

SEAPLANSSPACE
Country Specific Manual Sweden
Coastal and Marine Spatial Planning in Sweden



Editors:
R. Dobak & H. Nilsson

Coastline Web

08 (2021)

SEAPLANSPACE

Country Specific Manual Sweden

Coastal and Marine Spatial Planning in Sweden

Editors:

Robert Dobak & Henrik Nilsson

Authors:

**Jeanette Conradsson, Marianne Dahlbäck,
Carl Dahlberg, Anothai Ekelund, Andreas Gylling
Johan Hollander, Mattias Holmquist, Dan Janérus,
Per Jonsson, Per-Olav Moksnes, Erkki Palmu,
Jonas Pålsson, Emma Teglund, Sofia Wikström**

Kalmar 2021

ISSN 2193-4177

ISBN 978-3-939206-26-2

This report contains the Swedish Country Specific Manual that was developed in the SEAPLANSPACE project. The SEAPLANSPACE project is funded by the EU under the INTERREG South Baltic funding scheme (2014-2020). The aim of the SEAPLANSPACE project is to improve the understanding of Marine Spatial Planning (MSP) among employees, stakeholders and the public.

More information can be found on the project website: www.seaplanspace.eu



European
Regional
Development
Fund

The contents of this manual are the sole responsibility of the authors and can in no way be taken to reflect the views of the European Union, the Managing Authority or the Joint Secretariat of the South Baltic Cross-border Co-operation Programme 2014-2020.



Länsstyrelsen
Kalmar län



Imprint

Cover picture: Swedish Coast (Picture: Robert Dobak)



Coastline Web is published by:

EUCC – Die Küsten Union Deutschland e.V.
Friedrich-Barnewitz-Str. 3,
18119 Rostock, Germany
mitarbeiter@eucc-d.de

Coastline Web is available online under <http://www.eucc-d.de/>.

The responsibility for the content of this report lies solely with the authors.



EUCC – Die Küsten Union Deutschland e.V.
Coastline Web 08 (2021)
Selected Monographs in Marine and Coastal Science
ISSN 2193-4177, ISBN 978-3-939206-26-2

- SEAPLANS SPACE -

Country Specific Manual

Coastal and Marine Spatial Planning in Sweden

Content

Coastal and Marine spatial planning in Sweden – concept and terminology	3
Introduction to Marine Biology.....	16
The importance of connectivity to marine planning.....	22
Physical impact on shallow coastal ecosystems in Sweden	29
Information, data, guidance and modelling in MSP in Sweden	35
Green infrastructure – coast and sea.....	43
Local sustainable solutions to global and regional challenges in the Blekinge Archipelago Biosphere Reserve	48
Ecosystem-based Marine Spatial Planning methods in Sweden – SYMPHONY	53
Marine Spatial Plan for Blekinge's coastal municipalities.....	59
Intermunicipal planning cooperation regarding the sea along the High Coast.....	63
Blue comprehensive plan and Maritime business strategy in Northern Bohuslän	70
Summaries of experiences of the SEAPLANSspace project	78

Coastal and Marine spatial planning in Sweden – concept and terminology

In Sweden the EU's Maritime Spatial Planning Directive has been implemented by adapting it to the existing national conditions. These conditions will continue to apply in the future, and will thus form the basis for all application of the Swedish marine spatial plans. When the EU launched a framework directive on maritime spatial planning, the European Parliament's and the Council's Directive 2014/89/EU in 2014, fresh opportunities were created for planning in Swedish waters. There is now an opportunity to abandon the sectoral planning that has previously been implemented through national authorities, often using the perspective and methods from land to plan the sea. Now, it is the time to take an overall approach by using the accumulated knowledge that will be conveyed through the marine spatial plans and their knowledge base. This can pave the way for better and longer-term decisions in all contexts concerning the coasts and the seas.

1 Marine spatial planning in Sweden – the legal framework

The introduction of more cohesive marine spatial planning in Sweden was preceded by studies presenting various proposals for renewal of the existing planning system. In 2009 the government set up the so-called marine spatial planning commission, which presented a comprehensive proposal based on the state's influence and role being more tangible at sea than on land. Thus a completely new law – the Marine Spatial Planning Act – was proposed, whereby the state was given a more prominent role in all marine spatial planning. The proposal took an overall approach to knowledge-building, functionality of planning tools and division of responsibilities. According to the commission, this new, more extensive responsibility for the state would also cover those parts of the sea that (even today) are the responsibility of the municipalities' administrative. An important aspect of the background to the proposal was that only a few of Sweden's total of 82 coastal municipalities had realised their obligation under the Planning and Building Act to plan their territorial sea. At the time of the commission's formation it was assessed that only four municipalities dealt with the sea in detail in their comprehensive plans. Following political trade-offs at governmental level, the marine spatial planning commission's proposals were left open.

In the implementation of the EU Maritime Spatial Planning Directive in Sweden, an alternative was instead chosen that meant marine spatial planning was included in existing legislation, namely Chapter 4 of the Environmental Code (SFS 1998: 808). Through the inclusion in the Environmental Code and the wordings of the new Marine Spatial Planning Regulation (SFS 2015: 400), the marine spatial plans were also linked to Chapter 3 of the Environmental Code. The inclusion in Chapter 4 Environmental Code and the link to Chapter 3 Environmental Code underlines the fact that development of marine spatial plans is a state affair and should be considered a manner of regulation and long-term management of the use of land and water areas.

One of the options could have been allowing the new marine spatial planning legislation to link to the Planning and Building Act (SFS 2010: 900), but (in these contexts) this mainly regulates municipalities' planning responsibilities and relationships with state national interests. With regard to marine spatial planning issues and the link between the Environmental Code and the Planning and Building Act, they will take the form of the adopted marine spatial plans being the 'new' state national interests regarding the sea, and an important component of the contribution to sustainable development of the sea.

Once adopted, as well as showing the state's balanced national interests regarding the sea, the marine spatial plan will also show 'other public interests of significant importance'. For example, the marine spatial plans will be the documents that the state, through the county administrative boards, will use at an early stage of the process when informing municipalities and other players about state interests

regarding the sea. Sweden will in future thus have two partially different systems: one whereby national interests on land are made up of the national-interest authorities' designated areas, and another at sea, where the marine spatial plan shows how the national-interest authorities' designated claims have (in some respects) been weighed up against each other and decided on by the government.

1.1 Division of responsibilities between Swedish authorities

In 2015 a marine spatial planning regulation was introduced as part of the implementation of the EU Maritime Spatial Planning Directive in Swedish legislation. This regulation specified in greater detail what Sweden's marine spatial plans are to include and how the division of responsibilities between authorities is to work. The Swedish Agency for Marine and Water Management was appointed as the authority with overall responsibility for the state's marine spatial planning and for development of the state's marine spatial plans. The National Board of Housing, Building and Planning which was (and is) responsible for guidance on planning issues on land and at sea, had in many ways been a logical option, but the task was assigned to the then relatively newly formed Swedish Agency for Marine and Water Management. The regulation also states that the Swedish Government is the determining authority regarding adoption of the marine spatial plans.

The Marine Spatial Planning Regulation also identified a number of responsible authorities for cooperation during various stages of the marine spatial planning process. Responsibility for developing the planning proposals is shared between the Swedish Agency for Marine and Water Management, The National Board of Housing, Building and Planning, the Swedish Board of Agriculture and the national-interest authorities included in the 'Regulation on land and water management' (SFS 1998: 896) and coastal county boards. The proposal developed will be compiled by the Swedish Agency for Marine and Water Management, which will also present the proposal to the Swedish government.

The county administrative boards and sectoral authorities are furthermore responsible for providing the Swedish Agency for Marine and Water Management with the requisite documentation within their respective areas of responsibility for production of the planning proposal. The county administrative boards also have the responsibility of actively seeking municipal and regional participation, and supporting and coordinating state work with regard to the municipalities in marine spatial planning contexts. Municipalities and regions that may be affected by the marine spatial plan are to be given the opportunity to participate in the work on the planning proposal, so local and regional conditions and needs eventually can be taken into consideration. In marine-planning contexts, the county administrative boards can be deemed to be the state's representatives in the dialogue with regional and municipal representatives (whilst at the same time maintaining their traditional administrative-board role). In accordance with the Marine Spatial Planning Regulation, the county administrative boards are also to collaborate with each other.

It is worth noting that when the Swedish Agency for Marine and Water Management was identified in the Marine Spatial Planning Regulation as being nationally responsible for developing proposals for marine spatial plans in collaboration with other authorities, this also resulted in Sweden getting two national, centralised authorities with overall responsibility and direct influence regarding many marine-planning issues:

- The National Board of Housing, Building and Planning, which has overall responsibility for guidance on planning issues. This includes guiding the national-interest authorities regarding application of the national-interest provisions at sea (and on land). The National Board of Housing, Building and Planning is also responsible for general supervision of land-use and water-use management. In this case, water use is with regard to territorial sea.
- The Swedish Agency for Marine and Water Management, which in cooperation with other authorities is developing a proposal regarding a state marine spatial plan from one nautical

mile outside the baseline up to and including Sweden's economic zone (taking into consideration local and regional conditions if necessary).

The divided responsibility becomes most apparent in the part of the territorial sea that starts 1 nautical mile outside the baseline and extends as far as Sweden's economic zone. Here it is The National Board of Housing, Building and Planning that acts as the guiding authority when it comes to planning on the part of the municipalities and national-interest authorities, as well as follow-up of the use of the sea. In the same area (the territorial sea), the Swedish Agency for Marine and Water Management is responsible for developing the marine spatial plans and running the state planning process regarding the sea – including keeping in touch with the municipalities and regions so as to be able to take into account regional and local conditions if necessary. Unlike The National Board of Housing, Building and Planning, the Swedish Agency for Marine and Water Management has no guiding role in planning contexts. In the case of the Swedish economic zone, the Swedish Agency for Marine and Water Management, unlike The National Board of Housing, Building and Planning, also has overall responsibility for marine spatial planning.

1.2 Marine spatial planning in Sweden – the implementation of the EU-marine spatial planning directive

In the Marine Spatial Planning Regulation, Sweden's seas are divided into three marine-planning areas: the Skagerrak/Kattegat, the Baltic Sea and the Gulf of Bothnia. As a curiosity, the definition and demarcation of the 'Baltic Sea' in Sweden differ in three different maritime EU directives: the EU Water Framework Directive (2000/60/EC), the EU Maritime Spatial Planning Directive (2014/89/EU) and the EU Marine Environment Directive (2008/56/EC). It is worth noting that the marine-planning areas (seen from the land) start one nautical mile outside the baseline and extend up to and including the economic zone. The reason why the Swedish marine spatial plans do not cover the innermost sections is that during the implementation process for the EU Maritime Spatial Planning Directive it was deemed that municipal issues and responsibilities should prevail in the zone closest to land. In addition, the area within the marine spatial plans closest to land is already included in coastal bodies of water regulated by the EU Water Framework Directive. In conjunction with implementation of the EU Maritime Spatial Planning Directive, in 2017 Sweden also established a so-called contiguous zone in Sweden's economic zone.

The demarcations and overlaps between different legislations are shown in the following illustration.

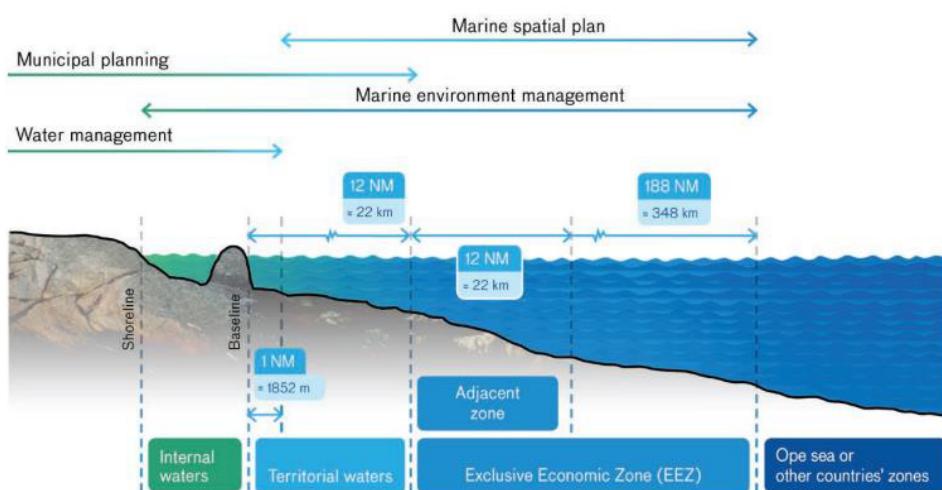


Figure 1: Terms, boundaries and planning responsibilities. The state shares planning responsibility for territorial waters with municipalities. In the Exclusive Economic Zone, the state has sole planning responsibility. Source: "Proposals for Marine spatial plans for Sweden, Gulf of Bothnia, Baltic Sea and Skagerrak/Kattegat", Swedish Agency for Marine and Water Management, 2019.

The Swedish marine spatial plans will comprise a map and a plan description. The map will show the basic features of use of the marine area, areas of national interest under Chapter 3 Environmental Code and other public interests of significant importance. The plan description will indicate the focus regarding use of the marine area, indicate and describe the areas within the marine area that are of national interest under Chapter 3 Environmental Code, describe public interests of significant importance and considerations that have formed the basis of the plan, indicate how issues regarding incompatible purposes should be resolved and clearly state the meaning and consequences of use of the marine area under the plan. The marine spatial plans must be compatible with Chapters 3 and 4 Environmental Code.

2 Marine spatial planning in Sweden – the Blue Growth concept

The content of the Swedish marine spatial plans is mainly governed by links to other legislation (which are developed below), and there are additionally a number of target-, policy- and strategy-related documents mainly at national and regional levels, whereby the marine spatial plans will contribute to realisation. The marine spatial plans (like the national work on the EU Maritime Spatial Planning Directive) shall be designed in such a way that economical-, social- and environmental objectives are integrated (with an ecosystem approach). The plans shall provide the requisite guidance on use of marine areas for the purpose(s) they are most suited to in the long term. Due to the implementation in Sweden, this means that the Swedish marine spatial plans made according to the EU -directive work mainly by addressing the legislation in Chapter 4 Environmental Code.

Since the Swedish marine spatial plans mainly address state interests and are decided on by the government; the available target-, policy- and strategy-related documents are primarily produced by (or aimed at) state authorities. The following are some of the most important documents regarding the objectives to be attained.

- 'A Swedish maritime strategy – for people, jobs and the environment' (Government)
- 'Sweden's environmental goals' (Parliament)
- 'Fossil-free Sweden' (Government)
- 'Sweden's climate strategy' (Government)
- 'Sweden's Plan of Action for Agenda 2030' (Government)

There are also several sectoral target-, policy- and strategy-related documents from national authorities, e.g.:

- '*Strategic plan for transition of the transport sector to fossil-free*', Swedish Transport Agency (2019). The strategy is Sweden's way of meeting shipping's goal of reducing greenhouse-gas emissions. The IMO has agreed on reduction of greenhouse-gas emissions from international shipping by at least 50% by 2050, compared with the 2008 level. In the longer term the aim is for emissions to be phased out as soon as possible. The target forms part of an initial strategy adopted in 2018 that will form the basis for continued regulatory development.
- '*Plan of action for domestic shipping and short sea shipping*', Swedish Transport Administration (2019), is an example of how the government has commissioned central authorities with redirecting transportation from road to sea in coastal contexts. A national freight-transport strategy sets out a number of proposed measures that are to contribute to attainment of transport-policy objectives, bolstering of industry's competitiveness and promotion of the transfer of freight transport from road to rail and sea. The main advantage of shipping is that there is spare capacity, both in ports and in fairways.

- ‘Common strategy for Swedish fisheries and aquaculture’; Swedish Agency for Marine and Water Management and Swedish Board of Agriculture (2021). The aim of the strategy is to set out a common way forward for the sustainable development of commercial fishing, recreational fishing, fishing tourism and aquaculture in Sweden. The strategy includes a vision and a number of objectives for the future development of fishing and aquaculture. It will form the basis for development and implementation of sector-specific plans of action with measures and activities in order to attain the strategic objectives.

Most of the regional target-, policy- and strategy-related documents are usually regional adaptations of national objectives for facilitation of regional and local implementation. The fact that many legislations and many authorities are involved makes it a difficult task to describe the overall approach of the Swedish Blue Growth concept.

3 Which Swedish legislation must take marine plans into consideration?

The marine spatial plans will link to a number of different legislations in coastal and maritime areas where the indicative marine spatial plans will constitute part of the knowledge base regarding a decision on use of the sea. Once the marine spatial plans have been adopted the following legislations will, when appropriate, have to take into account the guidance in the marine spatial plans. The legislation concerned is as follows:

- Continental Shelf Act (1966:314)
- Roads Act (1971:948)
- Act (1978:160) on Certain Pipelines
- Act (1983:293) on Establishment, Expansion and Closure of Public Fairways and Public Ports
- Minerals Act (1991:45)
- Act (1992:1140) on Sweden's Economic Zone
- Act (1995:1649) on Construction of Railways
- Electricity Act (1997:857)
- Natural Gas Act (2005:403)
- Aviation Act (2010:500)
- Planning and Building Act (2010:900)
- Environmental Code (1998:808)

In total, some 10 Swedish authorities (including the government) will have the right to decide in accordance with the above legislations, whereby consideration will be given to the marine spatial plans decided on, where appropriate. The authorities that will need to use the marine spatial plans for future decisions regarding various marine activities are as follows:

- The Government
- General Administrative Court
- Land and Environment Court
- Land and Environment Supreme Court
- Supreme Administrative Court
- The Mine Inspector
- County Administrative Board
- Energy Market Court
- Swedish Transport Administration

- Swedish Transport Agency
- Swedish Maritime Administration
- Geological Survey of Sweden

It is worth noting that municipalities (and regions) are missing from the list; they must also take into consideration Chapters 3 and 4 of the Environmental Code, because the legislation of the Planning and Building Act (which governs the development of municipal comprehensive plans and detailed development plans) is linked to this legislation. The aim of municipal planning shall be for land areas and water areas to be used for the most suitable purpose(s), and to give priority to uses that from a general standpoint entail good management – including taking into consideration those parts of the Environmental Code that accommodate the state marine spatial plan.

The definition of 'public interests of significant importance' may differ slightly, depending on the sector to which it is being applied. What are public interests of significant importance is considered at national level in the marine spatial planning process. One of the following criteria should be met in order for it to be considered a public interest of significant importance in marine spatial planning:

- Of great national importance.
- Needed for important societal functions now or in the future.
- Needed in order to achieve significant societal benefit.
- Needed in order to meet Sweden's international commitments.
- Needed in order to implement or maintain nationally or internationally important structures.

If any of the criteria are met, a local, regional, national or international issue can be a public interest of significant importance.

4 Marine spatial planning in Sweden – interactions with other Swedish regulations on planning on land and at sea

As mentioned previously, implementation and application of the EU Maritime Spatial Planning Directive in Sweden is adapted to Swedish national legislation. The legislation has above all been adapted, and can be divided into two categories:

- Municipal planning opportunities
- State planning opportunities

International legislation also affects the implementation and application of Swedish law, but in this context international legislation is considered to have been introduced when there is an equivalent Swedish law (or when there is a nationally adopted target-, policy- and strategy-related document adapted to Swedish circumstances).

4.1 Municipal plans and their interaction with the marine plans

A municipality can make both detailed development plans and comprehensive plans regarding the sea – something that has been possible since adoption of the Planning and Building Act in 1987. In this context, the municipalities also include those regions that have a formal regional planning responsibility to develop a regional plan in accordance with the Planning and Building Act.

Table 1: From the Planning and Building Act, Chapter 3, Section 1. Source: The Swedish Parliament, 2021.

Planning and Building Act (2010:900)
Chapter 3 Comprehensive plan

Section 1 Each municipality must have an up-to-date comprehensive plan covering the entire municipality.

Of relevance to the marine spatial planning is the fact that under the Planning and Building Act the municipal comprehensive plan must clearly state the basic features of the intended use not only of land, but also of areas of water (in this context the sea) within the municipality area. The comprehensive plan expresses the municipality's opinion on what is most the appropriate use of water in the sea from a certain standpoint. The comprehensive plan is not binding, but like the marine spatial plan made by the state, it is indicative regarding future decisions on how land areas and water areas are to be used. Future decisions are not only decisions made by municipal councils but also decisions regarding examinations, e.g. at land and environmental courts, of environmentally hazardous activities. The comprehensive plan provides guidance regarding detailed development planning and building-permit examination outside zoned areas.

Furthermore, in comprehensive planning in accordance with the Planning and Building Act the municipality must account for national interests under Chapters 3 or 4 of the Environmental Code and how they are satisfied in the municipality's planning (a function that the marine spatial plans will take over once they have been adopted). Furthermore, the municipality must always report in the comprehensive plan on coordination of relevant national and regional objectives, plans and programmes of importance to development within the municipality. The content and effect of the comprehensive plan (and thus how the municipality addresses the marine spatial plan) must be clearly stated in accordance with the Planning and Building Act. The comprehensive plan will be the subject of public consultation whereby those affected by the plan, e.g. industry, associations and the public, can comment. The plan proposal will then be presented and reviewed, also through public consultation, whereby the county administrative board's (or the state's) so-called review statement will form part of the planning documents.

4.2 Regional plans and regional planning regarding the sea

The terms 'regional plan' and 'regional planning' should be kept separate, as they may have different meanings depending on the context. 'Regional plan' is usually the legal term for a regional plan to be drawn up by certain listed players in accordance with the Planning and Building Act. In these context 'regional planning' can also involve initiatives whereby many individual municipalities collaborate and adopt a bigger geographical perspective than the individual municipality within the parameters of their collaboration. The planning approach then goes from being of a more local nature to being more regional – i.e. a form of regional planning (and neither is the result of the collaboration a 'regional plan' as envisaged by the Planning and Building Act). The topic relating to regional planning can be anything, and does not always have to result in a spatial plan as per the Planning and Building Act (e.g. a comprehensive plan) – the formats can thus differ.

In accordance with the Planning and Building Act, the idea is that a regional plan should set out the basic features regarding use of land and water areas, and should provide guidance on decisions about individual municipalities' comprehensive plans, detailed development plans and area regulations. Nationally there are currently two regions with a legal mandate to draw up regional plans in

accordance with the Planning and Building Act, namely Skåne and Stockholm (in other regions it is voluntary). They have not, however, presented plans dealing with the sea in greater detail, though there are two examples concerning the sea. The first is from Stockholm, and focuses on archipelago planning and rural development: '*Rural and Archipelago Strategy for the Stockholm Region*', Stockholm County Council Report 2018:2. The second example comes from Skåne, where in spring 2021 Region Skåne had a regional plan ('*Regional plan for Skåne 2022-2040*', Region Skåne) that was undergoing consultation. The plan states that '*Region Skåne needs to develop its role regarding marine and coastal planning.*'

As regards regional planning, on the other hand, it may arise from voluntary initiatives at regional geographical level when there is no possibility of preparing a formal regional plan. In Sweden there are two examples of major municipal collaborations that have taken place regarding the coast and the sea, namely from the Skagerrak/Kattegat's marine spatial planning area in the form of a '*Blue Comprehensive plan*' (Strömstad, Tanum, Sotenäs and Lysekil municipalities), and from the Baltic Sea's marine spatial planning area in the form of '*Marine spatial plan for Blekinge's coastal municipalities*' (Municipalities of Sölvesborg, Karlshamn, Ronneby and Karlskrona). In this context the municipalities have seen benefits of collaborating on various planning issues concerning coastal and maritime areas, and have thus collaborated on planning issues from a regional standpoint.

The forms of collaboration have arisen for various reasons in the Skagerrak/Kattegat and Blekinge. Whatever the reason for the common forms of collaboration, in order to have a legal effect in planning contexts the results must be adopted as a comprehensive plan. This can only be done by each municipality adopting the part of the draft plan covering that municipality's area of the sea, through the Planning and Building Act. The driving force behind working together has been the ability to take an overall approach to various issues that are important from a regional perspective, and in which maybe not only the municipalities but also the region and to some extent the county administrative board have been involved. Later in the report you can read more about these two examples (see the texts in the webinar section based on the presentations '*Marine spatial plan for Blekinge's coastal municipalities*' and '*Blue comprehensive plan and marine business strategy*').

In some areas of Sweden there may in future be indicative plans from a national, regional and local standpoint. This may in future mean parts of Sweden's territorial sea will be covered by up to three indicative plans, namely the individual municipality's comprehensive plan, a regional plan and the state marine spatial plan.

