

Marine and coastal ecosystem restoration

Online lecture for SC87 on Ecosystem Restoration for SDG's.

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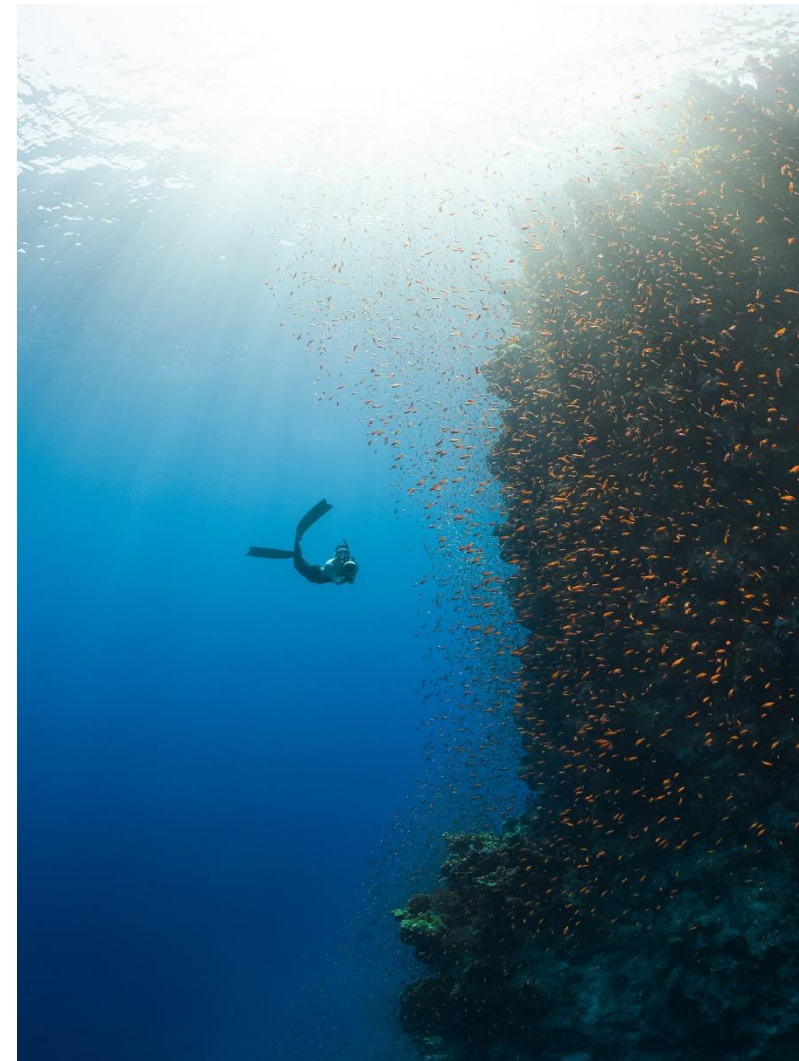


What to expect

- ▶ Ocean's role
- ▶ Threats to biodiversity
- ▶ Protection and beyond
- ▶ Restoration demystified
- ▶ Focus on ecosystems
- ▶ Marine restoration methods/techniques
- ▶ Policy landscape
- ▶ Scaling up restoration
- ▶ Challenges ahead

The ocean: life-support system & climate regulator

- ▶ Spanning **71%** of the planet, marine and coastal ecosystems provide manifold **ecosystem services** essential to human well-being, including oxygen production, food and water supply, climate mitigation and adaptation, and host to **80% of global biodiversity**.
- ▶ **40%** of the global population resides within 100 km of the coast, steadily rising. Over **3 billion people**, primarily in developing nations, rely on marine and coastal biodiversity for their **livelihoods**. For **1 billion people**, food from the ocean is their primary source of protein.
- ▶ **Economic benefits** including jobs and finance in sectors such as fisheries, renewable energy, eco-friendly tourism, etc.



Key drivers of marine biodiversity loss



Overexploitation: Over 1/3 of commercial fish species are severely depleted due to unsustainable fishing practices and bycatch, placing thousands of marine species at risk of extinction.

Habitat Destruction & Changes in Sea Use: Unregulated coastal development and harmful practices are causing extensive loss and degradation of critical habitats.

Climate Change & Ocean Acidification: Rising CO₂ levels have led to increased ocean temperatures, acidity and amplified oxygen depletion, critically threatening marine organisms, particularly corals and shellfish.

Pollution: Marine ecosystems are compromised by pollutants like (micro)plastics, heavy metals, and excess nutrients, causing eutrophication, harming marine life, and disrupting the food chain.

