



Science for Environment Policy

THEMATIC ISSUE:

# Coastal zones: achieving sustainable management

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## Science for Environment Policy

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## Introduction

# Coastal zones: achieving sustainable management

*Coastal zones are the link between land and the sea and are unique areas, highly diverse in species, habitats and ecosystems. They are environmentally sensitive and economically valuable, with ecosystems rich in biodiversity also providing benefits such as protection from the elements, food and opportunities for the generation of renewable energy. They are also extremely important to human activities, supporting employment as well as providing aesthetic value, areas for sports and recreation and playing a significant role in our cultural heritage.*

*Yet, while activities such as aquaculture and tourism are beneficial to the economy and human well-being, they can also place significant pressures on coastal zones, including loss of and damage to biodiversity, contamination by hazardous substances, and introduction of non-indigenous species and marine litter. Moreover, increasing economic growth, as well as new interests (e.g. offshore wind farms) making use of marine and coastal resources, means there is a mounting stress on valuable ecosystems. Given the recognised importance of coastal zones and the ecosystem services they provide to humans, sustainable management of these resources is essential.*

## Current European coastal policies

To address this challenge, the EU has developed a number of policies that aim to provide a coherent approach to the sustainable protection, use and management of marine and coastal resources.

Overseeing these policies is the Integrated Maritime Policy<sup>1</sup> (IMP) with the Marine Strategy Framework Directive<sup>2</sup> as its environmental pillar, aiming to protect biodiversity and other resources by taking an ecosystem-based approach to management efforts and integrating both human and environmental considerations into the decision-making process. The IMP is also supported by the Blue Growth<sup>3</sup> strategy, which supports long-term sustainable growth for maritime activities considered to have great future potential for technical innovation and expansion.

Complementing this approach, the new Maritime Spatial Planning Directive<sup>4</sup> will require EU Member States to develop a spatial approach to deliver the improved coordination and sustainability of socioeconomic activities taking place in marine areas. Additionally, the EU recommends that Integrated Coastal Zone Management (also known as ICZM) brings together diverse groups of stakeholders to coordinate the application of different policies that affect the many uses made of coastal resources – encompassing activities as diverse as aquaculture and wind farms.

Finally, as proposed in the EU Climate Adaptation Strategy<sup>5</sup>, increasing pressures due to climate change mean that it is essential to consider measures to take account of sea level rise or changes in storm surge patterns when managing coastal activities. Careful, long-

term management of coastal ecosystems is vital to retain their overall resilience and to enable sustainable human uses to continue.

Given the complexity of policy initiatives and interests focusing on coastal zones it is vital to find new ways to integrate multiple considerations into policy development, implementation and local practice and to ensure management focuses on the long term in these areas. This Thematic Issue presents key pieces of recent research focusing on the interaction of ecological, economic and social objectives into coastal management and policymaking.

## Key pieces of research

The management of coastal resources has been a source of academic interest for decades, but the increasing demands placed on them offer an opportunity to reassess current trends and themes.

The majority of the articles present experiences with the implementation of key EU policy initiatives. The first, **‘MSFD implementation: strengths and barriers assessed across European marine regions’**, reveals that despite the availability of resources for policy implementation, the greatest challenges lie in coordination between institutions and governance levels. The researchers point out that a lack of understanding about roles and responsibilities prevents the effective implementation of the Marine Strategy Framework Directive (MSFD). However, the research also shows that many opportunities to support MSFD implementation do exist and highlights the potential of the four Regional Sea Conventions (responsible for the Baltic Sea, Black Sea, Mediterranean Sea and the North-east Atlantic Ocean), which support the regional coordination of the Directive.

Research summarised in **‘Users value Marine Spatial Planning in pilot project’** evaluated local experiences with Marine Spatial Planning (MSP) in the UK in order to assess the effectiveness and usability of a non-statutory MSP plan in Scotland and identify lessons for future work as well as other practitioners. This article finds that major successes can be attained through collaboration between local authorities and organisations to resolve environmental issues (e.g. seabed habitat destruction) and can also provide additional socioeconomic benefits: for example, closing an area to scallop dredging will mean that fisheries can market their produce as sustainably sourced, thus adding a premium to its value.

In the article **‘Mutual trust between coastal stakeholders key to successful coastal climate change adaptation’**, researchers examined stakeholder engagement and interaction between groups involved in coastal use and management in Portugal. Their survey of stakeholders and residents in coastal communities showed that there was a strong awareness of coastal threats and the possible impacts of climate change, and a common willingness to engage in coastal management decisions. They found that that successful coastal adaptation requires stakeholders’ willingness to engage in decision making, as well as mutual trust between the public and policymakers.

**‘The Irish marine environment: high public awareness, but low trust in management’** describes how researchers found that the role of scientists in formulating marine policy could increase public support for policies. The study identified that the Irish public are sceptical of government and industry’s ability to manage the marine economy, but place a large amount of trust in scientists.

Researchers suggest that littering on Australian coasts could be reduced by providing environmental information to temporary residents in the article **‘Temporary coastal residents are less aware of anti-littering programmes’**, as temporary workers tended to be less aware of local environment programmes than permanent residents and other visitors.

Based on a UK study, the article **‘Marine Protected Areas: how to improve community support?’** stresses that social impacts must be considered alongside economic and environmental impacts when designing Marine Protected Areas. Researchers found that tensions between local stakeholders (such as recreational users and fishers) could be reduced and support gained when applying collaborative management approaches.

The second set of five articles discusses new tools and methods to support and improve policy implementation. **‘Balanced scorecard can support Integrated Coastal Zone Management’** identifies a useful method for assessing ICZM local plans such as municipal, district and regional strategies. As coastal areas have traditionally been subject to the uncoordinated input of a variety of different sectors, such as environmental management or tourism, the Balanced Scorecard tool presents a valuable method to integrate multiple interests and supports successful and cost-effective policy implementation.