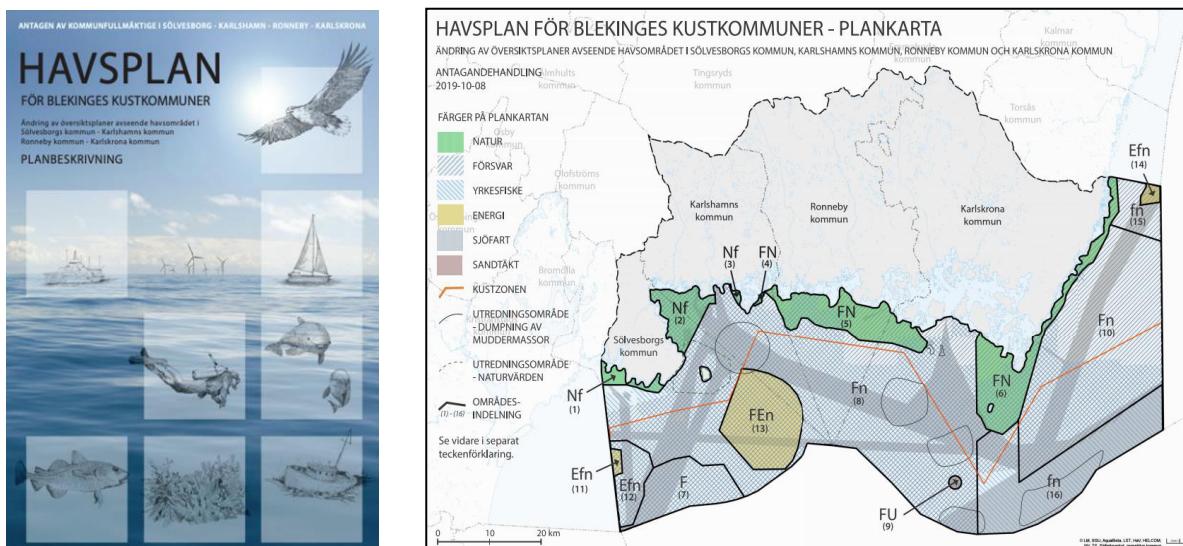


Figure 2 The Comprehensive plan shows various water uses that will constitute guidance for future decisions on how the sea should be used. Source: Planning map '*Marine spatial plan for Blekinge's coastal municipalities*' (Municipalities of Sölvesborg, Karlshamn, Ronneby and Karlskrona). Source: Karlshamn, 2019.

4.3 State planning through national interests on the coast and at sea – differences between Chapters 3 and 4 of the Environmental Code

Through various central national authorities, the state has done what can be described as sectoral planning for certain sectors of society. The rights of some government authorities to identify areas that are or may be of national interest can be linked to legislation going back a long way (what used to be called national spatial planning). In general, regarding the national-interest claims it can be said that when handled by sectoral authorities they can relatively easily change, e.g. the extent of a naval military shooting range or a shipping fairway.

4.4 Principles of national interest under Chapter 3 of the Environmental Code

Through Chapter 3 of the Environmental Code and the ‘Regulation on land and water management’ sectoral authorities designate various major areas for protection against measures that could significantly affect or impede access to or use of certain facilities (the areas as a whole or updates to the areas can be found on the relevant authority's website or, for example, via the county administrative boards' Planning Catalogue).

Table 2: From the Environmental Code, Chapter 3, Section 1. Source: The Swedish Parliament, 2021.

Environmental Code (1998:808)

Chapter 3, section 1

Good management

Section 1 Land and water areas shall be used for the purpose(s) for which the areas are best suited, taking into consideration their nature and situation, and existing needs. Priority shall be given to use that promotes good management from a public-interest standpoint.

As regards the designated areas, one can deem a particular sectoral interest to be making a claim to the area to which the municipalities are thereby to relate in the comprehensive plans – but what actually applies at a specific location is not determined until a review has taken place and it has been assessed that no significant damage is being caused to the national-interest values by the authority examining an issue.

The state has carried out sectoral planning through various central national authorities with the legal support in the Environmental Code, Chapter 3. The Environmental Code specifies which public interests can justify an area of national interest (those relevant to marine spatial planning are listed below) that is to be protected against different influences from other sectoral interests. National interests can be identified for areas of particular importance to:

- commercial fishing
- conservation values
- outdoor life
- conservation of the cultural environmental
- deposits of substances and materials
- industrial production plants
- energy-production and energy-distribution plants
- facilities for the final storage of spent fuel and nuclear waste
- communications facilities, electronic
- communications facilities, Road Traffic Act

- waste-management facilities
- water-supply facilities
- total-defence facilities.

As regards some of the interests, none, or only a few, have been identified as being national interests.

4.5 Principles regarding national interests under Chapter 4 of the Environmental Code

As well as the above areas, there are areas designated pursuant to Chapter 4 of the Environmental Code that are of national interest in their entirety – these major areas and associated value descriptions. Through Chapter 4 of the Environmental Code and the ‘Regulation on land and water management’, certain sectoral authorities designate various major areas that as a whole are to be deemed national interests. The areas have chiefly been designated and selected in view of their high nature conservation- and cultural values. The areas may entail a big geographical distribution, but the rules shall be applied in such a way as not to impede development of existing urban areas or local businesses.

The difference between Chapter 3 and Chapter 4 of the Environmental Code is that the national interests in Chapter 4 are geographical areas decided on as a whole. What applies to interests, regardless of whether they are designated pursuant to Chapter 3 or Chapter 4 of the Environmental Code, is that it has been a long time since the legislation was introduced. Although minor modifications, changes in approach and different policy initiatives contribute to interpretation of national interests with differing focuses.

Tab. 3 From the Environmental Code, Chapter 4, Section 1. Source: The Swedish Parliament, 2021.

Environmental Code (1998:808)

Chapter 4, section 1

Areas that are of national interest in their entirety

Section 1 The areas listed in Sections 2 to 8, taking into consideration the conservation values and cultural values in those areas, are of national interest in their entirety. Interventions by development companies and other environmental interventions may only take place if

1. *they do not encounter any obstacle under Sections 2 to 8 and*
2. *they are possible in a way that does not significantly harm the areas' conservation values and cultural values.*

The provisions of the first paragraph of Section 2 and of Sections 2 to 6 do not preclude development of existing urban areas or local businesses, or implementation of facilities necessary for total defence. And if there are special reasons, neither do the provisions preclude facilities for extracting deposits of substances or materials referred to in Chapter 3. Section 7, second paragraph. Act (2001:437).

4.6 The national authorities that can identify national interests and influence their interpretations

By looking at the design of national interests, it can quickly be established that coasts and seas have often been depicted from a rather narrow, sectoral land-related perspective. This is in part a consequence of a lack of knowledge, but it is also because of the difficulty of understanding the human and natural processes affecting our coast, our coastal waters and the open sea.

The authorities with formal legal responsibility under the ‘Regulation on land and water management’ for producing materials on matters that can be deemed to be national marine interests include:

- fishing (Swedish Agency for Marine and Water Management)
- energy production and energy distribution (Swedish Energy Agency)
- nature conservation and outdoor life (Swedish Environmental Protection Agency and Swedish Agency for Marine and Water Management)
- conservation of the cultural environment (Swedish National Heritage Board)
- extraction of materials (Geological Survey of Sweden)
- communications facilities (Swedish Transport Administration and Swedish Post and Telecom Authority)
- total defence (Swedish Armed Forces and Swedish Civil Contingencies Agency)

This has often resulted in a planning situation that, thanks to the structure of the national-interest system, has often meant that several different interests have been in exactly the same place, creating a lack of clarity as to what applies. This is only decided through a review, e.g. in the shape of an offshore wind farm, which needs to be in a suitable location. From a business standpoint the possibility of predictability has thus been limited, because the state has had many interests in the same place, without being able to rank them before a review, as the national-interest system is not designed to facilitate ranking of any of the interests.

Many operators have thus experienced poor predictability as to whether their particular project, which may be of national interest at the site, will take precedence over other national interests at the site. There are/have, for example, been places where offshore wind power, commercial fishing, protection of valuable natural resources, total-defence interests and shipping have been suitable uses in accordance with various national interests (or international agreements). This creates difficult conditions for businesses to make investments in the sea, because the outcome is not a given until the matter has been reviewed, and this can only be done when the conditions, technical solutions etc. have been described at a very detailed level – something that can be extremely detailed at an early stage, when the suitability of the location should be focused on.

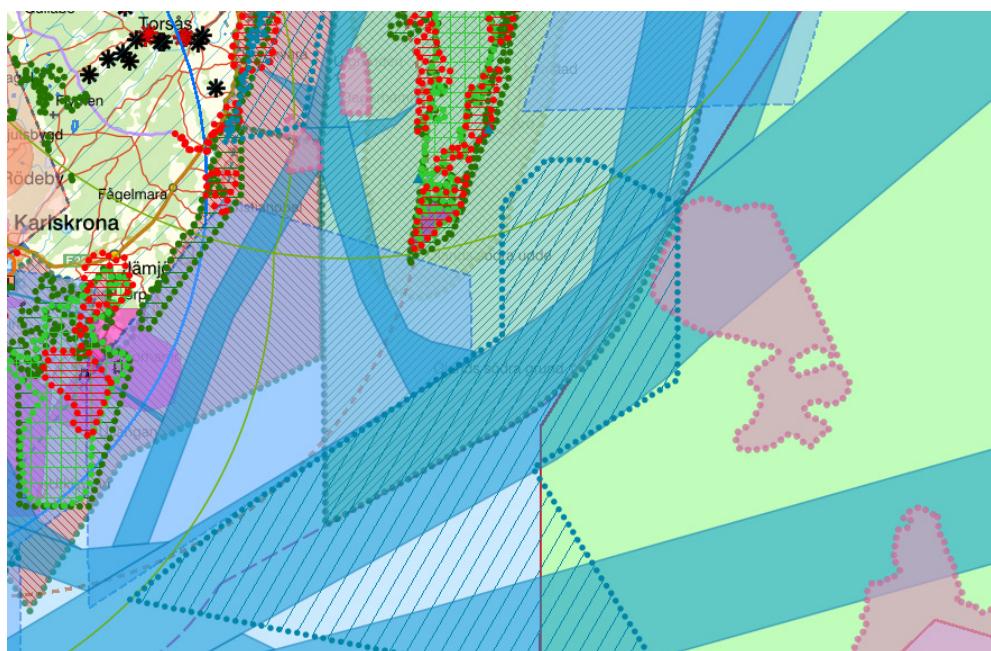


Figure 3: Examples from the Baltic Sea, south east of Kalmar County. On the shallow off-shore area Norra Midsjöbanken – there are at least four overlapping national interests at some places: national interest in energy production, Natura 2000 site under the Birds Directive, Natura 2000 site under the Habitats Directive, national interest in fairways and national interest in commercial fishing. Source: The County Administrative Board of Kalmar, 2021.

4.7 Information on national interests and their values

In planning context the state also has a responsibility (through the above authorities, which are responsible for identifying the national interests) to provide especially municipalities, but also other players, with information or so-called planning documentation. The planning documents are a way of providing the requisite information for a description or specification of the national interests. They are provided by the county administrative boards through the joint tool '*Planning Catalogue*' – a digital online tool (more information on the Planning Catalogue is to be found in the webinar part of the presentation '*Information, data, guidance and modelling in MSP in Sweden*').

Whilst sectoral data has been available, it has been hard to gain an overview of the general situation regarding all state-sector claims (and their possible consequences, if realised). The availability of good planning documentation and data on the sea in various respects has been difficult to produce and has often been deficient in terms of the many interests or regional and local geographical levels. One reason for the low level of interest may be the relatively few activities, compared with the number on land, that take place at sea. No-one has had any reason to be more interested in the sea.

In order to overcome the lack of information, some county administrative boards and/or municipalities have taken the initiative regarding various types of modelling and prediction, in order to try to create a picture of what the natural environments are like, so as to better be able to direct measures at places with the greatest need within the marine environment. But these models lack an important parameter: reliable, high-resolution bathymetric data that could provide a better picture of conservation values. This information is deemed confidential, owing to total-defence needs, thus it is not disclosed. This results in less precision in the modellings, making it harder to use conservation values at regional and local level.

Webinars

One of the main activities of the SEAPLANSPACE project was to deliver trainings to staff at local and regional administrations on MSP and sustainable marine governance. To this end, the Swedish project partners chose to organize four webinars for civil servants at municipalities and county administrations in the regions of Skåne, Blekinge and Kalmar.

The following four webinars were delivered:

1. Planning prerequisites in coastal and marine areas (26 January 2021)
2. Information, data, planning guidance and modelling (4 February 2021)
3. Positioning and prioritizations in coastal and marine areas (9 February 2021)
4. Municipal cooperation in the comprehensive planning of coastal and marine areas (16 February 2021)

Each webinar was composed by different presentations. These have been transcribed and are presented in text on the following pages.

References

- Blue Comprehensive Plan and Maritime Business Strategy of Northern Bohuslän (2018)
- Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014, establishing a framework for maritime spatial planning (2014)
- EU Water Framework Directive (2000/60/EC)
- EU Marine Environment Directive (2008/56/EC).
- Marine Spatial Plan for Blekinge's coastal municipalities (2019)

Sweden's Environmental Code (SFS 1998: 808)
Sweden's Marine Spatial Planning Regulation (SFS 2015: 400)
Sweden's Regulation on land and water management (SFS 1998: 896)
Sweden's Planning and Building Act (SFS 2010: 900)
Swedish Transport Agency (2019). Strategic plan for transition of the transport sector to fossil-free
Swedish Transport Administration (2019). Plan of action for domestic shipping and short sea shipping
Swedish Agency for Marine and Water Management and Swedish Board of Agriculture (2021). Common
strategy for Swedish fisheries and aquaculture
Swedish Agency for Marine and Water Management (2019). Proposals for Marine spatial plans for Sweden,
Gulf of Bothnia, Baltic Sea and Skagerrak/Kattegat 2019

This chapter was prepared by Robert Dobak; County Administrative Board of Kalmar, Sweden.

Robert Dobak
Länsstyrelsen Kalmar
Regeringsgatan 1
391 86 Kalmar, Sweden
robert.dobak@lansstyrelsen.se

Introduction to Marine Biology

Understanding the importance of coasts and seas starts with knowledge of the processes and biology at the interface between land and sea. Over the centuries people have settled on the coasts, because of food, transportation and housing. This has also had a great impact on the coasts and seas: to start with locally – and now globally. People are now rediscovering and realising the importance of many functions of nature: common eelgrass's stabilising effect on shallow seabeds, the effect of land-based wetlands on the reduction of nutrient inputs to the sea, and species' complex needs for different habitats during their various stages of life. It is thus becoming increasingly important to adapt human activities in planning, administrative and conservation contexts to the complex impact on a location.

1 Introduction to marine biology and the sea's physical processes

Globally the earth's coastal areas are home to around 600 million people or nearly 10% of the world's population (Oliver-Smith, 2009. United Nations University), whilst around 2.4 billion people or nearly 40% of the world's population live within 100 km of the coast (UN, 2017. The Ocean Conference). The low-lying coastal areas and the areas adjacent to them offer a wide range of livelihoods, with a firm financial anchoring that includes residential areas, industries, tourism and recreation and productive fishing areas. The value of coastal activities and the associated ecosystems accounts for around 75% of the global social economy, and represents a major component in terms of ecosystem-service values.

Our oceans generally have a salinity of about 35 parts per thousand (which means that 1000 g of oceanic salt water contains 35 g of dissolved nutritive salts), but these contents can greatly vary, depending on the conditions. For example, in the Baltic Sea, which is greatly influenced by large freshwater inflows from the rivers in the north, this leads to the water in the Gulf of Bothnia having an extremely low salinity (approx. 2 parts in a thousand). After that the salinity increases as one moves southwards in the Baltic Sea, and onwards towards Skagerack. The Baltic Sea's unique variations in salinity have a major impact on its organisms and ecosystems, as adaptable freshwater species can live together with saltwater species.

Cold water with a high salinity has a higher density than warm water with a low salinity. Big differences in salinity and temperature between different water masses lead to the formation of stratification, whereby heavier water settles nearest to the seabed and lighter water settles above it. The water masses can often be separated by a so-called halocline, which stops the light and heavy layers from mixing with each other. And the halocline can prevent oxygenated surface water from getting to the deeper parts, resulting in oxygen deficient or completely anoxic seabeds.

As well as the variations in salinity, light availability plays a major role for many of the oceans' photosynthesising plants. In clear, oceanic water, light can penetrate down to depths as great as 200 metres, whilst the water in coastal areas (which is affected by run-off and sediment from the coast) is much cloudier, and there is thus less visibility depth. Turbidity is affected by many different factors, whereby human activities (e.g. dredging or dumping of sediment) affect the light conditions, entailing a risk of adversely affecting photosynthetic organisms.

2 Coastal areas

The coast is where the land meets the sea. Coastal areas are extremely dynamic zones that accommodate a rich diversity of different plant and animal species, resulting in a high degree of productivity with many different ecosystem services. As the coast is easy to get to and examine, knowledge of our coastal areas is good, and there is a good level of understanding as regards the many

conditions. Various forms of physical processes, e.g. wave action, substrate erosion, sedimentation, light transparency, dehydration and salinity variations place different demands on organisms' adaptability. Distribution of the species is thus created – so-called zoning. Each species has a particular niche, which can mean that certain species live close to the shore, whilst others live in far deeper waters.

Big differences in ecosystem types are also found between hard and soft seabeds. On beaches with cliffs or other types of hard seabed one encounters species that are good at attaching themselves, e.g. algae, barnacles and mussels. Areas with a soft bottom, however, are suitable for species that dig or can anchor themselves to the sediments. Typical species from soft-bottomed habitats are various types of worm, burrowing bivalves and seaweed (e.g. eelgrass). It is notable that soft-bottom communities noticeably differ from hard-bottom communities in terms of species composition, physical processes and ecosystem services.



Figure 1: The bladderwrack is living on hard seabeds. The bladderwrack (as well as the eelgrass living on soft seabeds) are community forming species that works as a substrate for numeral other species. Source: Forstyrelsen, Åland, 2005

3 Estuaries

Other important and crucial marine areas are estuaries, or river mouths, where freshwater from rivers meets saltwater from the sea. In these areas towns or other types of activity often develop, as the areas are frequently protected from storms. Just like inland seas with their brackish aquatic environments, estuaries also have a naturally lower diversity, as few species can adapt to these types of conditions. On the other hand, these estuary species exhibit a high level of biological productivity. Thanks to the fact that nutrient-rich sediments accompany river water and can periodically flood areas suitable for

agriculture, estuarine areas all over the world have become popular habitats for humans. Thus they have also recently become some of the most polluted areas on earth.

4 Eutrophication and its effects in the Baltic Sea

The Baltic Sea, which in a broader sense could be likened to a large estuary, is a unique and fragile inland sea that places stringent demands on good governance and plans of action. The individual factor that has had the greatest adverse effect on the Baltic Sea is the input of nutrients (nitrogen and phosphorus) arising from agriculture in the countries around the Baltic Sea. Agriculture's increasing use of fertilisers and the drying of many land-based wetlands mean that large amounts of nitrogen and phosphorus are being transferred to the Baltic Sea. With higher levels of nutrients, the microalgae living in the sea are stimulated to achieve greater growth. The effect of this fast growth is to be seen in the explosive algal blooms that are being discussed in the news and media during the summer, as light irradiation and temperature in the water increase.

The algae gradually die and sink to the bottom as so-called 'marine snow'. On the bottom the plant parts are broken down by various types of bacteria, which during this degradation process use oxygen. Because the algae are present in enormous quantities, large amounts of oxygen are consumed, leading to oxygen-deficient or completely anoxic seabeds. In short, this means that the more organic matter there is to be broken down, the greater is the risk of the formation of areas with anoxic seabeds. Cod's ability to reproduce in the Baltic Sea is thus adversely affected, as they need access to areas of high salinity and oxygenated water (a combination usually found in very deep water). Although adult cod have a high tolerance of variations in the sea's salinity, cod is considered to be a saltwater species. Cod eggs have a lower salinity tolerance, and require higher salinity levels – when the deepest areas of the sea bottom in the Baltic Sea become anoxic, the eggs die. Eutrophication thus contributes to major adverse effects on the Baltic Sea's various cod stocks.

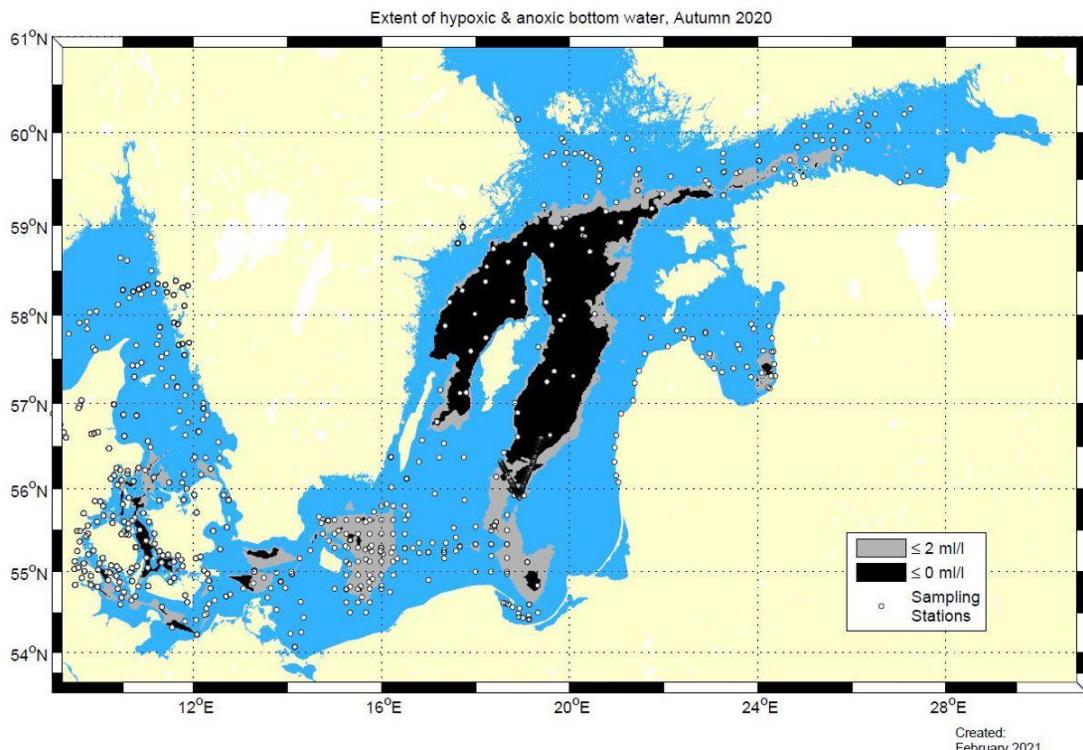


Figure 2: Picture showing oxygen depleted areas in the Baltic Sea during autumn 2020. Source: 'The Baltic Sea Oxygen report 2020' The Swedish Meteorological and Hydrological Institute, 2021.

5 Threat to the coast – coastal erosion

During the webinar the threat to our coasts and greater coastal erosion were discussed in connection with global climate change. Rising sea levels plus more violent and more frequent storms are creating more wave energy coming towards our coasts. Southern Sweden in particular is exposed to coastal-erosion effects, and is expected to be impacted more in the future. Along the coast of Skåne and Halland, where there are long beach areas and coastal settlements, there is an increased risk of infrastructure being impacted by climate change.

Coastal erosion is not a new problem, but in the past the traditional strategy has been to build groynes, concrete foundations and/or rock revetments to protect the coasts. More recently, increased understanding of coastal processes has led to the realisation that the old solutions often entail fresh problems, and can sometimes even speed up erosion.



Figure 3: Picture showing a construction that affects the erosion / accumulation of sands. Source: Peter Caputa, 2021.

Because of the problems of grey infrastructure, research has begun to involve studying other types of solution. One approach currently under evaluation is use of so-called ecosystem-based climate adaptations, whereby you work with instead of against nature. In an endeavour to prevent the effects of coastal erosion, researchers have recently begun studying whether restoration and replanting of seaweed, such as eelgrass (*Zostera marina*), can act as green infrastructure.



Figure 4: Picture showing a meadow of eelgrass. Source: Forstyrelsen, Åland, 2005.

Seaweed, which is related to ordinary shrubs and trees on land, migrated back to the sea about 75-100 million years ago. Worldwide there are 72 marine species that principally live on shallow soft bottoms along the coasts. Because seaweed has roots (unlike algae, which attach to their substrate using an attachment organ on hard substrates), they can anchor themselves in soft sand or clay. What has recently been discovered is that these roots bind coastal sand and prevent movements in the sediment. Seaweed's leaves have also been shown to have a positive effect in terms of reducing erosion, as they can attenuate the energy from waves and currents by up to 40%. Through a number of different projects in the counties of Kalmar, Skåne and Västra Götaland work is currently in progress on restoration of seagrass meadows. Seagrass meadows are worth protecting and preserving, as these environments also contribute to additional ecosystem services. Seaweed is a so-called community-forming species, and it also serves as a nursery for many commercially important fish species, whilst acting as important a carbon sink that binds carbon dioxide in the sediment.

With the lecture and this text, I've endeavoured to give a brief introduction to processes in the sea and marine biology – with a particular emphasis on the Baltic Sea. I've also wanted to emphasise the ecosystem services offered by the sea and our coasts, and show the risks of failing to look after the resources the sea offers. Although the sea and land markedly differ, the two environments affect each other and interact to a very high degree. The interaction between sea and land is continuous, affecting transportation of nutritive salts, biodiversity and many other processes. This means that measures on land often have a significant impact on the sea – and vice versa. This exchange has been ignored for far too long. With this webinar series there is the hope of increasing understanding of coastal and maritime planning. Developing an approach involving both sea and land is highly valuable in terms of coastal planning and exploration.

References

- FN, 2017. The Ocean Conference: One Planet. One Ocean: The Intergovernmental Oceanographic Commission of UNESCO. Paris. 2017. 68 pp. (English) IOC Brochure 2017-1
- Oliver-Smith, 2009. Linking Environmental Change, Migration & Social Vulnerability. United Nations University: Studies of the University: Research, Counsel, Education, Publication Series of UNU-EHS, No. 12/2009, United Nations University

This chapter was prepared by Johan Hollander; Sasakawa Global Ocean Institute / World Maritime University, Sweden.

