Extract from:

Area-based conservation as a key tool for delivering SDGs

SDG 14: Life below water

Summary for policy makers

Marine ecosystems are declining at an unprecedented rate. For example, about half of all live coral reefs have already been lost. Almost a third of reef-forming corals, sharks and shark relatives and over a third of marine mammals are currently threatened. At least 60 per cent of fish stocks are harvested at their maximum capacity and 33 per cent are fished at an unsustainable level – and these are underestimations, because up to 33 per cent of fish catch by weight is illegal, unreported or unregulated. Climate change exacerbates ecosystem loss and extinction risk for marine species due to the increase in average water temperature, heatwaves, deoxygenation and acidification.

SDG 14 requires states to address these challenges and protect marine ecosystems from all the anthropogenic pressures that threaten them. Simultaneously, SDG 14 requires protection and enhancement of livelihood opportunities for coastal communities that depend on marine resources, and especially for small-scale fishers and developing countries.

Effective area-based conservation tools like Marine Protected Areas and Locally Managed Marine Areas can play an important role in both biodiversity conservation and sustainable use of marine resources. This is why Target 14.5 requires protection of at least 10 per cent of coastal and marine areas. In addition, other Spatial Protection Measures linked to sustainable management of fisheries and outside protected areas also have an important role to play. There is a wealth of evidence that shows that area-based conservation tools are essential for the protection and recovery of marine ecosystems and species.

Besides biodiversity improvements, effective area-based conservation can provide socio-economic benefits to local communities, due to enhanced yields for small-scale fishers, both inside and near protected waters, and increased opportunities for the tourism sector.

What is the challenge?

Marine ecosystems are declining at an unprecedented and accelerating rate in human history. For example, the latest assessment by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) shows that about half of the live coral cover of reefs has already been lost (coral reefs are among the ecosystems with highest biodiversity). The same assessment shows that almost a third of reef-forming corals, sharks and shark relatives, and over a third of marine mammals are currently threatened. Further, more than 10 per cent of the extent of seagrass meadows (which play a key role for biodiversity conservation and carbon storage in the sea) have been lost since 1970.[1] A number of human-induced pressures contribute to this decline, the most important being overfishing, climate change and plastic pollution.

The state of marine fishery resources is continuously depleting due to overfishing. FAO's monitoring data show that in 2015 (the most recent year for which data are available) 60 per cent of fish stocks were harvested at maximally sustainable rates (i.e. they were fully fished stocks), 33 per cent were fished at an unsustainable level, and only 7 per cent were underfished.[2] These figures are underestimations, because up to 33 per cent of fish catch (by weight) is illegal, unreported or unregulated (IUU),[3] with regional variations: in West Africa this share rises to about 40 per cent of total catch by weight.[4] IUU represent one of the most important threats to the sustainability of fishery.

Climate change exacerbates ecosystem loss and extinction risk for marine species, due to the increase in average water temperature, heatwaves, deoxygenation and acidification. According to IPCC's Special Report on the Ocean and Cryosphere,[5] since 1993 the rate of ocean warming has more than doubled and marine heat waves[6] have doubled in frequency and became longer-lasting, more intense and more extensive. Ocean acidification, due to the rising concentration of CO_2 in the atmosphere, and the consequent increased uptake in the oceans, increased by 26 per cent since pre-industrial times.[7]

According to the most recent data,[8] the ocean has already lost 2 per cent of its oxygen inventory between 1960 and 2010, due to reduced solubility of oxygen in water caused by increasing temperatures, reduced ocean circulation and associated ventilation (all phenomena triggered by climate change).[9] Loss of sea ice is having major impacts on marine food webs, fisheries and access for Indigenous people. All the above-mentioned pressures interfere with ecosystem dynamics, with an increasingly negative impact on a wide range of marine species. For example, acidification and heatwaves have a significant impact on warm-water coral reefs and rocky shores dominated by calcifying organisms like corals, barnacle and mussels, and marine heatwaves have already caused large-scale coral bleaching events.[10] According to the latest IPBES assessment, climate change is expected to result in a decrease of fish biomass by 2-25 per cent and a reduction of the ocean's net primary production of 3-10 per cent by the end of the century.

Plastic pollution also represents an increasingly threatening pressure on marine wildlife. It has been estimated that 12 million tonnes of plastic end up in the oceans every year, and notably 8 million tonnes from coastal mismanaged waste, 2 million tonnes from inland waste, 1.5 million tonnes from primary microplastics and 0.6 million tonnes from lost fishing nets.[11] Many marine species ingest, are entangled or suffocated by marine plastics, and floating plastics contribute to the spread of marine invasive species, which constitute another pressure on marine ecosystems. For example, plastic litter affects at least 86 per cent of marine turtles, 44 per cent of seabird species and 43 per cent of marine mammals.[12]

SDG 14 combines targets focusing on the conservation of marine ecosystems and others ensuring their sustainable use. Biodiversity conservation is addressed by Target 14.5, which requires protecting at least 10 per cent of coastal and marine areas, and by three targets aiming at reducing the most important pressures: a) Target 14.1 on marine pollution, including marine debris and nutrient pollution, b) Target 14.3 on ocean acidification and c) Target 14.4 on overfishing. In addition, Target 14.2 combines

the conservation and the sustainable use components, by requiring states to "*sustainably manage and protect marine and coastal ecosystems [...] and take action for their restoration*".