Researchers present a model to help assess policies to reduce nutrient pollution in the Baltic Sea in **‘Baltic nutrient abatement measures identified by hybrid ecological-economic model’**. The model combines ecological and economic considerations to support the selection of optimal cost-effective management measures. Thus, the results from running the model suggest that aiming to achieve a good environmental state of the Sea overall, rather than aiming to meet the Baltic Sea Action Plan’s (BSAP) nutrient load targets for each sea region, was the most cost-effective approach.

More sustainable resource planning can potentially be achieved, according to the article **‘Sustainable coastal land planning links social needs with ecosystem services’**, in which researchers found that spatial planning processes in the region of Krummhörn, Germany, could be improved by a greater understanding of the links between ecosystem services and their social effects. The study presents guidelines for a participatory approach, which integrates social and ecosystem considerations into climate adaptation measures.

In **‘New web-based system supports Integrated Coastal Zone Management’** researchers describe their open source software to help coastal managers plan sustainable coastal development. Focusing on the North Sea, the tool provides up-to-date information on relevant topics such as populations and land use to support integrated management of coastal areas affected by climate change.

Based on a Portuguese study, the final article, **‘Coastal ecosystem services’ valuation by stakeholders improves planning decisions’**, presents a framework which stakeholder groups can use to value marine and coastal zone ecosystem services. The study stresses that to ensure successful policy implementation it is essential to involve stakeholders in environmental management and decision making.

This Thematic Issue demonstrates experiences and tools to integrate ecological, social and economic considerations into marine and coastal policy and management. While this has been a long-standing challenge, and will remain so, the articles demonstrate progress and present opportunities for the achievement of ecosystem management. Nevertheless, the growing pressures placed on coastal zones from human activities mean that policy action must continue to strive for significantly improved management to achieve the desired sustainability.

1. [http://ec.europa.eu/maritimeaffairs/policy/index\\_en.htm](http://ec.europa.eu/maritimeaffairs/policy/index_en.htm)
2. [http://europa.eu/legislation\\_summaries/environment/water\\_protection\\_management/l28164\\_en.htm](http://europa.eu/legislation_summaries/environment/water_protection_management/l28164_en.htm)
3. [http://ec.europa.eu/maritimeaffairs/policy/blue\\_growth/](http://ec.europa.eu/maritimeaffairs/policy/blue_growth/)
4. [http://ec.europa.eu/maritimeaffairs/policy/maritime\\_spatial\\_planning/index\\_en.htm](http://ec.europa.eu/maritimeaffairs/policy/maritime_spatial_planning/index_en.htm)
5. [http://ec.europa.eu/clima/policies/adaptation/index\\_en.htm](http://ec.europa.eu/clima/policies/adaptation/index_en.htm)

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# MSFD implementation: strengths and barriers assessed across European marine regions

*There are adequate resources to implement the Marine Strategy Framework Directive (MSFD) in Europe, a recent study concludes. However, more clarity is needed on the roles of different institutions at EU, regional and national levels in implementing the Directive.*

*“...researchers evaluated the current state and preparedness of regional governance structures to implement the MSFD and achieve good environmental status of the waters.”*

**Source:** Lucio Carlos Freire-Gibb, L.C., Koss, R., Margonski, P. and Papadopoulou, N. (2014).

Governance strengths and weaknesses to implement the marine strategy framework directive in European waters. *Marine Policy*. 44: 172–178. DOI:10.1016/j.marpol.2013.08.025.

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[Marine ecosystems, Sustainable development and policy assessment](#)

**European marine areas** and coastal zones require good governance to balance environmental protection with social and [economic](#) needs. Among the policies and instruments the EU and its Member States (MS) can use to [protect marine waters is the MSFD](#)<sup>1</sup>, as well as the Maritime Spatial Planning Directive, designed to establish a common EU framework for MSP and adopted in July 2014.

The relationship between the MSFD and MSP has implications for marine and coastal areas. The MSP concept directs where and when human activities can take place in marine and coastal waters to ensure that these activities are sustainable. It is identified by the MSFD as a delivery tool and the new MSP Directive will require Member States to address ‘land/sea interactions’ as part of planning in their waters. Furthermore, the MSFD structure allows MS to take a flexible approach to ecosystem-based management decisions.

The MSFD covers the four marine regions in Europe: the Baltic Sea, Black Sea, Mediterranean Sea and the North-east Atlantic Ocean. These four regions are collaboratively managed by Member States and surrounding neighbouring countries, through the four Regional Sea Conventions (RSCs).

As part of the [EU-funded ODEMM](#)<sup>2</sup> project, researchers evaluated the current state and preparedness of regional governance structures to implement the MSFD and achieve good environmental status of the waters. To gather information on this, they carried out 30 face-to-face interviews and an online survey of 264 marine stakeholders across all four marine regions. The results of this analysis reveal the importance of all stakeholders – including EU Member States, non-MS and the private sector with a vested interest in marine natural resources, participating in governance structures to ensure that the MSFD is successfully implemented.

The survey also shows that the strengths of European marine governance to implement the MSFD lie in the availability of governance resources at EU, marine region and national levels as well as the clear distinction of roles of institutions. The respondents suggested one set of resources is the Regional Sea Conventions and, as these governing structures already exist, they can play a leading role in implementing the MSFD. Of the Conventions, the Helsinki Convention ([HELCOM](#)), for the Baltic Sea, and the Oslo-Paris Convention ([OSPAR](#)), for the North-east Atlantic, are more developed than the other two RSCs (the [Barcelona Convention](#), for the Mediterranean Sea, and the [Bucharest Convention](#), for the Black Sea) and are in a better position to lead MSFD implementation. A major issue hampering implementation of the Directive is uncertainty about the roles of institutions responsible for executing the MSFD, in particular, their levels of authority. This is caused by different approaches and interpretations of the rules among bodies at different levels, e.g. by the RSCs at the regional level and individual Member States at the national level.

