

MARINE NATURE- BASED SOLUTIONS

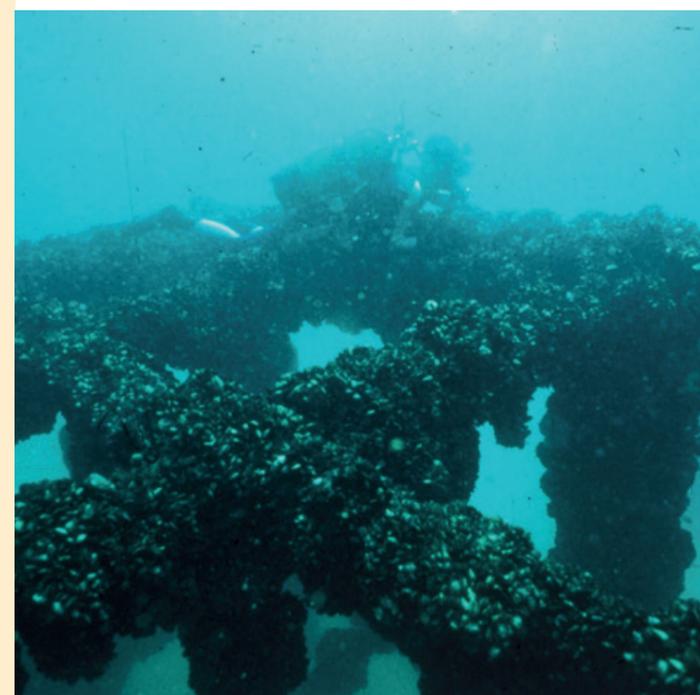
WHERE SOCIETAL CHALLENGES
MEET THE POTENTIAL OF OUR OCEANS

European Fisheries and Aquaculture
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Marine Nature-Based Solutions: Where societal challenges meet the potential of our oceans

Nature-Based Solutions, or NbS, are solutions that weave natural features or processes into design, management and engineering practices to solve societal problems. The concept of NbS is not new. It has surfaced in the past in many shapes and forms such as eco-engineering, bio-mimicry or building with nature. Nature-Based Solutions, as a concept, however, has developed rapidly during the last years and is now frequently appearing in a broad spectrum of policies developed within the European Union.



In 2022 EFARO published a scientific paper on Marine Nature-Based Solutions (NbS)¹ in order to facilitate a critical debate about the prospects and pitfalls related to the operationalisation of marine NbS in an EU context, providing an analysis of core definitions, potential categories of marine NbS and a suite of case studies. Here you will find an extended summary of this paper.

¹ Riisager-Simonsen, C., Fabi, G., van Hoof, L., Holmgren, N., Marino, G., & Lisbjerg, D. (2022). Marine nature-based solutions: Where societal challenges and ecosystem requirements meet the potential of our oceans. *Marine Policy*, 144, 105198.

Why is it still necessary to discuss what ‘Nature-based Solutions’ are?

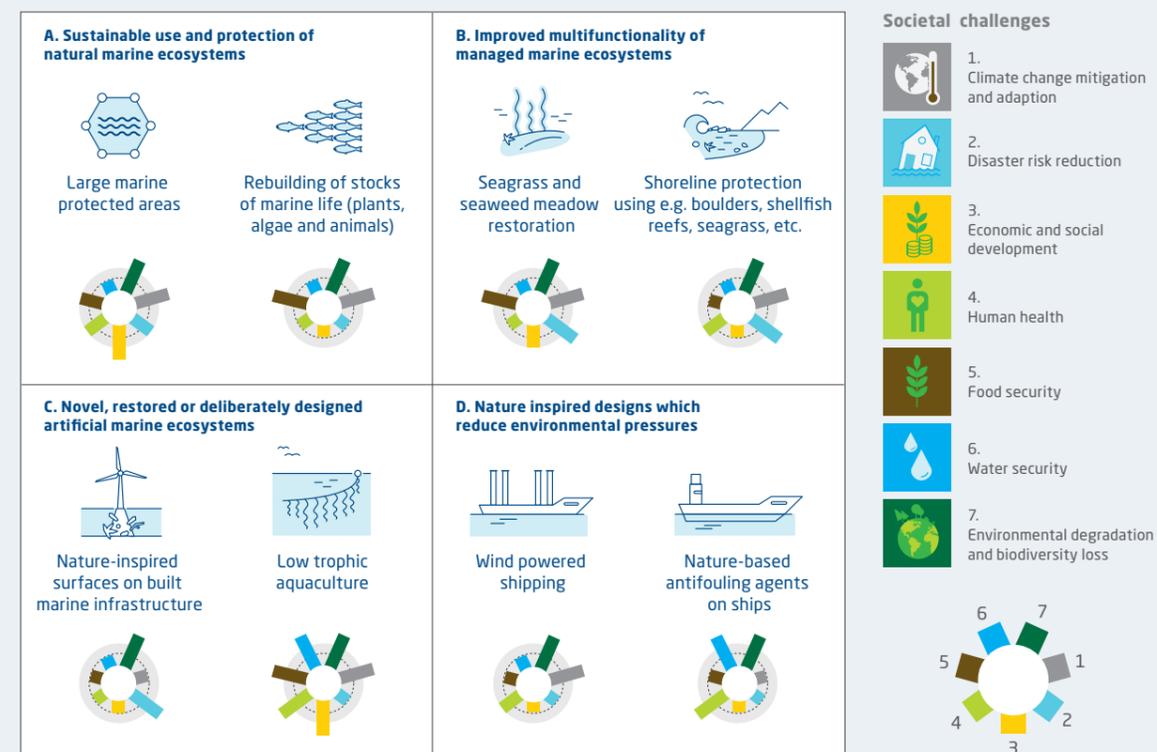
The recently launched EU Blue Economy Strategy emphasises the deployment of NbS. Europe’s coastal waters, shelf and open ocean present multiple options for testing new and scaling up known NbS, which could support both environmental restoration simultaneously with supporting climate adaptation or mitigation benefits and the Blue Economy. With all these developments, why then start a discussion on Marine Nature-Based Solutions?

