WHY IS NATURE RESTORATION CRITICAL FOR MARINE AREAS?

Publication date:
January 2022

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Marine and coastal ecosystems are immensely important for biodiversity and human well-being. The ocean provides oxygen and food, regulates the climate and hosts a large part of Europe's biodiversity. Marine ecosystem services include protecting coasts from flooding due to rising sea levels and erosion [1], providing habitat for fish species and thus improving fishing opportunities [2], and carbon sequestration and storage [3]. Nature-based recreation in estuaries and transitional waters alone generated €279 million in 2018 [4]. In 2017, the EU's maritime economy generated EUR 216 247 million in gross value added, representing 1.6 % of the total EU economy, and employed roughly 4.9 million people [5].

However, Europe's seas are overexploited. **93 % of Europe's marine area is under different pressures from human activities** (fishing, tourism, marine traffic, coastal development, etc.) and there is hardly any part of this area that is not affected by at least two pressures. Particularly intensive use exists in Europe's coastal and transitional waters, where urban and industrial agglomerations are often located [6].

Among others, about 40% of EU fish stocks are subject to overfishing with catch quotas having been repeatedly set above scientifically recommended levels [7],[8]; about 43% of Europe's shelf/slope seabed is under physical disturbance (35% caused by bottom trawling), increasing to 79% when focusing in the coastal strip (0-10km) [9]; plastics accounts for 84% of all items found on Europe's beaches [10]; hundreds of non-indigenous species have been introduced into all regional seas, with shipping as the major pathway of introduction [11]. Moreover, climate change is causing ocean warming, acidification and oxygen depletion as well as loss of resilience through extinction or redistribution of species at increasing intensity [5].

Restoring marine areas can enable marine and coastal ecosystems to (once again) perform their natural functions, improving their overall health and resilience. It also can significantly increase the sustainable supply of marine ecosystem services on which we depend [12], including the reduction of climate risk and improving coastal adaptation.

Coastline of Gomera, Spain, Photo by N. Stelljes

HOW CAN THE NRL CONTRIBUTE TO IMPROVED HEALTH AND RESILIENCE OF THE EU'S MARINE AREAS?

The European Commission's proposal for a **Nature Restoration Law** (NRL) [13] establishes the basis for cohesive actions to rebuild degraded ecosystems across the EU. It sets legally binding targets, including the **restoration of nature on 20% of the EU's land and marine areas by 2030** and for the restoration of all ecosystems by 2050 (**Article 1**). The NRL proposal addresses explicitly the **'restoration of marine ecosystems'** in **Article 5**. For seven different habitat groups[1] , which are defined in Annex II, the NRL proposal states, that Member states should "put in place the restoration measures that are necessary to improve to good condition those areas where the habitats are not in good condition" [13]. The NRL states, that by 2050, for 90% of the area of these habitats, restoration measures should be in place.

The marine restoration targets under Article 5 will contribute to the EU **Marine Strategy Framework Directive's** (MSFD) aim to achieve **'Good Environmental Status'** (GES) in all EU seas, requiring reductions in pressures and a certain condition of marine ecosystem components. It will also contribute to achieving **'Favourable Conservation Status'** (FCS) of marine Annex I habitats and marine habitats of species protected under the EU **Habitats and Birds Directives** (HD; BD) [14].

While progress has been made in reducing some pressures and in specific areas, **most marine areas have not achieved GES so far** [9]. In addition, a large proportion of marine habitats protected under the HD are still in unfavourable conservation status or in decline as well as many in an unknown condition, and certain pressures on them are increasing [15].

The NRL and its targets for marine areas hold promise for addressing these **interlinked challenges**. The NRL goes beyond the scope of the MSFD by targeting specific habitats for restoration, particularly those that support a wide variety of species. The NRL targets put a stronger focus on the maintenance of ecological functions. It is stressed, that "restoring habitats can be a particularly effective way to achieve the recovery of whole marine ecosystems, including species" [14]. It will also allow for more granular monitoring of data on marine species, which can then be used to set specific restoration measures. National restoration plans will need to consider and work with the national Marine Strategy for achieving GES and any conservation measures under the Common Fisheries Policy (CFP).

However, to achieve these goals in marine areas, NGOs are calling on EU legislators to ensure that fisheries are more restricted and better managed since they contribute most to marine biodiversity loss. NGOs also called for coherence with the CFP to be strengthened including the "dysfunctional legal process" (Article 11) to be addressed, on which the NRL relies to implement fisheries restoration measures [16], [17].

[1]These habitats include: 1) Seagrass beds, 2) Macroalgal forests, 3) Shellfish beds, 4) Maerl beds, 5) Sponge, coral and coralligenous beds, 6) Vents and seeps and 7) Soft sediments.

