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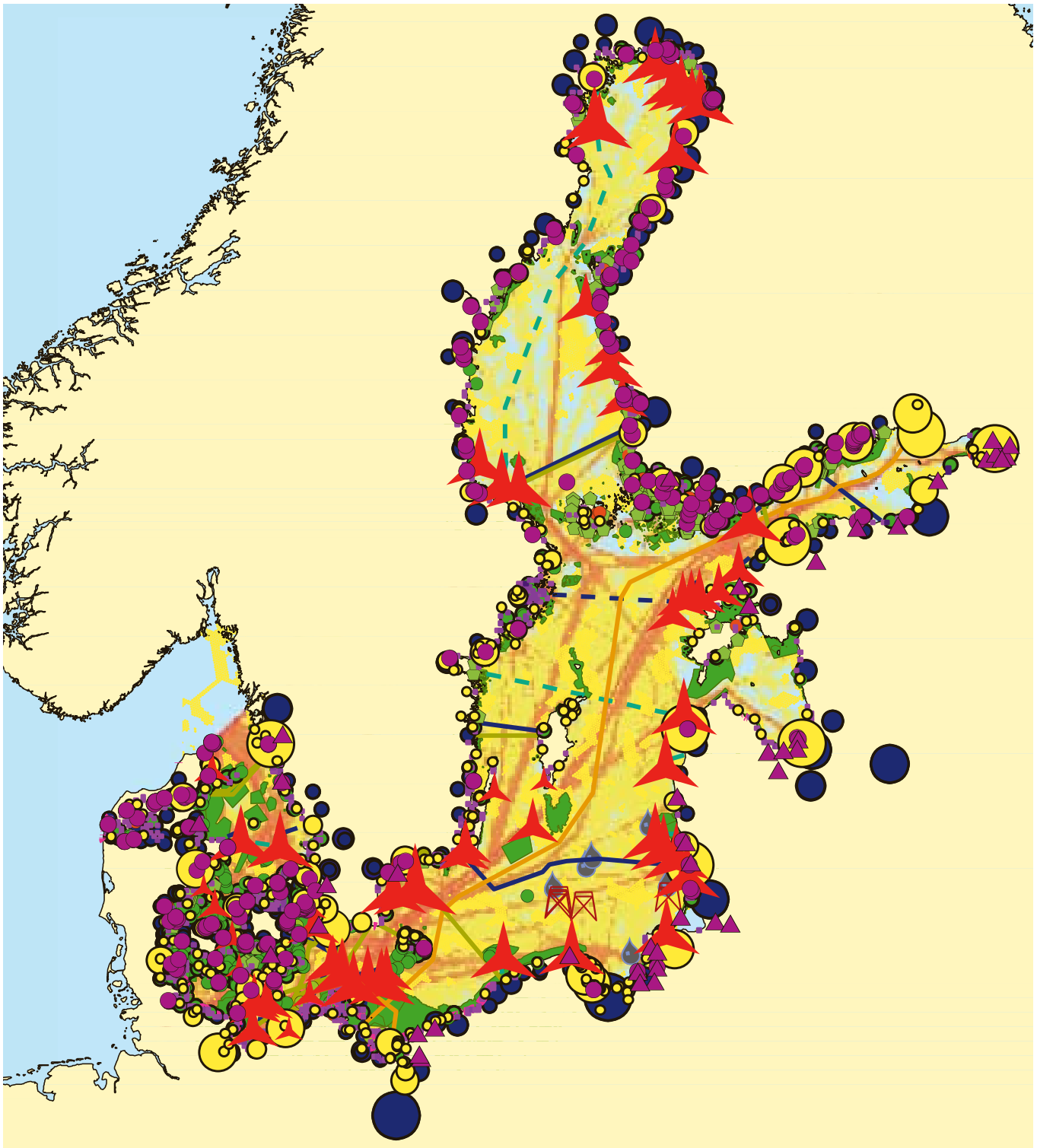
Future Trends in the Baltic Sea

WWF Baltic Ecoregion Programme 2010



Data source: HELCOM/WWF

Shipping, fishing, energy cables and pipelines, tourism and recreation. There are many ways in which the Baltic Sea is used today and the competition for sea area gets further intense every year. Wind farms, oil extraction and cables are being projected at many places on the sea floor while shipping routes, boat traffic, fisheries and other human activities are already affecting the same areas.

Contents

Executive Summary

The Baltic Sea is getting more and more crowded, used by a variety of maritime activities, almost all projected to increase and expand substantially over the next 20 years. This growth will increase demand for the limited space and resources of the sea, and could consequently lead to increased conflicts within maritime sectors, between sectors, and between human uses and nature.

One of the most striking examples of this projected growth is shown by the shipping sector. The Baltic Sea is already one of the most densely trafficked sea regions in the world. Over the next 20 years, shipping is expected to double in terms of the number of ships. At the same time, the size of the ships is predicted to increase substantially. The wind energy sector is also expecting enormous growth, increasing today's capacity of about 400 MW by 6,000% to 25,000 MW. Other human uses of the sea expecting growth include tourism and recreation, port capacity, electric cables and pipelines, as well as physical exploitation of the coastline and sea bottom. Some sectors are predicted to be quite stable such as oil and gas development and military activities.

Looking at all sectors together it becomes clear that the Baltic Sea is facing an extensive expansion of human activities within the coming 20 years with a projected growth of several hundred percent for many sectors. For many sectors, however, strategic plans still have not been developed which makes it impossible to predict the growth and areal needs of these sectors and to give a clear picture of the total growth and future trends in the Baltic Sea. Until now, allocation of space in the marine environment has been done on a single-sector basis, mainly without a plan-based holistic approach and giving little or no consideration to objectives from other sectors, to the cumulative pressure on the ecosystem from all human uses together, or to conservation requirements based on what the ecosystem can sustain. If we continue working in this way, it will lead to increased competition and conflicts over marine space, with a high risk of overuse of marine resources. In addition to the pressures from place-based maritime activities, the already stressed Baltic Sea ecosystem is exposed to further pressures from diffuse sources like agricultural and industrial pollution and climate change. So far there has been no attempt to do a holistic and strategic plan for all sectors and human uses of the Baltic sea together. The lack of integrated planning and management in many cases results in counteracting decisions that hinder sustainable development in the region.

We have now reached a level where the cumulative pressures from human use risk exceeding the capacity of the ecosystem. To make space for marine species and habitats as well as sustainable human use, we have to start planning and managing our use of the sea in a better way. We have to move beyond the current fragmented patchwork of governance models and regulatory frameworks that still predominates our approach to the management of the Baltic Sea on the local, national and international level towards a more holistic and integrated approach.

As this report clearly shows there is an urgent need for a better, more integrated, planning and management of the Baltic Sea. WWF sees Integrated Sea Use Management as a long term, strategic, inclusive and transparent process to minimize environmental impacts from resource use and to maximize benefits to society.

Photo: Ted Holt

Allocation of space in the marine environment has been done on a single-sector basis, mainly without a planned holistic approach, giving little consideration to the objectives of other sectors and the cumulative pressure on the ecosystem from all human uses together, or to the conservation requirements based on what the ecosystem can sustain.

Foto: Lasse Burel (Östersjövy); Ola Jennersten (Inlagd dvärgmås). Bilden är ett montage.

Introduction

The Baltic Sea is getting increasingly crowded with a growing number of maritime activities. Increased human activities on the seas lead to growing competition over limited space and resources. Fisheries and shipping are activities that we are all familiar with in the Baltic Sea, but the sea offers resources for many more activities including energy generation and transmission, resource extraction, tourism and recreation. It is also acting as a repository for excess nutrients and other substances from agriculture, industry and other human activities.

Finding a balance between economic, social and environmental quality is a challenge for governments in the Baltic Sea region. At the national level, governments have developed their own environmental and development policies. At the sea basin level, the contracting parties to the Helsinki Convention (HELCOM) have agreed to improve the environmental status of the sea by 2021 in line with targets set within the 2007 Baltic Sea Action Plan (BSAP). At a European level, the EU Integrated Maritime Policy (IMP) was introduced in 2007, with the objective to integrate different maritime-related policies. The EU Marine Strategy Framework Directive is the environmental pillar of the Integrated Maritime Policy with an aim to achieve good environmental status of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. The EU Strategy for the Baltic Sea Region was adopted in 2009 to make the region more environmentally sustainable, prosperous, accessible and attractive, safe and secure.