How can effective area-based conservation help?

Area-based conservation can contribute to the two components of SDG 14, i.e. biodiversity conservation and sustainable use. As regards the first, there is wide consensus among experts that Marine Protected Areas (MPAs) are **essential to protect marine ecosystems**.[13, 14, 15] For this reason, both SDG Target 14.5 and Aichi Target 11 of the CBD's Strategic Plan for Biodiversity 2011–2020 require that 10 per cent of coastal and marine areas at the global level are included in MPAs. However, currently only 5.3 per cent of the world's oceans is covered by actively managed MPAs, less than half of which (i.e. 2.5 per cent) is in highly protected (no-take) MPAs.[16]

Besides biodiversity conservation, area-based conservation can also **provide socio-economic benefits to local communities**, thereby contributing not only to Target 14.B and 14.7, but also to a number of other SDGs, including SDG 1 "No poverty", SDG 2 "Zero hunger", SDG 3 "Good health and wellbeing" and SDG 8 "Decent work and economic growth".

Socio-economic benefits can be provided by MPAs via different pathways. Restrictions on fishing inside protected areas can lead to **an increase in fish density and size in surrounding waters** due to the spillover and nursery effect. The first one refers to the movement of fish from protected to unprotected areas,[17, 18, 19] whereas the latter occurs when protected areas act as fish spawning and nursery grounds, thereby benefitting neighbouring areas thanks to the movement of eggs and larvae.[20] In MPAs where restrictions on industrial scale fishery activities are in place**, small-scale artisanal fishers can benefit from higher yields** than in non-protected waters. There is normally a trade-off between level of protection and economic benefits for fishers, as in general, no-take MPAs deliver the best results in terms of ecosystem protection and recovery.[21, 22, 23] However, when well-managed, MPAs allowing some degree of fishing also contribute to marine conservation.[24] The following factors enable MPAs to deliver benefits to small-scale fishers, while maintaining fish stocks at a sustainable level: presence of a management plan, high MPA enforcement, fishers' engagement in MPA management[25] and promotion of sustainable fishing.[26] No-take areas and areas allowing fishing activities can be combined to find a balance between conservation and socio-economic objectives. In fact, about 18 per cent of MPAs at the global level include both no-take zones and zones allowing some degree of fishing. This share is higher in regions with high human density and intense use of the sea (for example, this share rises up to 92 per cent in the Mediterranean).[27] For these regions, ensuring good management, stakeholder participation and enforcement is even more important.

MPAs can provide an **opportunity to increase tourism, which can provide additional socio-economic benefits**.[28] In fact, higher environmental quality and increased recognition of an area as a tourist destination (i.e. the "designation effect") can attract visitors in, or in the vicinity of, MPAs. This leads to increased livelihood opportunities for those owning or working in hotels, restaurants and leisure associations, and in general for the local economy. Tourism can have a very significant impact on marine and coastal wildlife,[29] and for this reason it needs to be managed to keep it within sustainability limits and make sure that the carrying capacity of ecosystems is not exceeded.[30] This requires an effective management plan and enforcement measures, the establishment of strategies to reduce the impact of recreational users and communication activities to promote good practices.[31] The promotion of ecotourism, which provides livelihood opportunities to local communities with limited damage to ecosystems, can play a key role in this sense.

Finally, area-based conservation can **provide opportunities for research and education**. There is a growing body of studies that use data collected inside MPAs and other area-based conservation tools for a wide range of purposes, ranging from the analysis of marine species and ecosystem dynamics to the analysis of the institutional, social and economic factors influencing the delivery of conservation and socio-economic benefits.[32] Moreover, research and development activities based on MPAs are increasingly contributing to innovations in biotechnology applications[33] in different sectors, such as for example food (e.g. alginate extraction), energy (e.g. biofuels from algae), health (e.g. drug development).[34] A good example is the large-scale research project Seafarm, which aims to develop a closed loop biorefinery process for algae in Kosterhavet Marine National Park (Sweden).[35]

Approaches that support SDG 14

All MPAs and marine OECMs contribute to SDG 14 and Targets 14.2 and 14.5 in particular. MPAs and OECMs allowing for a certain degree of fishing activities support also Targets 14.4 and 14.7 linked to sustainable use of marine resources. These types of MPAs and OECMs also contribute to other SDGs, and in particular SDGs 1, 2, 3 and 8. Networks of MPAs and OECMs are often supported by area-based approaches to sustainable use that have some benefits for marine biodiversity while contributing to Targets 14.4 and 14.7. A combination of both conservation and sustainable use approaches provides the most benefits across all SDG 14 targets, and beyond.

