, offers a binding framework to protect and enable recovery of ecosystems beyond national jurisdiction, including where threats such as potentially polluting wrecks must be addressed first.

James Strong

Abstract

Marine ecosystem restoration is rapidly scaling from local interventions to coordinated regional and international initiatives. Effective restoration planning requires robust and consistent spatial data on habitat distribution, condition, pressures, and ecological connectivity across national boundaries. This talk explores the scientific and operational challenges of establishing shared baselines, mapping habitat condition, integrating cumulative anthropogenic pressures, and modelling restoration potential and recovery. It highlights the importance of harmonised monitoring, collaborative modelling frameworks, and international cooperation to support coherent, climate-resilient marine restoration strategies at basin and regional scales.

Liana Talaue McManus

A Planning process for Marine Ecosystem Restoration in Shared Large Marine Ecosystems (LMEs): the case of the South China Sea and Gulf of Thailand

Liana Talaue McManus

Lead, Transboundary Diagnostic Analysis (TDA) – Strategic Action Programme (SAP) Process Implementing the Strategic Action Programme for the South China Sea and Gulf of Thailand (SCS SAP) Project (with support from GEF, UNEP &UNOPS)

ABSTRACT

The Transboundary Diagnostic Analysis (TDA) and Strategic Action Programme (SAP) Planning process provides an approach to govern shared waters. In the South China Sea (SCS) and Gulf of Thailand (GoT), the TDA provides a contemporaneous analysis when climate change, pollution and biodiversity loss all converge as existential threats to the region.

The two LMEs seat in the Indo-West Pacific Region that is ground zero for global environmental change. The Indo-Pacific Oceanic Warm Pool provides the major heat source to the atmosphere and influences global climate patterns. The Coral Triangle, flanked by the SCS to its west, is the global epicenter for shallow-water marine biodiversity, which the SCS helps to maintain. Over the last fifty years, the region's coastal waters have become polluted with fertilizer run-off and single-use plastics. Overfishing has caused the fisheries of the GoT to collapse, and that of the SCS on the brink of one.

The Coordinating Body for the Seas of East Asia has provided the regional coordinating mechanism for ocean governance in the region. Without a convention, regional projects have become the soft platforms for collaboration with limited reach to coastal waters. The current TDA shows that regional governance must: (1) delineate functional transboundary MPAs in designated sites to halt further ecosystem loss and decline; 2) codify regional standards for major pollutants; 3) implement total allowable catch for critical fish species; and (4) set up blue carbon-based financing to integrate ecosystem services in regional conservation and climate change mitigation.

Mark Vermeij

Abstract

Small Caribbean nations all see their marine resources decline as a result of global and local changes. Coral reefs are arguably best to illustrate the issues arising when islands want to develop “in a sustainable manner”. Many interventions have been proposed by science to address the decline of reefs, but many, often unbeknownst to scientists themselves, prove impossible to achieve for small island nations. This leaves coral reefs without any “hope” in the foreseeable future despite the existing ambition to work towards measures to halt or even reverse their decline. Rather than proposing unaffordable tech solutions, ineffective “feel good” initiatives or “new conservation paradigms”, scientists would best serve realistic conservation efforts by providing now largely missing metrics on when conservation should be considered (or ended once successful). Based on personal experiences, Vermeij will discuss such commonly encountered paradigms held by scientists that seem to often stall rather than motivate or support nation’s ambitions to improve the long-term survival (and use) of their marine resources.