Photo: Mauri Rautkari / WWF-Canon

More sites need to be protected to provide sufficient protection for the entire Baltic Sea ecosystem.

Despite all these conventions and agreements, the Baltic Sea remains one of the most threatened marine ecosystems on the planet. Eutrophication with yearly algae blooms and dead zones, overfishing, pollution by hazardous substances and loss of biodiversity are still major threats to the Baltic Sea. The HELCOM Holistic Assessment" has shown that none of the 14 open sea basins of the Baltic Sea are in good status.[1] It has become obvious that one of the reasons for this dire state is the lack of integration and strong political leadership, which results in counteracting decisions that hinder good intentions from moving forward. For example, decisions to stop eutrophication are counteracted by other decisions to increase agricultural practices that have a negative impact on the Baltic Sea.

Marine policy and legislation have been developed over the years in a fragmented way and on a single-sector basis, sometimes in response to a major emergency or a new demand. This has created a patchwork of governance models and regulatory frameworks that still predominates our approach to the management of the Baltic Sea on the local, national and international level.

The use of marine space has until now been planned and managed sector by sector, mainly without a plan-based holistic approach and giving little or no consideration to objectives from other sectors, to the cumulative pressure on the ecosystem from all human uses together, or to conservation requirements based on what the ecosystem can sustain. Moreover, there is still a lack of integrated planning between the Baltic Sea countries when allocating marine space and resources.

WWF believes that a truly integrated and coordinated planning and management of all uses of the sea, based on an ecosystem approach, is essential to solve the urgent problems in the Baltic Sea. With increased competition for use of the sea, it has now become even more crucial to move beyond the current fragmented patchwork and establish a more Integrated Sea Use Management (ISUM) across countries, sectors and levels of governments. Jointly developed goals and targets has to be set across sectors and countries defining

the Baltic Sea we want in the future as well as the kind and level of human activities that can fit within the limits of the ecosystem. Such a holistic plan is missing today.

This report outlines scenarios for the future development of the various sectors operating in the Baltic Sea region over the next 10 to 20 years. The scenarios are based on political statements, visions and development plans from different sectors compiled from written documentation and through interviews carried out in the region.

The ambition of this report is to illustrate probable scenarios for the future based on best available knowledge. As with all attempts to look into the future, it does not claim to be an accurate prediction of what will come. It is rather intended as a first attempt to combine the various plans and visions that exist in the region to catch a glimpse of what might happen if we do not take a more integrated approach to maritime management and planning.

The aim of this report is to:

- Investigate future trends for different sectors of human activity in the Baltic Sea and find out if these sectors are likely to overlap in terms of sea use or resources needed to fulfil their future plans or visions;
- initiate a discussion on how to achieve a more efficient, holistic and integrated planning and management of the Baltic Sea and by doing so reduce potential conflicts while supporting sustainable development in the region within the capacity of the ecosystem
- provide thoughts and recommendations for the way forward.

The following chapters illustrate the present situation and future predicted trends for different sectors in the Baltic Sea – now and up to 2030.

Photo: Arvydas Kriukta

Photo: Almgren

To achieve rational use of the Baltic Sea area and to obtain a good environmental status, the spatial planning of the Baltic Sea must be integrated between all countries sharing it.

SECTORS

1. Wind Energy

The offshore wind energy sector has experienced strong growth over the recent years. In the last decade the trend has been visible in all of the Baltic Sea countries, with somewhat higher frequency in Denmark and Germany and a lower frequency in Latvia, Lithuania and Russia.

At present, there are 13 wind farms in the Baltic Sea, situated in Denmark, Germany, Sweden and Finland with a total capacity of about 436 MW.[2]

Future trends

According to the EU climate and energy package, the EU Member States have agreed to produce 20% of the total EU electricity demand from renewable sources by 2020[3]. In addition, 12% of the renewable energy should come from wind energy. This decision has stimulated a continued expansion of wind farms in the region. There are already plans for 29 new offshore wind farms in the Baltic Sea region to be completed by 2020 that are either under construction, formally authorized or that have been applied for (Fig. 2).[4] Together, these new farms have a planned total capacity of 10,843 MW, which is an increase of about 25 times compared to current production levels (Fig. 1).

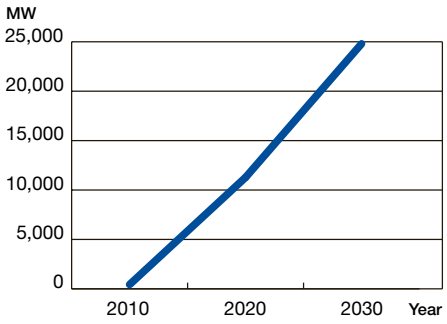


Figure 1. Predicted amount of electrical energy produced in megawatts (MW) by offshore wind farms in the Baltic Sea 2010–2030.[12]

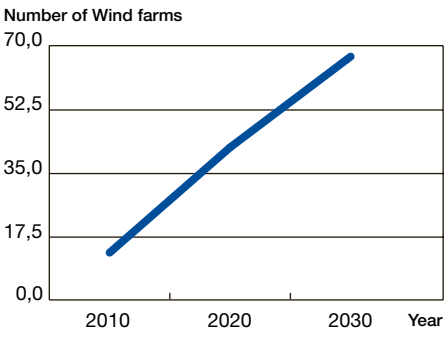


Figure 2. Number of offshore wind farms in the Baltic Sea 2010–2030.[13]

At present, there are 13 wind farms in the Baltic Sea and there are plans for 29 new offshore wind farms in the region until 2020. Including the existing wind farms, the wind energy sector will cover an area of about 2,436 km² in 2030. Photo: Still Pictures / NordicPhotos

Between 2020 and 2030, there are plans for developing another 25 offshore wind farms in the region[5]. If these plans are implemented, there will be a total of 67 offshore wind farms in the Baltic Sea by 2030 (Fig. 2) with a combined capacity of around 25,000 MW (Fig. 1). This is an increase by 6,000% in the coming 20 years.

The planned and projected wind farms will also be larger in size than current farms. At present, most wind farms contain up to 20 turbines. The future wind farms are projected to contain up to 500 turbines. For example, the Estonian wind park, Hiiumaa, planned to be in operation by 2020, will contain 250 turbines with a total capacity of 1,000 MW. This park alone will produce more than double the current total capacity of the whole region.[6]

Judging from the plans of three of the future offshore wind farms (two on Krieger's Flak and one on Stora Middelgrund), the sea area needed by a wind farm that produces 100 MW is on average about 10 km²[7]. Assuming that the proportions between size and MW is applicable for all wind farms planned for the next 20 years, an area of about 2,500 km² will be needed to accommodate all planned farms in the Baltic Sea. This would mean that, including the existing wind farms, the wind energy sector will in 2030 cover an area equal to the size of the Estonian island of Saaremaa or the Swedish island of Gotland.

Impacts

Wind power is a renewable energy source and as such, something that is

supported by WWF and by the wider society. As an activity that needs vast areas of the sea, offshore wind power is a good example of the need for better planning of sea use.

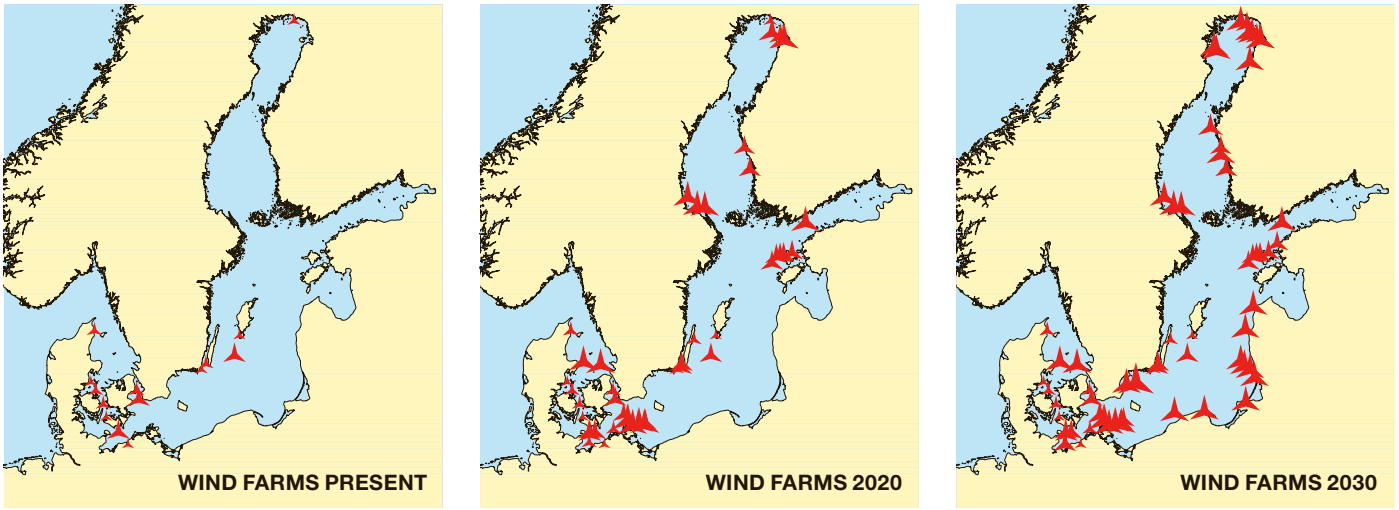
Large scale wind farms located offshore are frequently discussed as their presence in a certain area often collides with other interests such as shipping, fishery, extraction of sediment, laying of cables and pipelines and military activities. Furthermore, wind farms change the natural scenery, which may affect tourism and recreation in a negative way.