Opportunities for implementing the Directive, as well as threats to it, are currently dominated by the recent economic crisis. If the crisis results in a more closely integrated EU, the Commission would be in a stronger position to ensure that Member States meet their responsibilities for implementing the MSFD, the researchers say. On the other hand, funding cut-backs have undermined scientific research and stakeholder engagement in decision making and could potentially shift marine strategy policies towards employment and economic growth and away from environmental aims.

1. Directive of the European Parliament and of the Council establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). See: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF>.
2. Options for Delivering Ecosystem-Based Marine Management (ODEMM) was supported by the European Commission under the Seventh Framework Programme.

# Users value Marine Spatial Planning in pilot project

*A pilot Marine Spatial Planning (MSP) project in the UK has found MSP to be a useful approach in managing marine waters sustainably. Sharing the knowledge and experiences gained in developing the Shetland Islands' Marine Spatial Plan (SMSP) can help other authorities in the process of developing similar plans, says the project team.*

*"The Shetland Islands' Marine Spatial Plan... was particularly useful in detailing environmental restrictions and sensitivities, exclusion zones, cultural and heritage uses...in the seas around Shetland."*

**This is timely**, as European Commission proposals<sup>1</sup> for a common EU framework for MSP and integrated coastal management were debated by Member States during 2013. The resulting Directive<sup>2</sup> establishing a framework for Maritime Spatial Planning was adopted by the European Parliament in 2014 and will require Member States to develop Maritime Spatial Plans by 2021, applying an ecosystem-based approach to support sustainable development and growth in the maritime sector.

In 2006, the Shetland Islands, UK, produced a Marine Spatial Plan<sup>3</sup> as a pilot study to test the MSP approach to the sustainable management of Scotland's coastal and marine environment. The Plan, developed by an MSP project team and assisted by local stakeholders and the community, provides a policy framework to help the local authority guide the placement of future aquaculture developments in coastal and marine waters. Although use of the Shetland Islands' Marine Spatial Plan (SMSP) has been voluntary until now, the local authority is in the process of adopting it as Supplementary Guidance to its Local Development Plan in 2014.

In 2012, the SMSP's project team reviewed the usability and effectiveness of the plan. The review provided a valuable synopsis of how the plan has progressed and shows a good example of 'learning by doing'. The project team also believes the pilot study will be useful for other comparable regions when developing marine spatial plans. To conduct the evaluation, the project team reviewed marine licences for works within Shetland's marine and coastal waters, planning reports and scientific studies. They also surveyed relevant stakeholders, including industry representatives (in aquaculture, for example), marine planners and regulators.

Users of the SMSP reported that it was a valuable resource. It provided key guidance and local information on the feasibility of obtaining consent for marine licensing and development projects, and the application processes for these. The SMSP, which included an atlas of maps, was particularly useful in detailing environmental restrictions and sensitivities, exclusion zones, cultural and heritage uses and opportunities for development in the seas around Shetland. In 2009, 46% of successful marine-related planning applications submitted to the

Shetland Islands' Council had referenced the Plan. In 2013, since the review, this figure has risen to 88%.

A major success has been for members of the SMSP team to work with the Shetland Shellfish Management Organisation (SSMO), which manages local shellfish fisheries, in closing shellfisheries to scallop dredging. These areas had been identified as [sensitive seabed habitats](#) that could be negatively affected by shellfish fishing. This measure has resulted in economic benefits for local shellfish industries as they can promote their products as being sustainably sourced, which attract a product premium.

An important aspect of marine spatial plans is identifying areas for development opportunities where different activities can co-exist. The review found that some industry developers did not think that zoning (creating areas where only certain activities can take place) would be the most suitable way to do this. As a result, the SMSP team used a sensitivity-led approach, based on information gathered from local advisors, planners, regulators, communities and developers, to produce maps of areas where development is either restricted, likely to be in conflict with other users or more likely to succeed via the location of activities in the same place.

An adaptive management approach to MSP, as adopted in the SMSP, allows for initial plans to be refined and regularly updated as part of a continuous review, evaluation and monitoring process. The feedback from this process is fundamental in addressing uncertainty over time within an evolving discipline.

**Source:** Kelly, C., Gray, L., Shucksmith, R. and Tweddle, J.F. (2014) Review and evaluation of marine spatial planning in the Shetland Islands. *Marine Policy*. 46:152–160. DOI:10.1016/j.marpol.2014.01.017

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1. Proposals for a Directive of the European Parliament and of the Council establishing a framework for maritime spatial planning and integrated coastal management (2013/0074). See: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0133:FIN:EN:PDF>

2. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0089&from=EN>

3. See: <http://www.nafc.ac.uk/SMSP.aspx>

# Mutual trust between coastal stakeholders key to successful climate change adaptation

*A lack of trust between stakeholders, planners and decision makers in coastal Portugal is obstructing adaptation to climate change plans, finds a new study. The researchers suggest that building trust between stakeholders and coastal managers could lead to improved participation and dialogue for future planning, financing and implementation of coastal adaptation.*

*“Overall, the results indicate that there is a strong awareness of coastal threats and the possible impacts of climate change and a common willingness to engage in coastal management decisions.”*

**Source:** Schmidt, L., Gomes, C., Guerreiro, S. & O’Riordan, T. (2014). Are we all on the same boat? The challenge of adaptation facing Portuguese coastal communities: Risk perception, trust-building and genuine participation. *Land Use Policy*, 38, 355–365. DOI:10.1016/j.landusepol.2013.11.008

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**The Portuguese coast** is under increasing threat from erosion, which is putting communities, [ecosystems](#) and economies at risk. Nearly 75% of Portugal’s population now live in coastal municipalities. Erosion has increased in the last 30 years as a result of human activities, such as sand extraction and inland alterations to rivers and estuaries, and is set to worsen under climate change. Sea level rise of 40 cm to 1.20 m is expected by 2100.