Marine Protected Areas

- **Marine protected areas (MPAs)** can be designated under national legislation or to implement international or regional agreements.[36] MPAs can impose different degrees of restrictions over extractive and non-extractive economic activities, ranging from no-take zones, where all extractive activities are forbidden, to multi-use areas, where small-scale fishery and sustainable tourism are allowed. Unfortunately, many MPAs around the globe do not reach the desired conservation objectives because they lack a management plan and, even with a plan in place, enough resources for protection and management – they are "paper parks". For example, only 32 per cent of the 74 managers of Mediterranean MPAs surveyed in a recent study said that their MPA has a management plan that is implemented; only 10 per cent believe that the staff numbers are adequate to their MPA's management needs; and more than half of them have a budget that is inadequate for even basic management needs, including 24 per cent with no budget at all.[37] A recent study by WWF found that even if 12.4 per cent of the EU marine area is included in an MPA, only 1.8 per cent is covered by a management plan.[38] A stronger political commitment is needed for MPAs to fulfil their potential and contribute to SDG 14, which will require a substantial increase of resources for planning, management and enforcement.[39]

Marine OECMs

- OECMs which restrict access for reasons other than conservation or natural resource management, can also benefit biodiversity. They are often called "**de facto refuges**". Examples are offshore wind installations, military exclusion zones and wrecks.[40] Some evidence has been collected on the beneficial impacts of such structures on fish density. For example, a recent study has shown that Atlantic cod and pouting are seasonally attracted towards wind turbines in the North Sea to feed upon the dominant prey species that aggregate there and grow.[41] Some preliminary exercises are being conducted to identify broad types of marine uses that may or may not be potential OECMs.[42]

Another specialised designation is important in marine areas:

- **Locally Managed Marine Areas** (LMMAs) – which are also called **Collaborative Fisheries Management Areas** (CFMAs) and **Community Conservation Areas** (CCAs)[43] – are actively managed by resident or neighbouring communities. There are

many examples around the world of successful LMMAs,[44] such as for example in Kenya[45] and Madagascar.[46] In many cases, LMMAs are more easily accepted by local communities than centrally managed MPAs, as they can be tailored to cater for local needs and contribute to empower vulnerable stakeholders through increased food security and learning opportunities.[47] They can also be more effective because they can make use of local and traditional knowledge on fishery management.[48] LMMAs will usually be protected areas or OECMs but in some cases can be neither.

Key complementary approaches

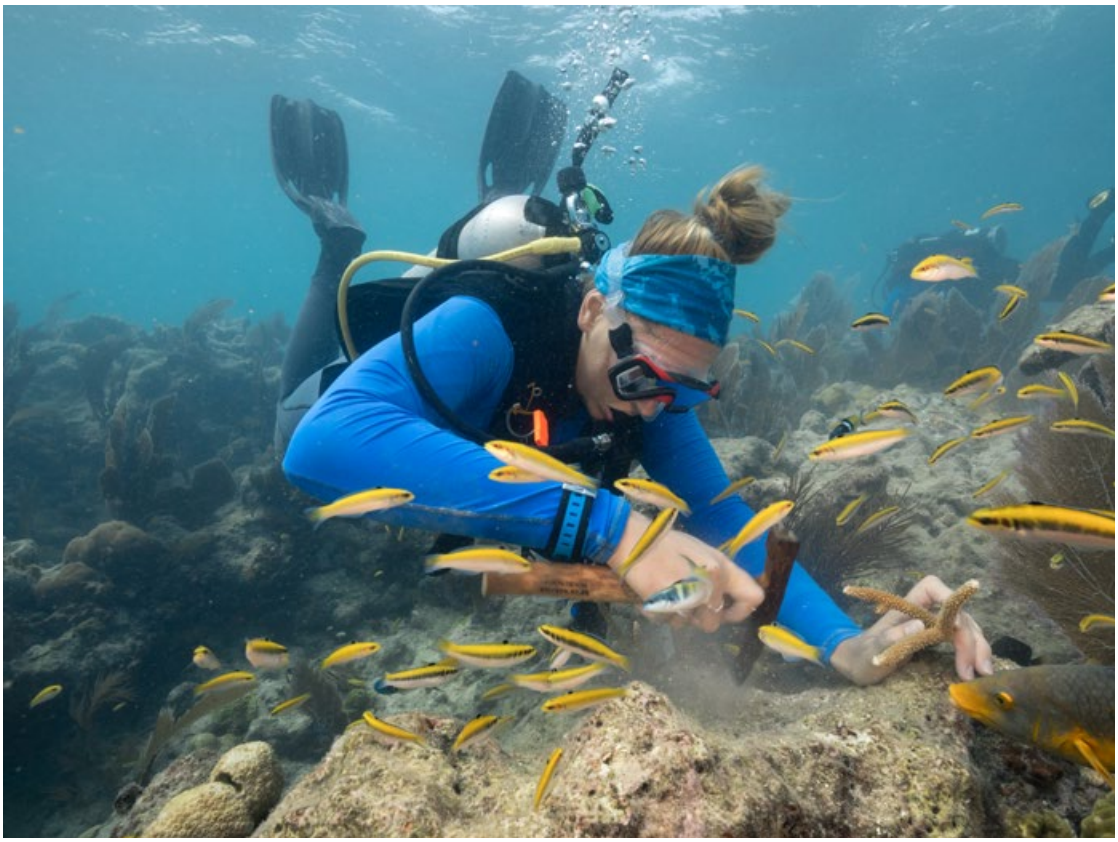
This includes some area-based approaches that are *not protected areas, nor usually OECMs* but can have benefits for marine biodiversity while contributing to other elements of SDG 14 (e.g. 14.4, 14.7):