Johan Hollander
World Maritime University
P.O. Box 500
201 24 Malmö, Sweden
joh@wmu.se

The importance of connectivity to marine planning

1 Introduction

In various ways human activities affect the possibility of plant and animal life living in the environments for which it has adapted. Species (and groups of individuals within a species) may be affected, e.g. when jetties are built or shallow waters are dredged, resulting in that the individuals are being cut off from contact with their conspecifics. The consequences are often that the landscape becomes fragmented from the species' point of view and that so-called connectivity deteriorates. Creation of knowledge about different species (and their movement patterns in the various phases of their lives) allows work that is more structured and considered, in order to protect many species. An understanding of the way different species move around the marine landscape concerns not only management and conservation issues but also many different types of human activity in the sea, not least spatial planning. Knowledge of species' connectivity within the marine landscape creates improved prerequisites as regards influencing site selection and precautions if establishment of environmentally hazardous activities have to take place along a stretch of coastline.

1.1 The importance of connectivity to marine planning

Different species of plants and animals normally have unique distribution patterns within the marine landscape. Species' distribution depends on many different factors – both abiotic (e.g. depth and bottom type) and biotic (e.g. interactions between prey and predators). Understanding underlying factors that determine species' distribution is crucial to ecology and a prerequisite for successful planning, management and protection of coastal and marine environments.



Figure 1: Spawning area for cod (Bornholm Basin) and dispersal of cod larvae to nursery areas. The colours indicate the dispersal from the spawning grounds around Bornholm, where the probability increases from blue to red. Source: Per Jonsson, 2021.

Not least, within the field of spatial planning and practical management the necessity for a landscape-ecology perspective becomes clear. From the landscape-ecology perspective, connectivity (or organisms' possibility of switching between different geographical areas) is a crucial consideration. For most species it is important to have access to several different types of environment or area, often with differing characteristics. They may, for example, be specific areas for reproduction, nursery grounds, wintering or protection. In general, it is also important for long-term survival that there be a sufficient area of high connectivity in order to maintain a sufficiently large population, not least in terms of genetic diversity.

1.2 Connectivity's important function in the coastal and marine landscape

Connectivity between areas of the coastal and marine landscape can arise in many ways. Biological connectivity arises when organisms can move from one area to another. In the sea many species have free-drifting eggs, larvae and seeds that can be passively transported by ocean currents for long distances – sometimes 100s of kilometres. But adult organisms such as fish can also actively move from one area to another. Sea trout, pike and herring, for example, migrate between coastal spawning and nursery grounds and foraging areas in the open sea. A serious current environmental problem is the fact that many habitats are becoming ever smaller. As well as the area decreasing in size, this often also leads to fragmentation involving isolated habitat islands with low connectivity in between. This reduces biodiversity. One such example is the loss of many areas of eelgrass, where a more cohesive distribution 40 years ago has broken up into smaller and more isolated meadows.

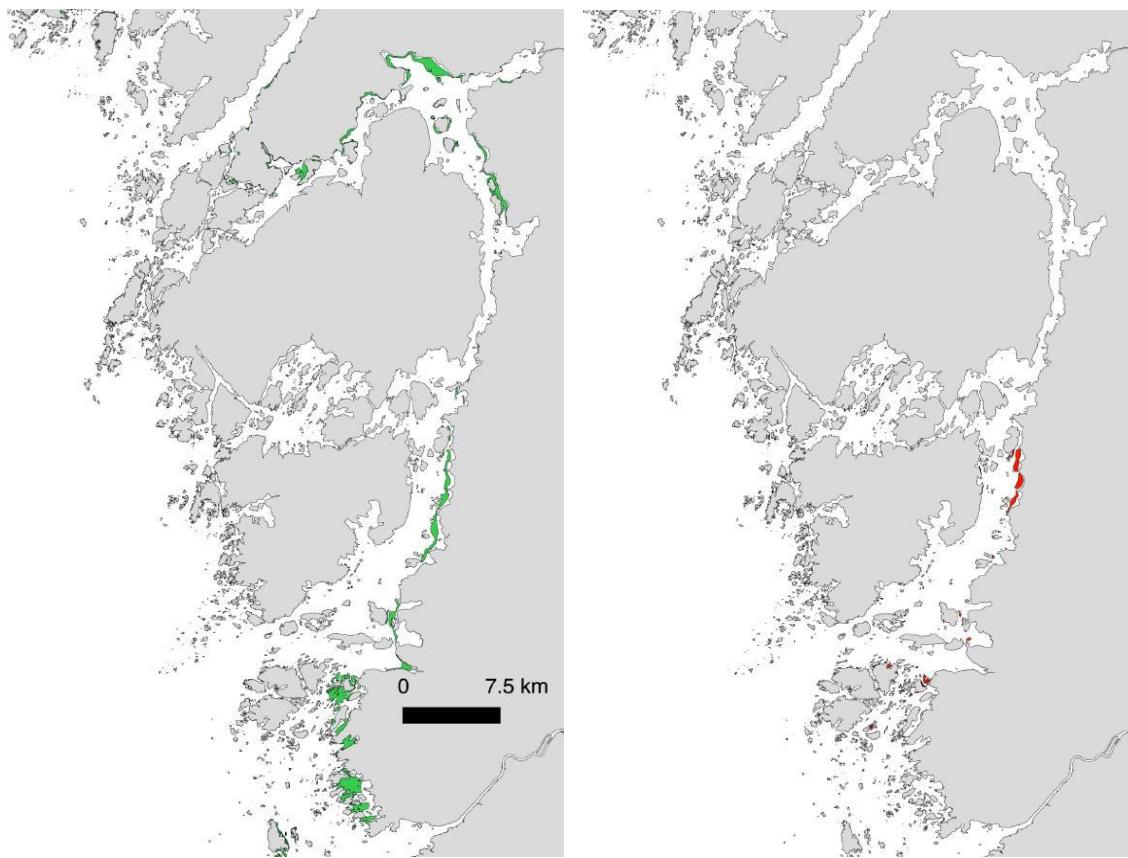


Figure 2: Loss of eelgrass in Skagerrak/Kattegat with a 90% decrease in many areas. Map on the left from 1980, map on the right from 2015. The red area indicates eelgrass meadows that have disappeared. Source: Per Jonsson, 2021

Over the years various structures such as ports, anchorages and jetties (often with associated maintenance in the form of dredging and effects of shipping traffic) have affected the seascape where they were built. Fragmentation can lead to a big cohesive population splitting up into smaller, partially

isolated local populations associated with differing degrees of dispersal. Such a population of many local populations is known as a metapopulation, and it places special demands on management, depending on the degree of connectivity. In a metapopulation, dispersal affects a number of different processes. Both ecological processes (e.g. population size, local extinctions and invasions of new habitats) and evolutionary processes (e.g. genetic diversity, adaptations to local environments and species formation) can have an impact on planning, management and nature conservation. From a landscape-ecology perspective, it can be said that connectivity is driven by a combination of dispersal capacity and the habitat's surface distribution.

2 The concept of 'Green infrastructure' in the sea

A new concept in the planning, management and protection of nature is 'Green infrastructure', the aim of which is to maintain connectivity between geographical areas and different ecological habitat types. The objective is to ensure both biodiversity and important ecosystem services for humans. A very important tool for the assessment of connectivity and 'Green infrastructure' is good habitat mapping of the marine environment. The situation as regards the different coastal and marine environments is lagging behind compared with the environment on land, though the ongoing national marine mapping will hopefully improve the state of knowledge. However, much of this mapping is based on modelling, and until adequate mapping is achieved it will be difficult to assess connectivity. A basic estimate of connectivity in the marine environment can be obtained through analysis of habitat distribution. One can measure dispersal using direct and indirect methods as well as modelling. They all have pros and cons, and combining the methods is usually advantageous.

2.1 Mapping of 'Green Infrastructure' using different methods

The commonest methods of creating a picture of how different places in the marine landscape are connected and how different species use them are:

- direct methods;
- indirect methods;
- modelling

For some species it is possible to track individuals in the landscape using a so-called '*direct*' method. The most traditional method is labelling and then recapturing (e.g. of fish, marine mammals and seabirds); you then get two positions for where each individual has been. There are now sophisticated active, electronic devices that can register and even transmit positions in high resolution. For many other groups of organisms, direct methods such as this are hard to apply. Direct methods are also time-consuming and expensive, and usually only a few individuals can be tracked. In many cases, however, they can provide very valuable information and complement other more indirect methods.

The commonest '*indirect*' method is use of genetic markers. There are many indirect methods, often based on several assumptions requiring advanced knowledge of population genetics. Put simply, a method is based on the similarity of genetic markers being determined for individuals throughout or in parts of the distribution area. The more similar the markers in different areas are, the greater the connectivity. A method often used in landscape ecology is estimation of connectivity based on habitat distribution. You can then measure how well areas with the same or differing habitats are interconnected. Mapping of habitat distribution creates a picture of any fragmentation and any barriers. This can be an effective method for coastal fish requiring vegetation-rich bottoms and/or access to several different types of environment.

Another method is '*modelling*', often for species chiefly dispersed by ocean currents. Examples are seeds of seagrass species (e.g. eelgrass) and free-drifting larvae from animal species (e.g. bivalves and starfish). A crucial tool in this context is an oceanographic model that can calculate water transportation using currents.

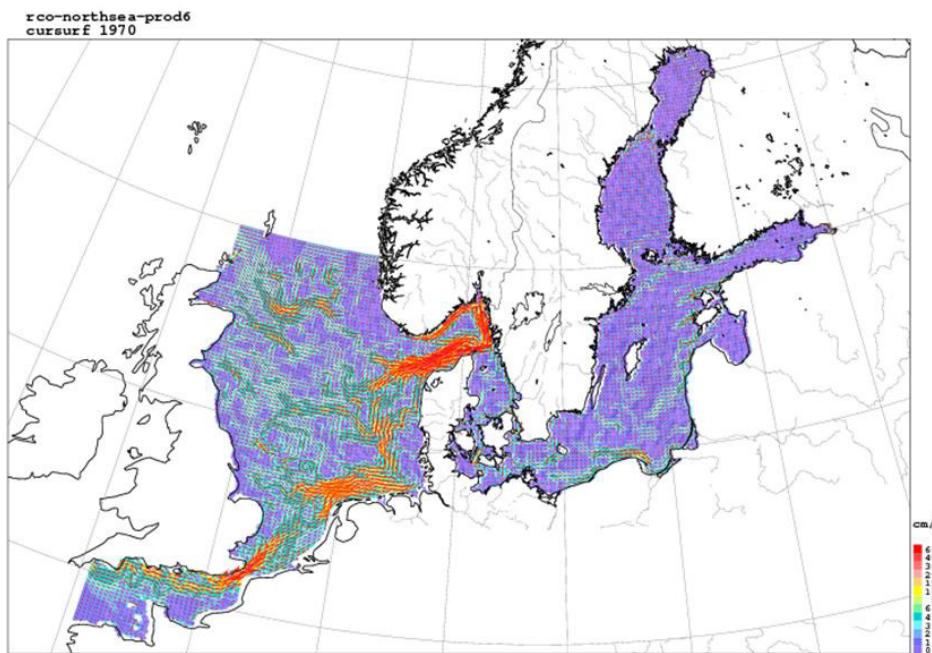


Figure 3: Modelling of dispersal and connectivity for species with the dispersion of spores, seeds and larvae driven by ocean currents. The NEMO-Nordic model of the Swedish Meteorological and Hydrological Institute (SMHI) is shown here. Source: Swedish Meteorological and Hydrological Institute, 2021.

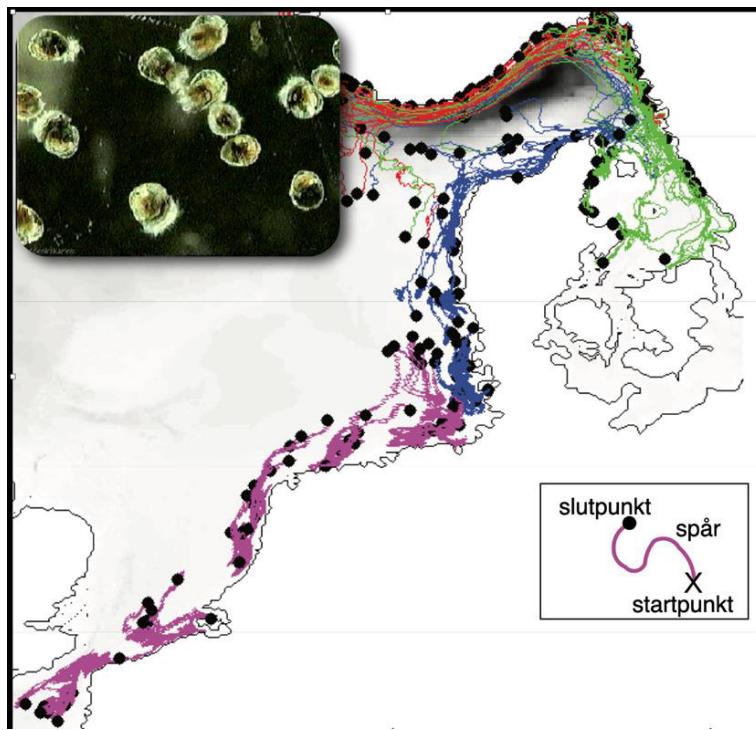


Figure 4: Biophysical model of ocean currents and larval biology showing the potential dispersal of different organisms (each organism being represented by one colour). “slutpunkt” = final destination, “spår” = track, “startpunkt” = starting point. Source: Per Jonsson, 2021.

An oceanographic model simulates dispersal through virtual particles being moved by modelled ocean currents. In such a biophysical model the particles can be given different biological properties in order to mimic larvae, for example. The chief features are the spawning time, how long the larvae drift in

the water and any behaviours – e.g. drifting at certain depths. Often many millions of virtual larvae are thus simulated so as to gain a good picture of the connectivity between many different areas. The model can also simulate what the variations might be like over time, e.g. from one year to another.

Although ocean currents determine much of the dispersal of free-swimming larvae, biology is important. For example, the dispersal distance is greatly influenced by the depth at which the larvae drift, and for how long and how far they drift before settling (falling to the bottom). It is often species-specific.

3 Application of methods when selecting areas that can be protected in coastal and marine environments

Using modelled dispersal data one can also examine the connectivity between areas protected on grounds of important conservation values, e.g. different nature reserves and/or Natura 2000 sites. When the number of dispersal days increases, more and more protected areas are interlinked. In some areas one sees that several protected areas act as networks – often something to be sought after. An important but often overlooked aspect of connectivity is effects on genetic diversity. A high level of genetic diversity is especially important in an environment in flux, where evolution of new adaptations can be crucial to future survival. Although the relationship between connectivity and genetic diversity is complex, it can by and large be said that fragmentation and impaired connectivity lead to less genetic diversity and decreased adaptability.

With few exceptions marine spatial planning (e.g. municipal comprehensive plans or national interests) is based on the characteristics of different geographical areas when adopting a position on the most appropriate use. Consideration is then given to the possible impact of the use in relation to the impact regarding various background factors. The impact can be deemed to be local as a result of a specific use, e.g. a marina, or large-scale, e.g. in the form of eutrophication or climate change. A major shortcoming of the methods employed is that use in all individual sub-areas is seen as isolated activities, i.e. with use in one area no consideration is given to the overall impact arising from several other areas. It is rarely taken into consideration that areas can be interconnected, i.e. that there are varying degrees of connectivity in the landscape.

The capacity for dispersal and connectivity can be critical when species change their distribution – e.g. in response to changes in the environment such as the ongoing climate change. Knowledge of habitats and species' varying needs for connectivity can be useful in many other contexts. For example, connectivity can be a factor to be taken into consideration regarding dispersal between areas involving different stressors, such as contaminants, sediments (from dredging and dumping work) and movement of debris and rubbish in marine environments. One aspect of connectivity concerning planning, management and protection of various areas is the importance of maintaining connectivity between spawning and nursery areas. There is also a general benefit to be gained from maintaining functional landscapes, i.e. creating the conditions for 'Green infrastructure' for various species in the marine environment. Similarly, it is important to consider ecologically functional networks when designating protected areas, e.g. through nature reserves and Natura 2000 sites.

Estimation of connectivity in practical management – as exemplified by eelgrass

In a landscape-ecology and landscape-genetics study the aim was to get a picture of the importance of connectivity for eelgrass (*Zostera marina*) on Sweden's west coast.

The objective was to reverse ongoing losses of areas where eelgrass grows, reduce the fragmentation of eelgrass stocks and test the prerequisites for restoration by:

- identifying the metapopulation's structure – dispersal paths and barriers
- estimating genetic diversity and genetically separate populations
- identifying suitable populations for restoration

- analysing the network of existing designated protected areas – possible improvements

As already mentioned, a good knowledge of a habitat's distribution is often a prerequisite; eelgrass is perhaps the marine species about which the most is known.



Figure 5: Eelgrass (*Zostera marina*) is also-called a ‘community-forming’ plant that offers habitats for many other marine species. Source: Per Jonsson, 2021.

As well as detailed information on current distribution, there are also historical inventories showing that in several areas there has been a dramatic decrease in eelgrass growth. Eelgrass is a community-forming species that provides several ecosystem services, but on a global level growth of eelgrass is estimated to have decreased by about 30%. Locally (or regionally), big reductions in growth of eelgrass can be seen, e.g. in Kattegat and Skagerrak, where in places the decrease is as much as 90%. One exception is Gullmarsfjorden on Sweden's West Coast, where the population has been relatively constant.

Connectivity was first estimated using genetic methods, and the results showed some differentiation. They indicate partial barriers between different areas, i.e. reduced connectivity. The genetic study was combined with modelling of the dispersal of floating seed capsules, which in the case of eelgrass drift with ocean currents. Dispersal in the oceanographic model showed largely the same barriers as were indicated by the genetic analysis. The dispersal model identified three relatively separate areas in the Gullmar region and around Marstrand that were extremely consistent in terms of genetic similarity.

The agreement with genetic analysis increased the credibility of the modelled connectivity, which was then refined, so as to allow an understanding of how different eelgrass meadows functioned within the network.

Using a connectivity-based network analysis such as this, it was possible to identify the eelgrass meadows that were important to the entire metapopulation. These eelgrass meadows scored highly in the continued analysis. Since the distribution of historical meadows was also known, it was furthermore possible to calculate whether certain meadows that have now disappeared had been of great importance to connectivity within the metapopulation. Such lost meadows should be given high priority in restoration work. A final analysis used both connectivity and information on the genetic diversity of various eelgrass meadows in order to model how genetic diversity can be expected to develop over the next 100 years. Modelling shows that based on current conditions there is a high risk of genetic depletion and local extinction around Marstrand, whilst things are looking far more positive for the area around Gullmarsfjorden.

To sum up, this eelgrass study showed:

- identification revealed partially isolated populations
- proposals regarding management units
- in this instance proposed management units tallied with bodies of water in the work on bodies of coastal water in accordance with the EU Water Directive
- analysis of connectivity and of current and future genetic diversity can enable identification of particularly valuable or threatened meadows
- network analysis can provide guidance on restoration of historical meadows with a major potential effect on the entire metapopulation
- the genetic study indicates suitable donors for restoration

References

- SMHI,NEMO-Nordic model: <https://www.smhi.se/kunskapsbanken/oceanografi/oceanografiska-modeller/oceanografiska-modellen-nemo-nordic-1.169170>. Swedish Meteorological and Hydrological Institute
- Jonsson, PR., Moksnes, P-O., Corell, H., Bonsdorff, E., Nilsson Jacobi, M., 2020. Ecological coherence of Marine Protected Areas: New tools applied to the Baltic Sea network. *Aquatic Conserv: Mar Freshw Ecosyst.* 2020; 30 : 743–760

This chapter was prepared by Per Jonsson; University of Gothenburg, Sweden.

Per Jonsson
Tjärnö
45296 Strömstad, Sweden
per.jonsson@marine.gu.se

Physical impact on shallow coastal ecosystems in Sweden

Shallow bays are attractive environments for many of our leisure activities that involve the use of various forms of boats. The large number of recreational boats (and the facilities required for them) in Sweden has a big impact on shallow coastal ecosystems. As they often act as the seas' nurseries, many different species are affected, including various types of cod, pike and eel. Protecting more and larger areas along our coasts and changing our behaviour when navigating in shallow marine areas in our boats creates opportunities to reverse the trend of negative impacts on shallow coastal ecosystems. Well-thought-out planning, management and conservation measures and, not least, changes in boating behaviour can help reduce the accumulated impact along the coasts.

1 Physical impact on shallow coastal ecosystems in Sweden

Shallow bays with vegetation are important nursery environments for fish in both the Baltic Sea and the Skagerrak/Kattegat. In the Baltic Sea and the Gulf of Bothnia they are nurseries for freshwater species such as perch, pike and zander. In the Skagerrak/Kattegat, where eelgrass is the predominant type of vegetation, the bays constitute important nursery environments for various cod species and many other fish species, e.g. eel.



Figure 1: Picture showing a shallow archipelago environment. Source: Forstyrelsen, Åland, 2005.

The presence of underwater plants in these bays is very important for the recruitment of fish along the coast. The greater the vegetation coverage in a bay, the more fry one will find (Hansen et al. 2019), and there is a positive correlation between the area of suitable environments for fish recruitment and adult fish stocks in a coastal area (Sundblad et al. 2014).

In addition to increasing the production of fish, underwater plants with several important ecosystem services help humans by:

- reducing climate change through absorption of carbon
- reducing eutrophication through absorption of nutrients
- reducing beach erosion through stabilisation of the bottom sediment
- improving water quality through removal of organic particles from the water and a reduction in sediment turbidification
- improving the area's recreational value through creation of clearer waters, nicer beaches, increased biodiversity and more fish

Examples of how soft-bottom vegetation can create clearer water by reducing turbidity are to be found in several places. In the Baltic Sea a positive link has been found between the amount of vegetation and the depth of visibility in the water in bays with varying shallowness (Austin et al. 2017). In Bohuslän, however, it was found that the depth of vision decreased by about two metres after eelgrass meadows disappeared when turbidification of bottom sediments increased (Moksnes et al. 2018). Overall these shallow, wave-sheltered bays and straits with their vegetation provide people with a number of important ecosystem services, e.g. increased biodiversity, increased production of commercial fish species, clearer bathing waters and reduced climate effects and eutrophication (Rönnbäck et al. 2007).

2 Different forms of human impact

There are many different types of impact in sensitive shallow waters. A lot of them are directly or indirectly linked to boat sports and utility traffic operating in our waters, or facilities used for these purposes. The different types of impact include:

- jetties and piers covering and shading sensitive underwater plants
- dredging and dumping that destroy bottom environments and spread turbid sediment over large areas
- changed current conditions around jetties, piers and dredging channels that affect the surrounding environment by altering water yield, sedimentation and water turbidity.

Jetties stop sunlight reaching eelgrass and other plants on the seabed. The degree of shading depends on the selected design – floating jetties, for example, cause twice as many adverse effects as piled jetties. 50-100% reductions in eelgrass have been measured around jetties. Over 500 ha (around 7%) of the eelgrass in Västra Götaland County has disappeared or been adversely affected by jetties (Eriander et al. 2017).

Dredging and dumping adversely affect vegetation through removal of sediments (dredging), covering of sediments (dumping), changed hydrodynamics (dredging + dumping) and turbidification and dispersal of sediments (dredging + dumping).

Dumping of dredged spoil has an impact in the form of increased turbidity, sedimentation, dispersal of nutrition and contamination. The sediment from dumping sites can be disseminated over distances more than 10 km from the dumping site, with significant sedimentation on various seabed habitats. At some marine locations there are approved dumping sites located less than 100 metres from protected Natura 2000 sites. In many instances there are areas rich in underwater vegetation, e.g. eelgrass areas, in the immediate vicinity of the dumping sites (Eriander et al., unpublished data). Eelgrass can be adversely affected by sedimentation on its leaves, both through shading and through reduced oxygen exchange.

Increased sediment in the water also harms fish recruitment and bivalves:

- through sedimentary particles on fish eggs creating oxygen deficiency and causing them to sink
- through sedimentary particles damaging and blocking fish-larvae gills
- by making it hard for fish larvae to find food
- through blocking of bivalves' filtration organs

3 The big impact of recreational boating

Unfortunately, these shallow coastal environments are also particularly sensitive to various types of disturbance, Swedes' great interest in recreational boating being one of the problems. To shed light on this, in 2019 the Swedish Institute for the Marine Environment brought out the report '*The impact of recreational boats on shallow coastal ecosystems in Sweden*', the objective of which is to compile scientific knowledge on the environmental effects of recreational boats, and to provide support for more sustainable management of recreational boating activities (Report by the Swedish Institute for the Marine Environment 2019:3).



Figure 2: Sailing boat – more environmentally friendly than motorboats in coastal, shallow areas? Source: Robert Dobak, 2021.

Boat traffic has an adverse impact on nurseries in these seas, in that propellers and anchors affect sensitive plant and animal species. Wakes and turbulence caused by motorboats lead to bottom erosion and give rise to turbid water in protected shallow areas where the bottom sediment easily clouds up. Studies of the Baltic Sea show that there is a negative correlation between the number of berths and the amount of vegetation in shallow waters; when the number of berths exceeds six per hectare,

bottom vegetation's coverage rate is reduced by up to 64% (Hansen et al. 2019). The cause of the negative link is not yet clear, but it is probably due to increased turbidity in the area brought about by motorboat traffic, as well as damage to vegetation brought about by propellers and anchoring activities.

