WWF
NEWSLETTER
JANUARY
2011



Marine Update 63

# DEVELOPING NETWORKS OF MPAS

## Designing and implementing network resilience in response to climate change

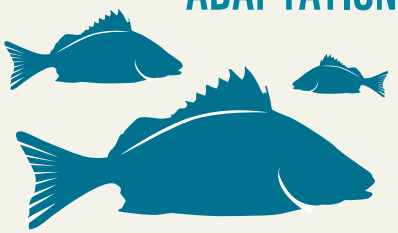


It is widely acknowledged that well-designed and well-managed networks of marine protected areas (MPAs) can help increase the resilience of the marine environment to cope with natural and anthropogenic changes.

It's also recognised that resilience is an essential component of delivering ecological coherence.[1] In addition, a well-designed and ecologically coherent network of MPAs can contribute to efforts to mitigate the impacts of climate change and increase the ability of marine ecosystems to adapt to climate change. Thus, such a network would contribute to the delivery of a climate change adaptation strategy.

This Marine Update considers further the guidance necessary to ensure that the UK's ecologically coherent network of MPAs contributes to efforts to mitigate and adapt to climate change, and to ensure it can deliver benefits that assist the wider marine environment to become more resilient.

## MITIGATION AND ADAPTATION



In the marine environment climate change will lead to changes in species and habitat distribution.

The Royal Commission on Environmental Pollution[2] recognises that mitigation and adaptation are not alternative strategies. Even if attempts to mitigate the extent of human-induced climate change are successful, it is anticipated that significant changes in the environment of the planet will still occur. In the marine environment, climatic changes are likely to lead to increases in sea surface temperatures, ocean acidification and changes in ocean currents and circulation patterns.[3] This, in turn, would lead to changes in species and habitat distribution.

Climate change impacts will exacerbate other existing pressures on marine ecosystems. Consequently, 'business as usual' in conservation management approaches may no longer be viable. Therefore, it is necessary to make full use of every tool at our disposal to ensure that biodiversity, ecosystems and ecosystem processes, and communities are able to adapt to the changes that are predicted.

## A CRITICAL COMPONENT

### OF ADAPTATION IN THE MARINE ENVIRONMENT IS TO BUILD RESILIENCE TO OTHER EXISTING OR NEW THREATS AND DRIVERS OF DEGRADATION

According to the Intergovernmental Panel on Climate Change, adaptation involves adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, to moderate harm or exploit beneficial opportunities.[4] It is defined by Smit and Wandel as 'a process, action or outcome in a system in order for the system to better cope with, manage or adjust to some changing condition, stress, hazard, risk or opportunity.'[5]

A critical component of adaptation in the marine environment is to build resilience to other existing or new threats and drivers of degradation. This will 'buy time' for marine ecosystems to better withstand the existing pressures of multiple uses, and the subsequent cumulative impacts which are already evident. Managing current climate-related risks and reducing other pressures and drivers of degradation are practical 'no regrets' steps we can take now to help reduce vulnerability in the future.

WWF-UK believes that an ecologically coherent network of well-managed MPAs should be designed to make a significant contribution to:

- the mitigation of carbon emissions; and
- the adaptation of marine biodiversity to a changing environment. This includes building the resilience of the marine environment to respond to pressures such as the impacts of climate change.

The introduction of the UK Marine Acts* and the development of an ecologically coherent network of MPAs throughout UK waters present a significant opportunity to enhance the ability and capacity of the marine environment to respond to cumulative impacts, including those associated with climate change. However, it is essential that the network of MPAs

© CHARLES HOOD / WWF-UK

An ecologically coherent network of well managed MPAs can help marine biodiversity adapt to a changing environment.

* Marine and Coastal Access Act, 2009 and Marine (Scotland) Act, 2010.



Managing current climate related risks and reducing other pressures and drivers of degradation are practical 'no regret' steps.

is designed to maximise opportunities for mitigation, adaptation and building resilience.

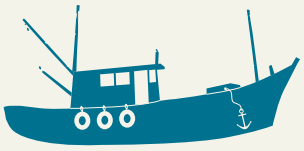
Natural England and the Joint Nature Conservation Committee's Ecological Network Guidance[6] to regional stakeholder groups on identifying Marine Conservation Zones when addressing resilience simply refers to the existing guidance on replication, connectivity, viability and protection. It states that MPA networks that represent (and replicate) all habitat types across their geographical range are more resilient.