To safeguard the future prosperity of the country as a whole, adaptive responses to coastal management are needed to minimise both erosion and the future effects of climate change. Stakeholder engagement is important to this. Coastal stakeholders, in sectors such as tourism, fishing, business, and environmental management, often have competing or overlapping interests. Thus, environmental interventions that are aimed at benefiting one group, can potentially interfere with, or actively harm, another group’s interests. This is especially the case with fishing communities and the development of coastal tourism facilities.

The researchers in this paper conducted face to face surveys of 643 residents and business owners and in-depth semi-structured interviews of more than 60 people, to examine how stakeholders and residents of three Portuguese coastal communities – Vagueira, Costa de Caparica and Quarteira – perceive possible changes to coastal management, and the extent to which they trust coastal managers. The researchers also examined how coastal stakeholders and residents considered their participation in future forms of adaptive coastal management. The three coastal areas were selected as they share similarities in their development and the problems they face from erosion and flooding, making them suitable for comparative analysis, but are markedly different in their historical evolution and social composition.

The results showed that all three communities were aware of coastal erosion, and knew that it is likely to worsen in the future. Over 80% of respondents in all locations considered it important to maintain the coast as it currently is.

Less than 5% of respondents said they participate in public discussions on coastal management. Of those who did, only a quarter felt they had any influence on outcomes. The stakeholder interviews indicated that public discussions are rarely publicised, which leads to a perceived lack of transparency, and a belief that they were unlikely to influence outcomes.

Interviews with officials revealed that, in some cases, local people were not perceived as important partners in decisions, and hence there was no need to communicate all available information. However, over 95% of the survey respondents felt that the general public should have input on coastal matters, alongside other stakeholders, such as local authorities and scientists.

Overall, the results indicate that there is a strong awareness of coastal threats and the possible impacts of climate change, and a common willingness to engage in coastal management decisions. However, this is undermined by lack of unity between the decision makers and the public in the coastal management decision making process, leading to distrust and poor communication.

The authors suggest that, although there is currently a high level of distrust in local authorities among stakeholders such as the public and local businesses, there is a willingness among all stakeholders to engage in adaptive management approaches, provided there is a genuine commitment from official bodies.

# The Irish marine environment: high public awareness, but low trust in management

*The Irish public are sceptical of government and industry's ability to manage the marine economy, finds a survey. However, they place a large amount of trust in scientists. The research also indicates that people living in Ireland have a reasonable level of knowledge of the importance of different marine ecosystem services.*

*"...this type of survey could be used to help inform marine policy development, by gathering information on the opinions and preference of communities using, or affected by, coastal and marine resources."*

**Source:** Hynes, S., Norton, D., & Corless, R. (2014). Investigating societal attitudes towards the marine environment of Ireland. *Marine Policy*, 47, 57–65. DOI:10.1016/j.marpol.2014.02.002

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**In 2010 marine related economic activity** was estimated to be worth €1.2 billion to the Irish economy. Yet coastal and marine environments are under threat from a number of pressures, such as marine [litter](#), pollution and [climate change](#), and action is required to mitigate these threats and improve the quality of [marine environments](#).

The [Marine Strategy Framework Directive](#)<sup>1</sup> (MSFD) requires EU Member States to use an integrated approach to achieve a 'good environmental status' of marine waters by 2020. Part of the integrated approach involves incorporating the viewpoints of many different stakeholders in how the marine environment is managed. The position of organised groups of stakeholders, such as industry or environmental groups, are often captured in policy consultations. However, the opinions of ordinary citizens are difficult to include in the decision making process and the views of citizens towards the marine environment are relatively unknown.

The researchers explored the values, concerns and preferences towards the Irish marine environment of 812 individuals through a national survey. The survey was conducted in such a way as to capture a representative sample of the population, as recorded in the 2011 census.

Areas covered by the survey included concern about the threats to the marine environment, the level of support for marine planning and action, and views on the competence of different groups to manage the marine environment.

Respondents saw the greatest threats as industrial pollution and litter. Less than 50% perceived a threat from [agriculture](#), despite being identified as a threat by the Irish Environmental Protection Agency. Sixty eight per cent of people believed that the marine environment was in a good state.

Both market (e.g. food and tourism) and non-market (e.g. climate and recreation) ecosystem services were rated as being highly important by respondents. The three most important services offered by Irish seas and coasts were believed to be: a marine food source (91%), the oceans as a tool to regulate the environment (87%) and recreation and tourism (86%).

Compared to other EU nations, (France, Germany, Poland, Portugal, Spain and the UK) the Irish public were far more sceptical of the ability of both government and industry to make plans about where and when different activities can happen at sea, i.e. marine spatial planning. Instead the Irish public placed more trust in the competency of scientists than policymakers to achieve this task. This suggests that a greater, or more transparent, role for scientists in marine policy formation could result in greater support from the public.

Overall, the study uncovered a number of details about the Irish public's perception and attitudes towards the marine environment and its management. This suggests that this type of survey could be used to help inform marine policy development, by gathering information on the opinions and preferences of communities using, or affected by, coastal and marine resources.

1. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF>

# Temporary coastal residents are less aware of anti-littering programmes

*Littering on coasts could be reduced by providing environmental information to temporary residents, research suggests. The study found that temporary residents were just as likely to litter as permanent resident populations and other visitors, but tended to be the group least aware of local environmental programmes.*

*"...temporary residents did not litter more than other groups. However, they were less aware of local environmental programmes than were non-resident workers."*

**Waste found on coasts and in oceans** is a serious problem across the globe. It can kill or injure wildlife and damage ocean floor habitats and communities. It also poses health and safety and [economic](#) problems, through decreasing tourism levels or blocking intake pipes on boats and ships, for example.

The problem of marine litter, whether discarded accidentally or deliberately, is essentially a social and behavioural problem. As such, its solution must also be social. This has led to the development of global programmes aimed at raising awareness and changing behaviour to combat the issue of [marine](#) litter.

In order to better understand the social factors driving marine litter, the researchers in this study examined littering behaviour and the degree of awareness of different environmental programmes in Gladstone, Australia. Gladstone, a small industrial city, is located on the Queensland coast close to the Great Barrier Reef, and has a non-resident population of around 7%.