Although individual recreational boats and jetties do not have that great an impact on the environment, by virtue of their large number they create a major cumulative effect in these shallow and sensitive environments. New aerial surveys show that there are currently over 110,000 jetties covering nearly 2,000 km of seabed along Sweden's coasts (Report by the Swedish Institute for the Marine Environment 2019:3). Based on the correlation that over six berths per hectare have an adverse effect on bottom vegetation, this survey suggests that nearly 20% of the coast's shallow soft bottoms are at present adversely affected by jetties and recreational boats. Even more worryingly, the current rate of exploitation of shallow soft bottoms is not decreasing (there being around 1,700 new jetties every year) – despite beach protection and many new protected conservation areas along the coast.

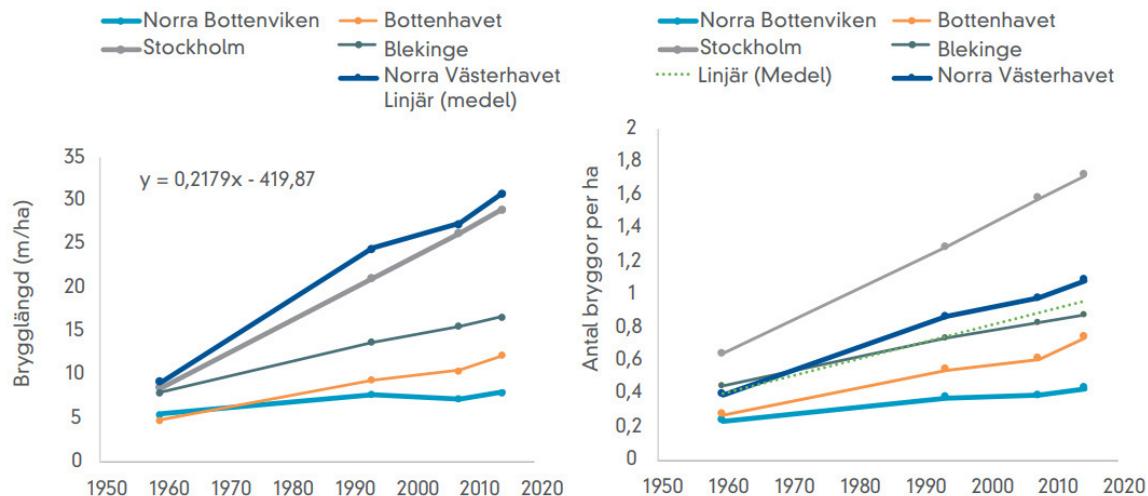


Figure 3: Results of analysis of focus areas, partly by area and partly as funds. On the left, results of mapping are shown as the number of metres of jetty per hectare of shallow wave-sheltered areas and on the right as the number of jetties per hectare of shallow wave-sheltered areas. Source: Swedish Institute for the Marine Environment, 2019.

To sum up, shallow coastal ecosystems in Sweden are currently subject to extensive negative physical impacts. In sensitive, wave-sheltered, shallow waters the cumulative environmental impact is currently serious, and development is not deemed sustainable.

4 How can we reduce physical impact in shallow coastal ecosystems?

Avoid exploitation of shallow wave-sheltered areas by:

- Apply a landscape perspective to coastal planning, and steer exploitation and boat traffic away from sensitive shallow waters.
- Set aside more and larger areas that protect valuable, sensitive shallow waters.
- Increase interest in and opportunities for storing boats on land during the summer, in order to reduce the need for berths and biocides.

Improve administration, follow-up and supervision by:

- Improving documentation and information on the impact of operations for administrators and decision-makers.
- Considering cumulative effects when assessing individual cases.
- Improving monitoring and supervision of permissible and impermissible operations and introducing national registers of jetty, dredging and dumping cases.
- Providing information that reducing motorboat speeds creates less wake.
- Informing boat owners that sensitive and shallow soft-bottom areas should be completely avoided.
- Informing boat owners that they should avoid anchoring in areas with sensitive flora and fauna. Buoy mooring should if possible be used, or the anchor should be lifted vertically, to reduce damage to the seabed.

References

- Austin ÅN, Hansen JP, Donadi S, Eklöf JS (2017) Relationships between aquatic vegetation and water turbidity: A field survey across seasons and spatial scales. PLOS ONE 12(8): e0181419. <https://doi.org/10.1371/journal.pone.0181419>
- Cole och Moksnes 2016. Valuing Multiple Eelgrass Ecosystem Services in Sweden: Fish Production and Uptake of Carbon and Nitrogen. *Frontiers in Marine Science* 2:121. doi: 10.3389/fmars.2015.00121
Cole SG and Moksnes P-O (2016); ", *Front. Mar. Sci.* 2:121. doi: 10.3389/fmars.2015.00121
- Eriander et al. 2017. The effects of small-scale coastal development on the eelgrass (*Zostera marina L.*) distribution along the Swedish west coast – Ecological impact and legal challenges, *Ocean & Coastal Management*, 148:182-194, 2017, Elsevier
- Hansen, J. P., Sundblad, G., Bergström, U., Austin, Å. N., Donadi, S., Eriksson, B. K., & Eklöf, J. S. 2019. Recreational boating degrades vegetation important for fish recruitment. *Ambio*, 48(6), 539–551. <https://doi.org/10.1007/s13280-018-1088-x>
- Moksnes, P.O., Eriander, L., Infantes, E. et al. Local Regime Shifts Prevent Natural Recovery and Restoration of Lost Eelgrass Beds Along the Swedish West Coast 2018. *Estuaries and Coasts* 41, 1712–1731 (2018). <https://doi.org/10.1007/s12237-018-0382-y>
- P Rönnbäck, N Kautsky, L Pihl, M Troell, T Söderqvist, H Wennhage 2007. Ecosystem Goods and Services from Swedish Coastal Habitats: Identification, Valuation, and Implications of Ecosystem Shifts, *Ambio* Vol. 36, No. 7 (Nov., 2007), pp. 534-544, Springer
- Sundblad, G., Bergström, G., Sandström, A., Eklöv, P. 2014. Nursery habitat availability limits adult stock sizes of predatory coastal fish. *ICES Journal of Marine Science*, Volume 71, Issue 3, March/April 2014, Pages 672–680
- Swedish Institute for the Marine Environment, 2019. The impact of recreational boats on shallow coastal ecosystems in Sweden. *Havsmiljöinstitutets rapport* 2019:3

This chapter was prepared by Per-Olav Moksnes; University of Gothenburg, Sweden and Sofia Wikström; Baltic Sea Centre, Stockholm University, Sweden.

Per-Olav Moksnes
Göteborgs Universitet
Box 461
405 30 Göteborg, Sweden
per.moksnes@marine.gu.se

Sofia Wikström

Östersjöcentrum
Stockholms universitet
106 91 Stockholm, Sweden
sofia.wikstrom@su.se

Information, data, guidance and modelling in MSP in Sweden

Marine spatial planning and management require access to both basic and detailed information, and in some instances maybe also creation of more specialised information for specific purposes. Looking at the guidance and the knowledge and planning documentation available for various contexts on various websites is a good start. For example, there is guidance on maritime comprehensive planning (on the Swedish National Board of Housing, Building and Planning's website), material produced within the state marine spatial planning process (on the Swedish Agency for Marine and Water Management's website) or various guidance such as 'Green infrastructure for the sea' (on the Swedish Environmental Protection Agency's website) or the Planning Catalogue (on the Planning Catalogue's/County Administrative Boards' website).

Information, data, guidance and modelling

Finding basic or more processed information on activities in the sea can sometimes seem complicated. The information is often not gathered in one place but is to be found in subsets with different data hosts or in different data sources. It is nearly always inadequate, and not that extensive – especially in comparison with the usual information on conditions on land. The difficulty in finding information thus reflects the sectoral approach that has also dominated coastal and maritime planning.

In general, the material available can be roughly subdivided into two areas:

- Information that provides the basis for spatial plans (knowledge base)
- Planning documentation

A knowledge bases can be said to be information ranging from analogue raw data to finished GIS layers. There can be big differences between different types of information, and perhaps not all metadata will be quality-assured – and maybe there won't be any data hosting, maintenance and updating either. But this type of information can be very useful when there is a shortage of data.

Planning documentation (as defined with regard to spatial planning) is above all information needed for management of national interests pursuant to Chapters 3 and 4 of the Swedish Environmental Code (SFS 1998:808) together with the related Swedish Regulation on Land and Water Management (SFS 1998:896). In this context it is the state's remit to specify and refine the information on national interests. This is done by central authorities producing information on their respective sectoral areas, then the county administrative boards compiling the investigations, plans, programmes and planning documentation that are important for management of land and water within the county. It is also the county administrative boards' responsibility to be responsible for information being made available (e.g. through the Planning Catalogue – see below). The municipalities can use the planning documentation in their planning work, when producing comprehensive plans and detailed development plans or when examining environmentally hazardous operations.

The county administrative boards may also propose that national interests should be added, and that demarcations should be reviewed or specified (or refined). One of the main purposes of the planning documentation is that the county administrative board should seek to ensure that the various authorities' national objectives are adapted to the regional conditions, and that they make an impact within the county. In the planning dialogue between the municipality and the state, the documentation forms the basis for advice and recommendations during the initial process, and in the final stage there is a check as to whether the interests have been served in certain specific respects. The planning documentation is also used when Chapter 2 of the Swedish Planning and Building Act (PBL, SFS 2010:900) is used by municipalities in conjunction with decisions on use of land and water areas.

It is worth noting that once the government has adopted the marine spatial plan(s), it/they will be the tool to be used with regard to national maritime interests. The marine spatial plans, when they are adopted, are the national maritime interests, and the document/cartographic service that everyone should turn to when it comes to maritime guidance about the states interests in the sea.

Planning Catalogue

The state authorities use the Planning Catalogue as a tool for provision of the information that has been produced. The Planning Catalogue consequently only contains information for which the state has been responsible in some context. For example, there are no municipal comprehensive plans in the Planning Catalogue (though there are audit statements by the county administrative boards, which form part of the adopted municipal comprehensive plan). Unfortunately, there is no equivalent to the Planning Catalogue from a municipal or business standpoint.

For use of the Planning Catalogue there are a number of guidelines to help visitors to the site. Use '*Help*' to access the '*Planning Documentation Search Manual in the Planning Catalogue*'. You can search by:

- geographical definition (e.g. national, county, municipality)
- planning status (e.g. soil and water regulations, planning documentation, factual data)
- topics or areas (e.g. marine spatial planning, development and spatial planning, climate, total defence)

Search results can take the form of PDF documents, downloadable datasets, websites, database portals or WMS services. In the Planning Catalogue you can also access a gross list of all materials that could be used for a planning strategy such as is mentioned in Chapter 3. Swedish Planning and Building Act (PBL).

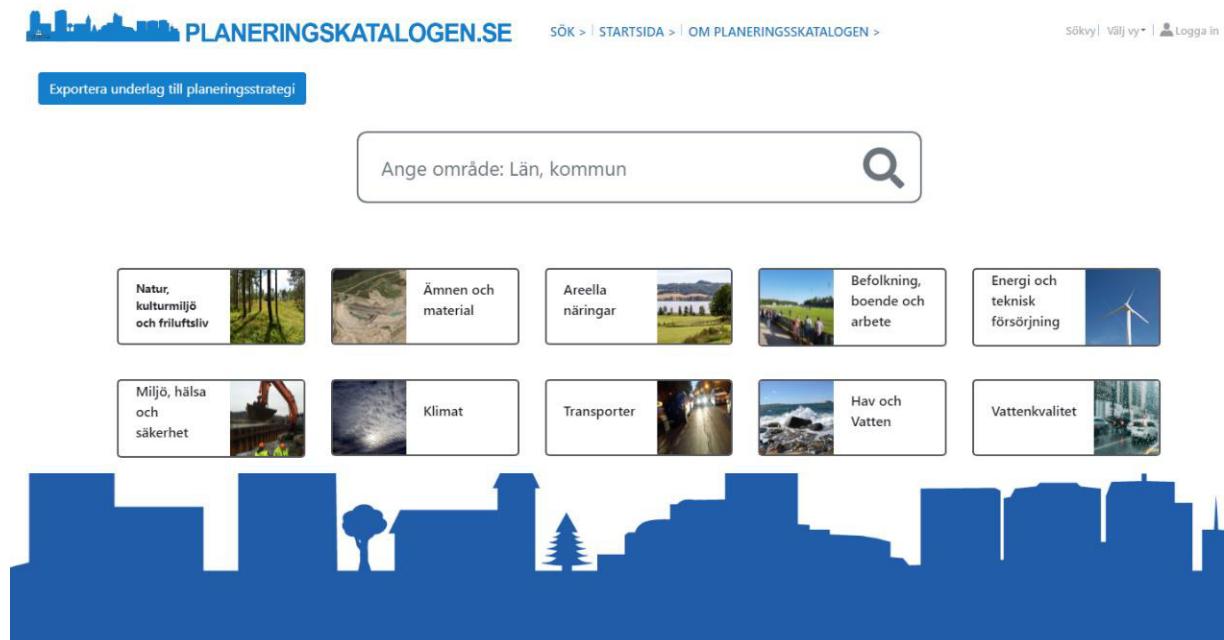


Figure 1: The internet interface in the Planning Catalogue when it is opened for searches. Source: County Administrative Board of Kalmar, 2021.

Methods and guidance

Formally the Swedish National Board of Housing, Building and Planning is the responsible, directive central authority in matters of spatial planning pursuant to the Swedish Planning and Building Act (responsibility for maritime guidance applies to the so-called territorial sea – or the area from the baseline out to a maximum of 12 nautical miles). With regard to preparation of the state marine spatial plans, the Swedish Agency for Marine and Water Management (SWAM) is responsible for drawing up a proposed marine spatial plan in cooperation with the other relevant government authorities (in accordance with the Marine Spatial Planning Regulation – SFS 2015:400). The Swedish Agency for Marine and Water Management does not, however, have any guidance responsibility equivalent to that of the Swedish National Board of Housing, Building and Planning.

As regards guidance and methods, it is possible to use the Swedish National Board of Housing, Building and Planning's guidance on 'Comprehensive planning for the coast and the sea'. The Swedish National Board of Housing, Building and Planning is the authority that municipalities should turn to when the sea is involved, in matters of master or detailed planning or production of a regional plan in accordance with the Swedish Planning and Building Act.



Översiktsplanering vid kust och hav

- Kommunal och nationell havsplanering
- Struktur och utformning ▾
- Maritima näringar ▾
- Klimatförändringar ▾
- Naturvärden ▾
- Friluftsliv
- Kulturmiljövärden
- Totalförsvaret
- Ordlista

Figure 2: The Swedish National Board of Housing, Building and Planning's guidance on coastal and maritime planning covers several topic areas. The pages include links to information on: Blekinge Archipelago, Tillväxt Bohuslän (Growth in Bohuslän), Maritime Strategy for Västra Götaland and much more. Source: Swedish National Board of Housing, Building and Planning (website), 2021.

Relatively extensive work may be available on individual topics – there may, for example, be work carried out under the auspices of the Swedish Environmental Protection Agency regarding endangered species or outdoor life on the coast and at sea. The Swedish Environmental Protection Agency has, for example, issued a report that provides guidance on green infrastructure in the sea – 'Green infrastructure in the sea – landscape perspectives in the management of Sweden's marine areas: Report 6930' – which may be of use in the work of mapping species' movement patterns, connectivity between different environments in the landscape and how outdoor life affects various conservation values.

Practical examples

As has just been mentioned, there are a number of practical examples of how data, guidance and maybe modelling have been used in the work of coastal and marine spatial planning. Some work deals with individual municipalities' comprehensive plans and other collaborations whereby municipalities have for various reasons joined forces in order to create a joint planning process.

The examples below only describe planning work with a view to drawing up a comprehensive plan for the coastal and maritime area. The list does not claim to be complete or exhaustive, but should be seen as a number of examples from which inspiration can be drawn:

Vellinge Municipality

The proposal 'Comprehensive plan for Vellinge Municipality's maritime area' has been issued, and is expected to be adopted by the City council in autumn 2021 (the documents used to make the proposal can be found on the municipality's website).

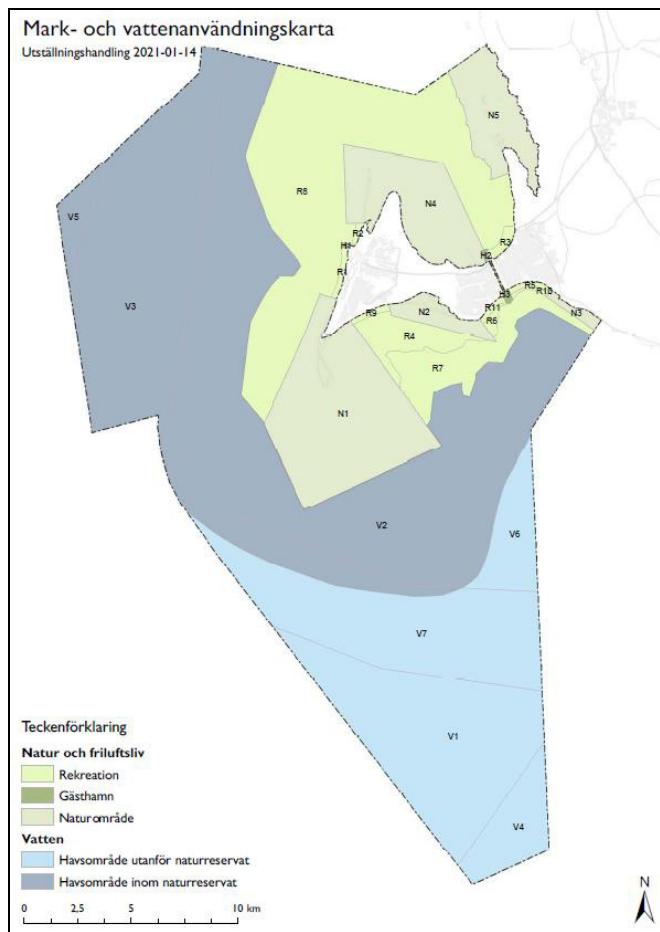


Figure 3: The proposal from Vellinge Municipality for the new comprehensive plan that also will cover the sea areas. N, R, V are indicating the most suitable way to use an area from the Municipalities point of view. Source: "Land and sea use map, proposal 2021-01-14". Vellinge Municipality, 2021.

Lomma Municipality

In the comprehensive plan dating from 2010 (currently being updated) the sea is included in the planning map, and is dealt with in the comprehensive plan.

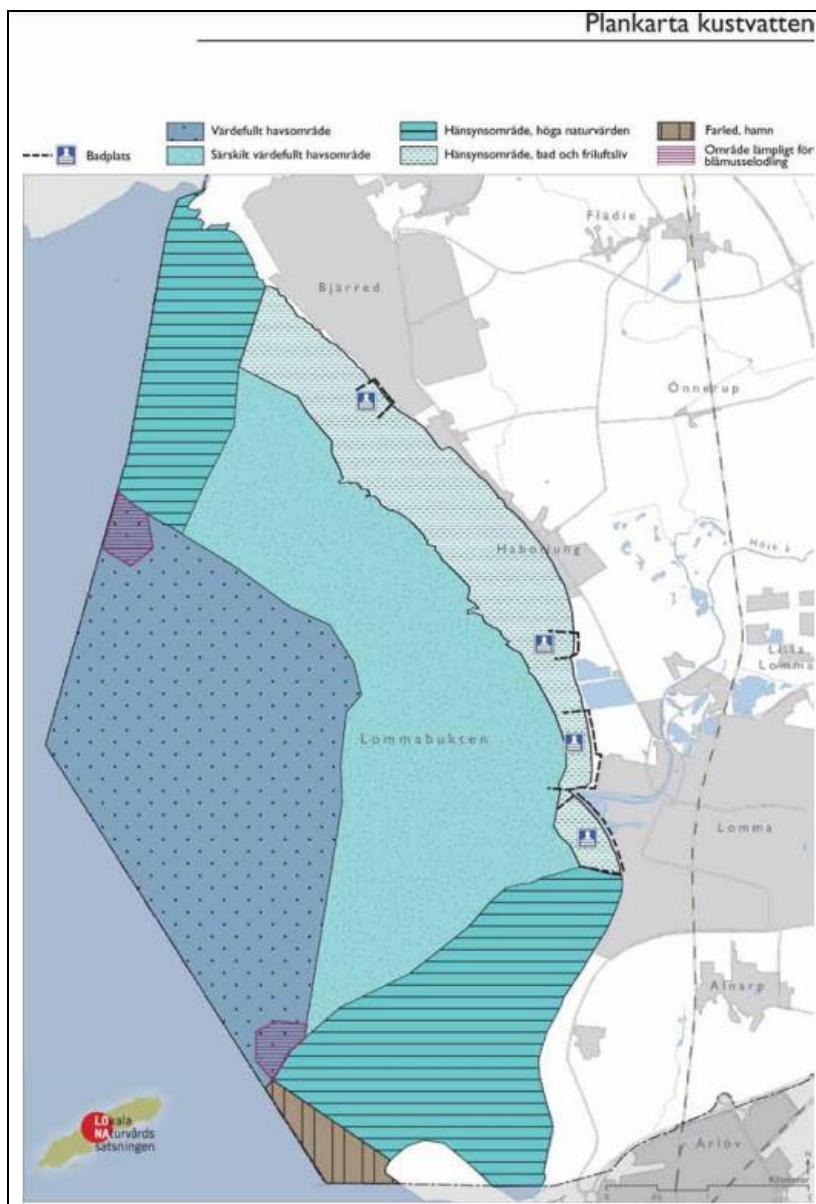


Figure 4: Lomma Municipality's current comprehensive plan shows different standpoints regarding the sea in the municipality. Source: "The 2010 Comprehensive plan for Lomma Municipality, 2010". Lomma Municipality 2021.

Sölvesborg Municipality

A new comprehensive plan is being drawn up in Sölvesborg. The current comprehensive plan, adopted in 2020, includes the option of producing offshore energy through wind power as one of the municipality's standpoints.

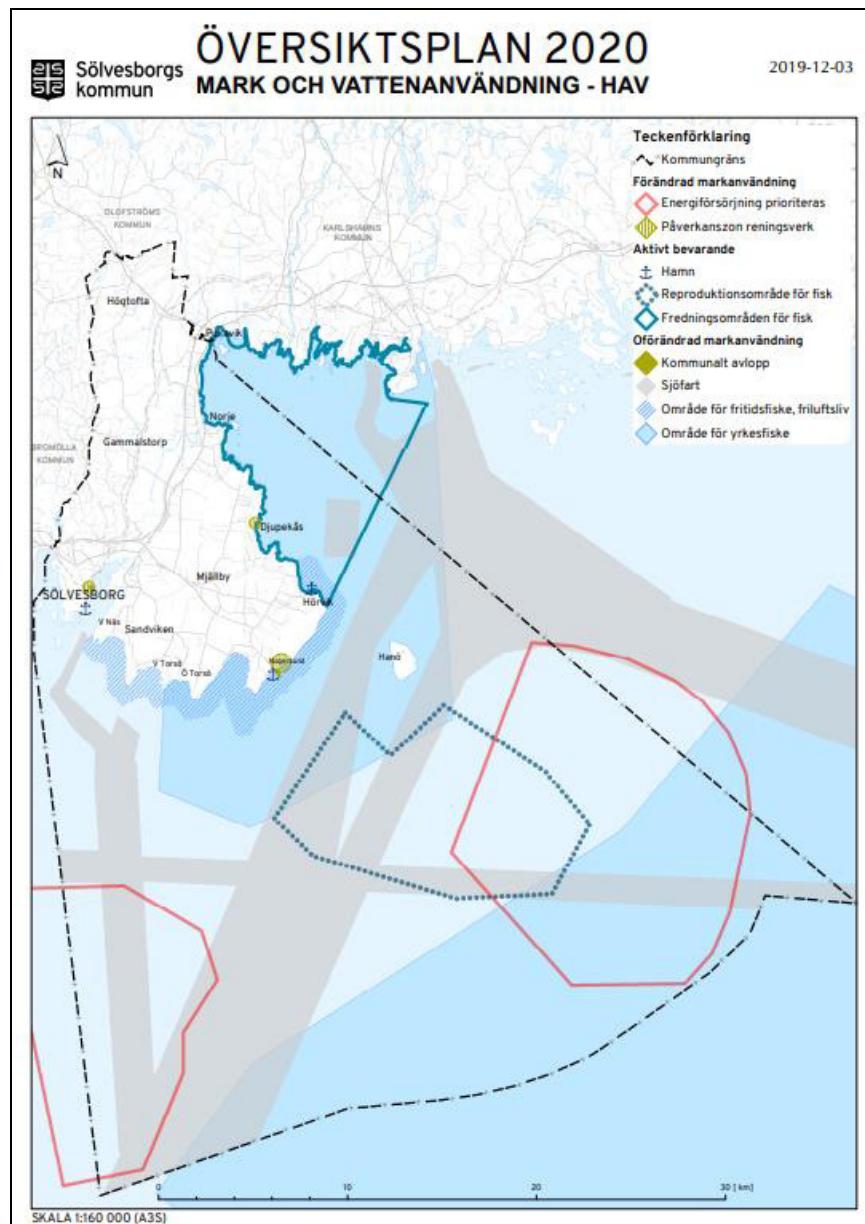


Figure 5: The ‘Land Use (at Sea-) map’, showing the area, with the aim of establishing offshore energy in Sölvesborg Municipality. Source: “Comprehensive plan Sölvesborg Municipality”, Sölvesborg, 2020.