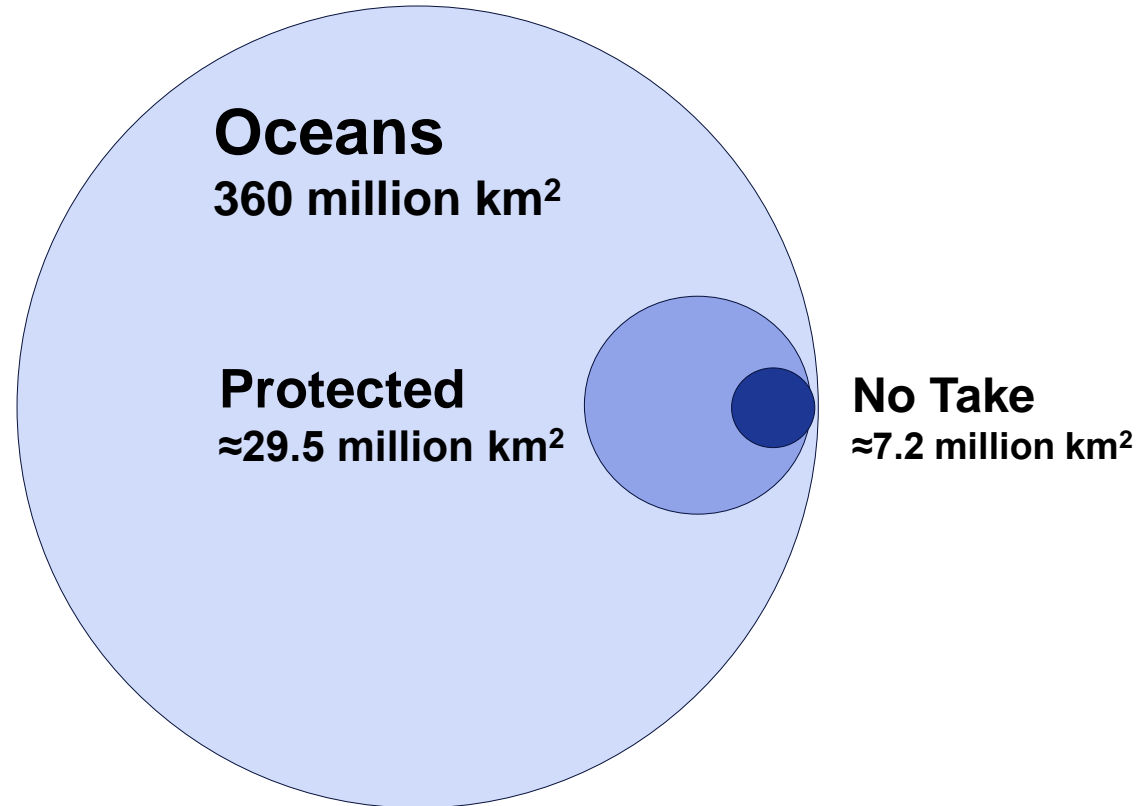
Invasive Species: Influx of non-native species disrupts ecosystem equilibrium, leading to the decline or extinction of native species and habitat transformation.

Is protection not enough?

Global Coverage of MPAs 8,16%

BUT: Only **2.4 %** strictly protected

- ▶ Protection often exists only on paper - few effectively eliminate threats from activities such as fishing within MPA boundaries
- ▶ Problems with management effectiveness incl. connectivity constraints, lack of adequate monitoring etc.



Defining restoration

” the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed

Society of Ecological Restoration (2002)