Temporary workers, who are resident in an area for just brief periods of time, are common in industrial areas. They may lack a connection to the communities in which they work, and, like tourists, are often blamed for anti-social behaviours, including littering.

The researchers conducted a survey of 136 people to investigate littering in Gladstone. The survey was used to identify littering behaviours, demographic information, awareness of local environmental programmes and their levels of guilt associated with littering.

The results showed that only 9% of people admitted to littering, and that this tended to occur more at recreational areas (excluding beaches), such as parks, followed by beaches and whilst boating. Twenty five per cent of respondents who admitted littering reported feeling no guilt for littering. Age was the only demographic factor strongly linked with littering behaviour; more of those aged 18 to 36 admitting to littering than those older than 36.

The reported littering rate is lower than reported in other Australian studies, and the authors note the possibility of people lying in the survey.

A total of 72% of respondents were unaware of environmental programmes in Gladstone. The type of resident, age, gender and level of education influenced their awareness of environmental programmes, with permanent residents much more aware than temporary residents, visitors and tourists. The respondents' level of education was particularly associated with a higher awareness of programmes focused on marine litter.

These results indicated that temporary residents did *not* litter more than other groups. However, they were less aware of local environmental programmes than were non-resident workers.

The study's authors recommend that coastal industries should provide information on local environmental programmes to temporary workers as part of their induction. Additionally, they suggest that other demographics, such as older people, should also be targeted to raise their awareness.

**Source:** Campbell, M. L., Paterson de Heer, C., & Kinslow, A. (2014). Littering dynamics in a coastal industrial setting: The influence of non-resident populations. *Marine Pollution Bulletin*, 80(1-2), 179–85. DOI:10.1016/j.marpolbul.2014.01.015

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**Read more about:**  
[Sustainable consumption](#), [Waste](#)

# Marine Protected Areas: how to improve community support?

*Plans for new Marine Protected Areas (MPAs) need to consider social impacts alongside economic and environmental impacts, according to a recent study, which found that an MPA in the UK has increased some tensions within its local community. The researchers suggest that collaborative management could also help increase support for MPAs and reduce stakeholder conflict.*

*"The study highlights the need for MPA managers and national policymakers to consider social impacts when creating MPAs..."*

MPAs are areas of the sea where some human activity has been restricted, usually to protect marine habitats. Although their impacts on local people have been investigated before, few researchers have examined the social impacts of MPAs in temperate waters. The study highlights the need for MPA managers and national policymakers to consider social impacts when creating MPAs, by including social science expertise in the planning phase and focusing on social issues during the consultation process, alongside economic and environmental impact assessments.

To help address this gap, the researchers conducted an 'exploratory' study of stakeholder attitudes towards an MPA in Lyme Bay, south-west UK. The Lyme Bay MPA was created in 2008 to protect 206 km<sup>2</sup> of marine habitat from the damaging effects of fishing gear dragged along the seafloor. While many stakeholders supported the scheme, local fishers favoured a smaller 41.2 km<sup>2</sup> MPA.

The researchers interviewed 28 people, including mobile gear fishers (e.g. those using scallop dredges and bottom trawlers) and static gear fishers (e.g. those using pots and traps), as well as recreational users such as sea anglers, divers and people from charter boat and dive businesses. They identified a number of common themes from these interviews.

All stakeholder groups acknowledged the long-term benefits of the closure. Static gear fishers working inside the MPA appreciated the closure as it protected their own gear from mobile gear and allowed them to access areas previously dominated by mobile fishing gear. Sea anglers also noted the same protection, as well as an increase in fish numbers and diversity.

However, there were also concerns about the MPA. For example, mobile gear fishers now have to make longer trips to find suitable fishing grounds, raising safety fears and forcing them to spend more time away from their families. The mobile gear fishers also resented the loss of their traditional fishing rights. In contrast, recreational users thought that the closure was justified; before the MPA was introduced, they had felt that a small group of stakeholders had been damaging the environment used by all.

The MPA also increased direct tension and conflict between stakeholder groups. In particular, mobile gear and static gear fishers fishing outside the closed area were forced into closer proximity, leading to disputes over damaged gear. Tensions between recreational users and fishers had also increased. The recreational users felt they were not well represented in the consultation that led to the MPA's creation, as they were afraid to speak out in favour of the plans.

To reduce tensions between stakeholder groups, the researchers recommend adopting a collaborative management approach, whereby stakeholders take an active role alongside local authorities in managing the MPA. This could help to establish networks and rebuild trust between stakeholder groups.

The researchers caution that the study was a first step towards understanding the social impacts of marine closures, rather than an exhaustive study. They interviewed relatively few people, so stakeholder views were illustrative rather than representative, and they were not able to measure changing attitudes over time.

**Source:** Hattam, C.E., Mangi, S.C., Gall, S.C., Rodwell, L.D. (2014). Social impacts of a temperate fisheries closure: understanding stakeholders' views. *Marine Policy*. 45: 269-278. DOI: [10.1016/j.marpol.2013.09.005](https://doi.org/10.1016/j.marpol.2013.09.005)

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# Balanced Scorecard tool could support Integrated Coastal Zone Management

*A strategic management tool used to monitor progress towards organisational goals can be adapted to Integrated Coastal Zone Management (ICZM), according to a new study. The researchers adapted the Balanced Scorecard for the Mediterranean region, and suggest that such an approach could be applied to other marine regions.*

*“The Balanced Scorecard aims to map a set of criteria to assess current performance – and the gaps between expected and actual performance when implementing a strategy.”*

**Coastal zone management** has mainly been fragmented and localised, focusing on specific sectoral activities, and linked in many cases to demonstration projects supported by the EU. Consequently, policies have sometimes been implemented inefficiently or have even been contradictory.