Municipal collaboration

Regional planning is an approach that can facilitate coastal and maritime planning. On the other hand, a ‘regional plan’ is a more formal concept that appears in the Swedish Building and Planning Act and currently applies to the Stockholm and Skåne regions.

As regards the regional-planning approach, some examples were presented during the webinars. The basis for commencement of collaboration and what it resulted in can be found in the chapters:

4.1 ‘Marine spatial plan for Blekinge’s coastal municipalities’

4.4 ‘Blue comprehensive plan and maritime business strategy’

In Västra Götaland there are also initiatives such as the ‘Programme of action for sustainable maritime industries’ and the ‘Maritime strategy for Västra Götaland’.

Regarding the regional-plan concept, there is some information on regional approaches, e.g. in Region Skåne's 'Regional Plan for Skåne 2022-2040', which has been out for consultation in 2021 (detailed information is available on Region Skåne's website). Other examples can be found in Region Stockholm's "Sustainable regional growth and archipelago development", with an emphasis on regional economic growth and archipelago development (detailed information is available on Region Stockholm's website).

Basic information, modelling and probability assessments

It can sometimes be hard to find information on regional or local geographical conditions with regard to the coast and the sea. If there is a possibility of establishing collaboration, e.g. between regions, municipalities and county administrative boards, in order to create greater knowledge within an area, then this is a rational way of working.

Through the KOMPIS collaboration the Swedish Agency for Marine and Water Management distributed money to the county administrative boards, which in turn granted money for suitable projects. The collaboration created many positive initiatives on use of the various knowledge bases in conjunction with coastal and marine spatial planning. The projects are summarised and presented in the project report 'Final report on the KOMPIS grant – Municipal coastal and marine spatial planning in state collaboration during the period 2016-2018', and can be accessed on the (coastal) county administrative boards' websites.

Other initiatives may include using existing local (or regional) data on the sea in order to try and create probability predictions regarding the existence of species in certain locations. With basic knowledge of where the various species are actually to be found, perhaps using data collected through various forms of field study, it may be possible to run a model, and to model where there is a major likelihood of the species existing. Using knowledge of directions, degree of exposure to waves and depth (with several variables), it is possible to use various tools to create images of possible locations where the species could thrive. The Swedish Agency for Marine and Water Management has produced a report on a method called Mosaic ('Mosaic – tools for ecosystem-based spatial management of marine conservation values', Swedish Agency for Marine and Water Management, 2020), which has been used in Blekinge by the municipalities and the county administrative board. The uncertainty of the calculations in the various modellings is checked using field verification.

Through the ongoing work on coastal and marine green infrastructure, more predictive and modelling work will be necessary in order to be able to say with a high degree of probability that species are to be found at various locations in the sea.

References

- Lomma Municipality: Comprehensive plan Lomma Municipality: the comprehensive plan from 2010 (which is being updated), the sea is included in the plan map and is dealt with in the comprehensive plan:
<https://lomma.se/>
- Maritime Spatial Plan for Blekinge's coastal municipalities (Municipalities Sölvesborg, Karlshamn, Ronneby and Karlskrona) <https://www.karlshamn.se/kontaktkort/havsplan-for-blekinges-kustkommuner/>
- National Board of Housing, Building and Planning: Guidance for comprehensive planning in the sea:
<https://www.boverket.se/sv/PBL-kunskapsbanken/planering/oversiktsplan/allmanna-intressen/hav/>
- Region Skåne: 'Region-plan for Skåne 2022-2040': <https://skane.maps.arcgis.com/apps/MapSeries/index.html?appid=84ac9b4bad2a496b9ec4130fd41b2f51>
- Region Västra Götaland: 'Sustainable maritime businesses': <https://www.vgregion.se/regional-utveckling/program/hallbara-maritima-naringar/>

Region Stockholm: with a focus on regional growth and archipelago development:

<https://www.sll.se/verksamhet/Regional-utveckling/stod/stod-till-service-i-skargarden-och-landsbygden/hallbarhet--regional-tillvaxt/>

Swedish Agency for Marine and Water Management (SWAM), 2020. Mosaic – tools for ecosystem-based spatial management of marine natural values: <https://www.havochvatten.se/vagledning-foreskrifter-och-lagar/vagledningar/ovriga-vagledningar/mosaic---ett-verktyg-till-stod-for-forvaltning-av-naturvarden-i-marina-omraden.html>

Swedish Agency for Marine and Water Management, (2021) The State marine planning process (on the Swedish Water and Maritime Administration's website): <https://www.havochvatten.se/planering-forvaltning-och-samverkan/havsplanering.html>

Swedish Environmental Protection Agency (2020): Green infrastructure in the sea – landscape perspective in the management of Sweden's marine areas. Rapport 6930 <https://www.naturvardsverket.se/978-91-620-6930-8/>

Söderköpings Municipality: Comprehensive plan Söderköping Municipality: the development of a new comprehensive plan is underway. The current master plan, which was adopted in, includes the possibility of producing offshore energy through wind power as one of the municipality's positions: <https://söderköping.se/tjanster/publikationer/2019/slutrapport-over-kompis-bidraget.html>

The County Administrative Board, 2019. Final report on the KOMPIS grant – Municipal coastal and marine planning in state collaboration during 2016-2018: <https://www.lansstyrelsen.se/västra-götaland/tjanster/publikationer/2019/slutrapport-over-kompis-bidraget.html>

The Planning Catalogue of the County Administrative Board: <https://ext-geodatakatalog-forv.lansstyrelsen.se/PlaneringsKatalogen/>

Vellinge Municipality: Comprehensive plan Vellinge Municipality: proposal for a new Comprehensive plan for Vellinge municipality's sea area (to be adopted in the Autumn of 2021). <https://www.vellinge.se/>

This chapter was prepared by Robert Dobak; County Administrative Board of Kalmar, Sweden.

Robert Dobak
Länsstyrelsen Kalmar
Regeringsgatan 1
391 86 Kalmar, Sweden
robert.dobak@lansstyrelsen.se

Green infrastructure – coast and sea

1 Introduction

In the field of nature conservation, it has become increasingly important not only to preserve individual species or individual valuable geographical areas but also to ensure the links and opportunities for exchange between different geographical areas. These factors have consequently also become important considerations to be taken into account in planning and management contexts. The aim of the method and the meaning of the term ‘Green Infrastructure’ (GI) is identification and specification of values important to nature conservation and outdoor life in the landscape. The work can result in documentation of knowledge and planning that is necessary to various players in many contexts. The increased knowledge enables work on strengthening connectivity between different areas for many of the ocean's organisms. In Blekinge the county administrative board and the coastal municipalities have together used the method in conjunction with the municipality-wide collaboration in order to develop a joint municipal plan regarding the sea through municipal comprehensive planning.

2 Green infrastructure – coast and sea

Over the years the Swedish landscape has become increasingly uniform. Larger-scale and more intensive farming has meant that huge, uniform forest areas and arable land have replaced the former more diverse landscapes. Similarly, the coastal and marine areas have been affected by various human activities such as boat traffic and facilities needed for the boat traffic. Over the years, many habitats have decreased in size and many species have become less abundant compared to only 50 years ago. This development has meant that the many species' habitats have been destroyed (or severely depleted), in turn leading to reduced biodiversity. All over the county of Blekinge there are still areas of particularly high biodiversity. They often also provide important ecosystem services that benefit people, e.g. through hiking trails and other outdoor activities. This in turn creates good conditions for nature tourism.

Green Infrastructure, as a method, is based on prioritising biodiversity and ecosystem services and integrating them into spatial planning and local & regional development. Once the landscape's values have been identified and pinpointed, with the correct knowledge it is possible to see how the areas affect each other and thus what the needs and opportunities are. This knowledge is important in order to facilitate planning of long-term sustainable landscapes, e.g. regarding agriculture and forestry, community planning, water use and conservation work.

Green infrastructure describes not only an approach but also various forms of physical natural environments. According to the Swedish Environmental Protection Agency, green infrastructure is defined as '*... ecologically functional networks of conservation areas and eco-value structures managed in such a way as to preserve biodiversity and promote ecosystem services throughout the landscape*'. The work on green infrastructure involves a particular emphasis on conservation, and has its point of departure in basic ecological theory. This means that species diversity and the size of local species populations generally increase with the quality and size of the areas. The reverse relationship is similarly assumed to apply, namely that species diversity and the sizes of local populations decrease with increased isolation and fragmentation. There have to be enough different habitats of sufficient quality and mutual proximity in order to allow ecosystems to continue to function. If nature is interconnected, then flora and fauna can move and spread throughout the landscape, thereby increasing biodiversity.

3 Crucial concepts – core areas and conservation cores

The components of green infrastructure can be described as follows:

- **Conservation core:** a conservation area with high conservation values that is particularly important as a bearer of biodiversity within the landscape. Many species have been identified or can be expected to be found at the location, given the area's characteristics. The area is an important habitat for many species, and is often classified as a conservation type.
- **Core area:** a core area is a bigger section of landscape featuring high ecological conservation values. Core areas have a greater density of networks, individual conservation cores and other important habitats. There are better conditions here for good dispersal and survival of flora and fauna than in surrounding landscapes.

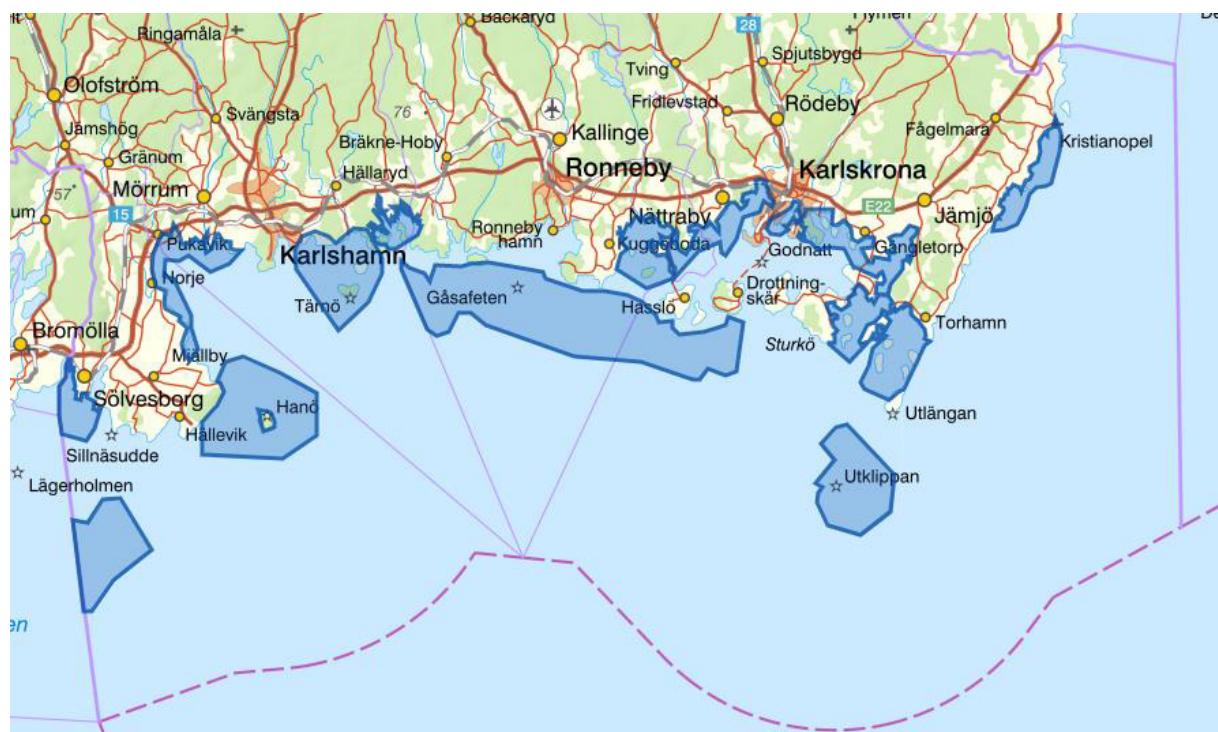


Figure 1: Coastal and marine core areas in Blekinge. Source: County Administrative Board of Blekinge (internet-based cartographic service), 2021.

The core areas constitute one of the cornerstones of the county administrative board's green infrastructure work in Blekinge. The core areas have so far been coordinated within the following categories:

1. Forest and Woodland
2. Arable Land
3. Lakes and Watercourses
4. Coast and Sea

The County Administrative Board of Blekinge has developed the core areas based on existing knowledge of the county's conservation values. In a core area it is advisable to preserve and strengthen

the designated conservation type. This means measures to preserve existing conservation cores and, if necessary, to increase the area, improve the quality or reduce the distance between the core areas. A regionally based survey to find the most valuable outdoor areas is also in progress. A regionally based process for developing core areas for wetlands from has also begun.

In a cartographic service, the County Administrative Board of Blekinge is presenting conservation cores and core areas for the various categories. An example is the coast and sea in the county of Blekinge, which boasts high conservation values and rich cultural environments. Core areas for 'Coast and Sea' are the areas with the highest scores in a conservation-value assessment, which means they are species-rich and contribute a number of different ecosystem functions. These ecosystem functions are often linked to coastal sea areas with abundant underwater vegetation. Thus the cartographic service can also show areas with good prerequisites for the presence of underwater vegetation.

The cartographic documentation of green infrastructure in Blekinge is gathered in a regional cartographic service for green infrastructure, and can be accessed via the following link:

<https://ext-geoportal.lansstyrelsen.se/standard/?appid=f7635ca3e7644b60abdec9ad5c679b49>

In each core area, core-area descriptions will gradually be made available, and will contain texts on the following areas:

- General information
- Conservation values
- Landscape context
- Current use
- Ecosystem services
- Challenges
- Consideration regarding testing and planning
- Need for action
- Stakeholders

County Administrative Board of Blekinge is using green infrastructure as a long-term approach. The goal is to continuously increase knowledge of landscape values, as well as the various players' awareness of the importance of factoring in geographical connections in all planning, management and conservation issues. The green infrastructure platform (and the related cartographic service) is an initial step, and the preparation of knowledge bases and the launch and communication of the concepts 'green infrastructure' and 'ecosystem services' constitute an important component. The green infrastructure documentation can be used in municipal planning concerning the sea, e.g. in the collaborative project started in Blekinge in 2014, when the four coastal municipalities commenced preparation of a detailed joint comprehensive plan regarding the sea. Right from the start, work involved harmonisation of marine green infrastructure and coastal & maritime planning, since the aim of both assignments was to create sustainable use of marine resources.

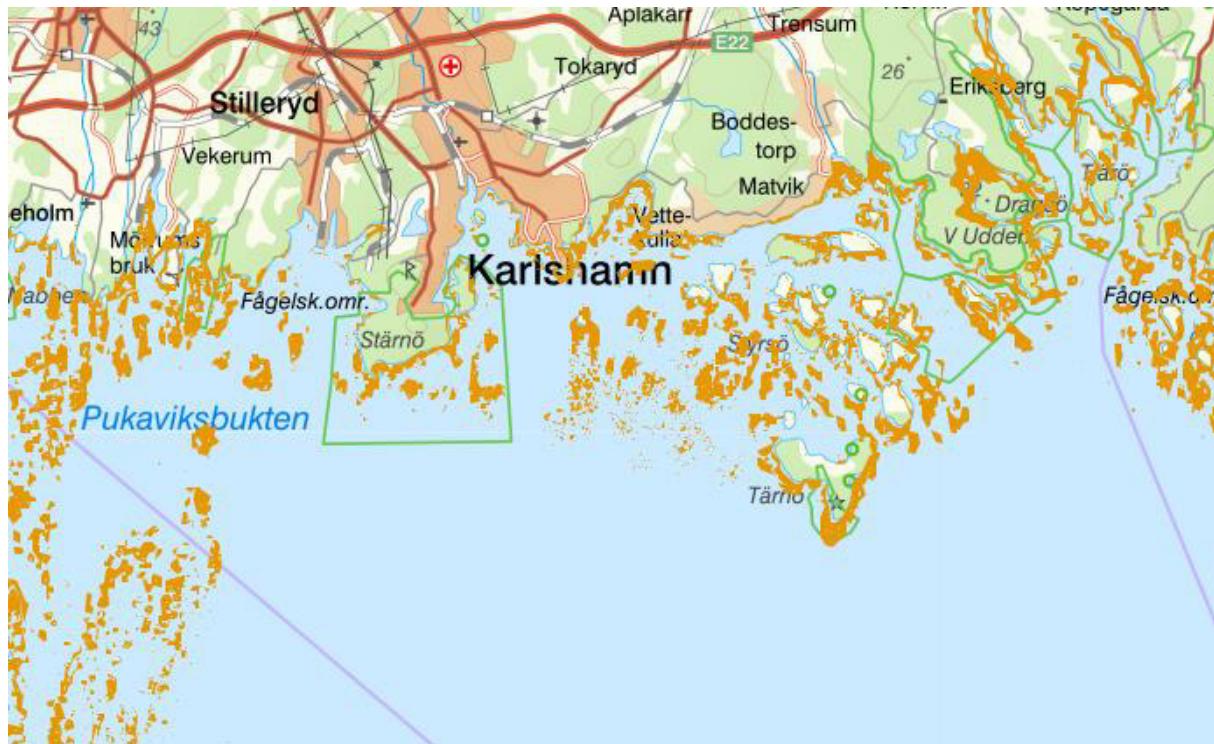


Figure 2: Conservation cores – the image is based on indications of where there may be conditions indicating the possible presence of large perennial macro algae such as bladderwrack (*Fucus vesiculosus*) and toothed wrack (*Fucus serratus*). Source: County Administrative Board of Blekinge (internet-based cartographic service), 2021.



Figure 3: Conservation cores – the image is based on indications of where there may be conditions indicating the possible presence of underwater vascular plants such as eelgrass (*Zostera marina*) and various pondweed species. Source: County Administrative Board of Blekinge (internet-based cartographic service), 2021.

References

In an internet based map service, Blekinge County Administrative Board presents value cores and value areas for the various categories:

<https://ext-geoportal.lansstyrelsen.se/standard/?appid=f7635ca3e7644b60abdec9ad5c679b49>

This chapter was prepared by Erkki Palmu and Anothai Ekelund; County Administrative Board of Blekinge, Sweden.

Erkki Palmu
Länsstyrelsen Blekinge
371 86 Karlskrona, Sweden
erkki.palmu@lansstyrelsen.se

Anothai Ekelund
Länsstyrelsen Blekinge
371 86 Karlskrona, Sweden
anothai.ekelund@lansstyrelsen.se

Local sustainable solutions to global and regional challenges in the Blekinge Archipelago Biosphere Reserve

Within the Blekinge Biosphere Reserve work is in progress on preserving and developing the high conservation and cultural values to be found in the area. Through collaboration between municipalities, government authorities and, not least, land and forest owners active within the area, the Blekinge Archipelago association is working on the long-term sustainable development of business and society. Various projects, e.g. ARK 56, are contributing to a more sustainable outdoor life by disseminating knowledge and commitment amongst all involved. Through so-called ‘ambassador training’ the networks are making it more possible for more people to become better informed about Blekinge Biosphere Reserve.

1 Local sustainable solutions to global and regional challenges in the Blekinge Archipelago biosphere reserve

In 2011, following a thorough application process, UNESCO conferred the title of '*Biosphere Reserve*' on Blekinge Archipelago association. The award is proof that there are significant, unique conservation and cultural values that need to be optimally preserved and managed for the future and for future generations. At the same time, business and society should be able to develop sustainably in the long term.

In order to preserve, support and develop Blekinge Archipelago in achieving the UN's Agenda 2030 sustainable development goals, a strategic tool and a business plan have been developed. They are updated every year. The strategic tool includes descriptions of the five areas of intervention that constitute the basis of what the Blekinge Archipelago association wishes to work on and strive for. The areas of intervention are linked to the various steering documents' objectives. New methods are being tested, new knowledge is being sought, information is being disseminated and new networks are being established so as to provide examples of how a conservation area can be preserved – whilst people are living and working there.

In the areas of intervention various topic areas, projects and activities are selected, each topic area being designed to promote one or more of the areas of intervention. In order to give the work further direction and focus, each activity has been given its own goals, approaches, time frames and collaborating parties, and has been allocated to a topic area. The topic areas are currently (2021) '*Information, learning and participation*', '*Sustainable tourism*', '*Keeping the biosphere clean*', '*Sustainable fishing*' and '*Sustainable agriculture and forestry*'.

2 A more sustainable hospitality industry

Challenges raised by the topic '*A sustainable hospitality industry*' are lack of profitability, lack of collaboration and inaccessibility. Part of the challenge is that the operations are not circular, which means they generate unsorted waste, fossil-fuel-based transportation and consumption of energy from non-renewable sources. Despite these challenges, the Blekinge Archipelago association in collaboration with academia and business, municipalities, county administrative boards and private members wishes to support, develop and preserve a sustainable hospitality industry. This has been done by creating a route for sustainable visits to the biosphere reserve – a so-called archipelago route. This project has been entitled ARK 56, and it comprises linked coastal routes within the UNESCO biosphere reserve. ARK 56 offers fossil-free access on foot and by bicycle, kayak or boat. Thirteen hubs interlink the trails, and offer food, accommodation, experiences and in some cases the option of changing your mode of travel. ARK 56's objective is to make the coast and the archipelago accessible

both to Blekinge residents and to visitors. A key factor in the project's success is the high degree of participation and commitment of the 60 participating companies.



Figure 1: ARK 56 – map showing trails and service hubs. Source: ARK 56 – suggested tour, Blekinge Archipelago (website), 2021.

Other objectives within '*A sustainable hospitality industry*' are 0 % unsorted waste, reduced quantity of waste, no trace of visitors, greater use of renewable energy and promotion of sustainable transport. In order to achieve these goals, the handbook '*Sustainable development within the hospitality industry*' has been developed in collaboration with the Southeast Sweden energy agency 'Energikontor Sydost' and by agreement with the Swedish hospitality-industry body Visita. The handbook is a guide to more sustainable entrepreneurship.

3 Development and use of new working methods

Blekinge Archipelago also supports the development and use of new technology in municipal and industrial wastewater treatment plants. The new technology allows removal from the water of contaminants consisting of microplastics, medicines and bacteria previously discharged by the treatment plants. Simrishamn is an example of a location where the new technology has been successfully installed. At an additional cost of about SEK 0.30/m³ the water is almost totally purified with regard to microplastics, medicines and bacteria before being discharged into the Baltic Sea.

Another collaboration on reducing discharge of microplastics into the sea has taken place together with students at Norrevångsskolan in Mörrum. Microplastics discharged into the sea are ingested by bivalves, fish and birds. The collaboration saw production of a leaflet on how increased use of wool rather than synthetic materials in clothes can have an impact on the volume of synthetic fibres (plastics) reaching the Baltic Sea.

Within the topic area '*Keeping the biosphere clean*' there are challenges including the increase in marine debris as well as medicines and microplastics in the sea. Blekinge Archipelago arranges beach

cleaning together with various players. Companies, associations and private individuals are welcome to take part. The beach cleaning is important in terms of making our coast and archipelago nice and clean, and as regards removing debris (often plastics) from the water and the ground.

In collaboration with the Swedish University of Agricultural Sciences (SLU) a national project on improved information about invasive garden plants is in progress, as invasion by alien species poses one of the greatest threats to biodiversity. The aim of the project is to create guidelines on how to effectively and inclusively communicate with garden owners in this regard.

4 Measures within forestry and agriculture

'Sustainable Agriculture and Forestry' poses challenges in the areas of eutrophication, algal blooms, droughts and declining diversity. Blekinge Archipelago is continuously working on applications regarding funding for wetland restoration. Together with benevolent landowners, and availing themselves of expert advice on where the wetlands are most beneficial, the association is also seeking permits for restoration of wetlands or creation of new ones. New wetlands can give a number of birds, amphibians, rare plants and even fish a fresh chance. Nurseries for spawning pike can be created in the shallow waters. The landscape around the wetlands is also attracting more life and becoming more beautiful to look at. Nature lovers and tourists are getting exciting new excursion destinations, sometimes equipped with birdwatching towers.



Figure 2: Aerial image showing algal bloom near Karlskrona. Source: The Swedish Coastguard, 2015.

The Forest Network is another project that will contribute to sustainable forestry in Blekinge Archipelago. The project will contribute to collaboration on climate-change adaptation and conservation measures within the Biosphere Reserve. Landowners wishing to develop their forestry, carry out climate-change adaptation and show greater consideration for conservation are to have quality-assurance work carried out. The collaboration will hopefully lead to an increased area of deciduous trees and a higher proportion of pine trees in the biosphere reserve. Experience values will

increase, and cultural environments will be better protected. Improved management of transition zones linking to lakes and watercourses also achieves a better quality of water within the forest landscape – and this will ultimately have a positive impact on coastal waters in Blekinge. More varied forestry in the area also makes for increased biodiversity through a greater number of old trees and richer shrubland – features characteristic of Blekinge Archipelago.

