Marine and coastal biodiversity offsets

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Summary

Impacts on marine and coastal ecosystems are increasing rapidly, particularly due to coastal development, pollution and over-exploitation of marine resources. New issues are beginning to emerge including expanding oil and gas exploration, seabed mining, renewable energy (particularly offshore wind-farm) development, shipping, and marine aquaculture. Sustainable development of marine regions is likely to include use of biodiversity offsets, which are increasingly being required by governments and banks. This briefing paper provides an overview of challenges to, and opportunities for, marine and coastal offsets.

Marine offsets are a novel idea and thus often perceived to be difficult or complex. However most marine offsets are unlikely to differ substantially from offsets on land – focusing on Marine Protected Areas (MPAs) or restoration of habitats – and examples of marine offsets already exist. Further, there are likely to be notable social and economic synergies with marine biodiversity offsets, such as through MPAs which conserve fish nursery areas: simultaneously conserving biodiversity and increasing production of regional fisheries, and thus improving local livelihoods.

There are large opportunities for additionality in marine offsets, owing to high threats and the limited state of marine conservation to date. For example, most marine ecosystems have very limited protection (<0.25% coverage). Further, restoration of ecological structure and function is more rapid in some marine ecosystems (e.g., mangrove, seagrass, coral reef) than in many on land. Nonetheless, marine ecosystems are more interconnected than those on land, which presents particular challenges of locating and measuring both industry impacts and offset gains.

1 What are marine and coastal ecosystems?

Marine and coastal areas include a wide range of ecosystems which are submerged in seawater either permanently or at some stage of the tidal cycle. The ecosystems referred to as 'marine' in this paper include: intertidal ecosystems such as mangroves, tidal mudflats, and salt-marshes; shallow-water tropical coral reefs; rocky reefs; kelp forests; seagrass beds; seamounts; pelagic (water column) systems and benthic (sea-bed) systems. Some of these ecosystems are particularly limited in their distribution, threatened by existing activities such as poor fishing practices, and important for marine biodiversity.

2 The need for marine and coastal biodiversity offsets

There is increasing recognition and practical experience of the value of biodiversity offsets, as part of the mitigation hierarchy, in addressing impacts on biodiversity on land. In comparison, offsets are rare in marine and coastal environments. Development of such offsets is, however, a key challenge for industries that operate in marine environments, including shipping, fisheries, tourism, and port and coastal developments. Industrial use of marine ecosystems is also increasing in other sectors, notably renewable energy (wind-farms and wave- and tidal-power), and for underwater cable and pipeline infrastructure. Marine offsets are a key emerging challenge for the oil and gas industry: a large proportion of exploration is offshore, increasingly in deep-water environments.

Legislative and financial drivers are also increasing for marine and coastal offsets. Many local, national and regional governments are developing, or already have, offset policies. Financial institutions increasingly require offsets as part of their risk management[1]. Specific requirements for marine offsets are limited to date, but much general offset legislation applies to the coastal and marine environments under national jurisdictions. For example:

- The State of Queensland has the most advanced marine-specific offset requirements, for all coastal developments which impact on marine fish habitat or protected plants.
- South Africa's Western Cape Province has developed guidelines on biodiversity offsets, although these are not yet legally binding.
- United States No Net Loss policy on wetlands, under section 404 of the Clean Water Act (1972)[2], includes intertidal wetlands, such as mangroves.
- European Union Birds and Habitats directives allow for the use of offsets for unavoidable impacts on Natura 2000 sites (Article 6 (4)). Both directives include coastal and offshore habitats.

3 How do marine and coastal ecosystems differ from those on land?

Marine and coastal ecosystems provide some of the most direct and important ecosystem services provided to human societies: a large proportion of the world's population rely directly on wild-caught food from coastal and marine waters, and coastal ecosystems such as mangroves and salt-marshes provide protection from floods and storms. Impacts on marine resources thus have direct and significant relevance not just to biodiversity but also to human wellbeing.

