

# Eutrophication mitigation

A passive or active management approach that needs to be considered in coastal protection

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# Who's speaking?

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- Vice chairman in Society for Ecological Restoration Europe (SERE)s Marine Restoration Working Group (MRWG)
- Freediver, seaweed farmer, water polo player, environmental advocate, thinker and a generally cheerful person



# Introduction

*“Dynamic area-based management tools has the ability to combine active and passive restoration within climate change into a holistic MPA management tool”*



# Eutrophication source

- **Internal nutrient loads**
  - Cyanobacteria blooms
  - Drifting Algae
  - Anoxia
  - Water stratification
  - Seafloor sediments
- **External nutrient loads**
  - Agricultural runoff
  - Forestry runoff
  - River runoff
  - Wastewater runoff
  - Unidentified sources runoff
  - Shipping
  - Atmospheric deposition

[Helcom – Eutrophication in the Baltic Sea](#)



# Strict protection criterias in MPA's

*“Strictly protected areas are fully and legally protected areas designated to conserve and/or restore the integrity of biodiversity-rich natural areas with their underlying ecological structure and supporting natural environmental processes. Natural processes are therefore left essentially undisturbed from human pressures and threats to the area’s overall ecological structure and functioning, independently of whether those pressures and threats are located inside or outside the strictly protected area”.*

[Day J., Dudley N., Hockings M., Holmes G., Laffoley D., Stolton S. & S. Wells, 2012. Guidelines for applying the IUCN Protected Area Management Categories to Marine Protected Areas. Gland, Switzerland: IUCN. 36pp.](#)

Activities that may be permitted in a Marine Protected Area	Ia	Ib	II	III	IV	V	VI
Habitation	N	N*	N*	N*	N*	Y	N*
Waste discharge	N	N	N	N	N	Y	Y
Mining (oil, gas, sand, gravel, coral)	N	N	N	N	N	Y	Y
Commercial fishing/collection	N	N	N	N	*	Y	Y
Recreational fishing/collection	N	N	N	N	*	Y	Y
Aquaculture	N	N	N	N	*	Y	Y
Works (e.g. harbours, ports, dredging)	N	N	N	N	*	Y	Y
Research: extractive	N	N*	N*	N*	Y	Y	Y
Renewable energy generation	N	N	N	N	Y	Y	Y
Restoration/enhancement for other reasons (e.g. beach replenishment, fish aggregation, artificial reefs)	N	N	N*	N*	Y	Y	Y
Problem wildlife management (e.g. shark control programmes)	N	N	Y*	Y*	Y*	Y	Y
Shipping	N	N	Y*	Y*	Y	Y	Y
Commercial tourism	N	N	Y	Y	Y	Y	Y
Non-extractive recreation (e.g. diving)	N	Y	Y	Y	Y	Y	Y
Traditional fishing/collection in accordance with cultural tradition and use	Y*	Y	Y	Y	Y	Y	Y
Non-extractive traditional use	Y*	Y	Y	Y	Y	Y	Y
Research: non-extractive	Y*	Y	Y	Y	Y	Y	Y
Restoration/enhancement for conservation (e.g. invasive species control, coral reintroduction)	Y*	Y*	Y	Y	Y	Y	Y

**Key:**  
■ = No  
■ = Yes  
■ = Variable  
■ = Generally no, unless special circumstance apply  
■ = No alternative exists and therefore special approval is needed

# Passive and active restoration in marine environments

- **Passive Restoration**
  - Removing or reducing stressors to allow for natural recovery
- **Active Restoration**
  - Human intervention to repair damaged habitats and accelerate recovery
- **Monitoring**
  - Systematic assessment of marine environments to understand their health, identify threats, and inform conservation strategies through data collection and analysis
- **Scenario modelling**
  - Project future changes in variables like temperature, oxygen and acidity, which are then used in marine ecosystem models to predict impacts on species, species composition, interactions and biomass
- **Active MPA management**
  - Dynamic area-based management tools has the ability to combine active and passive restoration within climate change into a holistic MPA management tool



*Klerk, B E, Heinrich, K & Primicerio, R 2024, 'Beyond equilibrium thinking : dynamic area-based management tools in a changing ocean', Frontiers in Marine Science, vol. 11, 1418435. <https://doi.org/10.3389/fmars.2024.1418435>*

# Conclusions

- Data and scientific feasibility is changing
- Ecological black swan events have to be taken into consideration
- Loss or extinction of keystone species in the Baltic Sea have to be accounted for when planning MPA's
- Evolutionary modelling of species and species interaction for different climate scenarios is important
- Strict protection, passive restoration and active restoration needs fluidity and adaptive tools
- Climate adaption, resilience and acceptance of species extinction needs to be understood by society
- Transdisciplinary and holistic scientific and social innovation is needed to build the transformational bridge into an uncertain future.
- Are you, your organisations or your societal insitutions prepared for the rapid changes that is coming?



**Thank you**

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