5 Challenges for fish and fishermen in Hanö Bay

The challenges of '*Sustainable fishing*' are to be seen in sick Baltic salmon, declining cod stocks and a lack of public opinion and research. Blekinge Archipelago has aroused public opinion on the acute state of salmon's health, and has in several different ways supported the ongoing research by taking part in Radio Sweden's review of the problem of sick Baltic salmon in its programme Kaliber. Together with County Administrative Board of Blekinge and The Swedish Anglers Association (the regional section in Blekinge), the Blekinge Archipelago association hopes it will soon be able to contribute to the restoration of watercourses in the biosphere reserve. This is contributing to healthier watercourses with greater biodiversity and better nursery areas for fish and bivalves.



Figure 3: Dead salmon in the river Mörrumsån, November 2016. They both died of their ailments before spawning. Source: Blekinge Archipelago, 2021.

6 Dissemination of knowledge and commitment

The final topic area, '*Information, learning and participation*', involves challenges in the form of people's lack of awareness and the objective of increasing participation in various networks for more sustainable development. As Blekinge Archipelago offers ambassador training every year, there is an opportunity to experience and learn more about nature and culture in the biosphere reserve. This

increases people's awareness and knowledge. Blekinge Archipelago is also working continuously on producing information that contributes to both conservation and development in the biosphere reserve.

Table 1: The support the association receives is constantly growing – it is gaining new member companies, more private members and followers on Facebook. Source: Blekinge Archipelago 10 years as a biosphere reserve - evaluation according to UNESCO of the years 2011-2021. Blekinge Archipelago, 2021.

Increasing association support 2018 - 2020			
	2018	2019	2020
Followers on Facebook	658	1200	1808
Downloads of the app ARK56	0	5000	14950
Member companies	28	52	60
Individual people becoming members	40	148	230
Trained ambassadors	30	46	68

A good publication is one that shows the route towards sustainable options and supports industries as well as conservation and cultural values. A positive development is to be seen in the support the association receives: more and more people are registering and supporting Blekinge Archipelago's various activities!

References

Blekinge Archipelago, 2021. Blekinge Archipelago 10 years as a biosphere reserve - evaluation according to UNESCO of the years 2011-2021

This chapter was prepared by Mattias Holmquist; Ronneby Municipality, Sweden.

Mattias Holmquist
 Kallvattenkuren
 Kurpromenaden 4
 372 36 Ronneby, Sweden
 mattias.holmquist@ronneby.se

Ecosystem-based Marine Spatial Planning methods in Sweden – SYMPHONY

It is hard to describe which human activities affect the various species and environments in the sea. One way of doing so is to use existing knowledge as the basis for a model that takes many variables into consideration, whereby various expected future developments in a variety of areas, e.g. climate change, can be taken into account. Through use of the tool SYMPHONY an attempt has been made to create a picture of how environmental impacts affect conservation values in Swedish marine waters. By inputting temperature rises into the model as per various climate scenarios, modelling can be created that shows the prerequisites for survival of species in a changed climate.

1 The tool SYMPHONY – how it was created and how it works

In many locations and from various standpoints life in the sea is under intense pressure. There is a risk of human activities that cause overfishing, emissions and climate change seriously damaging the marine environment in the long term, and in many cases there is a danger of a lasting impact. To ensure that the ocean's resources are used sustainably and efficiently in the long term, better planning is needed. Swedish marine spatial planning, the aim of which is to develop national marine spatial plans that the government will decide on, carefully maps out conservation values and pressures affecting the environment in the various marine areas.

One of the tools used to compile, analyse and present information is SYMPHONY. The method used in the associated tool was developed by the Swedish Agency for Marine and Water Management in collaboration with government authorities, universities and environmental consultants. SYMPHONY is based on a method first published and presented in 2008 in the journal '*Science*'. The author was B. S. Halpern (and colleagues). SYMPHONY is specially adapted to the conditions in Swedish waters. Halpern presented an index that on a global level reports cumulative environmental impact with spatial resolution.

The method has since been used in a large number of marine areas (Korpinen and Andersen 2016), including the Baltic Sea (Korpinen et al. 2012), the North Sea (Andersen et al. 2013; Andersen, Harvey et al. 2017), the Mediterranean and the Black Sea (Micheli et al. 2013), and the Arctic (Andersen, Berzaghi et al. 2017). In the Baltic Sea, the Helsinki Commission (HELCOM) method is used to demonstrate cumulative environmental impacts in relation to marine environmental status assessments in the Baltic Sea region (e.g. HOLAS I, II and (forthcoming) III).

The results of the analyses performed using SYMPHONY are based on the best available data, and comprise:

- maps showing loads
- maps of conservation values
- sensitivity matrix showing the extent to which the various loads affect the different conservation values

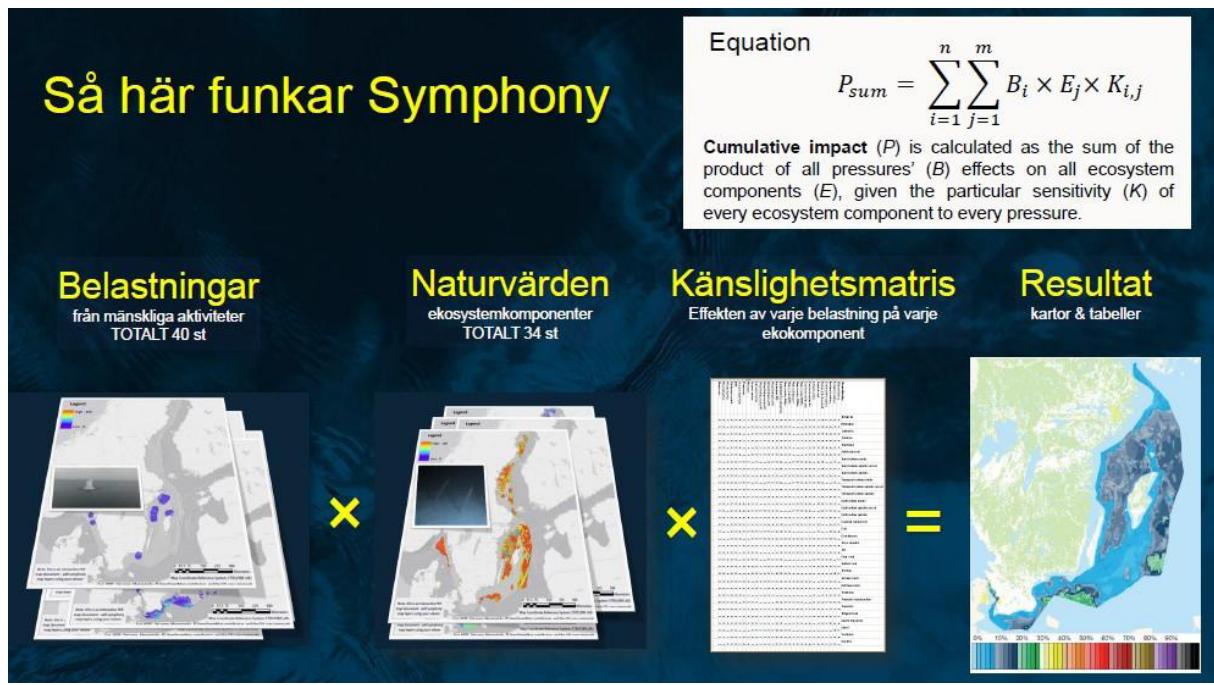


Figure 1: SYMPHONY compiles loads and conservation values, and assesses how these values in Sweden's seas are affected by these loads. The results are presented in cartographic form. Source: Jonas Pålsson, Swedish Agency for Marine and Water Management, 2021

Loads come from human activities that affect the marine environment. Human activity can cause a number of different loads, e.g. trawling, which as well as catching the fish can also damage the bottom environment by scraping up the seabed and clouding the water mass with sediment. Ecosystem components are habitats, species and groups of flora and fauna that constitute part of the marine ecosystem (there being an overlap between the different ecosystem components). Some ecosystem components are well known and precisely mapped, whilst for others there is thus far only modelling. But as ecosystem components are being mapped in more and more areas, the precision of the documentation is improving, as is the reliability of the results. For example, cod is a separate ecosystem component, but cod is also part of the ecosystem component Spawning, and is furthermore part of the bottom environments' ecosystem.

To calculate the environmental impact in each area (pixels), the values of the three main components are multiplied together. I.e. loads \times ecosystem components \times sensitivity. The product is a calculation of the cumulative overall environmental impact. Cumulative environmental impact is the total load from various human activities on plant and animal life in the sea. By combining each load with each ecosystem component and the sensitivity matrix, then adding up the results for each individual area, a map and statistics for the marine area examined are obtained. High and low values are clearly distinguished, e.g. by means of maps using different colour scales.

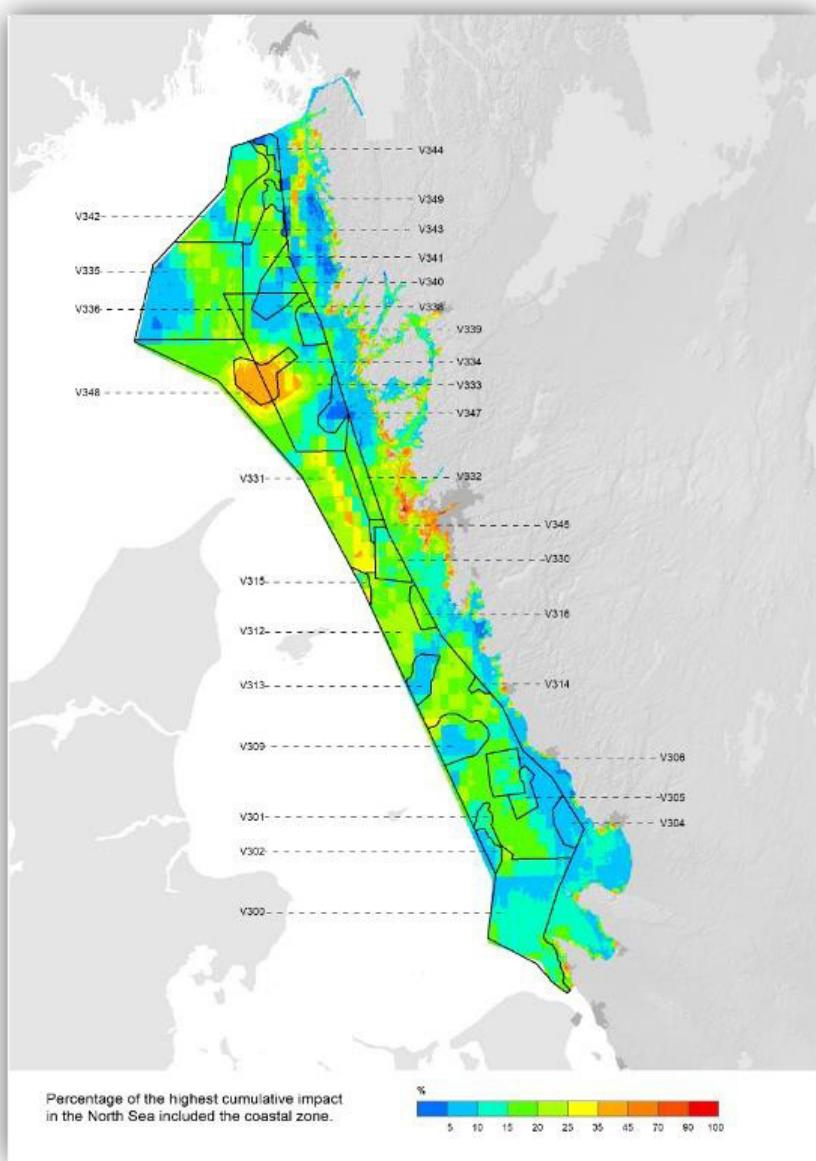


Figure 2: Environmental impact in the Skagerrak/Kattegat and the Baltic Sea calculated using SYMPHONY.
Source: Jonas Pålsson, Swedish Agency for Marine and Water Management, 2021.

2 How the SYMPHONY results can be used

The results of the calculations illustrate the magnitude of the environmental impact in different locations in the marine landscape, creating an overall picture and valuable documentation for marine spatial planning. Information on which loads have the greatest adverse impact on the environment and which conservation values are affected by what is presented as diagrams and tables. This makes it easier to understand what the problems are in different areas and how they can be reduced through better planning or other measures. Understanding where the environmental impact is especially high or especially low is important when prioritising and designing environmental protection.

With the aid of SYMPHONY, future environmental impacts can also be simulated at an overall level. Assumptions about how different loads will develop make it possible to compare scenarios and planning proposals' impact on the environment. Testing, comparisons and evaluations will make it easier to choose the right planning solutions. This scenario analysis is also used for the climate, by adding load maps of changes in temperature, salinity and ice coverage.

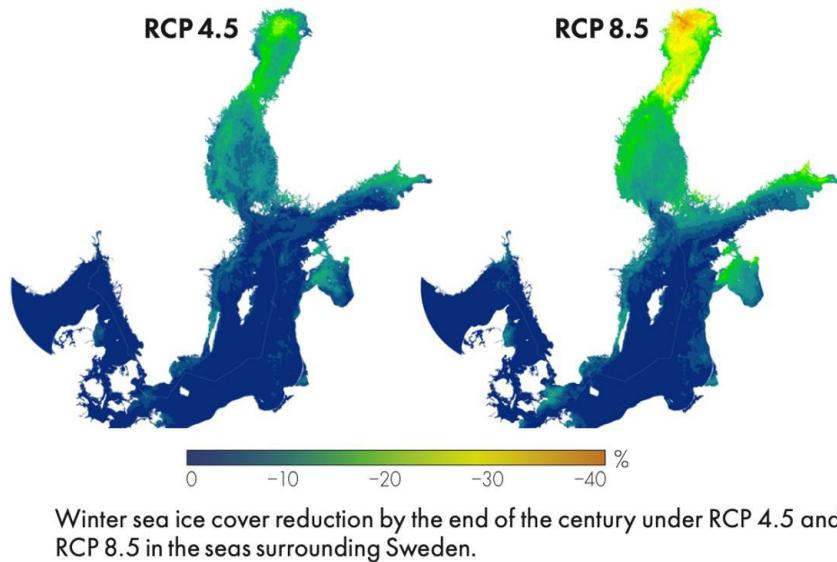


Figure 3: Examples of modelled ice-coverage maps developed as part of the ClimaMarine project for different climate scenarios: RCP 4.5 and RCP 8.5. The images show the reduction in the period when ice covers the sea; the scenarios are expected to arise by the end of the century, depending on the conditions. Source: Jonas Pålsson, Swedish Agency for Marine and Water Management, 2021.

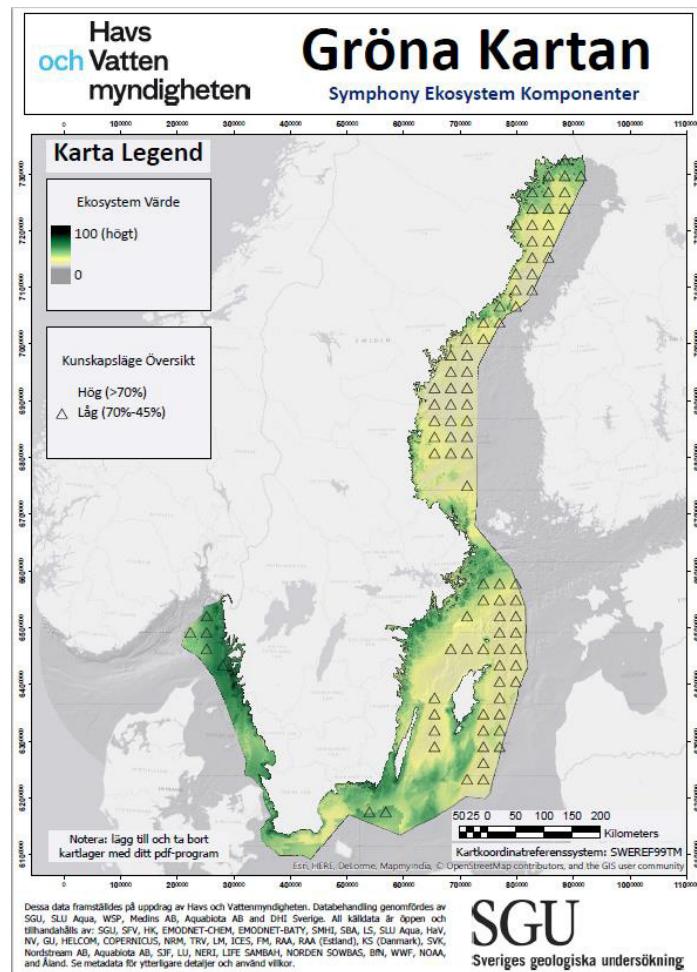


Figure 4: The so-called 'Green Map' was developed by way of support for calculating the conservation values during the national marine spatial planning process, in the development of the marine spatial plans. Source: Swedens Geological Survey, 2021.

An additional way of reproducing the information on the ecosystem components is presented geographically in the so-called '*Green Map*' (developed by the Swedish Agency for Marine and Water Management as documentation for the maritime planning process). The '*Green Map*' is a compilation and summary of all the ecosystem components put together, i.e. a form of green infrastructure. If an area is of great importance for many different ecosystem components, then the area has a high value on the '*Green Map*'.

3 The precision of SYMPHONY – input data, calculations and results

Since the SYMPHONY documentation includes data of varying degrees of reliability, there is also an estimate of aggregated combined uncertainty, whereby for certain geographical areas there is a greater degree of uncertainty than for others. The result is extensive aggregation of uncertainties. In order to give users an idea of which areas involve particular uncertainty, each map of ecosystem components has been mirrored with a map of the documentation's reliability. This uncertainty map is used within SYMPHONY in order to clearly show which areas require particular caution when interpreting the results.

Results from models should generally be interpreted with caution. The fact that SYMPHONY is based on so many composite models makes it even more important when interpreting the results to bear in mind that they constitute a rough estimate of a complex reality. Limits and figures in the results should thus not be interpreted literally, but should be seen as indications and orders of magnitude, as well as constituting a good relative comparison between different areas.

4 About cumulative assessments in marine spatial plans

Despite the extensive academic knowledge in the field, spatial cumulative environmental assessment has not yet been used in marine spatial planning in an integrated manner. It has almost exclusively involved academic modelling. Work on SYMPHONY started in 2015, and the initial results were available in 2017. Development of the method is ongoing, and is supported by scientific expertise. In Sweden SYMPHONY has been used within national marine spatial planning as from autumn 2017, during the planning, dialogue and evaluation phases.

From an international perspective, environmental impact occurs across national borders, and access to data is important to everyone. Despite SYMPHONY and similar tools being based on a number of assumptions, it is one of the best tools available for ecosystem-based marine spatial planning in the Baltic Sea. In SYMPHONY, new proposals regarding marine spatial plans can be compared with previous plans; by updating and comparing the underlying data, the impact of the marine spatial plans can also be modelled and evaluated. An overall comparison of the different types of environmental and climate impact is possible, and they can be transparently communicated to decision-makers and the general public, both within Sweden and in neighbouring countries around the Baltic Sea.

References

- Andersen, J. H., and Stock, A. (eds.); 2013. Human Uses, Pressures and Impacts in the Eastern North Sea. Technical Report, Danish Centre for Environment and Energy, Aarhus University, Roskilde, 134.
- Andersen, JH, F Berzaghi, T Christensen, O Geertz-Hansen, A Mosbech, A Stock, KB Zinglersen, and MS. Wisz. 2017. Potential for Cumulative Effects of Human Stressors on Fish, Sea Birds and Marine Mammals in Arctic Waters. Estuarine, Coastal and Shelf Science 184. Elsevier Ltd: 202–6.
doi:10.1016/j.ecss.2016.10.047.
- Andersen, JH, T Harvey, E Kallenbach, C Murray, Z Al-Hamdani, and A Stock. 2017. Under the Surface: A Gradient Study of Human Impacts in Danish Marine Waters. Copenhagen. NIVA DK Rapport 7128-2017 DK6.
- Benjamin S. Halpern, Shaun Walbridge, Kimberly A. Selkoe, Carrie V. Kappel, Fiorenza Micheli, Caterina D'Agrosa, John F. Bruno, Kenneth S. Casey, Colin Ebert, Helen E. Fox, Rod Fujita, Dennis Heinemann,

- Hunter S. Lenihan, Elizabeth M. P. Madin, Matthew T. Perry, Elizabeth R. Selig, Mark Spalding, Robert Steneck, Reg Watson 2008. A Global Map of Human Impact on Marine Ecosystems; *Science* 319, 948.
- Korpinen S and Andersen JH; 2016. A Global Review of Cumulative Pressure and Impact Assessments in Marine Environments. *Front. Mar. Sci.* 3:153. doi: 10.3389/fmars.2016.00153
- Korpinen, S., Meski, L., Andersen, J. H., and Laamanen, M. (2012). Human pressures and their potential impact on the Baltic Sea ecosystem. *Ecol. Indic.* 15, 105–114. doi: 10.1016 / j.ecolind.2011.09.023
- Micheli, Fiorenza, Benjamin S. Halpern, Shaun Walbridge, Saul Ciriaco, Francesco Ferretti, Simonetta Fraschetti, Rebecca Lewison, Leo Nykjaer, and Andrew A. Rosenberg. 2013. Cumulative Human Impacts on Mediterranean and Black Sea Marine Ecosystems: Assessing Current Pressures and Opportunities. 2013. *PLoS ONE* 8 (12). doi:10.1371/journal.pone.0079889.

This chapter was prepared by Jonas Pålsson; Swedish Agency for Marine and Water Management, Sweden.

Jonas Pålsson
Havs- och vattenmyndigheten
Box 11930
404 39 Göteborg, Sweden
jonas.palsson@havochvatten.se

Marine Spatial Plan for Blekinge's coastal municipalities

The four coastal municipalities in Blekinge – Sölvesborg, Karlshamn, Ronneby and Karlskrona – have jointly developed the ‘Marine spatial plan for Blekinge’. Through the creation of a project organisation for collaboration between the municipalities and within each individual municipality, the plan was developed in close collaboration between politicians and officials in the four municipalities. As the ‘Marine spatial plan for Blekinge’ is fundamentally a municipal cooperation and each individual municipality needed to adopt its part of the plan as a detailed comprehensive plan, there was a constant dialogue about the planning proposal with those who might be affected. The work on developing the joint plan adhered to the structure laid out in the Swedish Planning and Building Act, which means the joint plan was also out for consultation and has been on display – exactly as with a municipal comprehensive plan. All municipalities have adopted ‘their’ part of the jointly developed plan for the sea in Blekinge.

1 Background to the development of a marine spatial plan for Blekinge's coastal municipalities

The sea is and has always been an important part of Blekinge's identity, the proximity of the sea having shaped both the landscape and the people. Over the years, many generations have derived their livelihoods and their food from the abundant fish stocks. The sea has also acted as an important transport route, and has benefited the country's security and defences. The coast, the archipelago and the sea have always been interlinked, and together they hold huge natural and cultural values. The values are often linked to a number of major interests, which need to be taken into account in the various contexts. Many of these interests are of a distinct intermunicipal nature – thus there is great value in the fact that Blekinge's coastal municipalities have collaborated in a joint municipal project.

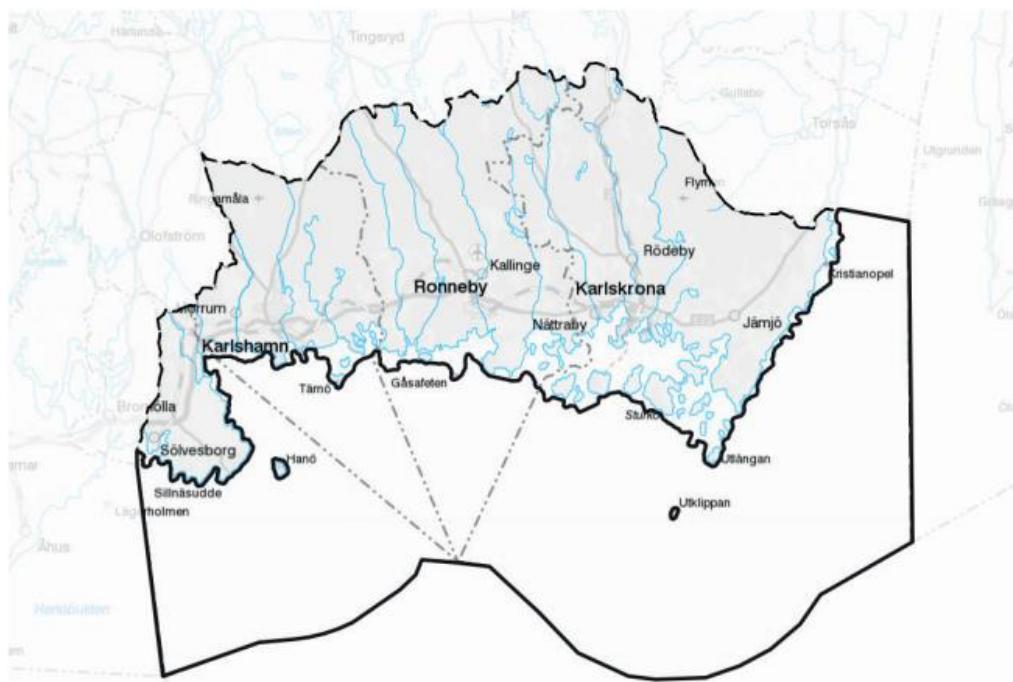


Figure 1: The image shows the total area of the sea that the ‘Marine spatial plan for Blekinge's coastal municipalities’ will cover (except for the most inner parts, this area is the complete territorial sea of Sweden). Source: Description of the ‘Marine spatial plan for Blekinge’s coastal municipalities’, 2019.