Recently the European Commission (EC)², IUCN³ and UNEA⁴ have each provided definitions of what they consider to be proper NbS. These definitions have a large overlap in acknowledging that we are looking for solutions that are inspired by nature to create environmental, social and economic benefits. However, the definitions differ significantly in some areas, particularly in relation to the overall rationale for NbS and the criteria for actions to be accepted as ‘NbS’. Turning to the ‘rationale’ for NbS, IUCN defines the ‘purpose of NbS’ as actions to protect, sustainably manage, and restore ecosystems, thus ensuring the natural state of ecosystems and their benefits. Contrary to this, using the EC definition, any planned action can be considered an NbS if you add some construction components to the action that will ‘benefit’ nature to a certain degree.

So why does this matter? In order to have a proper debate on what is to be considered NbS and what is not, there is a need to have a proper definition of the concept. Especially since NbS has been integrated into the EU taxonomy for sustainable finance, there is a risk of ‘green washing’ the more traditional non-NbS approaches by adding some NbS-touch.



Types of Marine Nature-Based Solutions



Types of nature-based solutions modified from Eggermont et al. (2015) with marine examples. Histograms are not based on quantitative analyses, but only illustrates what categories of IUCN’s major societal challenges, each example is likely to address based on the literature review.

Hence it should be clear where the boundaries are between NbS and non-NbS. And when addressing components of biodiversity, do some parts of the ecosystem get a higher priority over others? How to deal with trade-offs within the ecosystem? And at what geographical scale should the impact of the NbS be evaluated?

Let’s take a look at a number of types of NbS and some examples.