Yet, while these design principles, particularly replication and connectivity, are fundamental to delivering resilience, the basis of the guidance means that not all habitat types will necessarily be protected by the network. Pelagic features and mobile species will not be addressed in the same level of detail as benthic features and sedentary species.

The Ecological Network Guidance also notes the importance of ensuring adequate protection of biological variation across habitats and species, and genetic variation within species. However, protected areas for many species, including marine mammals, most fish species and seabirds, are not adequately encompassed by the guidance, and genetic variation within species is not addressed.

## CLIMATE CHANGE

### IMPACTS WILL EXACERBATE OTHER EXISTING PRESSURES ON MARINE ECOSYSTEMS.



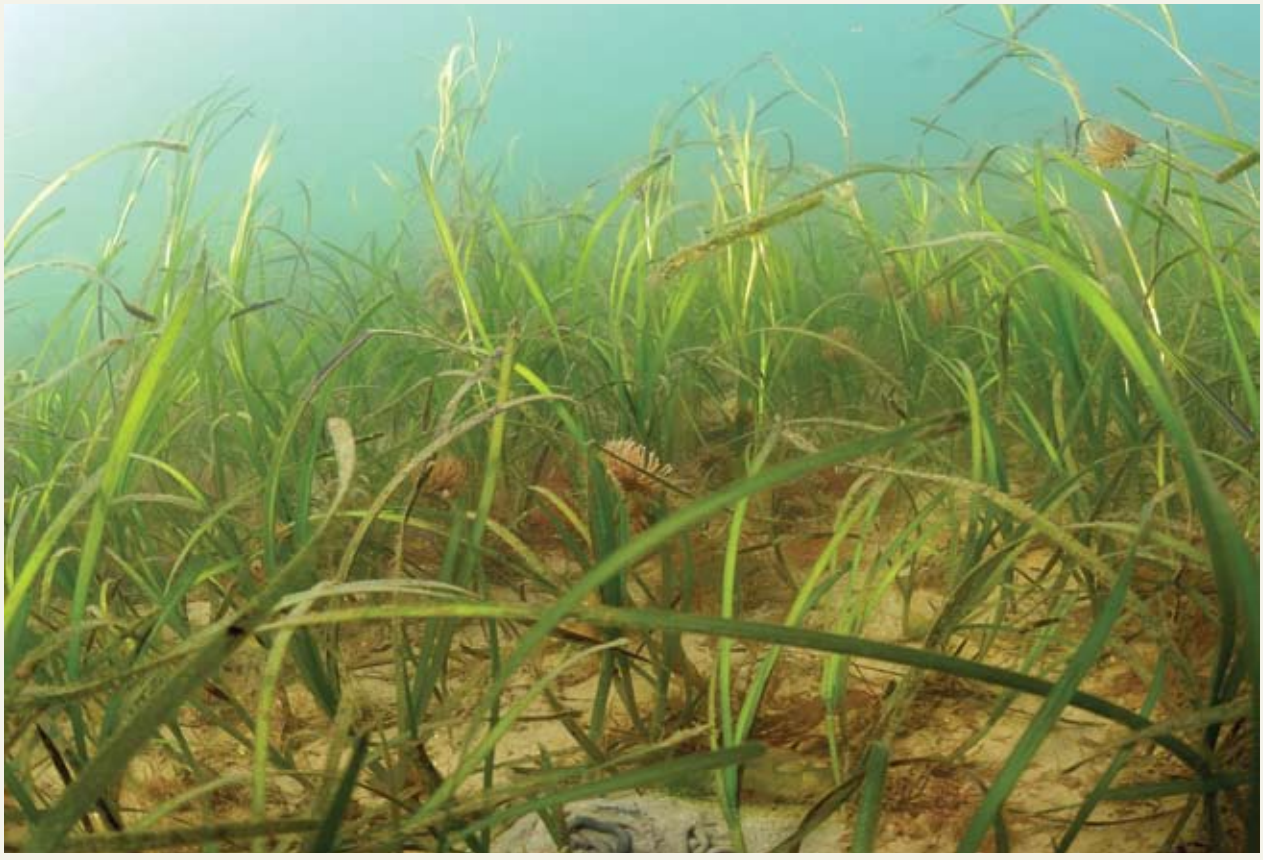
# MITIGATION
# ‘BLUE CARBON SINKS’