In 2002, the EU recommended that Member States implement a [strategic approach<sup>1</sup> to managing and protecting Europe’s coastline](#). In 2011, the Contracting Parties to the Barcelona Convention, including the EU, established a [binding Protocol to make ICZM compulsory for States bordering the Mediterranean Sea](#); this included the participating EU Member States.

The Balanced Scorecard was initially developed as a tool for businesses, incorporating both financial and non-financial data. It aims to map a set of criteria to assess current performance – and the gap between expected and actual performance – when implementing a strategy. It therefore helps managers align performance with organisational goals and enables them to check that the strategy is achieving the desired results.

To help implement and manage the municipal, district and regional strategies for Mediterranean ICZM, the researchers optimised the Balanced Scorecard template, reorganising its structure to match that of the Protocol, and to account for the different priorities required by public organisations, as opposed to businesses.

The process starts with identifying the ‘vision’ and ‘mission’ of the ICZM plan or programme. This is followed by a Strategy Map, which identifies four perspectives, each with its own goals, outcome measures and initiatives, which are linked by hypotheses about the cause-and-effect links between drivers and outcomes. The four areas of context chosen as particularly relating to public bodies working on ICZM were: Financial, Internal Processes, Learning and Development and Coastal Communities. The aim is to balance these four perspectives in a holistic manner. In this way, this adapted Balanced Scorecard approach describes a network of

feedback mechanisms that allow interventions to be assessed across the entire ICZM plan.

Derived from the vision and mission, and for each of the four perspectives, the plan then identifies Strategic Objectives that drill down to Initiatives: concrete actions that answer the question ‘How do we do it?’ The researchers advise that each Initiative is assigned a budget, the sum of which represents the budget for the appropriate Strategic Objective, allowing financial flows to be optimised and making it easier to reschedule financial commitments on the basis of progress.

The adapted Balanced Scorecard can also be used to identify performance indicators, which can be split into two groups. The researchers give an example of a Driver Indicator – where the scope is to measure significant change in coastal and marine habitats and species – as ‘increase migratory bird species on salt marshes by 4%’. An Outcome Indicator (where the scope is to preserve coastal zones for current and future generations) could be ‘decrease the number of environmental crimes committed in protected areas’.

A Balanced Scorecard approach to ICZM aims to lay out the relationships and individual actions necessary to achieve Strategic Objectives at a wide scale, then monitor and manage actual progress against concrete targets at an organisational level. While the researchers consider the cause-and-effect chains in this kind of approach to be logical and probabilistic rather than mathematical and deterministic (and they warn that if the map is not planned properly, it can transfer management errors to the entire framework), they say this approach can enable a greater level of understanding and comprehension of ICZM.

**Source:** Maccarrone, V., Filiciotto, F., Buffa, G. *et al.* (2014) The ICZM Balanced Scorecard: A tool for putting integrated coastal zone management into action. *Marine Policy*: 44: 321–334. DOI:10.1016/j.marpol.2013.09.024.

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1. Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of Integrated Coastal Zone Management in Europe. See: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32002H0413>

# Baltic nutrient abatement measures identified by hybrid ecological-economic model

*Policies to manage marine ecological quality can be improved by combining economic and ecological concerns, finds a new study. Using this integrated perspective, researchers developed a model which identified the most cost-effective options for reducing nutrient pollution in the Baltic Sea within a 40-year time-span. The total cost of meeting the commonly agreed targets is estimated to be €1,487 million annually.*

*"The study suggests there should be a larger reduction of phosphorus and smaller reductions of nitrogen than is outlined in the Baltic Sea Action Plan."*

The Baltic Sea supports a unique [ecosystem](#), which is threatened by many human activities. The most severe threat is from excess nutrients, which enter the Sea in runoff from agricultural and urban communities. These can lead to eutrophication and threaten important ecosystem services, such as those that underpin recreational activities, and thus the livelihoods of those dependent on these services. The problem highlights the conflicts that decision makers face in balancing necessary activities, such as [agriculture](#), which can pollute the environment, with the benefits of preserving a healthy marine ecosystem.

The Baltic Sea Action Plan (BSAP), developed by the Baltic Marine Environment Protection Commission, sets limits on nutrients entering different drainage areas discharging into the Baltic Sea, aiming to return it to a 'good environmental status' by 2021. Many different measures to reduce nutrient pollution, such as changes to [wastewater](#) treatment or restoring wetlands, offer ways of meeting these limits. Determining which measures are the most effective at reducing nutrient levels within different drainage areas requires an ecosystem-based approach, and an economic assessment is needed to identify and assess the most cost-effective measures.

The researchers in this study explored cost-effective measures to meet the BSAP goal of good environmental quality within 40 years, from 1981. They evaluated the costs and long-term effects of reducing pollution on nutrient and phytoplankton levels in the Baltic Sea by combining economic and ecological research into a single model.

The model results suggest that aiming to achieve a good environmental status of the Sea, rather than aiming to meet the BSAP load targets for each sea region, was the most cost-effective approach. It allowed more expensive measures in one area to be replaced with cheaper options in other areas.

The study suggests there should be a larger reduction of phosphorus and smaller reductions of nitrogen than is outlined in the Action Plan. The researchers suggest two reasons for this. The first is economic: measures to reduce phosphorus, such as improving wastewater treatment, are cheaper to put in place than measures to reduce nitrogen, such as restoring wetlands. The second is ecological: some phytoplankton species 'fix' nitrogen from the air and can add significant amounts of nitrogen to the Baltic Sea. However, these species require phosphorous and lower phosphorus concentrations reduce the amount of such phytoplankton, and consequently nitrogen levels in the Baltic Sea.

The cost of the most cost-effective outcomes from the model for reaching a good environmental status within 40 years was €1,487 million annually in future prices (assuming an interest rate of 3.5%), compared to earlier estimates ranging from €3,000 to €4,500 million. However, the authors note that these earlier figures were estimated based on older data and statistics and higher initial loads.

By integrating economic and ecological factors into a single model, this research provides a new tool for analysing and optimising policies designed to protect the Baltic Sea. The researchers believe that the model could also be useful for other purposes, such as performing cost-benefit analysis and optimisation for international environmental agreements.