- **Fishery Spatial Protection Measures** are temporal or permanent restrictions on fishery activities, such as for example special fishing permits or bans on specific fishing gears to protect specific vulnerable ecosystems or seagrass meadows.[49] Temporary closures of fishery areas,[50] such as for example periodically harvested coral reef reserves[51] or seasonal closures of octopus fishery areas,[52] belong to this category. While these measures cannot be considered as protected areas and only some may qualify as OECMs, they do deliver certain biodiversity benefits and play an important role in delivering SDG 14 targets. These kinds of measures can protect vulnerable species and ensure sustainability of fishery practices. Temporal or periodic closures are particularly beneficial for fast-growing fish populations or for those in low fishing pressure situations, whereas the conservation and restoration of fish populations with longer lifespan or higher fishing pressures may require more permanent forms of protection.[53] **Other marine areas with controls on use or access**, such as areas designated to protect specific species of great importance, can contribute to SDG 14. Examples are the seventeen shark sanctuaries that have been created by coastal and island governments across the globe to reduce shark mortality in their waters.[54] Shark sanctuaries cover almost as much area as MPAs globally.[55] Evidence shows that in shark sanctuaries the shark population decline is less pronounced, less sharks are being sold and there are fewer fishing threats than in non-shark sanctuaries. They can be a useful conservation tool, but in order to fully protect their target species they need to be used in combination with measures to reduce bycatch, ghost gear, marine litter and habitat destruction.[56] However, these only cover one or a small group of species and are therefore not protected areas or OECMs.
- **Particularly Sensitive Sea Areas (PSSA)** are proposed by a state or states and designated by the International Maritime Organization (IMO).[57] They are chosen because of their significance for ecological, socio-economic or scientific reasons and their vulnerability to damage by international maritime activities. To date, there are 14 PSSAs, including the Great Barrier Reef in Australia, the Western European Waters, the Baltic Sea, the Wadden Sea, the Canary Islands and the Galapagos Archipelago. The designation of PSSAs does not prevent international shipping, but places specific rules and controls to limit damage, such as for example the use of compulsory routes to avoid certain areas and bans on discharging waste. Some PSSAs overlap with marine protected areas but PSSA designation alone is not equivalent to being a protected area.

Case study

Protecting corals and seagrass to combat climate change and its impacts

Florida Keys National Marine Sanctuary (FKNMS), the United States



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Co-benefit SDGs

Jason Frohnmayer and **Zachary J. Cannizzo** (NOAA).

"Successful management of the Florida Keys National Marine Sanctuary relies on our valued partnerships. We are all part of the solution."

– Sarah Fangman, Superintendent, Florida Keys National Marine Sanctuary –

Background: Traditional management strategies are often insufficient to address the breadth, complexity and speed of climate management challenges unique to the ocean system, such as ocean acidification, dynamic boundaries and high connectivity. MPA professionals further note there is a "concerning disconnect between global oceanic climate impacts and the relative lack of experience and action needed to address these stressors at local and regional scales".[58]

Responding to these challenges, the Florida Keys National Marine Sanctuary (FKNMS), managed by the National Oceanic and Atmospheric Administration (NOAA), is addressing impacts to the sanctuary and surrounding region as well as offering specific examples of how its activities meet the climate related SDG 13[59] target on strengthening resilience and adaptive capacity to climate-related hazards (13.1) and integrating climate change measures into MPA management planning (13.2).

FKNMS protects almost 10,000 km² of ocean and coastal habitat of the Florida Keys archipelago south of the Florida mainland. Established by the United States Congress on 16 November 1990, the sanctuary is home to some of the most diverse and productive marine ecosystems in the country. The mangrove forests, seagrass meadows and coral reefs of the sanctuary are home to thousands of ecologically and economically important species including sea turtles, manatees, spiny lobster and many recreationally and commercially important fishes.

Sustainability challenge: Coral reefs are among the most fundamental habitats

to the ecology, economy and culture of the Florida Keys. The coral reefs of the Florida Keys are home to thousands of species of fish and invertebrates and provide an economic value of US$8.5 billion for southeast Florida. However, excessive nutrient loading, disease, climate effects and physical impacts such as boat groundings are threatening reefs. Ocean acidification and intense storms damage corals and rising ocean temperatures are causing dramatic coral bleaching events. In addition, Stony Coral Tissue Loss Disease (SCTLD), which first appeared near Miami in 2014, has spread throughout Florida's coral reefs, including over 95 per cent of FKNMS, causing widespread mortality.[60] The combination of human uses, climate change and disease have resulted in the loss of most of the coral cover in the Florida Keys.