The marine environment plays a fundamental role in the global capture, storage and redistribution of carbon. Over half the biological carbon in the world is captured by coastal and marine plants and animals and has been named ‘blue carbon’.[7] Not only do the oceans act as the largest long-term sink for carbon, but they also store and recycle 93% of the Earth’s carbon dioxide (CO2).[8] Coastal habitats, particularly salt marshes, seagrass beds and mangroves, cover less than 0.5% of the seabed, yet they form sinks which store 50%-71% of the carbon that is stored in ocean sediments.[9]

A study by IUCN[10] found that the carbon sink potential of coastal habitats such as saltmarsh, seagrass beds and kelp forests compared favourably with sinks on land. Habitats in temperate latitudes are of greater significance as carbon sinks than those in tropical latitudes. The UNEP Blue Carbon report[11] suggests that up to 25% of carbon emissions could be mitigated through the restoration, and the prevention of degradation, of marine habitat carbon sinks, along with slowing deforestation of tropical forests.

Prioritising the protection, preventing further loss and degradation, and enhancing the recovery of coastal and marine habitats which act as significant carbon sinks – including saltmarshes, seagrass beds, kelp beds and mangroves – should be a key requirement in the development of an ecologically coherent network of MPAs.





Protecting coastal habitat like seagrass beds can help mitigate carbon emissions by acting as carbon sinks.

A number of organisations recommend the need to safeguard habitat by using protected areas to assist in mitigating the impacts of climate change.[12] UNEP's Blue Carbon report recommends protecting 'immediately and urgently' at least 80% of remaining seagrass meadows, saltmarsh and mangroves. It also recommends catalysing the regeneration of blue carbon sinks, by allowing rapid growth and expansion of seagrass meadows, mangroves and salt marshes.[13] Clearly, the prioritisation of protecting these habitats will support and maximise opportunities for natural carbon sequestration, and minimise losses of stored carbon. Not only will this help contribute to a reduction in the impacts of climate change-induced warming, it could also contribute to a reduction in the threat posed by ocean acidification.

### Recommendation:

Within the UK-wide network of MPAs, it is anticipated that saltmarshes and seagrass beds of European significance will have been protected as Special Areas of Conservation under the Habitats Directive. Habitats that act as carbon sinks, including saltmarshes, seagrass beds and kelp habitats, should be prioritised for further protection when developing an ecologically coherent network of MPAs in the UK. This will ensure that sites of national and local importance that do not merit protection as special areas of conservation can be included in the UK-wide network of MPAs.

## CASE STUDY

© UTE COLLIER/WWF-UK

### MANAGED REALIGNMENT IN SOUTH-EAST ENGLAND – ABBOTTS HALL

Over the past four centuries, the UK has lost vast tracts of 'blue carbon sinks' – saltmarshes and other coastal habitats. Further losses of these habitats are predicted over this century. Protection of these critical habitats is essential. It will contribute to safeguarding the biodiversity of species that depend on coastal habitats. And it will contribute to the mitigation of carbon emissions, and adaptation to the impacts of climate change. With this in mind, and working in partnership, WWF helped Essex Wildlife Trust to purchase a coastal farm, Abbotts Hall. With the Environment Agency and other authorities, we breached the sea wall. It was a model project for managed coastal realignment, and allowed us to recreate the coastal wetlands which act as carbon sinks and provide a natural coastal defence.

### Recommendation:

Significant opportunities should be identified for including sites within the network where carbon-sink habitats can be restored.

# ADAPTATION AND BUILDING RESILIENCE

As well as acting as sinks for carbon, well-managed MPAs and MPA networks can help to reduce vulnerability and increase resilience to climate change and other threats in the marine system. MPAs have a critical role to play as refuges for species struggling to cope with the pressure of exploitation and a changing environment. They also provide refuges for species to restock in areas adversely affected by the cumulative impacts of climate change and additional pressures such as over-fishing.

Below are some of the key issues that need to be taken into consideration in the design and governance of climate-resilient MPA systems.

## Ensuring connectivity

Connectivity between protected sites is particularly important in the context of climate change adaptation. It allows for the protected movement of species between sites as the physical and/or chemical environment changes, leading to ecological changes.

**Recommendation:**

- Implementation of the connectivity design principle should include consideration of potential movements of habitats and species in relation to the changing environment, particularly in response to the predicted impacts of climate change.