**Source:** Ahlvik, L., Ekholm, P., Hyytiäinen, K., *et al.* (2014). An economic-ecological model to evaluate impacts of nutrient abatement in the Baltic Sea. *Environmental Modelling & Software*, 55, 164–175. DOI:10.1016/j.envsoft.2014.01.027

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# Sustainable coastal adaptation planning links ecosystem services with social needs

*From rising seas to fiercer and more frequent storms, climate change effects are putting increasing pressure on coastal populations and ecosystems throughout Europe. Human activities, such as farming and land-use changes, are already in conflict with ecosystems. However, linking ecosystem services with social preferences in coastal land-use management can lead to more sustainable resource planning, finds a new study. The researchers developed guidelines for a participatory climate change adaptation process, which integrates the social effects of adaptation measures with the ecosystem services that they affect.*

*"The researchers developed and examined a guideline for integrating both ecosystem services and social impacts into a participatory planning process for spatial and land management projects in the region of Krummhörn, Germany."*

**Source:** Karrasch, L., Klenke, T., & Woltjer, J. (2014). Linking the ecosystem services approach to social preferences and needs in integrated coastal land use management – A planning approach. *Land Use Policy*, 38, 522–532. DOI:10.1016/j.landusepol.2013.12.010

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**Sustainable measures** to adapt to climate change are necessary. An 'ecosystems approach' can lead to more sustainable solutions, by taking into account the value of ecosystem services, such as those which support food, recreation and [water](#) purification. However, while this approach considers socio-economic factors, there are complex interactions between nature and society.

This study suggests that spatial planning processes could be improved by a greater understanding of the links between ecosystem services and their social effects. These effects may include secure income, the perceived beauty of an area, a sense of place and competing land uses.

The researchers, therefore, developed and examined a guideline for integrating both ecosystem services *and* social impacts into a participatory planning process for spatial and land management projects in the region of Krummhörn, Germany. Many communities within Krummhörn are located within low-lying marsh areas and must be protected from the North Sea tide. Around one-third of the total area is below sea level.

The approach involved identifying locally relevant ecosystem services and social impacts, which were then categorised and organised. The researchers interviewed local stakeholders about these categories to determine their interests, preferences and needs concerning each. The 14 stakeholders interviewed represented sectors from water management, nature conservation, agriculture, policy and tourism.

The researchers found that, from a stakeholder's point of view, social impacts are of fundamental concern to any adaptation action. For instance, an 'attachment to place', was of particularly high relevance, as was 'trust' in those responsible for decision making. Some stakeholders did not trust politicians, for example, but all thought highly of water boards. The majority of stakeholders felt that it was important that new land-use management strategies had positive outcomes for all participants.

By assessing how different ecosystem services affect, or are used by, surrounding communities, an understanding of which ecosystem services are of most importance to these communities, and how they might best be managed, can be developed. The researchers suggest that using such a participatory approach allows the scientific understanding of ecosystem services to be merged with the analysis of their effects on communities. This would provide a new basis on which to make successful decisions and promote a collaborative and transparent planning process.

# New web-based tool supports Integrated Coastal Zone Management

*A free tool to help coastal managers plan sustainable coastal development is now available online. The decision support system provides up-to-date information and data on subjects such as populations and land use, to support integrated management of coastal areas in the North Sea region affected by climate change, both now and in the future.*

*"The Coastal Indicator System (COINS) provides practical support for planners implementing the European Commission's recently adopted Directive for a common EU framework for marine spatial planning and integrated coastal management."*

**Source:** Hansen, H.S. and Fuglsang, M. (2014) An Operational Web-Based Indicator System for Integrated Coastal Zone Management. *ISPRS International Journal of Geo-Information*. 3(1): 326-344. DOI:10.3390/ijgi3010326. This study is free to view at [www.mdpi.com/2220-9964/3/1/326](http://www.mdpi.com/2220-9964/3/1/326)

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**About one third of the EU's population** lives within 50 km from the coast and human activities, such as expanding urban developments, are increasingly putting pressure on the diversity of [ecosystems](#) found in these regions. Climate change, with its associated impacts, such as sea-level rise and more frequent extreme storms and storm surges, will only increase the pressure on the coastal environment. People living in coastal areas will also become more vulnerable to the effects of [climate change](#).

As part of the EU funded BLAST<sup>1</sup> project, researchers developed a spatial decision support system, called the Coastal Indicator System (COINS), to improve integrated coastal zone management in the face of climate change challenges. It provides practical support for planners implementing the European Commission's recently adopted [Directive](#)<sup>2</sup> for a common EU framework for marine spatial planning and integrated coastal management.

COINS is based on the DPSIR (Driver Pressure State Impact Response) framework. It assesses impacts caused by human activities and identifies potential environmental changes as a consequence.

Coastal planners can visualise the effects of climate change on coastal areas using the COINS system. They are able to develop scenarios of socio-economic development balanced with environmental protection that are realistically constrained by the potential effects of climate change. For example, users can see how coastal developments might be affected by flooding as a result of sea-level rises and storm surges.

The researchers consulted stakeholders from the countries around the North Sea to choose suitable sustainability indicators that can be used by COINS to monitor and evaluate the effect of coastal management strategies on sustainability under climate change. As a result, the researchers included seven climate-related indicators in COINS. Six of these come from the set of 27 indicators developed by the European Expert Group on integrated coastal zone management ([ICZM](#))<sup>3</sup>.

Four indicators provide information for managers trying to control further development on undeveloped coasts: demand for property on the coast, the area of built-up land, the rate of development of undeveloped land and the demand for road travel on the coast.

Two indicators recognise the threat to coastal areas from climate change: coastal zone erosion, and natural, human and economic assets at risk. The seventh indicator recognises the potential of the coastal zone as a resource for renewable energy.