Compared to ecosystems on land, marine ecosystems are more interconnected and have greater concentrations of animals at certain points in time. Marine species often have complex life cycles, occupying multiple ecosystems at different life stages. For example, some fish live as adults in the open seas or coral reefs, but reproduce and live when young in mangroves. Because marine ecosystems are so interconnected but key resources often have patchy spatial distribution, large proportions of a species often need to congregate in one place at one time in order to reproduce – for example at seabird nesting colonies, turtle nesting beaches, spawning sites for fish such as groupers, or during synchronised mass spawning of coral. These congregations are critically important to functioning marine ecosystems, and thus represent both a (impact) risk and an (offset) opportunity for the private sector.

The complex life-cycles of many marine species and connectivity of marine ecosystems increase the challenge of measuring industry impacts and mitigation/offset gains, particularly because losses and gains may be occurring far from project sites. These factors have contributed to a perception that marine and coastal biodiversity offsets need to be wholly different to those on land. In fact, while often likely to be more complex, the same principles and methods of design and implementation are common to both marine and terrestrial offsets.

[1] For example the Equator Principles

[2] Saltzman, J. and Ruhl J. B. (2006) *'No Net Loss' - Instrument Choice in Wetlands Protection* in Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience (Jody Freeman & Charles D. Kolstad eds., 2006)

4 What offset strategies are appropriate in marine and coastal ecosystems?

There are two main types of offset strategy: policy changes and site-based interventions.

Policy-based offsets include interventions that lead to changes in policy and practice within a sector or industry – globally, regionally or nationally. Examples of such interventions include: supporting the industry-wide use of Turtle Excluder Devices in fisheries to reduce marine turtle bycatch; changing longline fishing practices to reduce impacts on seabirds[3]; or working with communities to improve traditional management of marine resources. There have been few policy-based offsets to date, but they offer significant potential.

Site-based offsets are the most common type of biodiversity offset on land, and are just as relevant in marine and coastal ecosystems. Offset gains can be achieved through averting future threats (ecosystem and species protection) or remediating past threats (e.g. through ecological restoration). Offsets can involve a combination of these two strategies.

Averted Loss (or 'Protection') offsets aim to reduce current and future pressures on biodiversity at a site. Examples might include establishment of controlled-fishing zones or development of local sustainable harvesting systems. One of the most common effective ways to implement averted loss offsets is through establishment of Marine Protected Areas (MPA)s.

Marine site-based offsets will often resemble multiple-use MPAs. There is considerable evidence from around the world that well-managed MPAs can result in rapid ecological recovery – particularly of coral reefs, mangroves, and fish stocks[4]. MPAs can even help recovery of species like marine mammals that reproduce (and thus recover) more slowly[5]. The recovery of marine ecosystems in MPAs also has wider socio-economic gains. Increased fish populations in MPAs and/or protection of spawning sites can lead to 'spill-over' and improved catches of fish in neighbouring waters. Thus well-managed marine offsets can lead not only to biodiversity gains, but also to socio-economic gains. For industry, this means that multiple risks (biodiversity, livelihoods) can be managed through similar interventions at a single site.

Restoration offsets aim to remediate past pressures on biodiversity at a site. These activities include true 'restoration' (which aims to put back original ecosystems) and 'rehabilitation' (which aims not to put back original ecosystems, but to improve habitats to a better, stable state). Examples might include transplanting mangrove or seagrass plants from other natural areas or nurseries, transplanting coral stock from healthy reefs to degraded ones, providing a suitable substrate which enhances the chance of natural re-colonisation of corals, or the control or eradication of invasive species from the nesting sites of seabirds or turtles in order to increase their reproductive success6. Restoration is more feasible in coastal and structurally simple

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[3] Additional resources available at http://www.fakr.noaa.gov/protectedresources/seabirds/others.htm

[4] Selig ER, Bruno JF (2010) A Global Analysis of the Effectiveness of Marine Protected Areas in Preventing Coral Loss. PLoS ONE 5(2)

Harrison et al (2012) Larval Export from Marine Reserves and Recruitment Benefit for Fish and Fisheries. *Current Biology* 22 1023-1028

[5] Gormley, A. M., Slooten, E., Dawson, S., Barker, R. J., Rayment, W., du Fresne, S. and Bräger, S. (2012), First evidence that marine protected areas can work for marine mammals. *Journal of Applied Ecology*, 49: 474–480

