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.

Images: © Francesco Ungaro; Richard Bell / Unsplash

(IPBES 2019; IPCC, 2019; FAO, 2022)
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.

Possingham et al., 2015; Sala & Giakoumi, 2018; Marine Conservation Institute, 2022; https://protectedplanet.net/c/official-mpa-map
Defining restoration

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

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

Reducing Societal Impacts
Improving Ecosystem Management
Repairing Ecosystem Function
Initiating Native Recovery
Partially Recovering Native Ecosystems
Fully Recovering Native Ecosystems

Reduced Impacts
Remediation
Rehabilitation
Ecological Restoration

Gann et al., 2019
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.

(Abelson et al., 2020; Aronson et al., 2020; Filbee-Dexter et al., 2020; Shumway et al. 2021)
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

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

<table>
<thead>
<tr>
<th>Ecosystem</th>
<th>Local C burial rate (g C m⁻² yr⁻¹)</th>
<th>Local C stock in soil (Mg C ha⁻¹)</th>
<th>Global C burial rate (Tg C yr⁻¹)</th>
<th>Global C stock in soil (Pg C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt marshes</td>
<td>218±24⁵</td>
<td>162 (259)⁶⁵</td>
<td>4.8—87.3⁵</td>
<td>0.4—6.5</td>
</tr>
<tr>
<td>Mangroves</td>
<td>163⁵</td>
<td>255⁶⁴ (683.4)⁵⁸</td>
<td>22.5—24.9⁵⁸</td>
<td>9.4—10.4</td>
</tr>
<tr>
<td>Seagrasses</td>
<td>138±38⁵</td>
<td>139.7 (372)⁵⁹</td>
<td>48.0—112⁵⁹</td>
<td>4.2—8.4⁹⁹</td>
</tr>
</tbody>
</table>

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.

(Barbier et al. 2011; Duarte et al., 2013; Hansen and Reiss, 2015)
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)
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.
“Conserve and sustainably use the oceans, seas and marine resources for sustainable development”
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**

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[https://sdgs.un.org/goals; UNEP, 2021; Andriamahefazafy et al. 2022](https://sdgs.un.org/goals; UNEP, 2021; Andriamahefazafy et al. 2022)
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.

CBD, 2022; Perino et al., 2022
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

Key provisions:

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

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.).

Seddon et al., 2021; McAfee et al., 2022
Ecosystem restoration as Solution

Authors: Gregory Fushi, Rebecca Noebel (Ecolo Commissioned by the project "Support for the Design and Ecosystem Restoration" (DEEX)) and in collaboration with: Desertification, Sustainable Land Management (D SaLM)

Key messages

1. Climate change and biodiversity loss are interlinked and achieved separately in doubt. It is more targeted and effective. The concept of "Natural Based Solutions" (NBS) is decisive today.
2. Ecosystem restoration in NBS can make a crucial contribution to mitigate the impacts on human well-being. The UN Decade on Ecosystem Restoration is a golden opportunity to act on this line.
3. The successful implementation of ecosystem restoration depends on the coordination and involvement of all stakeholders, including local communities and decision-makers.

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

Authors: Gregory Fushi, Sandra Neumann, Rebecca Noebel

Key messages

1. Healthy ecosystems can lead to positive economic growth and improved human well-being. Ecosystem restoration can make such a contribution to the Sustainable Development Goals (SDGs) and the Post-2020 Agenda.
2. The UN Decade on Ecosystem Restoration is a unique opportunity to implement the SDGs and the Post-2020 Agenda.
3. Ecosystem restoration can be a powerful tool for achieving the SDGs and the Post-2020 Agenda.

Die Wiederherstellung wald Landscapes

Authors: Rebecca Noebel, Sandra Haase, Greg in the project of the "Support for the Design and Ecosystem Restoration" (DEEX) in collaboration with: Desertification, Sustainable Land Management (D SaLM)

Key messages

1. The Wiederherstellung Wald landscapes, indem der Waldschatz in Zukunft nachhaltig genutzt wird, ist eine der wichtigsten Herausforderungen unserer Generation.
2. Der Waldschutz ist ein zentraler Punkt der Agenda 2030 des Vereinten Nationen und soll dazu beitragen, die Umwelt zu schützen.
3. Der Waldschutz ist auch ein zentraler Punkt der Agenda 2060 des Vereinten Nationen und soll dazu beitragen, die Zukunft zu schützen.

The role of ecosystem rest on the UNFCCC and the Paris Agreement

Author*innen: Gregory Fushi, Rebecca Noebel (Ecologie Institut), Melanie Bertram and Laura Geske

In the project of the "Support for the Design and Ecosystem Restoration" (DEEX) in collaboration with: Desertification, Sustainable Land Management (D SaLM)

Key messages

1. The UNFCCC is the main international mechanism to address climate change. It provides a framework for countries to cooperate on climate change mitigation and adaptation.
2. The Paris Agreement is the central part of the UNFCCC and its implementation requires international cooperation and collaboration.
3. The role of ecosystem restoration in the UNFCCC and the Paris Agreement is crucial for achieving climate goals.

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

Author*innen: Gregory Fushi, Rebecca Noebel (Ecologie Institut), Melanie Bertram and Laura Geske

In the project of the "Support for the Design and Ecosystem Restoration" (DEEX) in collaboration with: Desertification, Sustainable Land Management (D SaLM)

Key messages

1. The CBD COP15 is the main international mechanism to address biodiversity loss. It provides a framework for countries to cooperate on biodiversity conservation.
2. The role of ecosystem restoration in the CBD COP15 is crucial for achieving biodiversity goals.
3. The role of ecosystem restoration in the UNFCCC and the Paris Agreement is crucial for achieving climate goals.

Kontaktdaten

2. Die Informationen zu der Global Ziel der CBD COP15 zum Schutz der Biodiversität weltweit.

https://www.ecologic.eu/18615
Thanks! Any more Questions?

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