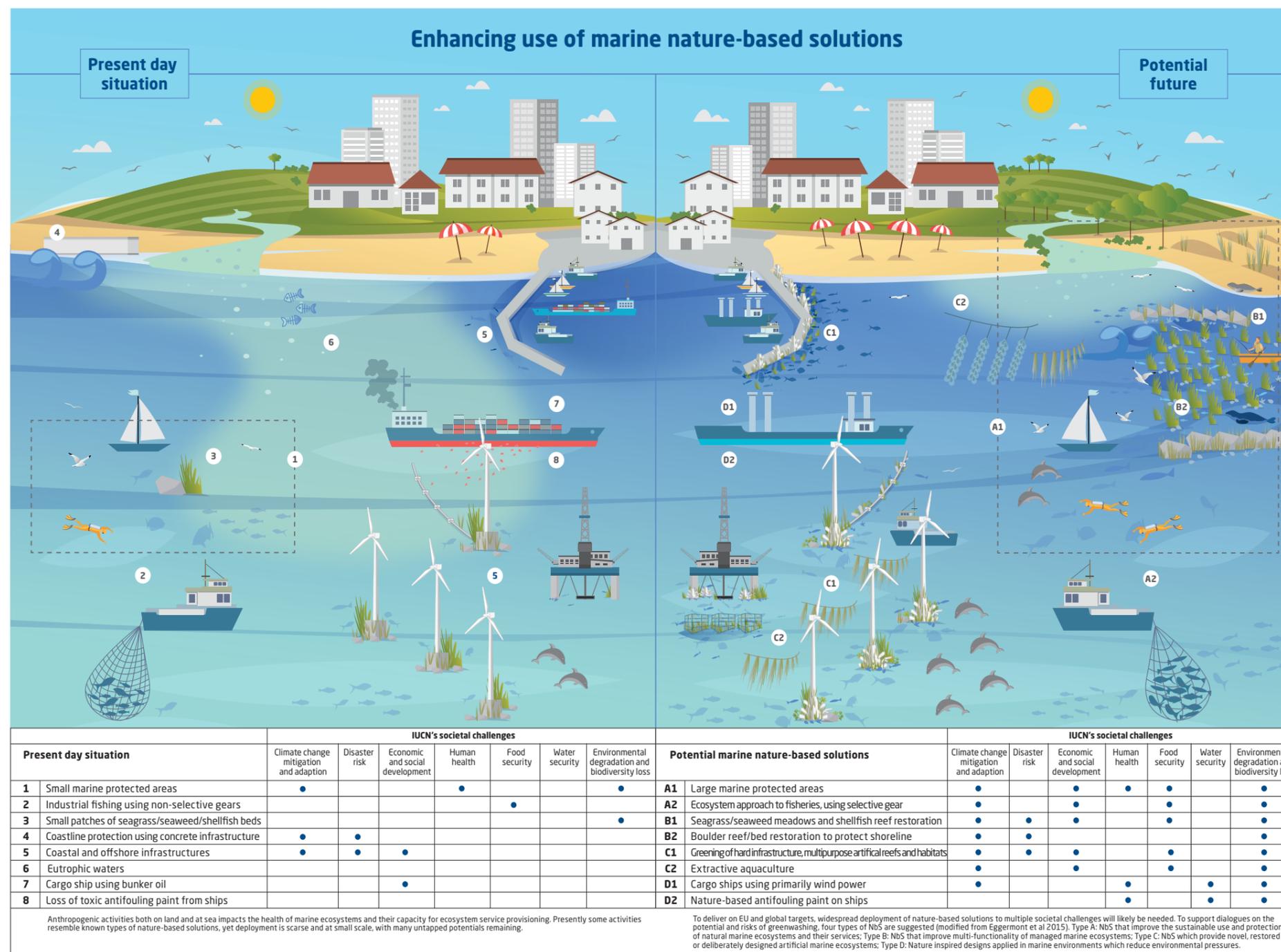
² European Commission, Science for Environment Policy The solution is in nature. Future Brief 24. Brief produced for the European Commission DG Environment. Bristol: Science Communication Unit, UWE Bristol., 2021.
³ IUCN, Resolution WCC-2016-Res-069-EN Defining Nature-based Solutions, 2016.
⁴ UNEA, UNEP/EA.5/Res.5. Nature-based solutions for supporting sustainable development. 2022.

Types of Marine Nature Based Solutions

Eggermont and colleagues⁵ provided a three-level typology of NbS, to which we add a fourth type:

- A.** NbS that improve the sustainable use and protection of natural marine ecosystems and their services; examples are Marine Protected Areas, using salt marshes and seagrass meadows for carbon sequestration and protecting and rebuilding stocks of marine fauna with the added benefit of their role in the carbon cycle.
- B.** NbS that improve multifunctionality of managed marine ecosystems; examples are mitigating the effects of climate change by restoration of seaweeds and seagrass in coastal ecosystems, restore shellfish populations to deliver several ecosystem services such as improved water quality and reduced sedimentation and instead of using hard-substrate coastal defence systems use intertidal coastal shellfish reefs and boulder habitats which next to coastal protection also increase the biodiversity.
- C.** NbS which provide novel, restored or deliberately designed artificial marine ecosystems; an example is 'greening of grey hard infrastructure' where concrete or steel pillars and walls used in harbours, break waters, pipelines, wind farm foundations, are shaped to accommodate better attachment of particular types of organisms and to offer shelter from predation to juvenile fish. Other examples are purposely designed artificial reefs to provide new habitats to reef-dwelling target species and/or manage their life-cycle and the cultivation of low trophic species such as seaweed and bivalve aquaculture which extract inorganic and organic nutrients which regulates nutrient cycling and carbon storage while at the same time provide food.
- D.** Nature inspired designs applied in marine environments which reduce environmental pressures; an example is decarbonisation of the transport sector, which next to a direct climate mitigation goal will also result in reduced emissions from diesel engines including NO_x, SO_x and particulate matter, which should benefit societal goals related to both human health and reversal of environmental degradation. Another example is the deployment of new types of antifouling agents, based on naturally occurring marine compounds.

In this figure the types of Marine NbS are illustrated.



⁵ Eggermont H, Balian E, Azevedo JM, Beumer V, Brodin T, Claudet J, Fady B, Grube M, Keune H, Lamarque P, Reuter K. Nature-based solutions: new influence for environmental management and research in Europe. GAIA-Ecological Perspectives for Science and Society. 2015 Jan 1;24(4):243-8.