Wind farms also occupy shallow sea areas that are often highly valuable from an ecological perspective, which may result in conflicts with nature conservation.[8]

It is important to note that the surface area wind farms occupy extends further than the physical structure. There is, for example, usually a safety zone of 500 meters around wind farms, with restrictions for shipping. There is usually also a buffer zone of 500 meters around the cables, which prohibits anchoring of vessels.[9]

Knowledge about the ecological impact of wind farms is still very poor. Wind farms can potentially cause interference with hydrological processes of the sea by altering water currents, transportation of sediments, and the natural movement of drifting marine organisms[10]. As the number of offshore wind farms increases, the question also arises whether noise generated by the turbines and other vibrations that can be transmitted to the sea will become significant enough to harm marine mammals[11] and fish.

On the other hand, offshore wind turbines can also act as artificial reefs that attract several marine species of flora and fauna and can also act as "sanctuaries" for fish.



Windmill Park Middelgrunden (Middelgrundens Vindmøllelaug) is an offshore wind farm composed of 20 turbines. The wind farm is situated outside the harbour of Copenhagen. Denmark has invested a lot of money in wind power. Their largest offshore wind farm to date contains 75 turbines.

Photo: Jorgen Schytte / Middelgrunden Windmill Park Copenhagen / NordicPhotos

SECTORS

2. Shipping

Since the mid 1990's, the Baltic Sea region as a whole has witnessed enormous growth in maritime transports.[14] Despite the fall in the shipping industry in 2008 caused by the economic recession, the Baltic Sea is still one of the most heavily trafficked seas in the world, accounting for up to 15% of the world's cargo transportation.

Each month there are around 3,500 to 5,000 ships on the waters of the Baltic Sea; around 2,000 sizeable ships are normally at sea at any given moment, including large oil tankers, ships carrying dangerous and potentially polluting cargoes, as well as many large passenger ferries.[15]

On top of the intense traffic with many crossing shipping routes, the Baltic Sea presents particular challenges to navigators because of its shallow waters, its many islands and its ice conditions in the winter.

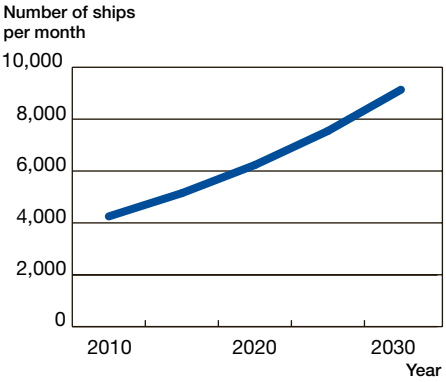


Figure 3. Predicted increase in the number of ships per month on the Baltic Sea 2010–2030.[24]

Future trends

Looking 10 and 20 years ahead, forecasts predict a huge growth in the sector. The number of ships is expected to double by 2030[16] (Fig. 3) and the size of ships is expected to increase substantially as well[17]. Shipping of oil, counted in tonnes, is predicted to grow by 64% by 2030[18] (Fig. 4). This massive growth in the shipping sector is mainly due to the expansion and construction of oil terminals on the shores of the Gulf of Finland and regional economic growth.[19] Also, the number of cruise ships in the area is increasing annually with a growing trend for the use of larger ships and more international cruisers[20].

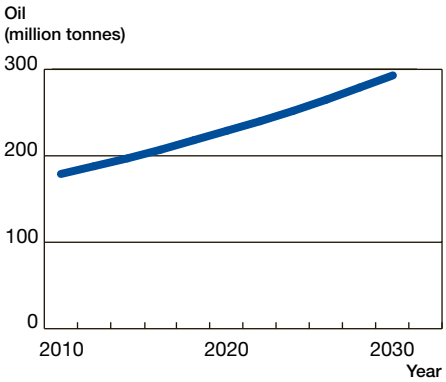


Figure 4. Predicted increase of shipping of oil on the Baltic Sea 2010–2030.[25]

Impacts

The enormous volume of shipping in the Baltic Sea is accompanied by a large risk of accidents. According to Helcom, there has been an increase in both groundings and collisions during the last years, and the number of accidents is estimated at 150 per year.[21] Many accidents result in oil spills. Since 1980 the Baltic Sea has experienced on average one major shipping accident per year resulting in an oil spill larger than 100 tonnes[22]. A large oil accident in the Baltic Sea would have serious ecological effects. Oil spills can have devastating impacts on vast areas of nature as well as on sectors such as fishing, tourism and recreation. Clean-ups after an oil spill can also cause extensive costs.

The area of the Baltic Sea occupied by shipping is larger than just the size of the ships and the lines of the routes. A safety zone around vessels and shipping lanes must be included to provide sufficient manoeuvring space.[23]

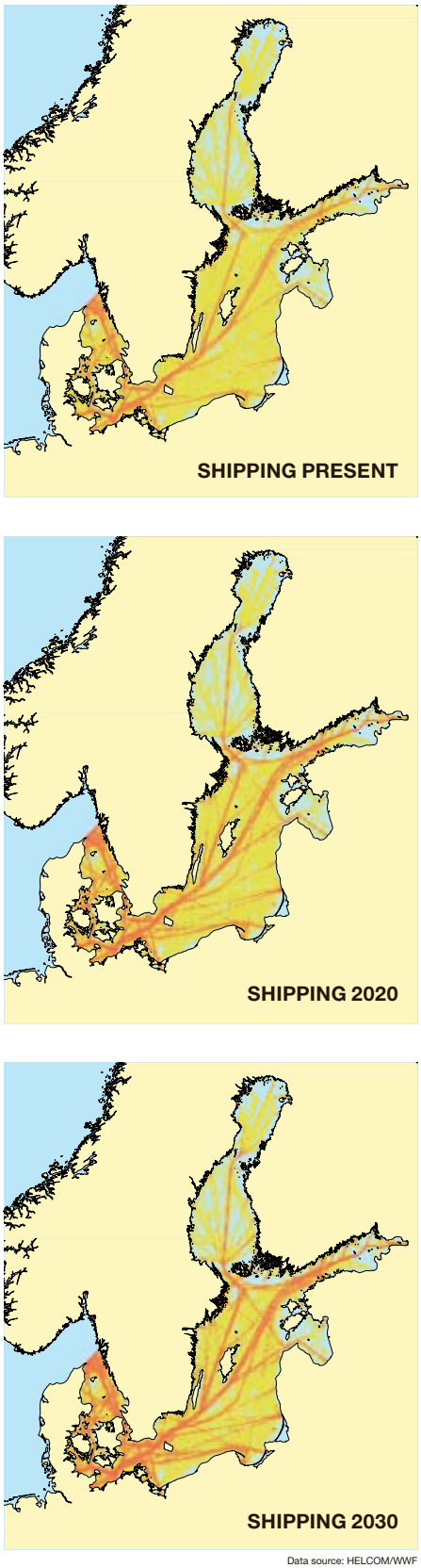


Photo: Prisma / NordicPhotos

The shipping of oil in the Baltic Sea area may grow by 64 percent by 2030. The increase is largely due to the expansion and contruction of oil terminals. Another trend seen in the Baltic Sea shipping sector is an increse of international cruisers as well as other large ships.