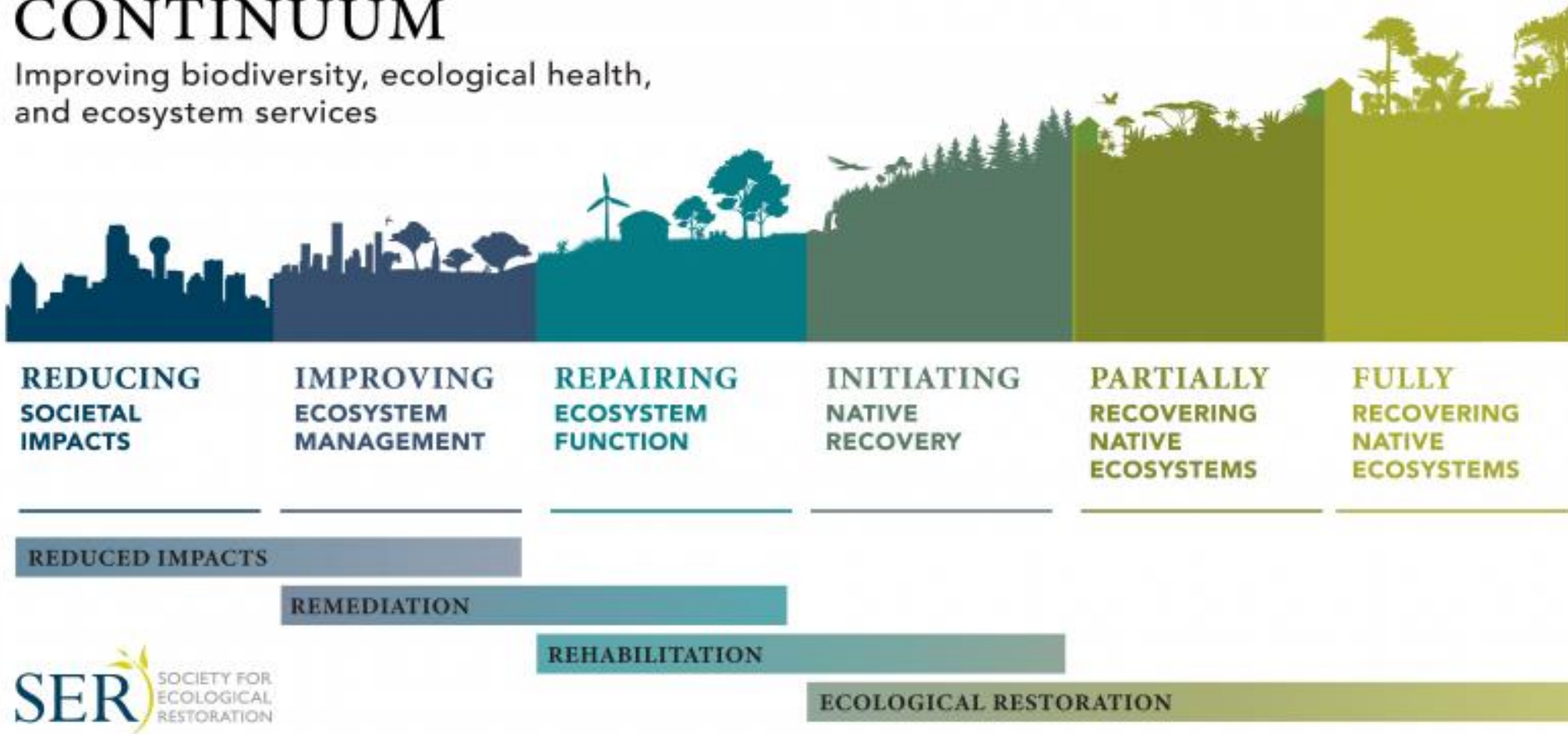
From
passive to
active
restoration

Ounanian et al. 2018

Spectrum of human intervention / continuum of practices

THE RESTORATIVE CONTINUUM

Improving biodiversity, ecological health,
and ecosystem services



Ecological Restoration

”

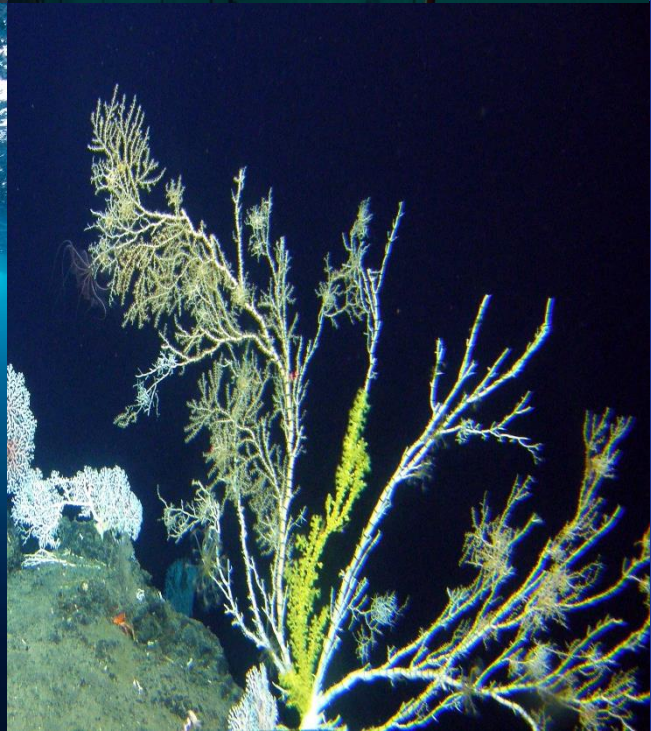
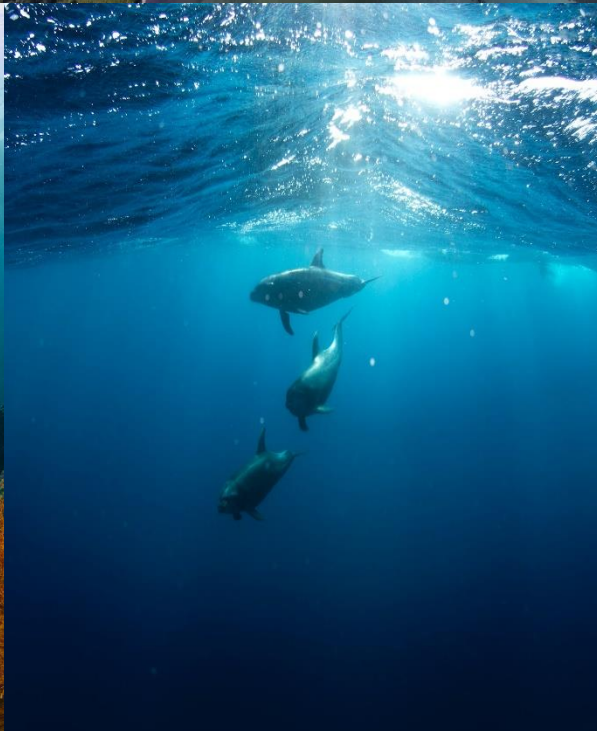
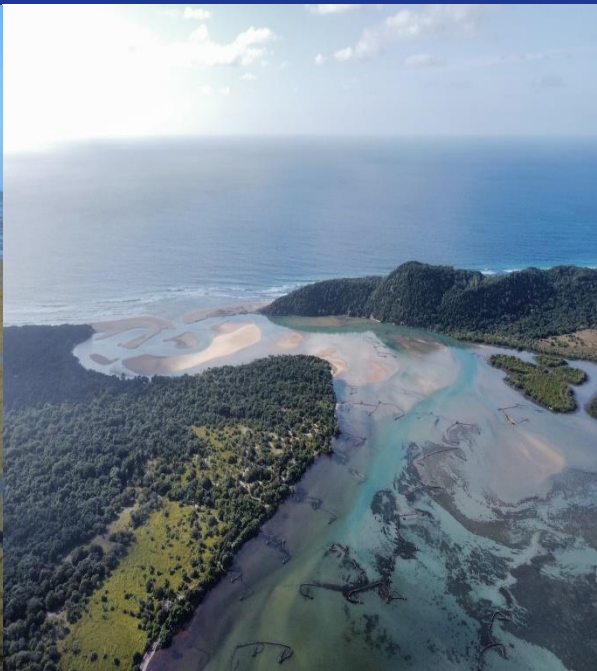
aims to recover biodiversity and ecosystem functioning, health, and integrity, both for humans and for other living organisms