Seagrass meadows are another key habitat under stress. The 1.4 million acres of protected seagrass meadows in FKNMS are vital for hundreds of species including sea turtles, manatees and economically important fishes. They also serve as nurseries for reef-associated species while offering coastal protection and carbon sequestration.[61] Climate and other human stressors, such as poor water quality, have substantially degraded seagrasses and their habitats. Boat propellers have scoured large areas of seagrass, while reduced freshwater flow and poor water quality from a century of intensive agriculture have destroyed thousands of acres. Climate change also impacts seagrasses through warming and sea level rise, which threatens to gradually drown these light-sensitive ecosystems.[62]

These impacts also have implications for coastal communities both in and beyond the sanctuary that depend on these resources. Coral reefs are a valuable natural resource that provides fundamental support for the economy while providing opportunities for recreation, education, scientific research and public inspiration. In addition, the fish we catch rely on corals to build the reef structure where they can breed and grow. Medicines that combat cancer, pain and inflammation have also been derived from coral reef organisms. Corals and seagrasses also provide coastal protection, an issue of growing importance as climate change is causing the intensity of coastal storms to increase. Healthy and resilient coral reefs also protect infrastructure and safeguard against extreme weather, shoreline erosion and coastal flooding.

In concrete socio-economic terms, coral reefs are estimated to annually support 71,000 jobs in south Florida. In addition, Florida's Coral Reef provides more than US$355 million/year in flood protection benefits to buildings and protects nearly US$320 million in annual economic activity.[63]

Healthy seagrass beds and mangroves also store carbon,[64] and can be an important part of regional and national climate mitigation plans. However, these societal benefits are threatened by degradation of these ecosystems from climate and non-climate stressors.[65]

Conservation solution: Sustaining a healthy ecosystem within FKNMS is a daunting challenge. A century of human impacts coupled more recently with climate impacts like coral bleaching, ocean acidification, increased intensity of tropical storms and sea level rise have degraded its ecosystem.

However, using a holistic approach, FKNMS staff are working with other NOAA offices, state and local partners, and community stakeholders to integrate adaptation measures into their sanctuary management plan. This climate-informed plan will address the new environmental conditions and deliver solutions both for conservation and socio-economic sustainability in the region.[66]

One of the ways that FKNMS is addressing the effects of climate change is to evaluate its impacts, as well as those of other human stressors, on the key ecosystems in the sanctuary.[67] The recently released restoration blueprint (which also serves as the draft environmental impact statement for the updated sanctuary management plan) draws on the lessons learned from 30 years of science, monitoring, technical experience and community involvement.[68] The blueprint considers alternatives to counteract the decline in vital ecosystems like coral reefs, seagrasses and mangroves through a series of regulatory and management measures

designed to reduce threats and, where appropriate, restore degraded habitats. For example, NOAA proposes expanding zones that provide a higher level of coral ecosystems protection from ship groundings, anchoring and other human impacts. Counteracting declines in "blue carbon" ecosystems such as mangroves and seagrass meadows could further prevent the release of stored carbon into the atmosphere and encourage mitigation through additional carbon sequestration.[69]

The sanctuary has also developed an ambitious restoration plan intended to increase the resilience of its coral reef ecosystems. Titled *Mission*: *Iconic Reefs*, the plan draws on cutting-edge restoration science and years of research, trials and scientific expertise.[70] The mission represents a science-based plan that considers the impacts of climate change while seeking to address the cumulative effects from a wide range of stressors. The plan aims to restore seven reefs that represent the diversity of the Florida Keys and proposes the overarching goal of creating a more resilient coral reef ecosystem while achieving 25 per cent stony coral cover.

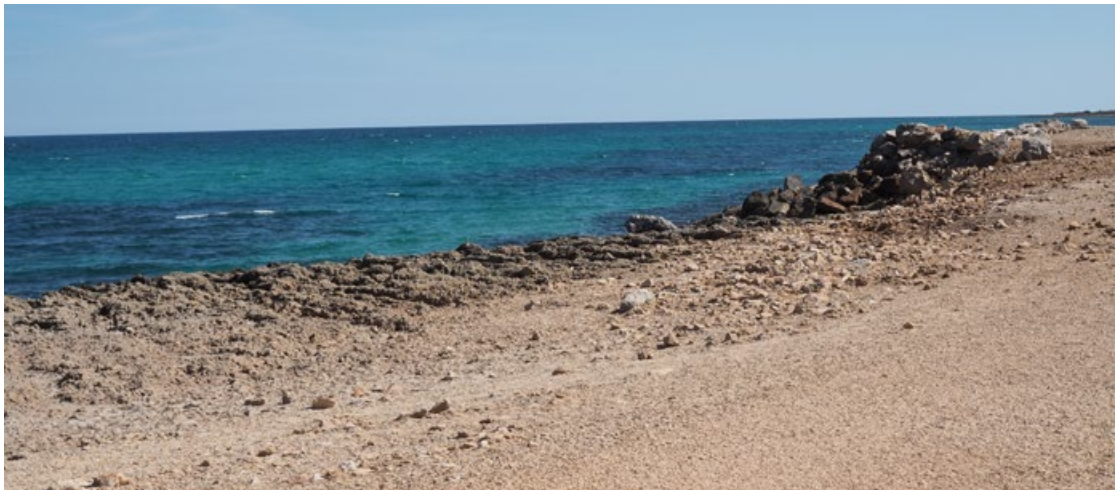
Mission: *Iconic Reefs* will protect and restore coral reefs by focusing NOAA and partner resources on a comprehensive restoration strategy informed by climate science. As a part of these plans, FKNMS is working with partners to grow climate and disease-resistant corals in nurseries and out plant them throughout the Keys. The plan also includes strategies for protecting climate refugia by determining which coral species are most resistant to bleaching, and what locations are more likely to promote coral growth and avoid catastrophic damage from storms. Healthy corals can help protect vulnerable coastal communities from extreme storms, expected to increase with climate change.