## Disaster risk reduction

Protection of coastal habitats within a network of MPAs can reduce the likely impacts of climate change by protecting sites that provide ecosystem services such as sea defences. These natural sea defences help absorb the energy of extreme events at sea (such as flooding and storm surges).[14] The World Bank report 'Convenient Solutions to an Inconvenient Truth' recommends scaling-up programmes which integrate protection of natural habitats into strategies that reduce vulnerability and disaster risks such as floods, cyclones and other natural disasters.[15] As natural coastal habitats provide important ecosystem functions such as fish nurseries, their protection delivers multiple benefits to people who rely on these ecosystem services. The role of MPAs as natural defences to extreme climatic events needs to be understood and prioritised as an adaptive solution to help avoid maladaptation.

CASE STUDY

© DIEGO M. GARCES / WWF-CANON

### CLIMATE CHANGE ADAPTATION IN THE MESO AMERICAN REEF

In Central America, in response to the global and local threats posed by climate change, WWF monitors the impact of climate variability on reefs and associated ecosystems, such as mangroves. Scientific monitoring results are shared with decision makers to support their efforts towards climate change policy interventions. Aside from the scientific and policy focus, we collaborate with coastal communities in climate change adaptation actions such as restoring mangroves and reefs, and establishing coral bleaching early warning systems.

### Recommendation:

Sites to be included in the development of the ecologically coherent network should offer ecosystems services which will provide natural protection against the likely impacts resulting from climate change. Priority should be given to protecting coastal habitats that can act as natural sea defences, such as saltmarshes.

## Providing refuge for biodiversity

Natural England and the Joint Nature Conservation Committee's Ecological Network Guidance[16] recognises that MPA networks are more resilient if they represent and replicate all habitat types across their geographical range. They also provide greater resiliance if they provide protection of biological variation across habitats, and species and genetic variation within species. Biologically diverse MPAs are able to dissipate the risk of disturbance, exploitation and change that is likely to result in the loss of habitats or species. Levels of biodiversity within MPAs need to be carefully monitored, as climatic changes are likely to affect abundance and distribution.

### Recommendation:

- The ecologically coherent network should include examples of biological variation across all habitats and species, and genetic variation within species in UK waters.

## Reducing the pressure of other threats and drivers of environmental degradation

MPAs, particularly MPA networks, help to build the resilience of habitats and systems. They also help to minimise losses to habitats and systems as a result of climate change. They achieve this by reducing or eliminating a range of existing and potential pressures within the network. The better the condition of marine habitats, the more likely they will withstand additional pressures resulting from climate change. Within protected areas, ongoing external pressures such as the exploitation of living and non-living resources are generally eliminated or significantly reduced, allowing the protected site to be more resilient to future change. This strengthens the case for significant numbers of sites of the network to be protected in highly protected sites.

### Recommendation:

- Within the UK-wide network of MPAs, a significant number of sites (a minimum of one in three for each feature*) or areas of the network should be highly protected. This will ensure the marine environment can develop maximum resilience to the impacts of climate change.

## Monitoring and evaluation

Highly protected MPAs provide scientific reference points, to monitor changes in the marine environment as marine systems respond to climate change.

### Recommendation:

- In order to understand better the impacts of climate change and also understand how the network contributes to resilience of the marine environment, monitoring and evaluation programmes must be developed to capture observations and identify areas of climate refugia, as well as changes in marine species distribution, population, and migration, including abundance of fish stocks. Given the levels of uncertainty in climate modelling projections, accurate information and evidence on the impacts of changes in current climatic variability is critical to help inform decision-making.

* WWF-UK's Policy Briefings (November 2009 and February 2010) on ecologically coherent networks of marine protected areas proposes that all conservation features should be replicated a minimum of three times within each bioregion, and that high levels of protection should be adopted for at least one replication of each feature.

# FLEXIBLE GOVERNANCE STRUCTURES

Many natural ecosystems can play similar roles in terms of mitigation, adaptation and resilience-building. But the particular value of protected areas is that generally they have a legal basis, agreed management including plans, and opportunities for further planning and adaptive management. An essential element of agreed management will be determining and implementing comprehensive assessment and monitoring procedures that contribute to adaptive management. Flexible mechanisms proposed under the Marine and Coastal Access Act, such as modifying MPA boundaries, provide a useful opportunity for facilitating adaptive management.[17]

MPA networks, in their design, need to be able to access and translate the best available climate science to better understand current and potential climate-related impacts on the marine environment and how these impacts interrelate to other threats. Additionally, areas of uncertainty in the science need to be identified and taken into account in planning. As climate change will affect all sectors at all levels, a multi-disciplinary approach is needed for MPA network management to take into consideration a changing climate and marine ecosystems.