Clewell & Aronson (2012)



Restoration required for coastal/marine ecosystems

- ▶ Restoration measures need to be taken, especially where **natural regeneration processes are hindered or impeded**
- ▶ Restoring degraded marine ecosystems increases **ecosystem services**
- ▶ Marine coastal Restoration (as **key NbS**) essential to meet both national and global conservation and climate targets and to counteract severe degradation
- ▶ Political attention to date still low; efforts & techniques for restoring marine ecosystems comparatively new (lagging), technical and governance challenges, still rarely implemented on a large scale so far



Example: Saltmarshes

- ▶ **Loss:** 50% of salt marshes worldwide have been either degraded or lost due to human activities
- ▶ **Services:** coastal protection, water purification, carbon sequestration, raw materials & food, maintenance of fisheries, biodiverse habitat, tourism, recreation, education & research



Table 2 | Carbon burial and soil stocks in vegetated coastal ecosystems.

Ecosystem	Local C burial rate (g C m ⁻² yr ⁻¹)	Local C stock in soil (Mg C ha ⁻¹)	Global C burial rate (Tg C yr ⁻¹)	Global C stock in soil (Pg C)
Salt marshes	218±24 ⁵	162 (259) ⁶⁵	4.8-87.3 ⁵	0.4-6.5
Mangroves	163 ³⁵	255 ⁶⁴ (683.4) ³⁸	22.5-24.9 ³⁵	9.4-10.4
Seagrasses	138±38 ⁵	139.7 (372) ³⁹	48.0-112 ⁵	4.2-8.4 ³⁹

Mean and, when available, standard error of the mean (±s.e.m.) of organic carbon (C) burial and stock within the top 1 m of soil. Maximum local C stock is provided in brackets. Global C stocks are estimated from local C stocks and ecosystem extension (Table 1) unless indicated. Superscript numbers indicate the reference sources of data.

”

The conservation, restoration and use of vegetated coastal habitats in eco-engineering solutions for coastal protection provide a promising strategy, delivering significant capacity for climate change mitigation and adaption.”

Clewell & Aronson (2012)