Lessons learned: FKNMS' efforts illustrate the value of early and continuing involvement of the community and stakeholders in the management process to foster understanding and partnership while building support for necessary actions. In addition to robust science, effective climate change adaptation requires deliberate inclusive partnership and capacity building among MPA managers, stakeholders and the public. Ultimately, the successful adaptation to climate change in marine protected areas – including the wider sustainability benefits that this fosters – will hinge on this collaborative ability. The challenge is daunting but by following the example of MPA managers, like those in the Florida Keys, it is possible to ensure that our marine ecosystems, and the communities they support, have the best tools and options available for adapting to a changing climate and mitigating its impacts.

Next steps: Public comments on the initial draft of proposed activities are currently being reviewed. Based on these comments, NOAA may issue a revised management plan and propose a set of draft regulations to establish changes, followed by another round of public comments on the revised proposal. Meanwhile, partnerships to restore the reefs and engage local communities and businesses are ongoing.

Sustainable development of a coastal community, building on the benefits of a marine protected area

Torre Guaceto Marine Protected Area, Italy



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"At the beginning we were not happy [about the designation of the MPA], there was some conflict between us and the management body, but now we see it was worthwhile. To catch this amount of fish outside the protected area I need to work four times as much. Working as we do here [i.e. under the rules established by the fishing protocol] allows us to obtain a higher income in the future, and to give work to our children. Small-scale fishing is not profitable anymore. We can continue to do this job only thanks to the protected area. Without the protected area we would have stopped doing this work a long time ago." [71]

– Fisher of Torre Guaceto, September 2010 –

"Since the Torre Guaceto natural reserve was created, we're very happy. We work inside the protected area once a week, and on other days we can fish elsewhere. We use very wide meshes, to give small fish the opportunity to escape, so that we only catch the largest fish."

– Fisher of Torre Guaceto, June 2019[72] –

Background: The Torre Guaceto Marine Protected Area (south-eastern Italy) includes both marine and terrestrial areas. The marine protected area (MPA) includes 179 ha of no access-zone (zone A), 163 ha of no-take but access buffer zone, used for guided tours, bathing and research activities (Zone B), and 1,885 ha that can be used for small-scale fishery under restricted conditions (Zone C). The terrestrial protected area covers 1,100 ha, 73 per cent of which is agricultural land and is mainly used to produce tomatoes, artichokes and olives. The marine protected area of Torre Guaceto is also included in a Site of Community Importance (SCI) under the Habitats Directive (7,978 ha, 95 per cent of which are marine).

Sustainability challenge: Before designation, there was no control of overfishing, and illegal fishing and blast fishing were common, leading to significant ecosystem degradation. Local visitors used to leave behind significant amounts of litter, which was not collected, and there was no organic agriculture. In general, the area was characterised by high levels of unemployment, criminality and a large shadow economy.

Key benefits: Various studies document an increase in size and density of fish target species after the designation of the Torre Guaceto MPA.[73, 74, 75] This translates into economic benefits to the local fishers.[76] The average catch per unit effort (CPUE)[1] in Torre Guaceto is reported to be almost two

[1] CPUE is often used as an indication of the abundance of a target species of fish. It is calculated by dividing the average catch by a measure of effort (e.g. number of hours or km of net employed).

14 LIFE BELOW WATER

Co-benefit SDGs

3 GOOD HEALTH AND WELL-BEING

8 DECENT WORK AND ECONOMIC GROWTH

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

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Institute for European Environmental Policy

Case study

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times higher than the CPUE near the MPA.[77] For some species, the CPUE inside the MPA is much higher than outside. For example, the CPUE of the scorpionfish, the most common catch inside the MPA, was 3,875 kg per km of net inside and 544 kg outside the MPA. The CPUE of the striped red mullet was 1,754 kg per km of net inside the MPA and 392 kg outside. The conservation measures also brought about a recovery of macroalgal communities, which harbour hundreds of species of invertebrates and algae. This is due to a reduction in the population of urchins, which are the most important alga grazers and are predated by seabreams, whose density increased due to the fishery protection measures.[78,79] The conservation measures benefit a much wider area than the MPA itself, thanks to the movements of eggs and larvae towards non-protected areas to at least 200 km southward.[80, 81, 82, 83]

The strong collaboration between the managing body and the fishers increased their awareness of the importance of sustainable fishing practices. For example, they now use the 30 mm-mesh net that is required inside the MPA even when they fish outside, where the legal minimum mesh is 22 mm. They do so to avoid capturing juveniles and thereby to not interfere with reproduction.

While there was no tourism in Torre Guaceto before the designation, the number of visitors from other regions and countries increased considerably over the last decade. As a result, new livelihood opportunities have arisen for the members of the local community owning or working in hotels, restaurants and bed and breakfasts, and for those working as personnel of the protected area, tourist guides and environmental educators.