Photo: Mikhail Markovskiy

SECTORS

3. Ports

There are more than 200 commercial ports in the Baltic Sea region. In 2008 these ports all together received more than 800 million tonnes of cargo and 91 million passengers.[26] Construction of new ports is a very slow process and in the last decade the number of ports in the Baltic has remained more or less the same.[27]

The rapid growth in vessel size is likely to cause challenges for the existing ports in the future, since bigger vessels need bigger and deeper channels, new cargo handling equipment and an upgrade of port infrastructure.[28] Reconstruction and expansion has been done in the last few years in the ports of Gdansk (Poland), Vuosaari, Helsinki and Turku (Finland), St. Petersburg and Ust-Luga (Russia), Muuga (Estonia), Malmö and Stockholm (Sweden), and in Ventspils (Latvia).[29]

Future trends

In the future, the number of ports will probably remain the same, but existing ports will become larger.[30] General cargo and container traffic managed by the Baltic Sea ports is estimated by Helcom to grow by 64% by 2020 and, if this trend continues, double by 2030 (Fig. 5).[31]

Current port capacity may cover the need for the next few years but will not be enough to meet the growth of cargo, containers and oil shipped on the Baltic Sea in the next 10–15 years.[32] The capacity shortages in the future will be most severe in the ports located along the German coast and the Gulf of Finland.[33]

Impacts

New investments in port areas face large environmental challenges, not least dredging. Dredging has large effects on the marine environment due to the physical destruction of habitats. It may lead to changes in the chemical composition of the water since toxins as well as nutrients can be released from sediments during dredging, triggering algal blooms and affecting marine life.[34] As a consequence, sectors such as fishing, aquaculture, tourism and recreation may be affected. The effects of dredging on the marine environment can persist over several years and in extreme cases over a decade.[35] Physical disturbance from constructions and toxic pollution may also be a threat.

Photo: Vera Tomankova

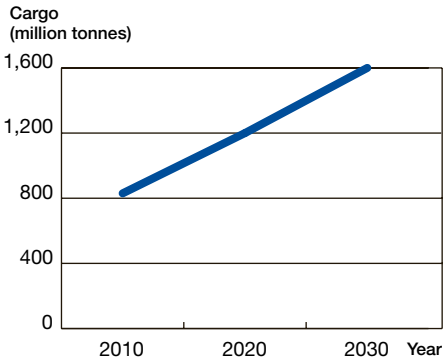
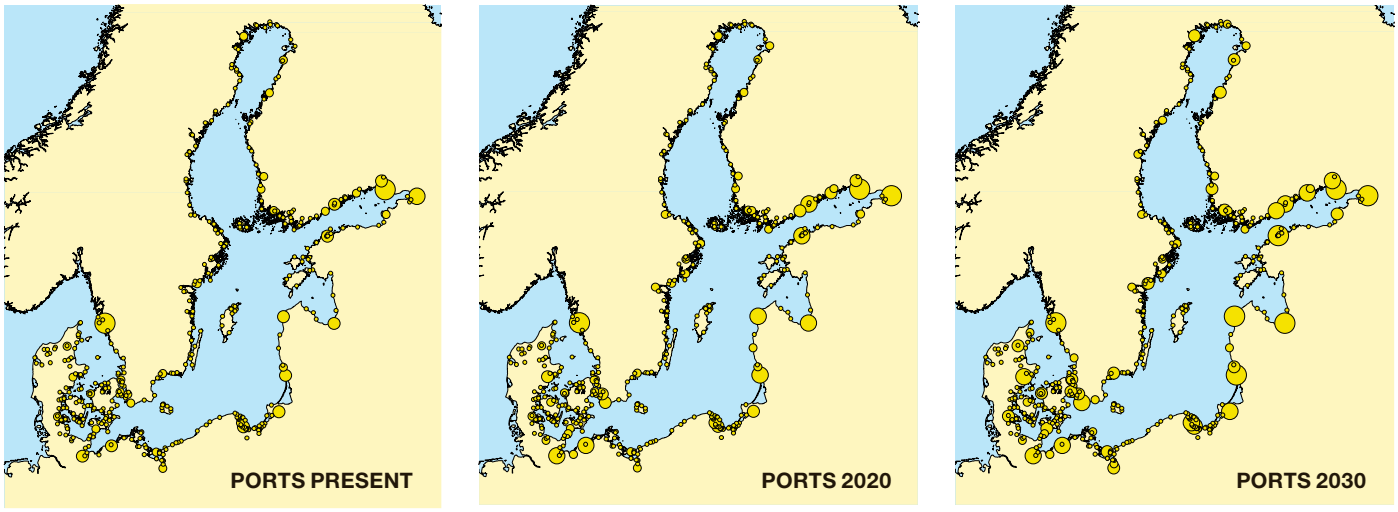


Figure 5. Predicted amount of cargo managed by Baltic Sea ports 2010–2030.[36]

Current port capacity in the Baltic Sea may still be adequate for a few years to come but will be far from enough to meet future needs of the shipping sector.

Photo: Valerijs Kostreckis

Cargo ship under loading in the sea port of Klaipeda, Lithuania.



Data source: HELCOM/WWF

Cargo turnover in thousand tonnes

- 10–5,000
- 5,000–15,000
- 15,000–30,000
- 30,000–75,000
- 75,000–2,000,000

Photo: Diego Cervo

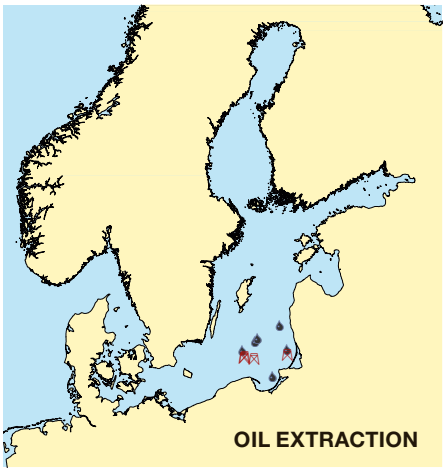
SECTORS

4. Oil and Gas Extraction

There are four oil platforms in the Baltic Sea, all of them located in the south-eastern part of the region in the oil fields of Kravtsovskoye and B-3.[37] Three of the platforms, Baltic Beta, Petro Baltic and PG-1, are Polish, and one, MLSP D-6, is Russian. The reserves in Kravtsovskoye and B-3 are estimated to last until 2030 or longer.

Future trends

Interest in oil exploration in the Baltic Sea is growing, and drilling has shown there is more oil to extract. The seabed southeast of Gotland, 50 km from the Polish oil platforms, is estimated to hold several hundred million barrels of oil. The Swedish oil company, Opab, applied for permission to drill but was denied in 2009 by the Swedish government due to environmental deference. However, Opab has declared that the company may apply for permission to drill in the Latvian or Lithuanian part of the same oil field. As the development of oil and gas exploration is a highly political issue, there is a lot of uncertainty in the future of the business.



Impacts

The number of oil spills per platform and year is 2.79 (based on statistics from the North Sea)[38]. The Russian D-6 platform has a yearly leakage of about 140 tonnes of oil.[39] These leakages are caused by operational spills and discharges, failure of pipelines caused by anchors passing over the pipe, corrosion or breakage, and blowouts from oil wells. D-6 is situated 22.5 km from the Kaliningrad coastline, and approximately one third of all oil spills from D-6 reach the coast. Depending on the size of the spill and the duration, the length of contaminated coastline has varied from 5 to 75 km.[40]

Oil leakages affect marine flora and fauna as well as the coastlines. As a consequence of this, both nature conservation and many commercial sectors are affected by the oil spill, such as fishing, tourism and recreation.[41] A large oil spill may have catastrophic impacts on these sectors.

The nearly enclosed Baltic Sea is particularly sensitive to marine pollution since the renewal of seawater is slow and major inflows from the narrow Danish straits are rare. The picture shows cleaning of a Common Murre (Uria aalge) covered in oil. A drop of oil the size of a coin is enough to kill a seabird. There is a regional cooperation in place to assist and respond to oiled wildlife incidents.

Photo: Fabrizio Bensch / Reuters / Scanpix

Oil extraction in the Baltic Sea is at a comparably low level today, but the interest for exploration and drilling is increasing.

SECTORS

5. Pipelines and Cables

Offshore pipelines and cables are increasing in the Baltic Sea as well as elsewhere in the world[42]. Many such installations in the Baltic Sea have been placed during the last decade[43] and there are many ongoing projects. For example, the controversial 1,200 km long Nord Stream pipeline is currently being laid between Russia and Germany.