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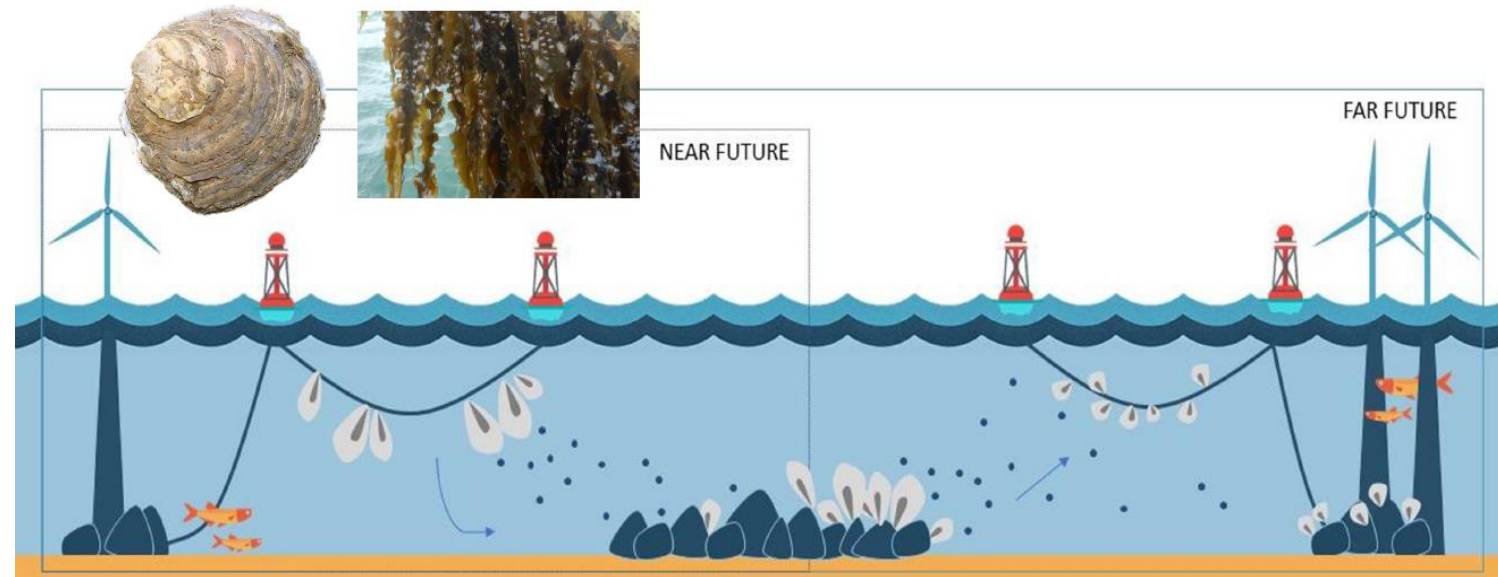
The conservation and protection of ecosystems that act as carbon sinks are among the cheapest, safest and easiest solutions to reduce greenhouse gas emissions and promote adaptation to climate change.”

Jones et al., 2012

➤ **BLUE CARBON ECOSYSTEMS**

Ecosystem restoration as an integral part of ocean multi-use

- ▶ **Concept of Multi-use:** Innovative approach to marine space utilization, aiming to maximise benefits while reducing potential conflicts and environmental impacts (such as from offshore wind farms). By integrating various activities, we can create to promote both economic productivity and ecosystem restoration.
- ▶ **Collaboration is Key:** Successful implementation requires diverse and intense stakeholder engagement and collaboration - not just about good design; complex technical, regulatory, and socio-economic hurdles to overcome.
- ▶ **Learning from Case Studies:** Offshore wind, European flat oyster aquaculture & restoration, and seaweed cultivation in a Belgium Case illustrate the potential of multi-use.
- ▶ **Challenges:** far from large-scale application. Remote offshore sites, harsh sea conditions, specific biological requirements of target species complicate efforts. Obstacles can be overcome with innovative solutions and concerted efforts.



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Policy Framework



“Conserve and sustainably use the oceans, seas and marine resources for sustainable development”

TARGET 14-1	TARGET 14-2	TARGET 14-3	TARGET 14-4	TARGET 14-5
REDUCE MARINE POLLUTION	PROTECT AND RESTORE ECOSYSTEMS	REDUCE OCEAN ACIDIFICATION	SUSTAINABLE FISHING	CONSERVE COASTAL AND MARINE AREAS
TARGET 14-6	TARGET 14-7	TARGET 14-A	TARGET 14-B	TARGET 14-C
END SUBSIDIES CONTRIBUTING TO OVERFISHING	INCREASE THE ECONOMIC BENEFITS FROM SUSTAINABLE USE OF MARINE RESOURCES	INCREASE SCIENTIFIC KNOWLEDGE, RESEARCH AND TECHNOLOGY FOR OCEAN HEALTH	SUPPORT SMALL SCALE FISHERS	IMPLEMENT AND ENFORCE INTERNATIONAL SEA LAW

14.1: By 2025, prevent and significantly reduce marine pollution

14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

14.3: Minimize and address the impacts of ocean acidification

14.4: By 2020, effectively regulate harvesting and end overfishing, IUU fishing and destructive fishing practices... in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield

14.5: By 2020, conserve at least 10 per cent of coastal and marine areas

14.6: By 2020, prohibit harmful fisheries subsidies

14.7: By 2030, increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources

14a: Increase scientific knowledge...in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries

14b: Provide access for small-scale artisanal fishers to marine resources and markets

14c: Enhance the conservation and sustainable use of oceans and their resources by implementing international law



The UN Decades for Ecosystem Restoration & Ocean Science for Sustainable Development

Ecosystem Restoration

Aim: To prevent, halt, and reverse the degradation of ecosystems worldwide.

Approach: By driving political and societal support that foster large-scale restoration practices, the Decade aims to enhance ecosystem resilience, improve biodiversity, and create a healthier environment.

- ▶ **Initiatives:** Bonn Challenge and its regional initiatives AFR100 (Africa) and Initiative 20x20 (Central and South America)
- ▶ Promoting "green" **jobs, partnerships and cooperation** at all levels from international to local to achieve ambitious restoration targets

Ocean Science

Aim: To support efforts to reverse the decline in ocean health and gather ocean stakeholders worldwide behind a common framework for sustainable ocean science.