Finally, the managing body and the grassroots organisation Slow Food are encouraging farmers inside the protected area to switch to organic farming – at the moment about 30 per cent of the area is organic land or in conversion to organic, and this share is rising because farmers are increasingly realising that they can get a premium price for organic products.

Conservation solution: In order to overcome the initial resistance of fishers to the MPA, the managing body involved them in the elaboration of a fishing protocol to define fishing activities inside the MPA. Key to the success of this initiative was the involvement of Slow Food, who mediated between fishers and the managing body, and of ecologists from the University of Salento. An adaptive management approach was chosen, meaning that the fishers agreed that the rules could be changed if a reduction in fish biomass were observed during the regular monitoring activities carried out by the managing body.

In addition, the managing body has been raising funds to support the resident fishers. For example, a grant from an Italian foundation called *Con il Sud* financed the purchase of new, more sustainable nets and a one-year project financed by *Federparchi*, the association that represents the managing bodies of Italian protected areas, remunerated fishers to reduce their fishing effort by 35 per cent, in order to test the impact of such a change on the fish stocks in the MPA.

The managing body and Slow Food engaged in frequent communication and collaboration with the agricultural landowners too and gained their support by convincing them of the economic advantages of the Torre Guaceto brand, which allows a premium price for agricultural products and synergies with the tourism sector.

A wide range of educational, sport, gastronomical and cultural activities have been organised by the managing body

and Slow Food. These initiatives attract an increasing number of visitors from other regions and countries, who create a demand not only for tourism services, but also for food products with the Torre Guaceto brand. In addition, Slow Food gave its label (called Presidium) to three Torre Guaceto products: fish, an ancient variety of tomato called *pomodoro Fiaschetto* and the extra virgin olive oil *Oro del Parco* (Gold of the Park). Presidia are labels that Slow Food grants to sustainable, traditional and seasonal food. They increase the reputation, and hence the demand, of Torre Guaceto's products and allow producers to sell at a premium price. They also provide free publicity to the restaurateurs using them, who are often involved in Slow Food events and initiatives, such as the Slow Food's Chefs' Alliance, a network of chefs who commit to use at least three Slow Food Presidia. The Presidia also help attract visitors interested in high-quality gastronomy. They are promoted in the events organised by Slow Food and the managing body, they are used in the café in the Torre Guaceto's lido and sold in the visitor centre (only *Pomodoro Fiaschetto* and *Oro del Parco*, not the fish).

Business case: The fishery rules increased the fish density and size inside the protected area, resulting in a higher income for resident fishers. The daily net income provided by a working day inside the MPA is reportedly double that which can be obtained outside (€140 versus €70 per day).[84]

Since the designation of Torre Guaceto, a significant number of bed and breakfasts have been established, and local rural farmhouses have been renovated to be rented to tourists. In 2013, there were 127 tourist structures, only 29 per cent of which were hotels (more recent data are not available). Between 2008 and 2013, the number of tourist structures increased by 78.8 per cent. The increase in tourism led to new livelihood opportunities for the local community. In 2015, it was calculated that the cooperative managing the educational and leisure activities in the area, the local diving and sailing associations, generated 128 jobs and a gross income of €187,000.[85] The beach of Torre Guaceto generates an income of more than €6 million per year, including meals, accommodation, parking, purchase of local products and other goods and services.[86]

Lessons learned: Lessons learned from the case study include the following:[87]

- Early engagement of and support to stakeholders can improve buy-in and result in high levels of environmental enforcement. In addition, adaptive management, which allows restrictions on resource use to be modified if variations in the state of ecosystems are observed, is key to ensure long-term sustainability and it motivates stakeholders to respect the rules.
- Synergies between agricultural/fishery stakeholders and the tourism sector, based on the sustainable use of natural resources and the conservation of ecosystems, can bring about benefits for all involved economic sectors.
- Labels can enable the creation of synergies between producers and the tourism sector.
- Successful marine protected areas can play an important educational role to stimulate sustainable behaviour.

Next steps: The managing body and Slow Food are working on the development of a new app for mobile phones to enable fishers to directly sell to restaurants (potentially getting a higher price than when selling to fishmongers). In addition, they are trying to set up the production of processed food from the protected area, including fish cooked in Torre Guaceto's tomato sauce and preserved in the Torre Guaceto oil. Other ideas to provide complementary sources of income to fishers without increasing their fishing effort include exploring the potential for pescatourism (i.e. the organisation of boat tours by fishers) and organising activities to attract visitors outside of the summer tourist season (e.g. sailing courses).

This case study was based on a site visit by the author in October 2017, plus scientific papers and reports.