Photo: EUPEC PipeCoatings France S.A. / Nord Stream

Workers installing equipment for the Nord Stream gas pipeline that will link Russia and the European Union via the Baltic Sea.

Future trends

Both the number of cables and the number of pipelines are increasing in the Baltic Sea. Electricity cables are increasing both as a consequence of the construction of new wind farms and with the purpose of connecting national electricity networks. The market for natural gas has increased steadily over the last decade and the construction of gas pipelines is increasing in the Baltic Sea as well as at the European and global level[44].

Looking at future plans for the region, cables and pipelines of a total length of about 3,810 km are predicted to be laid in the Baltic Sea over the next 20 years (not including cables for the planned wind farms)[45] (Table 1). Since this number is mainly based on plans up to 2020, it is a low estimate. The plans for cables and pipelines from 2020 and beyond are either vague or non-existing, making it difficult to make long term forecasts. This is unfortunate since the cable and pipeline sector may claim quite a bit of marine space in the future.

Impacts

To begin with, cables and pipelines occupy sea bottom area where they are placed. During the construction phase, when laying cables and pipelines, a safety zone is established, which temporarily affects e.g. fishing and shipping in the area. The presence of the cable-laying ship and related equipments may also disturb birds, fish and marine mammals depending on the marine region, the season, and other factors[46]. Laying of cables may stir up

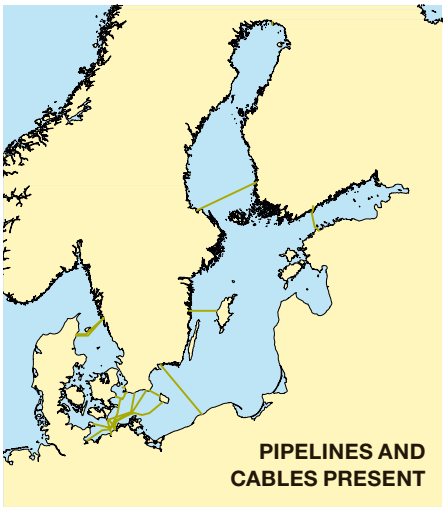
NAME OF PROJECT	CABLE TYPE	LOCATION	IN OPERATION	LENGTH OFFSHORE
Balticconnector	Gas pipeline	Finland – Estonia	2010	120 km
Great Belt	Electricity cable	Denmark	2010	30 km
Fenno-Skan 2	Electricity cable	Finland – Sweden	2011	200 km
Nord Stream	Gas pipeline	Russia – Germany	2012	1,200 km
Baltic Pipe	Gas pipeline	Denmark – Poland	2013	230 km
Estlink 2	Electricity cable	Estonia – Finland	2013/2014	140 km
Gotlandskabeln	Electricity cable	Sweden	2015 (earliest)	100 km
Nordbalt	Electricity cable	Sweden – Lithuania	2016/2017	350 km
Ekolänken	Electricity cable	Sweden	2015–2030	700 km
Ambergate	Electricity cable	Sweden – Latvia	2015–2030	390 km
(No name)	Electricity cable	Estonia – Sweden	2015–2030	350 km
TOTAL				3,810 km

Table 1. New cables and pipelines in the Baltic Sea that are either under construction, have been approved or are under consideration during the next 20 years (electricity cables from projected wind farms not included).[50]

Photo: EUPEC PipeCoatings France S.A. / Nord Stream

Photo: Andreas Kstermann / ostSeh / Nord Stream

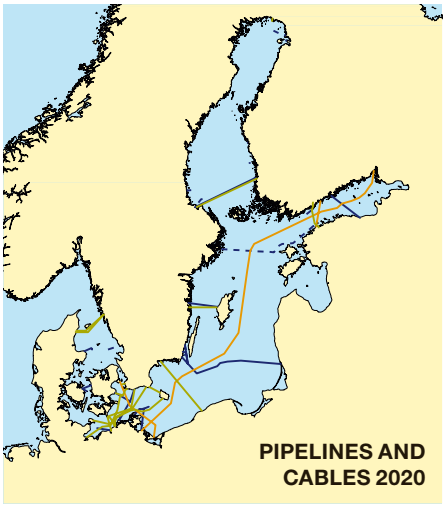
Storage and loading of pipe joints for the Nord Stream gas pipeline on the German Baltic Sea coast.

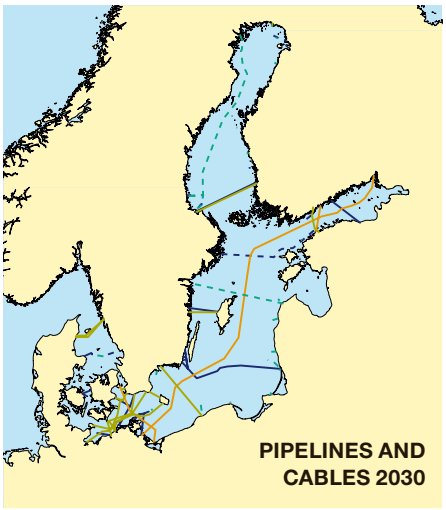


The number of cables and pipelines are predicted to increase in the future. Many plans are already underway for construction crossing over the Baltic basin.

Photo: Allseas / Nord Stream

Allseas' Solitaire is the largest pipelay vessel in the world. It is one of three vessels involved in the construction of the Nord Stream pipeline.





Data source: HELCOM/WWF

- Pipelines and Cables Present
- New gas pipelines 2020
- New electricity cables 2020
- Estimated electricity cables 2020
- Estimated electricity cables 2030

silt from the sea bottom, which affects marine flora and fauna, and sometimes the stirred-up bottom sediment contains toxic substances that are released into the sea water[47].

Once the pipelines and cables are in place, they may continue to affect fisheries. If the cables are not submerged in the sea bottom, trawling and anchoring are usually not allowed within an area of 500 meters around the cables[48]. Introduction of cables may also potentially have impacts on certain fish species by the electromagnetic fields induced by the electric currents in the cables.[49]

The area occupied by cables and pipelines is larger than just the size of the actual cable as a safety zone around cables and pipelines is needed for some uses. Assuming that this sector will continue to grow at the same pace, there will be a net of about 7,000 km of pipelines and cables criss-crossing the Baltic Sea by 2030, including the cables and pipelines of today, and the cables planned for wind farms.

SECTORS

6. Physical Exploitation

The coastal zones of the Baltic Sea are exposed to intensive physical exploitation with the greatest degree of development taking place in or adjacent to growing urban areas. Cities, industries, bridges, dams, coastal defence structures, summerhouses and other types of coastal or offshore development occupy larger and larger areas.

Future trends

Based on available information, it is not possible to illustrate the foreseen amount of development or the area exposed to intensive physical exploitation over the next ten to twenty years as there is no holistic plan available on major projects. There are, however, several spectacular plans for physical exploitation in the region. Estonia is planning to build the 7 km long Saaremaa Bridge to be completed by 2022[51]. The 19 km long Fehmarn Belt Bridge between Denmark and Germany is expected to be completed in 2018. Port Olpenitz, the biggest holiday resort in northern Europe, is planned to open in 2012. It is situated next to several nature protection areas at the mouth of the narrow Schlei bay in Germany.[52]

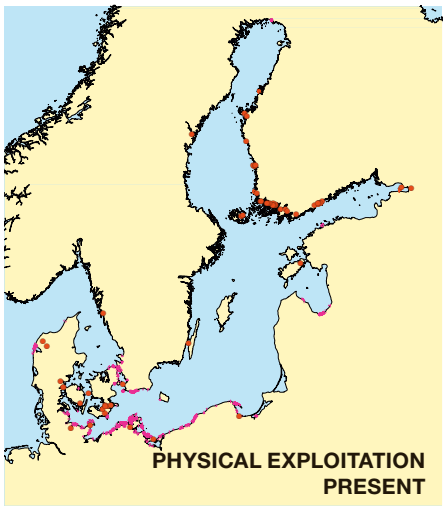
One of the major contributions to physical exploitation of the Baltic Sea coasts is the expansion of cities and residential development in previously undisturbed areas. Residential development, such as permanent and holiday houses, has increased on a large scale in several areas along the Finnish and Swedish coast. In Latvia, resort infrastructure is developing in an uncontrolled manner in areas such as Rucava Nature Park, where landowners are constructing houses illegally.[53] In Germany, several new marinas are currently being projected.