Approach: Science-policy interface / science-based management. The Decade aims to improve the scientific understanding of the ocean to inform policies and management practices. This will help in developing and implementing more effective marine restoration strategies.

- ▶ **Role of Restoration:** Marine ecosystem restoration as a key strategy for mitigating climate change, bolstering biodiversity, and sustaining blue economies.
- ▶ **Capacity Building and Knowledge Sharing**

The new Global Biodiversity Framework (GBF)

- ▶ At the 15th Conference of the Parties to the Convention on Biological Diversity (**CBD COP15**) in Montreal in December 2022, the new GBF was adopted with 4 long-term targets by 2050 (Goals A-D) and 23 action-oriented targets by 2030 (Targets 1-23).
- ▶ The target on ecosystem restoration is found under **Goal A Target 2**:
 - **By 2030, at least 30%** of degraded ecosystems should undergo restoration actions, including to improve their ecological functions and connectivity. This includes marine and coastal systems.
 - The specification of 30% of degraded area represents a **doubling** of the 15% target of the previous Aichi Target 15, which was not achieved.
 - It remains to be seen whether the Parties will succeed this time in translating the GBF targets into **national targets and successfully implementing systematic monitoring and adaptive management** through mainstreaming in all sectors



The EU Nature Restoration Law

- ▶ **Key Provisions:** This ambitious framework aims to restore "at least 20% of the EU's land and sea areas by 2030 and all ecosystems in need of restoration by 2050" (**Article 1**)
- ▶ **Restoration of coastal (Article 4) and marine (Article 5) ecosystems:** put in place restoration measures for the habitats of species protected by the Habitats and Birds Directives, as well as several other marine habitats/species
- ▶ **National Restoration Plans** will need to be set up by EU Member States
- ▶ **Approval and Next Steps:** The EU Parliament voted in favor of the NRL on July 12, 2023. The final form will be negotiated in a trilogue procedure between the Parliament, Council, and Commission.
- ▶ **Monitoring Progress:** The NRL calls for measuring and monitoring these binding targets, with evaluations set for 2030 and 2040.
- ▶ **Supporting Policies:**
 - European "Green Deal" – EU Biodiversity Strategy for 2030
- ▶ **Calls for Action:** NGOs urge EU legislators to address harmful fishing impacts more effectively and ensure better management of fisheries that contribute significantly to marine biodiversity loss.

The BBNJ-Agreement

Historic global agreement for the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (years in the making).

Formal Adoption: The treaty comes into force post ratification by 60 states and a 120-day waiting period.

Objective: The primary aim of the BBNJ Agreement is the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction (ABNJ), crucial for the sustained health of marine ecosystems.

Key Terms (Article 1):

- ▶ **Area-based Management Tool:** Tool for managing a geographically defined marine area to achieve conservation and sustainable use objectives.
- ▶ **Marine Protected Area (MPA):** Marine area managed for specific long-term biodiversity conservation objectives. May allow sustainable use if consistent with conservation objectives.

Potential for Restoration: Global mandate for passive restoration efforts aimed at rehabilitating marine ecosystems and maintaining biodiversity: landmark in the global effort to safeguard at least 30% of the world's oceans through the establishment of extensive MPAs.

Challenges:

- ▶ Fisheries regulated under international law and managed by Regional Fisheries Management Organizations (RFMOs) are exempt from some provisions. BBNJ mandates collaboration with RFMOs where MPAs may impact or overlap with their operations.
- ▶ High Seas Dual Perspective remains: Balancing the high seas as global commons shared by all humans vs. freedom of the high seas.

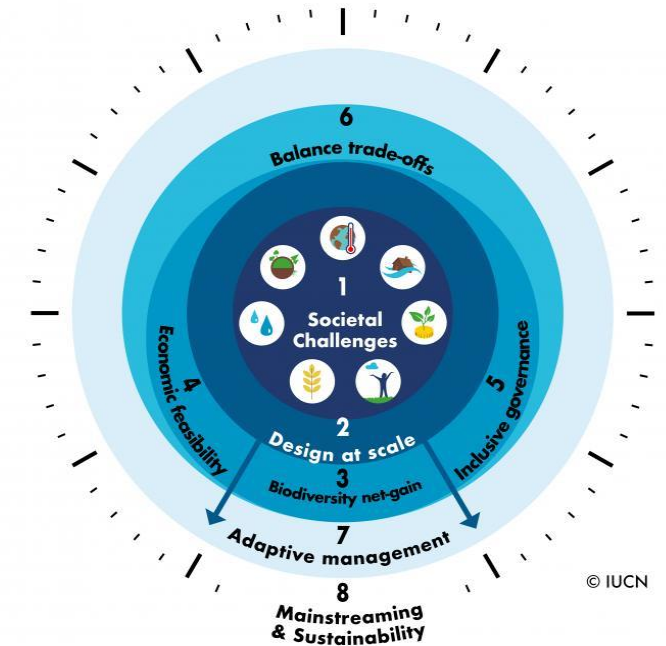
Scaling up restoration

Best-practice/success:

- Society for Ecological Restoration's (SER) standards for the practice of ecological restoration & tools for tracking intervention progress / Evaluating ecological restoration success
- IUCN Global Standard for NbS
- FAO 10 Principles that underpin ecosystem restoration
- UNEP and FAO Restoration Lighthouse Projects – 2 out of 10 marine: Small Island Developing States Program & Abu Dhabi Marine Restoration Initiative

Key provisions:

- Allocation of funding and capacity building
- Mainstream NbS into a wide range of activities, sectors (e.g., the private sector) and policies



TEN PRINCIPLES THAT UNDERPIN ECOSYSTEM RESTORATION



Key Challenges

- ▶ Pressure on biodiversity is continuing to increase (including from new & emerging threats and illegal activities)
- ▶ Knowledge of ecosystem management & restoration is currently inadequate for meeting the challenge of increasing production while sustaining ecosystem services
- ▶ Financial investment in biodiversity conservation/restoration needs to be scaled up enormously (order of magnitude)
- ▶ Socioecological Complexity (conflicting interest, managing trade-offs, finding synergies, etc.)

Ecosystem restoration as a Solution

Authors: Gregory Fuchs, Rebecca Noebel (Ecologic Institut)
Commissioned by the project "Support for the Design and on Ecosystem Restoration" (DEER)

Key messages

- I Climate change and biodiversity loss are interdependent addressed separately to date. A more integrated approach is needed. The concept of Nature-based Solutions (NbS) by decision-makers.
- II Ecosystem restoration is a NbS and can make a crucial climate goals simultaneously, while contributing to human achieve the Sustainable Development Goals 1, 2, 6, 13, 14
- III The success of restoration measures depends on their design, and on the acceptance of affected stakeholders. Eight criteria of the IUCN Global Standard for Nature-based Solutions (NbS) should be considered. At the same time, integrated planning processes can help to address both global crises, while avoiding conflicts (IPBES, 2021).

This paper is part of a policy paper series on the UN Decade for Ecosystem Restoration. It has been considered separately in the past, most notably: climate change, biodiversity loss and solutions. The Policy Paper series contributes to this, providing ideas and recommendations.



based on a decision of the German Bundestag

The role of the United Nations to Combat Desertification (UN Decade on Ecosystem Restoration)

Authors: Gregory Fuchs, Sandra Naumann, Rebecca Noebel
Commissioned by the project "Support for the Design and on Ecosystem Restoration" (DEER) and in collaboration with Desertification, Sustainable Land Management" (SV BoDeN+)

Key messages

- I Healthy ecosystems and land resources (soil, water and biodiversity) are essential for food, water, fuels and other raw materials and global prosperity. Ecosystem restoration enables safe and sustainable land use in the face of the growing demand for food, water, fuels and other raw materials.
- II The UN Decade on Ecosystem Restoration represents a significant step. The UNCCD has the mandate and can act as a trailblazer in this land degradation neutrality (LDN) links the UNCCD with the other UN conventions.
- III Sustainable land management (SLM) prevents the degradation of terrestrial ecosystems. As such, it is perhaps the most effective and cost-efficient way to address land degradation.
- IV Despite ambitious goals and the greater political relevance of the UN Decade, more resources are required, with industrialised nations leading the way. In the process to restore ecosystems, it is essential to take a gender-responsive and participatory approach, not least to foster synergies with the UN Convention on Biological Diversity (CBD) and the UN Framework Convention on Climate Change (UNFCCC) should be harnessed to a greater extent.

This paper is part of a policy paper series on the UN Decade for Ecosystem Restoration. It has been considered separately in the past, most notably: climate change, biodiversity loss and solutions. The Policy Paper series contributes to this, providing ideas and recommendations. We thank the UNCCD Secretariat for their valuable contributions.



based on a decision of the German Bundestag

Die Wiederherstellung waldreicher Landschaften

Autor*innen: Rebecca Noebel, Sandra Naumann, Gregor
Im Auftrag des GIZ Projekts „Unterstützung bei der Gestaltung für die Wiederherstellung von Ökosystemen“

Kernbotschaften

- I Die Wiederherstellung waldreicher Landschaften, bekannter als Forstlandschaften, ist ein wichtiger Baustein für die Erreichung der Klimaziele. Sie trägt zur Erreichung der Sustainable Development Goals (SDGs) bei und ist eine der wirksamsten naturbasierten Lösungen zur Bekämpfung des Klimawandels.
- II Forstlandschaften sind ein wichtiger Bestandteil der Biodiversität und spielen eine zentrale Rolle bei der Erreichung der Sustainable Development Goals (SDGs) 13, 14, 15 und 17.
- III Im Jahr 2011 startete die Bonn Challenge als globale Forstlandschaften-Initiative. Bis 2020 sollten auf 350 Millionen Hektar Forstlandschaften wiederhergestellt werden. Die Initiative hat sich als Katalysator für die Wiederherstellung von Forstlandschaften weltweit erwiesen.
- IV Die UN-Dekade für die Wiederherstellung von Ökosystemen (2021-2030) bietet einen neuen globalen Rahmen, in dem die Umsetzung von Forstlandschaften in den verschiedenen Sektoren gefördert werden kann.