Key lessons learned

We have looked into a large number of examples of NbS world-wide. Some of the key lessons we learned are:

- While many NbS are likely relevant for reaching specific environmental policy targets, few cases have yet been developed specifically for this purpose. The use of strategic environmental assessments could assist in overcoming this challenge.
- Changes to ecosystem services and disservices are often not evaluated. For marine interventions this would be relevant at both sea basin and the local scale where the intervention happens, to align with e.g., sea basin specific plans and conventions, which are often relevant in a European context. This could further help quantify how a specific NbS could support progress towards specific policy targets.
- NbS can support many types of marine biodiversity and ecosystem services. Where multiple impacts can be expected, and trade-offs between ecosystem targets exist, setting priorities is required.
- In some cases net gains in biodiversity and ecosystem services is relatively easy to see. In cases where marine ecosystem net gains are not feasible, direct reductions in pressures could likely provide equally relevant short term targets for marine NbS.
- To avoid significant burden shifting in terms of where, when, who and how severely people and ecosystems are impacted by interventions, a 'life cycle' perspective on impact assessments is needed.
- NbS which aim to exploit specific ecosystem services (e.g., fisheries, wildlife for nature-based tourism), are not necessarily supported by adequate management plans. These plans are required to ensure the sustainability of the NbS. A policy review is therefore advised in the evaluation of proposed NbS, just as the inclusion of relevant stakeholders to understand long term project risks. This should minimise the risks of greenwashing coastal development projects.
- Although there are today many NbS-like actions, many environmental, social and economic impacts have as yet not been monitored or at least been reported in many cases, making quantitative assessments of performance difficult.
- Future NbS aiming at piloting new or relatively unexplored or undocumented concepts should be accompanied by consistent monitoring programmes to document short- and long term impacts, to enable evidence-based decision making about where to deploy and how to scale solutions most effectively.
- While actions aiming at actively restoring degraded habitats are likely an intuitive way of conserving nature, this should not be used a priori to dismiss alternative types of NbS in all situations.

Key research questions for Marine NbS in Europe

Based on our key lessons above we have selected some high level research questions relevant for the development of consistent scientific advice about the potential of marine NbS in different contexts to relevant stakeholders.

- *Harvesting present knowledge:* Which present marine NbS-like actions have been monitored sufficiently to allow performance to be evaluated quantitatively and recommendations about efficient application and scaling in support of EU policy targets, and social challenges including in particular climate change mitigation, food security and reversal of environmental degradation which are key priorities in the EU Blue Economy strategy?
- *Choice of NbS:* What type of instrument is needed to evaluate which alternative marine NbS are most desirable from an environmental, social and economic perspective in an EU context, considering the overall demand for alignment with marine policies and the ecosystem approach?
- *Deployment and risk management of NbS:* What type of environmental data collection, policy alignment and degree of stakeholder involvement should be minimum requirements for each type of NbS in EU waters, considering the diversity among ecosystems and stakeholder communities?
- *Impact evaluation:* How should the overall environmental, social and economic sustainability of a marine NbS be monitored, evaluated and communicated both in relative and absolute terms?
- *Investor's perception of marine NbS:* How do investors perceive the potential role of marine NbS in relation to e.g. the new EU taxonomy on sustainable finance, and global focus on science-based nature targets? And what are the major knowledge gaps to cover from an investor perspective?





Five Policy recommendations

Based on our key lessons above we also have some recommended actions to assist Europe on reaching its NbS ambitions in a marine context.

- 1.** Develop and adopt a more stringent and consistent approach to the implementation of NbS in the Union, which clearly prioritises threatened biodiversity. The approach and target do not need to be identical across terrestrial or marine areas, nor the approach similar for all types of NBS to allow more stakeholders to take an active role.
- 2.** Performance and impact indicators for NbS are relevant to understand the degree of success, but do not replace the need for strict criteria in terms of what the Union accepts (and funds) as NbS, considering the significant variety of potential actions presented for example in this paper. Performance and impact should be aligned with policy targets.
- 3.** Implementation of the EC's approach to NbS should be a core feature of its research and innovation programme Horizon Europe throughout its innovation parts, and not just a subpart of its climate or biodiversity focused programme.
- 4.** Develop and adopt components of NbS where possible in litigation requirements for new marine constructions or decommissioning of present ones. Request member states to report on progress towards this to facilitate learning.
- 5.** Use the annual 'EU Blue Economy Report' by the EC to assess the specific marine and maritime sectors' potential for adopting NbS, and deliver guidance for implementation supported by the recent EU Knowledge Centre for Biodiversity and the European Environmental Agency.



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Colofon: pictures courtesy of G. Fabi, G. Marino, Ocean Image Bank
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