Impacts

Nature conservation, fisheries, shipping, tourism and recreation may all be negatively influenced by physical exploitation.

The construction of the Fehmarn Bridge may impact on seabed life and habitats. Similarly, the Saaremaa Bridge is being built over the Suur strait, which is an important bird area. The water is shallow and the bridge could disturb the strait's tidal flows.[54] Construction work may also cause sedimentation of particles, which can adversely affect valuable habitats like sea grass meadows. The noise created can disturb or deter animals from the site and surroundings, affecting not only the wildlife but also temporarily disturbing tourism and recreation.[55]

As the coasts of the Baltic Sea are becoming increasingly popular locations for housing (and tourism) projects, the coast and open sea will be more intensively used, which may have impacts on the environment, and be in conflict with nature conservation e.g. in adjacent or nearby marine protected areas.



Changes in water flow caused by physical constructions can have multiple effects on the surrounding ecology.

Photo: Jacek Oleksinski

SECTORS

7. Sand and Gravel Extraction

In most countries around the Baltic Sea, marine sediment extraction is a minor operation. In some regions in Denmark and Finland, however, the activity is of increasing economical importance.

The main reasons for sand and gravel extraction in the Baltic Sea are land filling, road construction, beach nourishment and construction in ports and other coastal areas.[56]

Future trends

Extraction of gravel and sand in the Baltic Sea is increasing[57]. In Finland, there are current plans to carry out major extractions in 2011[58]. In Germany, exploitation has been stable the last decade, or decreased slightly; no extraction licences have been granted in Germany recently[59].

The lack of long term plans for gravel and sand extraction in the region makes the future of this sector difficult to predict. It is likely, however, that extraction of gravel and sand will increase in order to supply the material needed for the construction of the planned projects of coastal infrastructure[60]. Also, growing coastal erosion due to climate change will further increase the demand for sand needed for beach replenishment in the region.[61]

Impacts

Removing sand and gravel from the sea results in changes to currents, sedimentation and possibly oxygen depletion locally. These changes are likely to affect fish stocks, other fauna, seabed vegetation, and erosion patterns[62], which in turn affects fisheries, nature conservation, tourism and recreation. An environmental impact assessment carried out in the Gulf of Finland concluded that gravel extraction could significantly increase turbidity and destroy local bottom communities.[63]

Other activities or sectors that may compete for the same areas as sediment extraction in the future are shipping (if sand and gravel is extracted in the way of planned shipping routes), cables and pipelines, wind farms and oil drilling.

Photo: Arvydas Kriukta

Growing coastal erosion due to climate change increases the demand for sand needed for beach replenishment in the Baltic Sea region. Ironically, the extraction of sand and gravel in itself also creates environmental changes that, in turn, are likely to affect erosion patterns; thus a viscous circle is created.

Photo: J. Hansen / azote.se

SECTORS

8. Military Activity

There are military zones of different types in the Baltic Sea. In official military areas and protection zones, recreational boating, mooring, shipping, fishing, anchoring, and diving are usually prohibited. There are also military training ranges, many of which temporarily prohibit other activities.

Future trends

Military activity, including exercises with naval units at sea and the safety areas associated with coastal firing-ranges, is by its nature very difficult to predict. In this study we have expected it to remain at approximately the same scale as today.[64]

One notable exception from this is a plan to establish about 10 military shooting areas along the Estonian coast.[65]

Impacts

Military zones and operations occupy area, which may be desirable for nature conservation, shipping, fishing, tourism and recreation, pipelines, cables and wind farms. Since military areas are relatively undisturbed, they often have high natural values and can therefore be well-suited for nature conservation. In densely populated areas they are often the only remaining sites where the potential establishment of large protected areas seem possible.[66]

The sites in Estonia where shooting areas are planned include important corridors for bird migration, important seal habitats and areas with a sensitive plant ecosystem.[67] The plans for these new military areas may therefore potentially be in conflict with nature conservation.

Photo: Alari Kivisaar

Grey Heron (Ardea cinerea) like many other bird species depend on conservation areas during their annual migration. Estonia has planned to designate desirable nature conservation areas for military shooting exercises.

Photo: UPI / Eyevine / IBL Bildbyr

The military uses specific zones in the Baltic Sea and its coastal areas for strategic military exercises and training prohibiting many other activities to occur in the same place.

SECTORS

9. Industrial Pollution

There are many pollution sources within the Baltic Sea region and in 1992, Helcom identified the most serious of them, putting them on a hot spot list. Today, over half of these 162 hot spot areas have reduced their output and so far 89 hot spots have been deleted from the list. However, there are still 73 hotspots left, most of them municipal or industrial in nature, that still have not been addressed adequately.

Many large municipalities in the Baltic Sea region have made major improvements in their wastewater treatment, reducing pollution loads substantially. The Gulf of Riga has, for example, seen considerable progress with 18 local hot spots deleted from the Helcom list. The area of the sea exposed to extensive industrial pollution is thus diminishing. However, even though levels of several hazardous substances, including PCBs, dioxins and furans, have been reduced considerably over the past 10 to 20 years, problems still persist[68].

Future trends

It is difficult to specify the exact area affected by polluting industries where problems still persist. New substances are continously introduced and there are still serious problems at many places in the region. The Helcom JCP (Baltic Sea Joint Comprehensive Environmental Action Programme) has a deadline for cleaning up all Helcom hot spots by 2012[69]. Helcom has also set a zero-emission target for all hazardous substances in the whole Baltic Sea catchment area by 2020.

Impacts

Pollution threatens biodiversity and hinders nature conservation in the habitats where the contaminants are discharged or where levels are high. Hazardous substances such as heavy metals, chemicals, household waste and environmental toxins, remain in the marine environment for long periods of time. They may also accumulate in the food web up to levels that are toxic to marine organisms, adversely affecting reproductive ability, especially of the top predators[70].

The toxicity of dioxins and dioxin-like substances is measured as "toxic equivalents", TEQ. In 2006 the EU limits for fish for human consumption was raised from 4 to 8 pg TEQ/g[71]. Still, some samples of e.g. herring and salmon from the Baltic Sea exceed this level[72]. The EU has granted Sweden and Finland an exemption from the maximum limits until 2011[73].

The most polluted areas of the Baltic Sea are therefore not suitable for fisheries, aquaculture, or tourism and recreation and have negative impacts on nature conservation measures like marine protected areas.

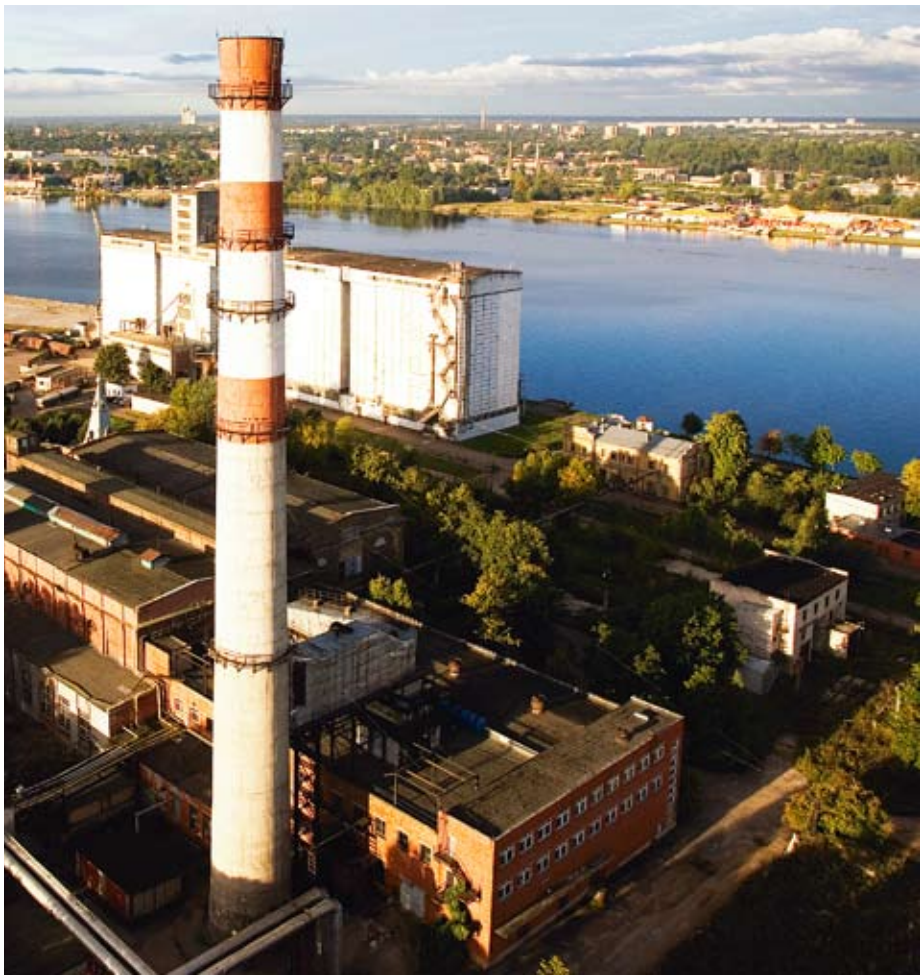


Photo: Jnis Ratnieks

Waters close to large cities and industries tend to have higher levels of hazardous substances. Output levels have decreased over the last decade while many new substances, whose effects are unknown, are added every year.