Case study

Area-based marine conservation as a means to strengthen climate resilience

Belize Barrier Reef System World Heritage Site, Belize

Co-benefit SDGs

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Background: The Belize coral reef is part of the world's second largest reef system, and the country contains the longest unbroken section of this reef, including a wide variety of coastal and offshore reef ecosystems. The area supports an enormous diversity of marine species, including the endangered West Indian manatee (*Trichechus manatus*) and green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), and loggerhead (*Caretta caretta*) sea turtles.[88] Around 26 per cent of Belize's terrestrial and marine areas are in protected areas and the reef system is recognised as a natural UNESCO World Heritage site. However, in the past there have been concerns that marine protected areas (MPAs) were not well integrated with the rest of the marine and terrestrial environment and local communities were not sufficiently involved in management decisions.[89]

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Image shows Healthy Reefs

Sustainable management and conservation of coastal zones is critical to Belize's economy. The livelihoods of fishers, other resource users and the tourism sector rely on these ecosystems. A decade ago, the value of the coral reefs and mangroves was estimated to be US$395-559 million a year[90] with 60 per cent of the population directly or indirectly dependent on goods and services from coastal and marine ecosystems.[91]

Conservation challenge: Despite their huge significance, the reef, seagrasses and mangroves are far from secure. Mangroves are under particular pressure and there has been widespread and unsustainable coastal development. The industries that the country relies on from an economic perspective – tourism, fisheries, real estate and agricultural industries – are also those that threaten the natural ecosystems that support these activities. These pressures are further exacerbated by observed and anticipated climate change impacts, including changes in sea surface temperatures, which are also associated with increasing frequency and intensity of tropical cyclones or hurricanes. In 2009, the Belize Barrier Reef Reserve System was added to the UNESCO World Heritage in Danger list partly due to risks from oil exploration and loss of mangroves, although it was removed again in 2018, following a moratorium on oil exploration across the whole Belize maritime zone and better forest protection.[92] But many pressures remain, for example to some of the fish populations.[93] The site was still rated as being of "*significant concern*" in IUCN's survey of natural World Heritage sites in 2020.[94] The need for an integrated approach to planning and managing marine resources is widely acknowledged.[95]

Conservation solutions: The Belize government adopted a comprehensive approach to management and planning.[96] The approach aimed to boost revenue to local stakeholders, for example from lobster fishing, increase the functional area of the reef and double the value of the coastal ecosystems for climate protection. The project used the InVEST model from the Natural Capital Project (a suite of free, open sources software models used to map and value the goods and services from nature) to inform the planning exercise.

Funding for part of the approach came from the Marine Conservation and Climate Adaptation Project (MCCAP) which is funded by the Adaptation Fund, and implemented by the World Bank. Belize ratified the Kyoto Protocol in 2003 making it eligible to access resources from the Adaptation Fund, which finances adaptation programmes in developing country Parties to the Kyoto Protocol that are particularly vulnerable to climate change. The *Belize Marine Conservation & Climate Adaptation Project* is a US$5.53 million project to implement priority ecosystem-based marine conservation and climate adaptation measures to strengthen the climate resilience of the Belize Barrier Reef System, among others. The project has three components: improving the protection regime of coastal and marine habitats, supporting viable and sustainable alternative livelihood options for reef users and raising awareness and building local capacity.

To date, this has supported expanding and securing MPAs, bringing the total coastal and marine area under protection from 13 per cent to 20.2 per cent of territorial waters (405,513 ha), and has expanded marine replenishment (no-take zones) from approximately 2 per cent to 3.1 per cent (58,699 ha) using a participatory approach.

The project has also supported development of mangrove regulations, which have subsequently passed into legislation and drafted a revision of the Coastal Zone Management (CZM) Act and Regulations. The target indicator for repopulation of coral reefs in replenishment zones has also been achieved, with six coral sites restored in each reserve (South Water Caye Marine Reserve and Turneffe Atoll Marine Reserve).

Business case: The adaptation, conservation and restoration activities applied in the Belize Barrier Reef System have both ecological and socio-economic significance, providing an opportunity for maintaining and potentially increasing the income level and marine resources available for an estimated 203,000 people living in the coastal areas. These activities will also significantly enhance the ecosystem functionality, resilience and capacity to adapt to increasing climate change impacts.

Lessons learned: The project so far has been broadly successful; it has in some ways gone further than expected in terms of designating new marine reserves and influencing mangrove conservation efforts. Through productive partnership and collaboration with fishers and community organisations, the Project has empowered them to find jobs that deliver direct benefits while protecting reefs, mangroves, seagrass and tidal marshes. In fact, the project approach turned out to be critical: not only restoring and conserving biodiversity but also supporting diversification of livelihoods, to ease pressures on ecosystems and secure environmental protection. Through this partnership, Belize is better preserving its marine environment, increasing resilience to climate change and supporting sustainable livelihoods of those who depend on this natural resource – thereby also setting a strong foundation for the country's transition to a blue economy.

Specific lessons from the project implementation included the importance of placing an emphasis on early development of the subprojects' proposals, related business plans and required social and environmental safeguard documents, as well as carefully considering and sequencing those activities that require lengthy national processes for obtaining necessary permits and approvals from various local organisations and agencies. The strategy and measures taken to address these challenges, such as capacity development efforts and skills training, proved to be critical for the success of the project. The project shows how important it is to have an integrated approach to coastal management and the blue economy vision for the country and link it to further needs specific to MPAs.

Next steps: Given the successful experience and lessons learned, it will be important to build on the insights of the Project and scale up its reach.

Information linked to this case study can also be found through the PANORAMA initiative.

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