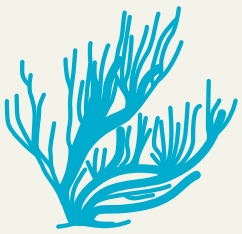
More MPAs like Lundy which have a zone off limits to human activities will contribute to building resilience in MPA networks.

**Recommendation:**

- Develop further guidance on the adaptive management of MPA networks in the context of climate adaptation (including building resilience), incorporating a process for the potential modification of MPA boundaries.
- An ecologically coherent network of MPAs has enormous potential for mitigating the impacts of and allowing adaptation to climate change. Such a network could also increase the resilience of the UK's marine biodiversity and the functioning of the marine ecosystem. But it can only achieve this if the appropriate functions are fully incorporated at the start of the process of network design.

## THE PARTICULAR VALUE

OF PROTECTED AREAS IS THAT GENERALLY THEY HAVE A LEGAL BASIS, AGREED MANAGEMENT AND OPPORTUNITIES FOR PLANNING AND ADAPTIVE MANAGEMENT



## References


1 See for example Dudley, N, Stolton, S, Belokurov, A, Krueger, L, Lopoukhine, N, MacKinnon, K, Sandwith, T and Sekhran, N (eds), 2010. Natural Solutions: Protected areas helping people cope with climate change, IUCN-WCPA, TNC, UNDP, WCS, World Bank and WWF, Gland, Switzerland, Washington DC and New York, USA, and Laffoley, D d'A and Grimsditch, G (eds), 2009. The management of natural coastal carbon sinks. IUCN, Gland, Switzerland. 53pp.

2 The Royal Commission on Environmental Pollution. Twenty-eighth Report Adapting Institutions to Climate Change. Presented to Parliament by Command of Her Majesty, March 2010. Cm 7843.

3 Defra's Climate Change Plan 2010, Department for Environment, Food and Rural Affairs.

4 IPCC 4th Assessment Report, Working Group II, Impacts, Adaptation and Vulnerability, 2007.

5 Smit, B and Wandel, J, Adaptation, adaptive capacity and vulnerability. Global Environmental Change 16 (2006) 282-292.

6 Natural England and the Joint Nature Conservation Committee, June 2010. Delivering the Marine Protected Area Network. Ecological Network Guidance to regional stakeholder group on identifying Marine Conservation Zones.

7 Nellemann, C, Corcoran, E, Duarte, CM, Valdés, L, De Young, C, Fonseca, L, Grimsditch, G (eds), 2009. Blue Carbon. A Rapid Response Assessment. United Nations Environment Programme, GRID-Arendal.

8 Ibid.

9 Ibid.

10 Laffoley, D d'A and Grimsditch, G (eds), 2009. The management of natural coastal carbon sinks. IUCN, Gland, Switzerland. 53pp.

11 Nellemann, C, Corcoran, E, Duarte, CM, Valdés, L, De Young, C, Fonseca, L, and Grimsditch, G (eds). 2009. Blue Carbon. A Rapid Response Assessment. United Nations Environment Programme, GRID-Arendal.

12 Dudley, N, Stolton, S, Belokurov, A, Krueger, L, Lopoukhine, N, MacKinnon, K, Sandwith, T and Sekhran, N (eds), 2010. Natural Solutions: Protected areas helping people cope with climate change, IUCN-WCPA, TNC, UNDP, WCS, World Bank and WWF, Gland, Switzerland, Washington DC and New York, USA, and Laffoley, D d'A and Grimsditch, G (eds), 2009. The management of natural coastal carbon sinks. IUCN, Gland, Switzerland. 53pp.

13 Ibid.

14 Dudley, N, Stolton, S, Belokurov, A, Krueger, L, Lopoukhine, N, MacKinnon, K, Sandwith, T and Sekhran, N (eds), 2010.

15 Environment Department, the World Bank. June 2009. Convenient Solutions to an Inconvenient Truth: Ecosystem-based Approaches to Climate Change.

16 Natural England and the Joint Nature Conservation Committee, June 2010. Delivering the Marine Protected Area Network. Ecological Network Guidance to regional stakeholder group on identifying Marine Conservation Zones.

17 Natural Environment Adapting to Climate Change, Department for Environment, Food and Rural Affairs, 2010.