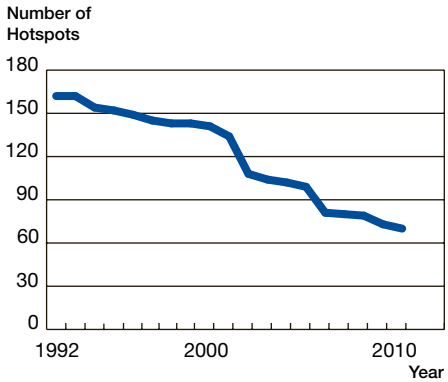


Figure 9. Number of polluting hotspots on Helcom's list, 1992–2009.[74]

SECTORS

10. Tourism and Recreation

The Baltic Sea region constitutes a fast growing destination for tourists. Every year the coastal areas are further exploited to meet the growing demand for hotels, recreation centres, marinas and camping sites[75]. In addition, cruise tourism is an up and coming, and fast growing, industry.

Future trends

Tourism in the region as a whole shows a stable growth in line with economic development (Fig. 6). For beach tourism, including camping and rental of summerhouses, forecasts indicate a general increase in demand which is not yet met by the supply.[76] Cruise tourism is increasing by about 12% per year in the region (Fig. 7).[77] Recreational boating is expanding with an annual growth of 5–6% within the EU[78] and recreational fishing is increasing as well[79].

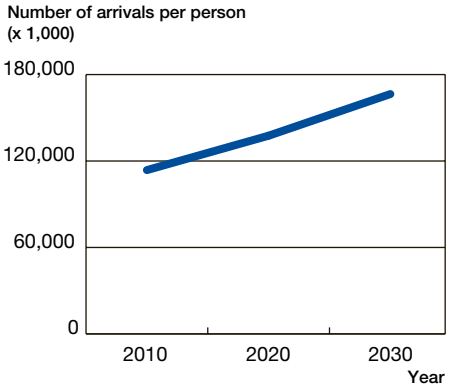


Figure 6. Scenario for number of arrivals in hotels and similar establishments in the Baltic Sea countries.[85] (Resident and non-resident.) The growth over the past 10 years was 21% in the region. Assuming a similar growth over the next 20 years, the number of arrivals would be around 160 million in 2030.

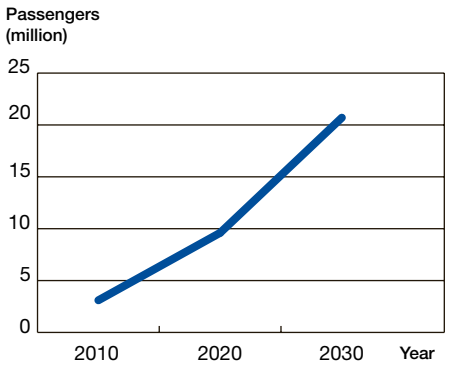
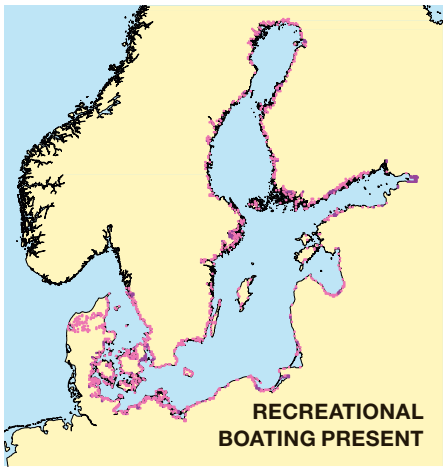
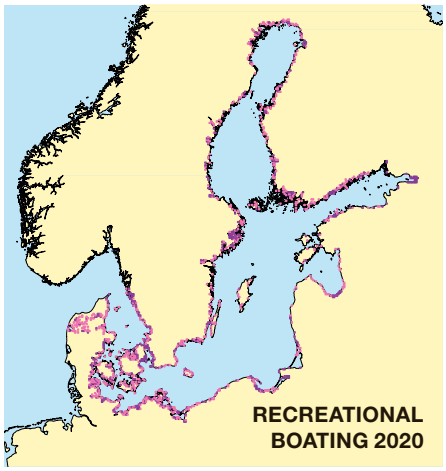
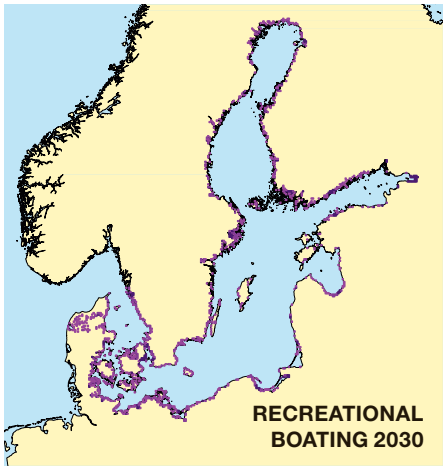


Figure 7. Scenario for the increase in cruise passengers in the Baltic Sea 2010–2030.[86] Cruise tourism has been increasing by about 12% per year in the region between 2000 and 2010. Assuming the same growth also in the future, the number of passengers would increase by about 600% in 2030.







Data source: HELCOM/WWF

Number of marinas

1–2 6–10
3–5 11–14

Recently, there has been a development towards more organised recreational activities. People tend to go fishing on organised trips that include hotel nights, rather than going camping on their own. As this trend increases the need for developed facilities, it will further increase the pressure on coastal ecosystems.[80]

Moreover, in many Baltic Sea countries, today's seniors are in better health and have a larger disposable income compared to earlier generations. There is a high likelihood that many will choose to retire at an earlier age and/or have a longer period of activity after retirement. As a result, the number of senior tourists is expected to increase substantially, which in turn will create an increased demand for activities, accommodation and transports, including during the low season.[81]

Impacts

Designing the coasts for touristic purposes has been a source of conflict in many Baltic Sea countries. There is an ongoing debate between tourism interest groups and groups from, for example, the fishing industry, town planning, or the military, on how the coastal areas should be used[82].

Tourism has a major environmental impact on coastal areas, which may affect other interests such as nature conservation and fishing. Besides land use, its demand for resources such as water and the need for waste disposal facilities puts pressure on water resources and coastal habitats. However, the pressure caused by the tourism sector is seasonally bound since most of the tourism in the Baltic Sea region takes place during the summer months of June and July.[83]

Although tourism can add environmental pressure, the sector has also been an important driver for nature conservation in many places, for e.g. in areas where ecotourism takes place.[84]

Photo: Pureline / NordicPhotos

The picture above shows a beach in Russia during the tourist season. The forecast for the beach tourism sector in the Baltic Sea region indicates a general increase in demand which is not yet met by a similar increase in supply. Recreational boating is also expanding as well as recreational fishing and cruising.

Photo: Aliaksander Vukolau

SECTORS

11. Commercial Fishing

Fishing is one of the most traditional activities at sea. The area occupied by fishing in the Baltic Sea is very hard to estimate. Commercial fisheries are intensive in the whole region, but fishing pressure is particularly high in the southern parts.[87]

Fisheries in the Baltic Sea are regulated by the European Union and by national political decisions. EU allocates fishing quotas, and the less fish there are in the sea, the more sea area the fishing vessels will need to cover to reach their quotas. At the same time, the number of commercial fishermen and fishing fleets in the region has decreased due to overcapacity in the sector and shrinking fish populations after several years of overfishing.[88]

Future trends

Since commercial fishing in the Baltic Sea is politically regulated through quotas on an annual basis, it is not possible to predict the level of, or the area used for, fishing over the next 10 to 20 years. If the fishing quotas are set at a level which, according to the International Council for the Exploration of the Sea (ICES), is sustainable for the survival of the fish populations, fishing will initially decrease in the region[89] but may later increase as fish populations are allowed to recover.