The origins of the municipal collaboration can be said to be a joint initiative taken by Blekinge County Administrative Board and the Blekinge Archipelago biosphere reserve. Autumn 2014 saw the initial presentation of the initiative that would lead to a joint municipal comprehensive plan. Geographically the demarcation includes the open-sea waters of Sölvesborg, Karlshamn, Ronneby and Karlskrona municipalities. These are areas of water starting 300 metres from land and islands, extending as far as to the outer boundary of the territorial sea. The plan does not start on land – it only covers the sea that has thereby been separated off in terms of coastal and archipelago issues.

2 The project organisation during development of Blekinge marine spatial plan

Following the initiative, 2015 saw the start of work involving municipalities inventorying knowledge and planning documentation and exploring the possibilities of applying for external finance through project funding. At the same time, work started on finding the structures for collaboration on the development of a joint marine spatial plan, and on considering whether it could be adopted by each municipality as a detailed version of the comprehensive plan. The work was carried out in collaboration with Blekinge County Administrative Board. In the spring of 2016 a project plan was developed and a KOMPIS (KOMmunal Planering I statlig Samverkan = municipal planning in government collaboration) grant was applied for and granted. The timetable was adapted so as to adhere to state marine spatial planning and its various stages. An additional application for a KOMPIS grant for the period 2018-2019 was submitted in 2018, and funds were granted by Blekinge County Administrative Board that very year.

The work has been run by a working group involving representatives from each municipality. The project has had a steering group within each municipality, ideally based on the municipal executive board's working committee. Each municipality has also had a reference group made up of officials with strategic functions.

3 Dialogue and consultation

As part of maritime planning, in 2017 the municipalities issued invitations to four dialogue meetings with different emphases and topics. At these meetings everyone with an interest in how the sea should be used could submit comments. These topic-related meetings were:

1. Commercial fishing, aquaculture and energy
2. Shipping, infrastructure, extraction and storage of materials
3. Conservation, risks, outdoor life and the hospitality industry
4. Defence, climate and the cultural environment

The formal consultation period was spring 2018. A joint consultation meeting was organised at which the draft marine spatial plan was presented in greater detail and the proposal was open for dialogue. As well as municipal representatives and consultants, 55 people attended the meeting. The revised proposal was exhibited in the spring and summer of 2019, after which Blekinge's marine spatial plan was adopted by the municipality in question later that year.

4 The plan's function and various uses in different areas

Once adopted as a detailed comprehensive plan in the municipality in question, the marine spatial plan will function just like a municipal comprehensive plan. The plan will thus form the basis for the municipality's future decision on what happens in the sea and where. It will also provide guidance in various planning and testing contexts. There will be interaction concerning the plan and the state marine spatial planning, as well as trade-offs between the various stakeholders, and spatial conditions for usage and conservation will be created.

The actual plan comprises a plan description and a planning map with accompanying legend. There is also the consultation report, and a review report containing the comments submitted during the course of the process, as well as the municipalities' responses to them. The marine spatial plan additionally includes a summary.

- As well as an introduction, the plan description includes a description of the actual planning proposal and its consequences, plus an account of current planning conditions
- The planning map shows the overall use of the marine area and recommendations for its use

The chapter '*Planning proposal*' describes the political standpoints for overall marine spatial planning in Blekinge. The descriptions of targets indicate the objectives to be attained, and the various strategies show how the marine area can be used, as well as constituting a basis for future decisions. The strategies laid out are based on the conditions and claims identified within the marine area. Proposals and standpoints include various sectoral interests such as the cultural environment, outdoor life and the hospitality industry, commercial fishing, aquaculture, and extraction and storage of materials. There are also proposals and standpoints regarding aviation and shipping, infrastructure, defence, energy and nature. There is a clear link between the recommendations of the plan description and the area subdivision of the planning map. The chapter '*Planning Conditions*' describes the basic starting points on which the marine spatial planning has been based. It presents current knowledge about the marine area, its geographical and physical conditions, how the marine area is used, and identified interests and other claims. The chapter acts as a knowledge base for the plan.

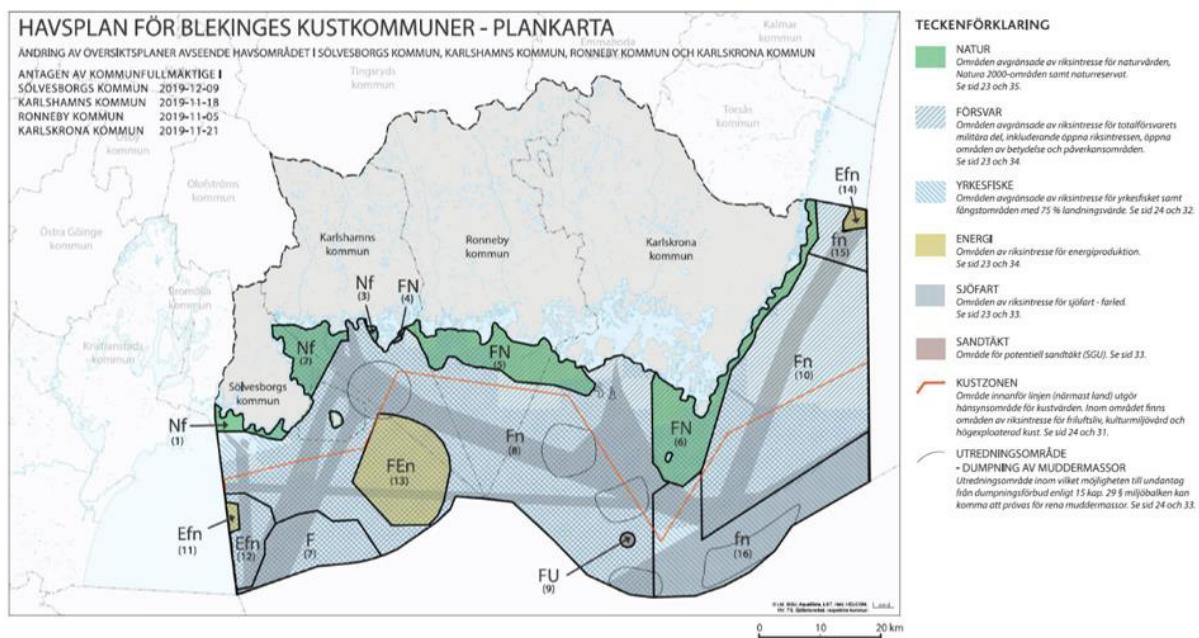


Figure 2: The map shows the geographical scope of the 'Marine spatial plan for Blekinge coastal municipalities' and the various water uses that will constitute guidance for future decisions on how the sea should be used. Source: Planning map 'Marine spatial plan for Blekinge's coastal municipalities' (Municipalities of Sölvesborg, Karlshamn, Ronneby and Karlskrona). Source: Karlshamn, 2019.

5 Challenges and benefits of municipal cooperation during the development of the ‘Marine spatial plan for Blekinge’s coastal municipalities’

Brief information on the experiences gained during work on the joint development of the plan.

Challenges:

- Differing governances within the municipalities; a political shift within a municipality may also delay the process
- Different planning conditions in the municipalities and partially different perceptions in the eastern and western parts of the county (defence / offshore energy)
- Different decision dates in the different municipalities (changes under one governance then had to be rooted in the other ones)
- A long process time means officials and politicians are replaced

Benefits:

- Instructive exchange, new contacts, partially new subject areas and variety in comparison with the ‘usual’ work
- It has been very valuable for municipalities to be able to go into greater detail and focus on knowledge of the sea
- No need to think about borders – the sea is ‘borderless’ and the issues are shared
- Unique and prioritised approach to work

The vision for Sweden's maritime strategy is also Blekinge's vision: to contribute to increased employment, reduced environmental impact and an attractive environment, through competitive, innovative and sustainable maritime industries. The reference point for the vision is 2050, and marine spatial planning – both state and municipal – is a tool in the pursuit of this vision.

References

Karlshamn, 2019. ‘Marine spatial plan for Blekinge’s coastal municipalities’: <https://www.karlshamn.se/kontaktkort/havsplan-for-blekinges-kustkommuner/>

This chapter was prepared by Jeanette Conradsson; Karlshamn Municipality, Sweden and Dan Janérus; Sölvesborg Municipality, Sweden.

Jeanette Conradsson
 Karlshamns kommun
 Samhällsbyggnadsförvaltningen
 Rådhuset
 374 81 Karlshamn, Sweden
 jeanette.conradsson@karlshamn.se

Dan Janérus
 Sölvesborgs kommun
 294 80 Sölvesborg, Sweden
 dan.janerus@sölvborg.se

Intermunicipal planning cooperation regarding the sea along the High Coast

In November 2017 the County Administrative Board decided to provide the municipalities of Kramfors and Örnsköldsvik with state funds through the Swedish Agency for Marine and Water Management's allocation for KOMPIS funding (municipal planning in state collaboration). The project's overall objective, through sustainable spatial planning regarding the coast and the sea, was to contribute towards preserving and protecting the High Coast's unique values, whilst at the same time creating conditions for a vibrant archipelago for everyone living and working in the area, as well as for visitors.

1 The KOMPIS-project

The municipalities of Kramfors and Örnsköldsvik have previously collaborated on several different issues concerning the High Coast. The closer collaboration began in 2016, on the basis of a political initiative. The starting point was the combination of the differing conditions in the coastal and marine area that make planning for the area very complex. In brief, it is a matter of the original character, the specific conservation and cultural values and the area's particular attraction as regards tourism and outdoor life, specifically because of the very high overall values.

The discussions focused on the importance of providing the best future starting point as regards a common approach to the various management/planning issues in this shared region. Since the marine spatial plan made by the state overlaps with the municipal comprehensive plans in the territorial sea, it was also important to adopt a joint approach as regards the reaction to the proposed national marine spatial plan. The cooperation between the municipalities also facilitated a joint response to the state planning. At the same time the individual municipalities were minded to review their current comprehensive plan.

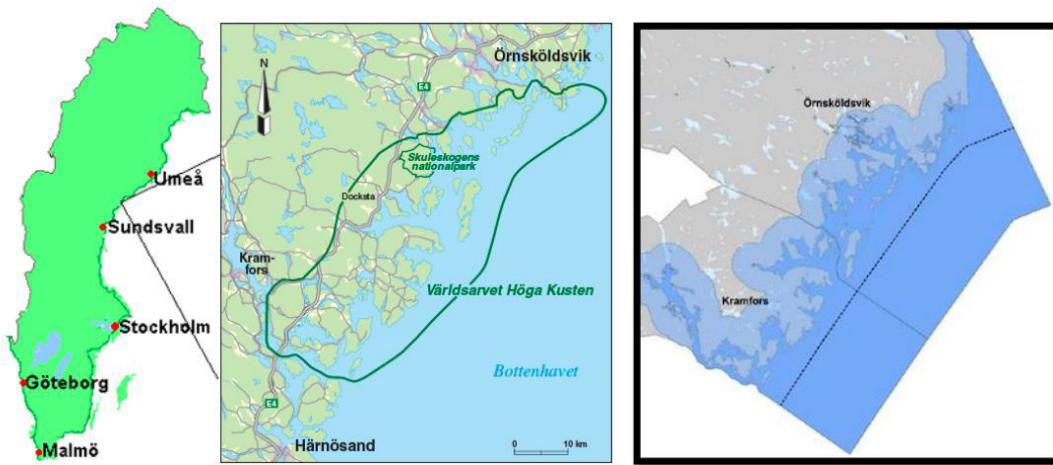


Figure 1: The map to the left shows where the World Heritage High Coast is situated in Sweden (the area also constitutes the area of cooperation). The map to the right shows the municipal marine area for the municipalities of Kramfors and Örnsköldsvik. Source: Kramfors, 2021.

A natural step was thus to apply for funding from the County Administrative Board of Västernorrland to use money from the KOMPIS (municipal planning in state collaboration) initiative introduced by the Swedish Agency for Marine and Water Management.

The aim of the funding was to enhance the municipalities' capacity to follow developments, meet up and submit comments on proposals regarding state planning. A further aim of the funding was to provide the municipalities with support for increased planning with regard to their coastal and marine areas and intermunicipal cooperation (for more information, see: *'The County Administrative Boards, 2019. Final report on the KOMPIS grant - Municipal coastal and marine planning in state collaboration during 2016-2018'*)

The purpose of the meetings was to achieve a consensus on management of the High Coast as a region. The process was led by a steering group comprising politicians from the municipal executive board and the community construction board from both municipalities, as well as officials in the form of environmental strategists, development secretaries and community planners.

1.1 Sub-target 1

The report produced within Sub-target 1 of the KOMPIS project describes ecosystem services and other planning conditions in the coastal and marine area within the municipalities of Kramfors and Örnsköldsvik. The documentation for the description comes from existing data that is available from authorities and other organisations. This includes places of interest for outdoor life, cultural environments, various types of habitats, transport corridors etc. Based on the identified ecosystem services and other planning conditions, conservation cores have been identified where there are several different interests at one and the same location. At these locations any threats, development opportunities and conflicts have been identified and reported. The maps produced in conjunction with the report serve as documentation for the report, and the identified conservation cores are visualised in them.

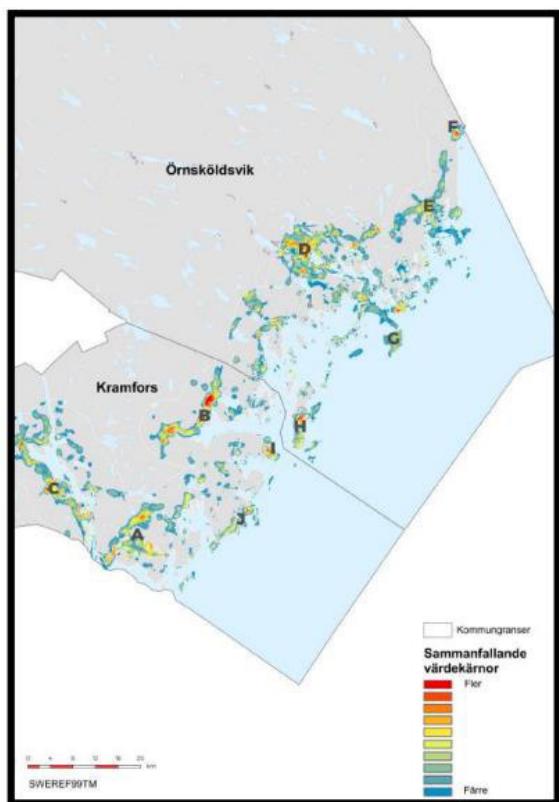


Figure 2: The map shows the intensity of different interests in different areas. Red indicates many converging interests, and blue indicates few converging interests. Source: Kramfors, 2021.

The report with its cartographic data (GIS layer) thus contributes to the municipalities now having the information gathered within their own organisation, facilitating both continued spatial planning and a dialogue between the municipalities.

1.2 Sub-target 2

Sub-target 2 entailed holding a number of dialogues / workshops with relevant politicians and officials from both municipalities. During these dialogues a geographically defined coastal and sea area was identified where there are special challenges or a need to adopt a standpoint. In connection with this, the particular issues the project would go into were also decided on. Finally, shared standpoints or guidelines were drawn up for the geographically defined area.

The dialogue process was planned by the appointed working group for the project. Kramfors Municipality's checklist for citizen's dialogues was used for support and quality assurance regarding the process. The starting point was to achieve the ambitions set out in the project target. Methods were thus developed in order to:

- Create a common picture of the conflicts of interest on which the dialogue process should focus.
- Identify a geographically defined area where there is a particular need to adopt standpoints.
- Develop shared standpoints or guidelines for a geographically defined area.

After planning the content and scope of the dialogue, the working group deemed that two dialogue sessions would be appropriate. The two dialogue opportunities were booked: the first in Örnsköldsvik and the second in Kramfors. The invitation included politicians and officials concerned who had the relevant expertise.

2 Implementation

Both dialogue sessions were designed as workshops, with the dialogue chiefly being conducted in small discussion groups, but also in the group as a whole. The participants were divided up so there would be representatives of both municipalities in all the groups, as well as there being different subject areas, e.g. the cultural environment, business, spatial planning. Parts of the project's working group acted as process leaders, and guided the groups through a number of issues and methods.

Workshop 1 (20.11.2018)

About 15 people took part in Workshop 1 in Örnsköldsvik. The workshop began with an introduction to the subject through a presentation of the project, its ecosystem approach and parts of the cartographic material created within the project. The participants were then divided into smaller groups, and were given the question:

'Which conflicts of interest is it particularly important to resolve, in terms of the conservation and development of the High Coast?'

The groups addressed the issue using an 'IDERA' exercise – an excellent way of generating ideas:

Immediate thoughts

The participants were instructed to initially think about the issue in silence.

Discussion in pairs

The participants were instructed to discuss their thoughts in the smaller groups, and to arrive at the five most important conflicts of interest as groups.

Expose

Each group was instructed to present the five selected conflicts of interest as a whole group, and to reflect on the outcomes without criticizing each other's choices, likewise as a whole group.

Rank

Each group was instructed to evaluate, as a group, the five proposed conflicts of interest, selected from all the proposals exposed, that they deemed to be the most important. Each group presented its choices as a whole group.

Arrange

The process leaders then arranged the proposals based on topic clusters and the ranking implemented. This was done as a whole group and in consultation with the participants, until a consensus had been reached regarding five conflicts of interest.

The aim of the exercise was to create a joint picture of the conflicts of interest the dialogue process would focus on.

The next step was a cartographic exercise, the five topics (the conflicts of interest decided on) being the starting point. All the groups were instructed to use stickers to mark geographical locations along the marine and coastal area on a big map where they deemed that a given conflict of interest was to be found. The groups were given three stickers to adhere for each conflict of interest.

The stickers caused some patterns to emerge on the map. The participants were invited to reflect on the appearance of the map, as a whole group. Process management then circled the geographically connected area on the map with the biggest cluster of stickers. Sensitivity regarding the participants was applied to this process.

The aim of the exercise was to identify a geographically defined area where there is a particular need to adopt standpoints.

Workshop 2 (09.01.2019)

About 15 people took part in Workshop 2 in Kramfors. The workshop began with a brief reiteration of the project's aims and targets, as well as feedback regarding the results compiled from Workshop 1. The participants were then divided into smaller discussion groups.

Each group worked on a specific topic (conflict of interest) based on the results of Workshop 1. The structure used was a variant of the Lotus Blossom technique, focusing on generation of ideas and problem-solving.

The technique involved developing what the conflicts of interest comprise and how they are expressed, and in the next step endeavouring to find relevant solutions. Participants were asked first and foremost to link the solutions to the municipalities' general planning, though other proposals were also welcomed. This was done through group discussions and documentation using five matrices (one for each topic). At regular intervals the groups rotated between topics, thereby building on each other's set of problems and associated solutions.

The participants had to start from the geographically defined area from Workshop 1, and during the exercise they were helped by a number of maps, which showed the geographical points they had previously marked for each conflict of interest. During the rotations between topics one group member was left at each table, with the remit of informing the next group of the previous group's reasoning and their responses. Reports on the results and subsequent reflections were delivered on two occasions as a whole group.

The aim of the exercise was to intensify the discussions on the conflicts of interest the dialogue process was to focus on.



Figure 3: Workshop where the participants formed a discussion group to find solutions associated to planning- and environmental issues in the World Heritage area High Coast. Source: Kramfors, 2021.

3 Conflicts of interest

Five conflicts of interest were identified during Workshops 1 & 2:

- Tourism – Conservation Values and Cultural Environment Values
- Business – Natural Environment Values
- Housing – Cultural Environment Values
- Housing – Social Cost
- Housing – Tourism

They were ranked based on the participants' prioritisations, both in the list above and in the map's legend, the most important conflict of interest being listed at the top.

Continued collaboration and workshops during 2020

In 2020 the municipalities of Kramfors and Örnsköldsvik have continued the process of developing new municipality-wide comprehensive plans. As part of the work, dialogues between officials from the different municipalities have been held, in order to develop proposals regarding joint standpoints. Standpoints arrived that are to be used as bases for each municipality's work with their comprehensive plan. During the work on the municipalities' comprehensive planning, the policy will be involved in the process. The standpoints will ultimately be determined politically with the adoption of each municipality's comprehensive plan.

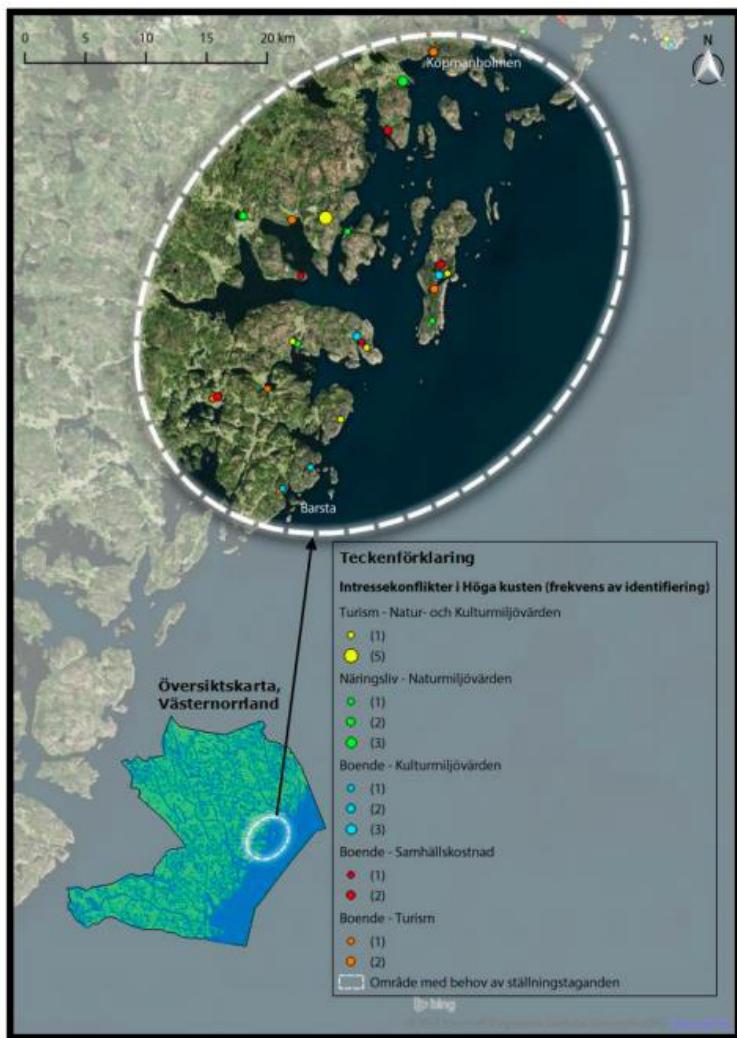


Figure 4: The cartographic image also shows where the conflicts of interest are to be found geographically. The legend also includes a ‘Frequency of identification’, which is shown by the different sizes of the points with an associated number. This means that the number indicates how many groups from the dialogue have set out a given conflict in the same area, and that this is symbolised by the proportions of the points. It is possible to see how a number of different conflicts are to be found, e.g. on the island of Ulvön and in Norrfällsviken. The clearest conflict of interest to be seen on the map is in the Skule area. Source: Kramfors, 2021.

4 Experiences gained

In general, the KOMPIS project has made for positive experiences regarding cooperation between the municipalities. There is a strength in sharing a set of problems and a solution, partly because together the municipalities have a stronger voice, but also because it is possible for the municipalities to exchange experiences regarding both sets of problems and solutions to them.

But the development of shared standpoints or guidelines for the geographically defined area was not completed in the process. The ambition is deemed to have been good, but it was important to produce high-quality documentation that could best substantiate the standpoints. Time was thus allowed for the dialogue process's emphasis on producing such documentation. The assessment is that the dialogue process has contributed to the municipalities coming a long way, and that well-thought-out material has been created. The results of the dialogues will constitute useful and practical documentation on which to build.

References

The County Administrative Boards, 2019. Final report on the KOMPIS grant - Municipal coastal and marine planning in state collaboration during 2016-2018: <https://www.lansstyrelsen.se/vastra-gotaland/tjanster/publikationer/2019/slutrapport-over-kompis-bidraget.html>

This chapter was prepared by Andreas Gylling; Kramfors Municipality, Marianne Dahlbäck and Emma Teglund; Örnsköldsvik Municipality, Sweden.

Andreas Gylling
Kramfors kommun
872 80 Kramfors, Sweden
andreas.gylling@kramfors.se

Marianne Dahlbäck
Örnsköldsviks kommun
Kontaktcenter
891 88 Örnsköldsvik, Sweden
marianne.dahlback@ornskoldsvik.se

Emma Teglund
Örnsköldsviks kommun
Kontaktcenter
891 88 Örnsköldsvik, Sweden
emma.teglund@ornskoldsvik.se

Blue Comprehensive Plan and Maritime Business Strategy in Northern Bohuslän

Sustainable use of the sea in the long term is often facilitated by creating a bigger regional perspective on many issues. Collaboration on the part of several municipalities (as in this case Strömstad, Tanum, Sotenäs and Lysekil) leads to many benefits. Especially when the comprehensive planning is supported by a maritime business strategy that has already been drawn up. Identifying and analysing the various area-related and spatial areas in a Maritime Business Strategy will make it easier to develop the joint Blue Comprehensive plan. The Blue Comprehensive Plan will apply like the usual municipal comprehensive plans when it has been adopted by the municipality in question. The process of drawing up strategies with objectives was intensive, and at the same time a new phase is initiated once the strategy and the comprehensive plans have been adopted. An equally important phase, as implementation will lead to attainment of the objectives and strategies.