KEY BENEFITS

Biodiversity benefits

The restoration of degraded marine ecosystems can **contribute to biodiversity** by, for example, minimising negative impacts of human activities, improving connectivity across habitats, restoring spawning and nursery areas for fish, and more. Large-scale restoration of marine area as foreseen under the NRL could enable **improved ecosystem and societal services** that benefit multiple sectors of the blue economy (e.g., playing a key role in ensuring the long-term sustainability of fishing activities, tourism, etc.). Restoring so-called blue carbon habitats such as seagrass beds can help mitigate climate change by storing carbon and help society adapt to climate change by buffering storms and reducing the impacts of sea level rise and coastal erosion [3].

Economic benefits

The **economic benefits** of restoring seagrass beds are estimated to be between €284 and €514/ha/year; for shellfish, mussel and oyster beds, they are estimated between €5,000 to €90,000 per ha per year [14]. Although accurate cost/benefit analyses are not possible due to lack of baseline data, there is evidence to support that the benefits of restoring marine ecosystems outweigh the costs. Although there may be some short-term losses to certain economic sectors, these are most likely outweighed by long-term gains. Particularly fisheries may benefit from increased catch in the medium to long term through the restoration of essential fish habitats.

Tyulenovo, Bulgaria, photo by Maria Teneva

MARINE RESTORATION PRACTICES

Active restoration

Active (or ecological) restoration to partially or fully recover native marine ecosystems **is particularly necessary where natural regeneration processes are impeded**. Measures proposed by the NRL include restoring seagrass meadows and kelp forests by actively stabilising the sea bottom and providing structures or substrates to encourage the return of marine life, for example coral/oyster/boulder reefs [14]. For ecological restoration to be successful, among other factors, appropriate site-specific species selection and composition, as well as integration of a socio-ecological approach and adaptation to changing conditions, including future climate scenarios, are critical [18-20].

Passive restoration

Passive restoration measures, however, **can also repair ecosystem functions and assist/initiate native recovery**. As such, the NRL refers to the reduction of various forms of marine pollution, such as nutrient loading, noise pollution and plastic waste, minimising negative impacts of fishing activities on the marine ecosystem, for example by using gear with less impact on the seabed. It also includes allowing ecosystems to develop their own natural dynamics for example by abandoning harvesting and promoting naturalness [14]. As for crucial success factors, it is recognised that restoration and protection as well as land and marine planning need to be coupled so that (land-based) pressures from human activities do not compromise the integrity of marine ecosystems and their successful restoration [21],[22]. Moreover, to fully reap the benefits of passive restoration, effective protection of a marine area must be established in the first place.

In this context, **Article 5 of the NRL** sets out the premise and obligation that "restoration goes hand in hand with protection and maintenance […] to ensure that the condition of ecosystems does not deteriorate before or after restoration" [14]. The NRL thus stresses that "effective, representative and coherent networks of marine protected areas (MPAs) can be vital in restoring degraded marine habitats to good condition and ensuring that they don't degrade again." Proposed measures of limiting the marine area subject to bottom fishing or promoting marine rewilding underline this.

Designation and enforcement of Marine Protected Areas

The designation of **marine protected areas** (MPAs), and particularly those that effectively curb threats, can therefore be a key measure to allow marine habitats to recover. Many studies have shown that marine no-take zones **are among the most (cost-)effective conservation measures in the ocean for curbing pressures** to marine ecosystems (particularly from fishing) **and restoring marine life** [23]. Given the current status quo on MPAs in the EU, the NRL is an opportunity for greater ambition in this area.

By the end of 2016, 10.8 % of Europe's seas had been designated as marine protected areas and marine Natura 2000 sites covered 515,000 km^2 or 8.9 % of Europe's seas in 2017, although they are less complete than the terrestrial network. While MPA coverage has improved in the last decade in 9 out of 10 regional seas, distribution of MPAs including Natura 2000 sites is skewed towards near-shore and coastal waters. The sites are often very small (high proportion below 5 km^2), and the network is not yet ecologically representative, especially deeper sea habitats are not represented [24]. Few areas are strictly protected, and few effectively eliminate threats from activities such as fishing within MPA boundaries [25]. In addition, protection currently often exists only on paper, and there remain problems with management effectiveness, e.g., lack of management plans, connectivity constraints, lack of adequate monitoring in some cases [26]. Overall, additional efforts are needed to address these challenges [27].

CONCLUSION

In conclusion, the state of the European seas is mostly poor and biodiversity loss has not been halted, it is even worsening. Faced with increasing threats, **urgent action is needed to restore marine habitats to good condition through large-scale restoration of marine ecosystems**. Improvements can be achieved through increased efforts and specific targets, such as for marine areas under the NRL, which shows promise. It is an ambitious legal framework that recognises and seeks to overcome the failures of previous approaches.

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

These policy briefs were written by IEEP and Ecologic Institute in the Think Sustainable Europe Network in response to the proposed EU nature restoration law.