[6] Pascoe S, Wilcox C, Donlan CJ (2011) Biodiversity Offsets: A Cost-Effective Interim Solution to Seabird Bycatch in Fisheries? PLoS ONE 6(10)

habitats. Active restoration of pelagic systems and seamounts is likely to be challenging: instead, passive management, such as protection from bottom trawling fisheries, may be the best option[7]. On land, ecological restoration is often slow and uncertain (e.g. tropical forest). In comparison, the interconnectivity of marine ecosystems means that under favourable circumstances marine restoration may sometimes be more rapid and successful– for example, re-establishment of coral reefs, seagrass beds and mangroves.

Summary of site-based offset options

Ecosystem*	Averted loss	Active restoration	Example
Tidal mudflats	Feasible, e.g. reducing reclamation	Feasible, e.g. re-flooding coastal areas which had previously been converted to dry land	The Wallasea Island Wild Coast Project will restore approximately 3,000 hectares of intertidal mudflats and saltmarsh in south-east England.
Salt-marshes	Feasible, e.g. reducing reclamation	Possible, e.g. replanting on coastal land	
Mangroves	Feasible, e.g. preventing conversion to shrimp ponds	Feasible, e.g. replanting former shrimp ponds	Mangrove restoration programmes are active in many parts of the world including the Guyana Mangrove Restoration Project.
Shallow water tropical coral reefs	Feasible, e.g. controlling dynamite and poison fishing	Feasible, e.g. restoration with artificial substrates or transplanting	The Dampier port upgrade in Australia involved the creation of artificial reefs to compensate for damage during construction.
Kelp forests	Feasible	Feasible, e.g. replanting disturbed areas	The Southern California Kelp Restoration Project has restored areas of kelp beds, resulting in a 100-fold increase in fish densities.
Seagrass beds	Feasible	Feasible, e.g. replanting disturbed areas	Seagrass restoration programs are active in many areas, e.g. in Florida
Seamounts	Most feasible in Exclusive Economic Zones (EEZ), e.g. creation of no-take zones	Low feasibility	The Bowie Seamount MPA in Canada was declared in 2008 as Canada's seventh MPA.
Pelagic	Most feasible in territorial waters, as legal mechanisms are weak for protecting areas in the open seas, e.g. creation of no-take zones	Low feasibility	No MPAs have yet been created specifically for pelagic biodiversity, but seasonal closures of fisheries areas form de facto pelagic protected areas[8]
Benthic	Most feasible in EEZs, e.g. creation of no-take zones which prevent bottom trawling	Low feasibility	The port of Rotterdam expansion offset impacts through creation of 25,000 ha of protected seabed

**This is a list of example ecosystems, and does not represent a comprehensive list of all ecosystems which may be impacted.*

[7]Elliott, M., Burdon, D., Hemingway, K. L., &Apitz S. (2007) Estuarine, coastal and marine ecosystem restoration: Confusing management and science - A revision of concepts. *Esturine and Coastal Shelf Science* 74 349-366

[8]Game et al (2009) Pelagic protected areas: the missing dimension in ocean conservation. *TREE* 24:7 360-369

5 What sites might be suitable for offsets?

The WCMC marine programme has collated datasets on the distribution of several important marine ecosystems. The Aquamaps program and BirdLife International Marine e-atlas also makes available useful data on species distribution. A large number of sites have already been identified as globally or nationally important for conservation of marine biodiversity, as discussed in the TBC briefing paper on 'Globally and nationally important sites as biodiversity offset opportunities'. For example, BirdLife International has recently identified a global network of marine Important Bird Areas. Most of these sites are unprotected and in need of management, offering high offset additionality potential for innovative developers. Moreover, compared to protected area systems on land, most national marine protected area (MPA) systems are very underdeveloped: less than 1% of the world's oceans and about 2% of territorial waters are protected. Significant potential thus exists to collaborate with governments to develop offsets that fit with plans for, and can be incorporated into, national MPA systems. Such offsets are likely to have high stakeholder support and increased permanence, and may relieve companies of the sole burden of management.