A prototype version of COINS is freely available on the internet: <http://blast-project.eu/index.php?page=224>. The researchers have used open source software and data from each country and users can also add their own data. However, there are some limitations – not all data have been harmonised across all the countries yet and land and sea data have not yet been fully integrated for the whole of the North Sea region, meaning the system cannot yet be fully implemented in all countries around the North Sea.

1. Bringing Land and Sea Together (BLAST) was funded by the European Union as part of the Interreg IVB North Sea Region Programme. See: <http://blast-project.eu/index.php>
2. See: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0089&from=EN>
3. [http://ec.europa.eu/environment/iczm/expert\\_group.htm](http://ec.europa.eu/environment/iczm/expert_group.htm)

# Coastal ecosystem services' valuation by stakeholders improves planning decisions

*A framework to value marine and coastal zone ecosystem services, which acknowledges but transcends monetary value, has been proposed by researchers. Using this approach, coastal managers can integrate the different values placed on ecosystem goods and services by various stakeholders to assess how these values affect planning decisions.*

*"It has been argued that methods to value ecosystems services need to go beyond monetary valuation and should also integrate ecological and social values."*

**The valuable goods and services**, such as greenhouse gas regulation, erosion control and fisheries supply, provided by coastal and marine ecosystems to support human wellbeing are under threat. To help protect these services, sustainable development which balances growth in marine and coastal zones with strategies to protect the environment is needed.

It has been argued that methods to value ecosystem services need to go beyond monetary valuation and should also integrate ecological and social values. One way this can be achieved is to use a participatory approach to decision making, which involves all stakeholders in policy developments and assessments.

The framework developed by the researchers includes such a participatory approach to value marine and coastal ecosystems. There are three stages to their framework. The first stage, 'setting the scene', identifies the institutional context of the decision-making. This helps managers understand the rules and regulations governing the decision to be made and the key factors that influence the decision. This stage is also used to identify relevant stakeholders, such as businesses, the public sector and civil society organisations, which might influence or be affected by coastal zone policy.

The second stage, 'deepen understanding', helps all stakeholder groups develop a shared overview of the problem, understand the long-term impacts of a decision on ecosystem goods and services, and allows stakeholders to assign values to the goods and services that would be affected by the decision. This can be achieved through focus groups or stakeholder mapping.

The third stage, 'articulate values', enables all stakeholders to discuss the different values placed on ecosystem services to gain a deeper awareness of the implications

of a decision. Various methods, including citizen juries, can be used for this.

By progressing through these three stages, stakeholder values can be integrated into the development and management of marine policies. Which methods and tools are used within each stage depends on the type of decision being taken and its particular circumstances.

The researchers, based in Portugal, suggest that this framework could be used, for example, in the marine and coastal planning processes required by the [Portuguese Marine Spatial Plan](#)<sup>1</sup> which aims to safeguard the sustainable use of resources in the sea and coastal zone. The framework can integrate top-down (e.g. proposals by government agencies) and bottom-up (e.g. business proposals for aquaculture or recreational activities) approaches in marine spatial planning and ensure a sustainable supply of ecosystem services.

Although participatory approaches may be resource intensive and time-consuming, the researchers conclude it is essential to involve stakeholders in the valuation, planning and management of complex environmental issues decisions, in order to improve decision-making and ensure successful implementation of coastal management policies.

**Source:** Lopes, R. and Videira, N. (2013) Valuing marine and coastal ecosystem services: An integrated participatory framework. *Ocean & Coastal Management*: 84: 153-162. DOI:10.1016/j.ocecoaman.2013.08.001

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1. [www.unesco-ioc-marinesp.be/msp\\_around\\_the\\_world/portugal](http://www.unesco-ioc-marinesp.be/msp_around_the_world/portugal)

# Related content

## Coastal flooding: failing to adapt is not an option, says study (November 2013)

**Climate change** will lead to an increased risk of flooding and huge economic losses if countries do not invest in appropriate adaptation measures, according to a new study. The research estimates the risks posed by flooding to cities around the world and the associated economic losses in 2005 and 2050, and suggests that flood protection must be increased to maintain the same level of risk to coastal cities.

[http://ec.europa.eu/environment/integration/research/newsalert/pdf/350na2\\_en.pdf](http://ec.europa.eu/environment/integration/research/newsalert/pdf/350na2_en.pdf)

## Policy settings key to debate over Dutch Wadden Sea (November 2013)

**There is an ongoing debate** over exploitation of the Dutch Wadden Sea, over issues including gas extraction and cockle fishing. According to a review analysing interactions between scientists and policymakers during these debates, the productivity of such discussions is substantially influenced by the policy setting, i.e. the level of government involved and the key decision-makers.

[http://ec.europa.eu/environment/integration/research/newsalert/pdf/351na3\\_en.pdf](http://ec.europa.eu/environment/integration/research/newsalert/pdf/351na3_en.pdf)

## Coastal wetlands can protect against rising sea levels and increasing storms ( March 2013)

**Coastal wetlands can substantially reduce erosion**, property damage and human deaths in the face of rising sea levels and severe storms, recent research concludes. Understanding whether wetlands can provide effective coastal protection is essential to developing effective climate change adaptation strategies.

[http://ec.europa.eu/environment/integration/research/newsalert/pdf/37si2\\_en.pdf](http://ec.europa.eu/environment/integration/research/newsalert/pdf/37si2_en.pdf)

## Coastal structure repairs can significantly disturb marine ecosystems (January 2012)

**Renovating coastal structures**, such as breakwaters, groynes, artificial reefs, quays and sea walls, can be destructive to marine ecosystems as it encourages opportunistic and invasive species, according to recent research. Repairs can be particularly damaging if conducted in spring or summer, so repair schedules should be recognised in marine planning strategies to minimise negative ecological effects, say the researchers.

[http://ec.europa.eu/environment/integration/research/newsalert/pdf/270na2\\_en.pdf](http://ec.europa.eu/environment/integration/research/newsalert/pdf/270na2_en.pdf)

## Thematic issue on Flooding, June 2013

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