1 Maritime Business Strategy and Blue Comprehensive plan in Northern Bohuslän

There are many interests competing for the sea as a resource. There is thus a need for a common approach that in the long term both protects and develops life on, in and by the sea in northern Bohuslän. This is why the municipalities of Strömstad, Tanum, Sotenäs and Lysekil have in parallel drawn up two political documents showing the intentions regarding marine resources in northern Bohuslän, the Blue Comprehensive Plan (Blue CP) and the Maritime Business Strategy (MBS). The Blue Comprehensive Plan is based on needs identified in the Maritime Business Strategy, and the strategy is based on specifications regarding the blue built-environment objectives developed as a basis for the strategy and the comprehensive plan.

The Maritime Business Strategy

The strategy has been developed on behalf of politicians, and harmonises with current strategies and plans within the various sectors and within the EU, nationally, regionally and at a local level. The strategy has been developed by holding investigations, discussions and knowledge days. The strategy, which acts as a form of handbook, includes information and analyses with clear objectives agreed on by the politicians. The strategy can be used by officials and politicians in need of more information on a maritime sector. It is at the same time available to stakeholders, contractors and local companies in order to increase interest in the opportunities offered by the maritime industries in this region.

The strategy is divided into four areas:

- '*Marine foods*'
- '*Maritime tourism*'
- '*Shipping and the boat industry*'
- '*Marine energy and research*'

Clear objectives have been drawn up for each area.

'Marine foods' has the following objectives:

1. There is to be sustainable fishing with related industries as a basis for a vibrant archipelago and the coastal communities' identity and attractiveness – both now and in the future.
2. Viable mixed aquaculture with related industries that do not harm the marine environment are to be given the chance to become established.
3. The marine food industry is to be given development opportunities.
4. A small-scale marine food industry involving locally caught fish and seafood linked to the local food culture and hospitality industry is to be encouraged and given the opportunity to develop.

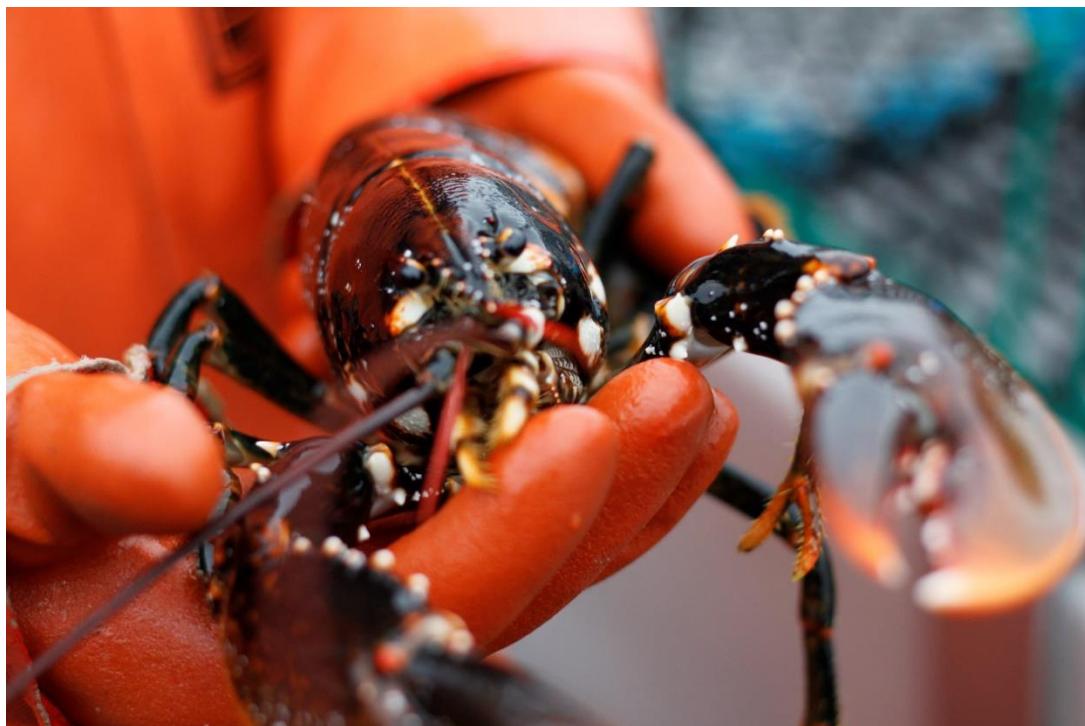


Figure 1: The image shows a lobster. It takes 5-8 years for a lobster to become sexually mature, and information indicates that they can live for up to 50 years. The distribution range in Sweden (which is governed by the salinity) in the sea includes the West Coast down to and including the northern Sound (Öresund). Source: Sotenäs municipality, 2021.

'Maritime tourism' has the following objectives:

1. For those who live here, the planning for the archipelago, the coast and the sea is to involve qualities that attract our visitors and lay the foundations for a flourishing tourism industry.
2. Our fantastic coast is to be clean and attractive, whilst at the same time being accessible to everyone.
3. The characteristics of the archipelago landscape and the coastal communities' cultural values are to be preserved and made accessible, and are to continue to contribute to our identity.

'Shipping and the boat industry' has the following objectives:

1. The land and water needs of shipping and the boat industry are to be prioritised in the strategic locations, in order to ensure opportunities for freight ports and the development of passenger traffic.

2. In the development of sustainable and considerate boating activities the aim will be a negligible adverse impact on the environment, wellbeing and safety.
3. The archipelago is also to be accessible to those who do not own their own boat.
4. Infrastructure for changed boat use will be supported – e.g. boat ramps, alternative storage, day rentals and boat scrap, to facilitate sustainable boat management.
5. Marinas and municipal ports will contribute to an improved environment and be attractive places to stay, and for boat maintenance.



Figure 2: The development of fishing is leading to ever bigger vessels, but there are still smaller vessels that can be used in various ways for coastal fishing. Source: Jerker Norlander, 2021.

'Marine Energy and Research' has the following objectives:

1. There are to be prerequisites for establishing marine-energy operations including marine test beds at suitable locations in our area.
2. The conditions for development of the research industry and its basis in local industry and local social life are to be improved.

The document describes in concrete terms what the municipalities need to do in order to achieve the objectives. A clear strategy in which the work is necessary so as to steer things in the right direction. All these measures have the same objective and involve the same vision for the future. These undertakings are crucial in terms of realising the opportunities to be found in the region's maritime area. The document is forward-looking and proactive, but also realistic and concrete. The ambition has been to as far as possible avoid conjuring up unlikely scenarios, and for the coast to be able to continue to flourish sustainably. The strategy applies until 2021, so as to match the EU's structural period (2014-2020). In order to ensure cooperation between municipalities, responsibility for maritime issues must be expressed and delegated within each municipality. The strategy and plan of action will be followed up every two years.

2 The Blue Comprehensive plan

The aim of the Blue Comprehensive Plan is to ensure good planning in terms of joint marine resources, and thereby to create the conditions for a healthy sea involving diverse activities and operations. Development of the plan has been based on the ecosystem approach, i.e. healthy ecosystems being fundamental and crucial to marine development.

The plan comprises three different documents: 'Recommendation Map', 'Plan Description' and 'Planning Conditions'.

- *The 'Recommendation map'* shows use of water within the planning area, and is a geographical presentation of the planning proposal's recommendations. The map has mainly been adapted for use in digital form. The online map includes information linked to each geographically presented item. To a certain extent this information is also available in the plan description.
- The '*Plan Description*' is the text document for the plan. It is divided into three parts: introduction, planning proposal and consequences. The planning proposal describes the political standpoints regarding overall marine spatial planning in northern Bohuslän, i.e. it formulates the vision, goals and strategies that are specified in the form of recommendations on how to plan and work on the development of the marine area. The vision is 'A maritime future with a healthy sea and archipelago'. The objectives are the same for maritime business strategy as for Blue comprehensive plan. The document then describes how to act in order to achieve the objectives – the so-called recommendations.

Five focus areas have been selected:

1. Conservation values
2. Marine foods
3. Maritime tourism
4. Shipping and boating activities
5. Marine energy and research

The Consequences part of the plan description gives an overall description of the ecological, economic and social consequences of implementing the planning proposal, compared with the consequences of not having a 'Blue Comprehensive Plan' for northern Bohuslän.

- '*Planning conditions*', i.e. the conditions and knowledge to be related to in marine spatial planning, are compiled in a separate document. It serves as an informational basis that makes for an understanding of the planning area and the conditions on which the planning is based. There is in general a wealth of information and a great deal of collected knowledge on the conditions on land, but there has not hitherto been any corresponding documentation on marine areas, despite their constituting a significant part of the municipalities. A significant knowledge base regarding the sea has been gathered and developed in the Blue Comprehensive Plan, but it is incomplete. Being able to add things, go into detail and make updates is important to and valuable for the development of northern Bohuslän, and thus an essential part of the continuous work on Blue Comprehensive Plan.

On the online map you can clearly see which areas are affected by the plan, and in what way. The online map's window menu describes what each colour and position means. For example, R5 shows areas suitable for aquaculture in the coastal zone. R6 comprises development zones where marine energy or aquaculture further out may be possible. R8 shows areas for consideration, where more considerate boating activities make for quieter, calmer and more pleasant experiences of the natural world. R9 shows areas for boating activities and outdoor life. In these areas accessibility is important, and it should not be impeded by other facilities.

The Blue Comprehensive Plan is the key to sustainable use of our coast and sea – now and in the future.

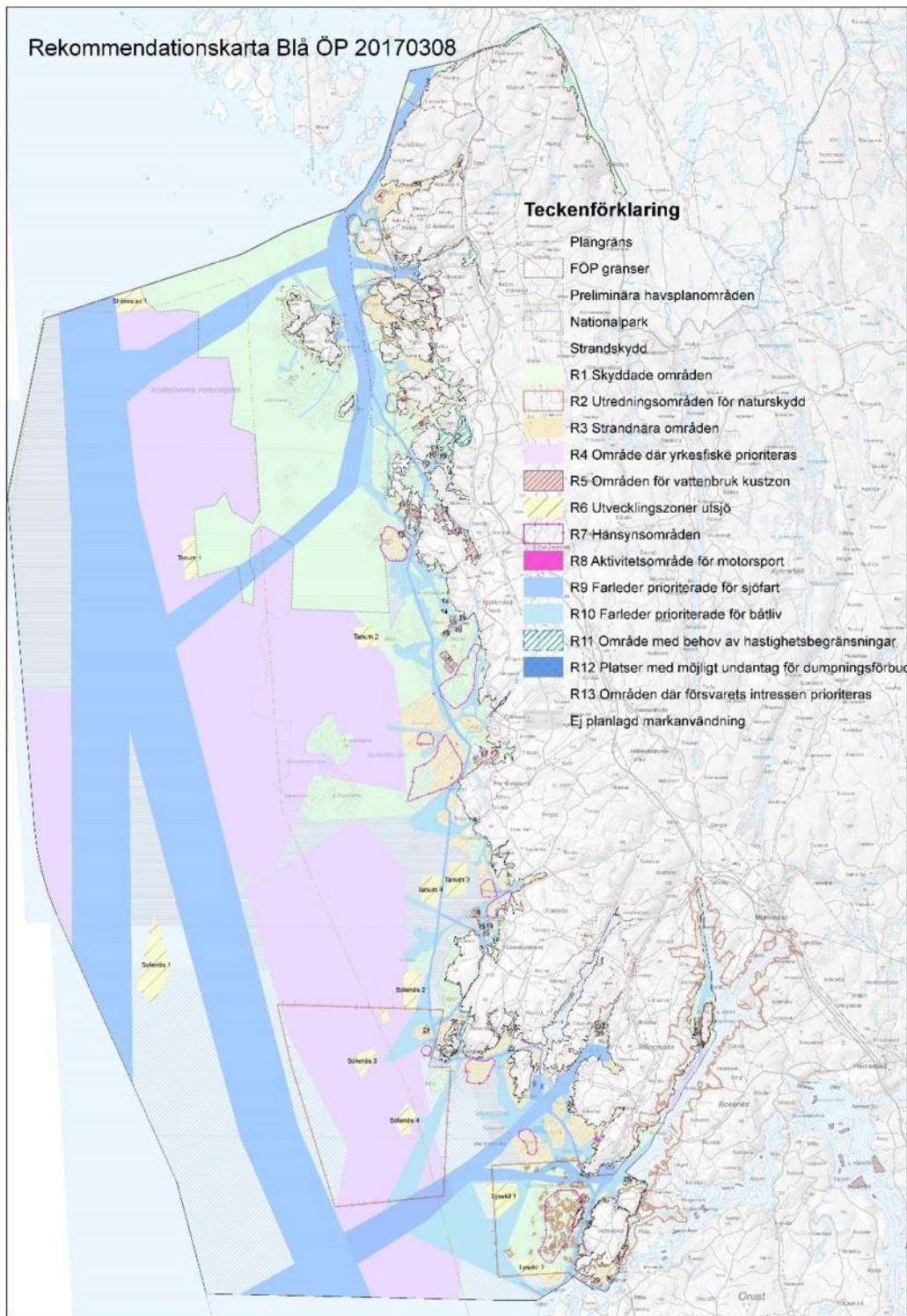


Figure 3: Recommendations regarding the use of the sea taken from the Blue Comprehensive Plan of Northern Bohuslän. In the legend, some of the areas are dedicated to development of off-shore techniques, like development of sea based energy (R6). Other areas are dedicated to coastal aquaculture (R5) and areas that needs restrictions in speed from boat traffic (R11). Source: Growth Northern Bohuslän: <https://www.tillvaxtbohuslan.se/bla-op/>, 2021.

3 Background to the plan and the strategy

The cross-municipal collaboration on joint preparation of a blue comprehensive plan and a maritime business strategy was based on previous work on planning and development issues in the archipelago. There, projects such as the ‘Coastal Zone Project’ (2007-2010) and the ‘Collaborative Plan for Valuable Coastal and Sea Areas’ (2008-2011) had highlighted common issues, needs and measures in northern Bohuslän. The excellent collaboration on these projects brought the Västra Götaland County Administrative Board and the municipalities closer together, and was continued in the work on Blue Comprehensive Plan and Maritime Business Strategy.

Based on these previous collaborations and the structural plan, 2013 saw a dialogue with representatives from several of the marine industries and interest groups linked to the sea. Project funding for Blue comprehensive plan and Maritime Business Strategy was applied for and received in the same year from both the Västra Götaland region and the Västra Götaland County Administrative Board. Project funding was subsequently also received for a regionally funded continuation project in 2014-2015. A programme of blue built-environment objectives was out for consultation in 2014. The programme consultation gave the general public, companies, organisations and authorities the opportunity to comment. The programme was the basis for a Blue Comprehensive Plan proposal presented in 2017. The general public, authorities, companies and organisations were once again given the chance to comment on the proposal, and it was subsequently revised. In spring 2018 the proposal went out for review, and was subsequently adopted.

4 Challenges of municipal collaboration

The work has had many advantages involving collaboration on planning issues. In a reversal of the perspective and instead a consideration of the challenges encountered at work, some of the resultant challenges are highlighted below:

- The difficulties of making many decisions (in accordance with the Swedish Planning and Building Act) in four municipalities (different meeting times, different procedures etc.)
- Comprehensive planning per se constitutes open processes necessitating effort that involves the members, and this takes more time in four municipalities.
- New data and new questions – there was no “That’s what we’ve always done”.
- A degree of reluctance on the part of municipalities to prioritise this work over other line activities.
- A major process whereby many representatives spent 5-10% of their time on the projects, leading to establishment on a broad basis but less continuity
- A major exchange of staff from the municipalities for the various project functions – partly because of the high staff turnover but also owing to low prioritisation.
- Difficulty bridging the Municipal Manager / Head of Administration / Unit Manager hierarchy in four municipalities so that everyone is on the same page about what to do and what resources are to be used.
- Minor input over an extended period is not seen as being input, but creates real costs.

These challenges are opportunities for learning, and things to be aware of and relate to. Structure and organisation can mitigate the effect of these challenges, but they do not remove it.

5 Implementation and the future

At the time of writing, Blue Comprehensive Plan has been in force for two and a half years. So how has the plan been used, what has been its impact along with the business strategy, and what new challenges have become clear?

A comprehensive plan is indicative, and requires the municipalities to bear the plan in mind and actively work on it when exercising their powers and doing other planning. During the initial period there have not been that many cases for which it is the most important document for the municipalities. Several new aquaculture approaches have at the same time been instigated, thus more cases are to be expected in the future. The format of collaborative recurrent meetings between officials responsible for the issues described in the plan has not worked. The consequence of this will be more difficult work in terms of updating the plan when necessary. This forum (the Blue Comprehensive Plan group) for the exchange of information and collaboration with the Västra Götaland County Administrative Board would have been good for all parties.

The state marine spatial plan has not yet been adopted politically, and there have been difficulties finding a format that harmonises the governmental and municipal plans. Nationally, one can at the same time see the strength of the pioneering work in northern Bohuslän, and the people who have been involved in the process are ambassadors. Experiences, lessons learnt and the knowledge they take with them in their work in other coastal municipalities, regions, government services, consultancy etc.

One issue that became clear during the work on Blue Comprehensive Plan and that has not yet been resolved is the matter of responsibility. Establishment of offshore facilities is expensive and involves many risks. Even established technology sometimes doesn't work, or companies that install new or existing technology close down. In these instances, it is often the case that insurances and systems for managing matters or carrying out dismantling don't exist or are inadequate. This often leads to municipalities ultimately being responsible for managing and financing this clean-up, which can be expensive. Not having a good system for this reduces municipalities' incentive for releasing innovative and important approaches.

Blue Comprehensive Plan includes many proposed measures that should be carried out, whilst many constitute the commencement of development measures or actions. Even the clearer recommendations include implementation steps that the municipality or county administrative board has not addressed. One such process is the proposed areas for consideration, for which collaboration and drive do not really work. Blue Comprehensive Plan is a good start, and a basis for working on marine issues, but continued collaboration and continuous work are required. Municipal ownership amongst managers and officials is important in this context. A major advantage for the municipalities in northern Bohuslän is that maritime issues are important. This led to the addition of Blue Comprehensive Plan and the business strategy, and to ensuring the continued creation of development opportunities in the area. The transition to more sustainable societies is crucial on land, in the coastal zone and at sea. The transition will require planning, collaboration and the will to realise it.

References

- Blue Comprehensive Plan (Blå CP): <https://www.tillvaxtbohuslan.se/bla-op/>
- Maritime Business Strategy (MNLS): <https://www.tillvaxtbohuslan.se/maritim-naringslivsstrategi/>
- The Swedish Environmental Protection Agency; 2011. Collaboration plan for valuable coastal and sea areas (2008-2011): <https://www.naturvardsverket.se/Om-Naturvardsverket/Publikationer/ISBN/6400/978-91-620-6471-6/>

Carl Dahlberg
Lysekils kommun
Kungsgatan 44
453 80 Lysekil, Sweden
carl.dahlberg@lysekil.se

Summaries of experiences of the SEAPLANSPACE project

How will the Swedish coastal and marine spatial planning system work from a European marine spatial planning- perspective?

How will the introduction of the EU's Maritime Spatial Planning Directive affect Swedish ways of coastal and marine spatial planning, primarily with regard to the state's national interests and the municipal comprehensive plans? Is Sweden facing a paradigm shift, or will the changes be small or insignificant as far as the Swedish planning system is concerned? Planning has always been about reconciling different interests or issues and placing them geographically, both temporally and spatially, to ensure the optimum outcome for everyone concerned. There may thus not be any major material changes.

As regards marine spatial planning, future evaluations and studies will in all probability examine how development, application and revision of the plans will in various ways contribute to societal benefit. Although the purpose of the SEAPLANSPACE project was never to evaluate how the EU's Maritime Spatial Planning Directive has been implemented in Sweden or how it may work in relation to the matters concerned, many experiences have been gained and shared during the course of the project. Some of these experiences are detailed in the report, but they deserve more attention and investigation in greater detail in some future context.

Various purposes of the marine spatial planning

The various paradigms have characterised different societal sectors and the planning culture that has developed over time in different planning contexts. According to some proponents, planning (as such) can be said to have met its remit when a certain geographical area has been deemed suitable for one or more activities. According to others, the planning has been implemented when the goals that the plan is to contribute to meeting have been met.

The intention of the EU's Maritime Spatial Planning Directive, i.e. that there must be planning so that ecological, economic and social objectives are met (with an ecosystem approach), may be difficult to realise, because of the more static Swedish national interest or the general planning system with what are in part totally different aims? The Swedish option of choosing an indicative function for national marine spatial planning (with only minor changes in the underlying legislation) will probably also affect the possibility of adopting the approach of the EU's Maritime Spatial Planning Directive. From a European perspective there is great scope as regards the marine spatial plans' functionality, as they give sectors of society more binding rights, as well as plans that, like the Swedish ones, are of a more indicative nature. Although marine spatial planning is about the impact of various activities on a marine area, control of these activities is also possible with (or can be supplemented by) means other than just the plans. One example is the Swedish government having taken the initiative of subsidising offshore-to-land connection charges to make offshore wind power more favourable from an economical point of view, and another is the regular international political negotiations within the EU as regards the different fishing quotas, and the sea areas from which the species may be taken.

Differences between different planning systems regarding the objectives

When in addition to the planning objectives, as with the EU's Maritime Spatial Planning Directive, some form of target attainment or results follow-up is applied, the issues and contexts immediately become more complex. How should they be applied correctly, from a Swedish standpoint? Planning should to some extent include an integral component that involves follow-up of the effect of the planning processes, as well as the effect of the plans on the sectors of society for which the marine spatial plans are intended. When it comes to the Baltic Sea, the environmental perspective is inevitable, because our sea are in many ways greatly affected by human activities. Although many of

the reasons why the sea is greatly affected originate from land-based sources, it is very important that marine spatial planning be such that it reduces the overall impact on the sea.

The marine spatial planning has the function of an umbrella for the various sectors' goals and results attainment. One thus also needs to answer questions as to whether evaluation and follow-up are to be via an umbrella or via the sectors – or maybe via the influence of the individual activities. The nature of that responsibility is at least as important as the responsibility for running the planning process or creating the actual plan. Perhaps the prerequisites regarding the sea, e.g. the Baltic Sea, can govern what the evaluation of target attainment is to be like? The many functions of the Baltic Sea as a tourist destination and a source of food production, as well as its importance to outdoor life, may need to be upgraded and strengthened.

The imbalance between the various interests

Access to data, the degree of organisation, political influence and other factors mean that the viability of dealing with certain sectors of society varies, be this individually or together in planning contexts. New interests, values and changing environmental conditions that require 'new' ways of using the sea need to be set against the 'old' ways. How they are variously rooted in society is important to the planning processes' degree of complexity. Interests that are hard to manage and are decided on at an international level are difficult to deal with from a national, regional or local perspective. Shipping legislation may be difficult to influence because of its complex and international structure. As an increase in shipping is causing higher noise levels at sea, some species in the Baltic Sea, e.g. the only species of porpoise, are on the decrease. The UN's International Convention on the Law of the Sea (UNCLOS), which regulates international shipping, includes a section on so-called 'freedom of navigation' (freedom to choose the sea route that is deemed best), which states different rights regarding ships' operations in both international and national waters. For example, a ship can basically sail wherever it wants, even outside established shipping lanes and within a coastal state's territorial sea, provided it doesn't endanger the coastal state's peace or security. Perhaps it's time the concept of 'freedom of navigation' be given new meanings, like: 'freedom of navigation – provided you're using dedicated shipping routes to protect the harbour porpoises in the Baltic' (freedom to choose the sea route deemed the most suitable – only if shipping lanes are chosen that don't adversely affect the porpoises in the Baltic Sea)?

Planning at different geographical levels

One experience gained during the webinars is that it can often be hard to make the different national and local scales work together and sing from the same hymn sheet. Interlinking shipping lanes on the high seas so they connect correctly to other countries' shipping lanes is one aspect of marine spatial planning, and another is endeavouring to make many of the coastal activities at local (or regional) level subject to the different planning systems. The impact in shallow sea areas over the years has led to large parts of our coasts being affected by boating facilities and the expansion of boating. How can this impact be regulated in the context of the exchange between the coast and the high seas? Is it a matter for spatial planning or is the issue more related to environmental assessments? Or is it rather a combination of different perspectives, so as to facilitate correct improvement of the environments in our shallow marine areas? Is society's regulatory framework up to date, so it can contribute to resolving new, multifaceted issues? The problems are often complex, thus the solutions can also be complex – the exchange between shallow coastal bottoms is important to the many organisms that spend periods living in this environment, then later spend most of their time in deeper waters. For example, most of the fish we eat.

By way of conclusion, it can be stated that marine-planning processes benefit from bringing in as many stakeholders as possible at an early stage and allowing them to take part and engage in every phase – from the initial phases during which data and documentation are verified through to the 'drawing' of the plans and integration of the follow-up in preparation for the next-generation marine

spatial plans. The fact that all the information and knowledge about a marine area is gathered in one place – the plan – is of great intrinsic value per se, in that it visualises the way the different players use the sea.

This chapter was prepared by Robert Dobak; County Administrative Board of Kalmar, Sweden.

Robert Dobak
Länsstyrelsen Kalmar
Regeringsgatan 1
391 86 Kalmar, Sweden
robert.dobak@lansstyrelsen.se