Das vorliegende Papier ist Teil einer Policy Paper Reihe zur UN-Dekade für die Wiederherstellung von Ökosystemen. Die Themen und Herausforderungen, die in der Vergangenheit meist getrennt voneinander betrachtet wurden, werden hier zusammengefasst. Sie beleuchtet ihre Wechselwirkungen und zeigt Lösungsansätze für eine gemeinsame Umsetzung.



aufgrund eines Beschlusses des Deutschen Bundestages

The role of ecosystem restoration for the UNFCCC and the Paris Agreement

Authors: Gregory Fuchs, Rebecca Noebel (Ecologic Institut)

Key messages

- I The UN Decade on Ecosystem Restoration urges to prevent, but also to restore ecosystems. Ecosystem restoration is considered as a crucial contribution to both mitigation and adaptation. Ecosystems can be an effective ecosystem-based adaptation and is one of the most powerful nature-based solutions to tackle climate change.
- II Under the United Nations Framework Convention on Climate Change (UNFCCC), the importance of restoration activities can be highlighted. Restoration actions in their Nationally Determined Contributions (NDCs) and the REDD+ mechanism (Reducing Emissions from Deforestation and Forest Degradation) can contribute to the achievement of the Paris Agreement. Sustainable management and enhancement of forest carbon stocks are essential for the vulnerability and adaptation assessment of ecosystems in the context of climate change.
- III To realise the adaptation potential of restoration, scaling up of restoration activities is essential. This requires ongoing and new commitments and channelling of resources into adaptation programmes and initiatives. Furthermore, blended financing is essential.

Das vorliegende Papier ist Teil einer Policy Paper Reihe zur UN-Dekade zur Wiederherstellung von Ökosystemen. Die UN-Dekade verknüpft Themen und Herausforderungen, die in der Vergangenheit meist getrennt voneinander betrachtet wurden, allen voran: Klimawandel, Verlust von Biodiversität und Degradierung von Land. Sie beleuchtet ihre Wechselwirkungen und zeigt Lösungsansätze für eine gemeinsame Umsetzung.



aufgrund eines Beschlusses des Deutschen Bundestages

Ergebnisse der CBD COP15 und ihre Bedeutung für die UN-Dekade zur Wiederherstellung von Ökosystemen

Autor*innen: Gregory Fuchs und Rebecca Noebel (Ecologic Institut); Mathias Bertram und Lena Green (GIZ)

Im Auftrag des GIZ-Projekts „Unterstützung bei der Gestaltung und Umsetzung der UN-Dekade für die Wiederherstellung von Ökosystemen“ (DEER) und in Zusammenarbeit mit dem Globalvorhaben „Unterstützung bei der Gestaltung und ersten Umsetzungsschritten des neuen globalen Rahmens für biologische Vielfalt“ (BioFrame)

Kernbotschaften

- I Die 15. Konferenz der Vertragsparteien des Übereinkommens über die biologische Vielfalt (Conference of the Parties to the Convention on Biological Diversity – CBD COP15) fand im Dezember 2022 statt. Ihr wichtigstes Ergebnis ist der Globale Biodiversitätsrahmen von Kunming-Montreal (Kunming-Montreal Global Biodiversity Framework – GBF). Er beinhaltet die Mission, bis zum Jahr 2030 den Verlust der Biodiversität aufzuhalten und umzukehren, um bis 2050 ein Leben im Einklang mit der Natur – unter anderem durch eine geschützte und wiederhergestellte Biodiversität – zu ermöglichen.
- II Der GBF beinhaltet vier langfristige Statusziele (Goals) bis 2050 und 23 Handlungsziele (Targets) bis 2030. Das Handlungsziel 2 legt fest, dass bis zum Jahr 2030 auf mindestens 30% aller degradierten Land-, Binnengewässer-, Küsten- und Meeresökosysteme wirksame Wiederherstellungsprozesse eingeleitet werden sollen.
- III Die UN-Dekade kann durch ihre globale Vernetzung und ihren umfangreichen Wissens- und Expertenpool maßgebend zur Umsetzung des GBF-Wiederherstellungsziels beitragen.

Das vorliegende Papier ist Teil einer Policy Paper Reihe zur UN-Dekade zur Wiederherstellung von Ökosystemen. Die UN-Dekade verknüpft Themen und Herausforderungen, die in der Vergangenheit meist getrennt voneinander betrachtet wurden, allen voran: Klimawandel, Verlust von Biodiversität und Degradierung von Land. Sie beleuchtet ihre Wechselwirkungen und zeigt Lösungsansätze für eine gemeinsame Umsetzung.



aufgrund eines Beschlusses des Deutschen Bundestages



Ecologic Institute

Science and Policy
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Thanks! Any more Questions?

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Credits Slide 1, 10 & 11:

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