If the quotas are set too high, the fish stocks in the Baltic Sea will eventually collapse, which will result in a more long-term decrease in fishing activities.

Forecasts made by the EU predict that the number of fishing vessels will continue to decrease[90]. This does not necessarily mean that a smaller area of the Baltic Sea will be exploited by fishing. As fishing pressure seems to be maintained by EU's quota levels, a decrease in fleet number may only imply increased quotas and larger areas to fish for a lower number of vessels.

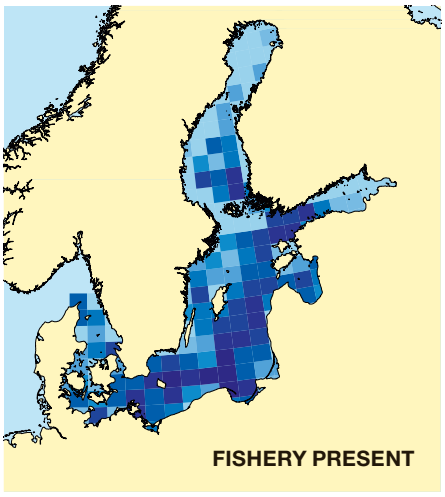
The fishing industry is probably also facing substantial challenges in the future with climate change leading to changes in fish population distribution and movement.

Also, recreational fishing is an important activity in the Baltic Sea region that is steadily growing.[91]

Impacts

Commercial fishing (as well as recreational fishing in some areas) in the Baltic Sea competes with most of the other sectors active in the same area that they use. Fishing is competing for space with wind farms and shipping. Also, in some military areas and some marine protected areas, fishing is not allowed depending on the level of protection.

The fishing sector is vulnerable since it depends on the fish stocks' survival and growth and consequently a healthy ecosystem that is not over-utilized. The sector is therefore highly dependent on ecosystem based planning and on the fact that the sea is not overused by itself or by other sectors. If the system with annual quotas used today would be changed to long term management plans, it would be of benefit to both the fishermen and the ecosystem and make integrated planning and management with other sectors easier.



Data source: HELCOM/WWF

Amount of fish landed in tonnes

1–500	5,001–7,500
501–1,000	7,501–10,000
1,001–2,000	10,001–20,000
2,001–3,000	20,001–40,000
3,001–5,000	

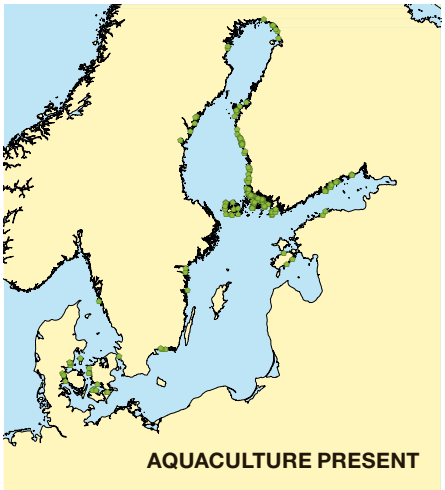
Photo: Stefan Rosengren

SECTORS

12. Aquaculture

Denmark, Finland and Sweden are important countries for marine aquaculture in the Baltic Sea. In the remaining countries in the region, there is extensive freshwater aquaculture but no or very little marine aquaculture.[92]

Photo: Greg M. Cooper Photography



Data source: HELCOM/WWF

Aquaculture marine and coastal

Finland, Denmark and Sweden have the most marine farms in the Baltic. Farms located in sheltered areas can have restricted water movement that cause for increased eutrophication.

Future trends

There is no compiled information about planned future developments of aquaculture in the Baltic Sea. In Estonia, Latvia and Lithuania, the coastline has very few suitable sites for large net cage farms or other types of mariculture. Therefore, development of marine aquaculture in this region is unlikely. Similarly, there are no forecasts indicating a development of marine fish farming in Poland over the next 20 years.

In Sweden, the potential to get permission for marine fish aquaculture activities is small due to concerns and worries over the negative impacts fish farming may have on the environment.[93]

However, in Denmark and Finland, attitudes to fish farming are more positive which make an expansion of marine aquaculture more likely in these countries. Finland has future plans for large off-shore fish farms in the Bothnian Sea. These plans are causing concerns for the newly established national park in the area.

Impacts

Fish farms release substantial amounts of nutrients to surrounding waters from discarded feed and from fish excrement. The narrow genetic make-up of farmed fish as well as the many diseases and parasites that farmed fish may spread could harm wild fish populations, jeopardizing the sustainability of the fishing industry.

Foto: Germund Sellgren

SECTORS

13. Marine Protected Areas

The Baltic Sea is home to a unique diversity of species and habitats and provides humans with a number of valuable services. Many of these are under severe threat. The establishment of representative and *ecologically coherent networks*[94] of marine protected areas (MPAs) is a valuable tool to protect the marine species, habitats and ecosystems, which is required by a number of conventions and agreements[95].

A marine protected area (MPA) is a marine area, which has been reserved by law or other effective means to protect part or all of the enclosed environment. Protection in various areas range from limits on certain kinds of human activities to complete closure of an area. There are two MPA networks in the Baltic Sea – the EU Natura 2000 network and the network of Helcom Baltic Sea Protected areas.

An assessment carried out by Helcom shows that about 12% of the Baltic Sea marine area is currently being covered by these two networks together.[96] Thus, the goal of protecting 10% of every ecoregion[97] by 2010 set by the Convention on Biological Diversity has been reached for the Baltic Sea.

However, although the overall goal of 10% has been reached for the Baltic Sea as a whole, this target has not been reached for all sub-basins, in particular the Gulf of Bothnia, and the network is neither ecologically coherent nor well managed[98]. Many designated sites still don't have a management plan and human activities such as fishing are almost never regulated within existing sites[99]. More sites therefore need to be protected to provide sufficient protection for the entire Baltic Sea ecosystem.

Future trends

According to scientific recommendations, a minimum of 20% of each habitat in a region need to be protected to ensure long term protection of the ecosystem. The European Commission is also using 20% as a guiding principle for sufficient protection when assessing EU-member states' contribution to the Natura 2000 network[100].

Consequently, to secure sustainability of the Baltic Sea ecosystem, 20% of each habitat should be set aside as marine protected areas as soon as possible. To establish an ecologically coherent network of MPAs that fulfil the 20% representation target for each habitat would, however, would most probably require about 30% of the entire Baltic Sea area to be set aside[101] (Fig. 8).

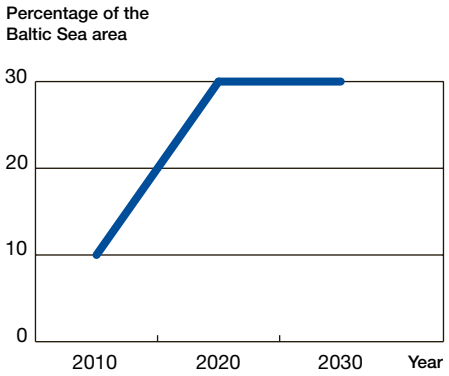


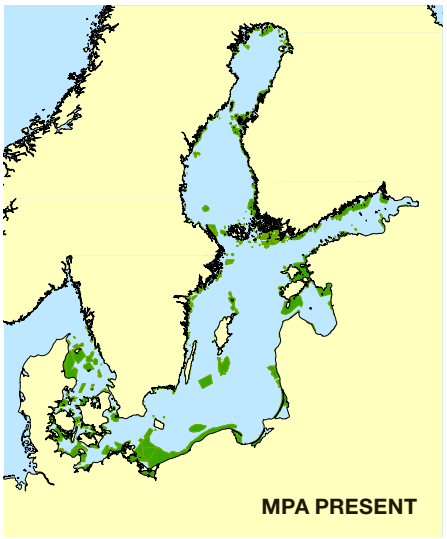
Figure 8. Desired scenario for the increase of Marine Protected Areas in the Baltic Sea for securing survival of the ecosystem.[103]

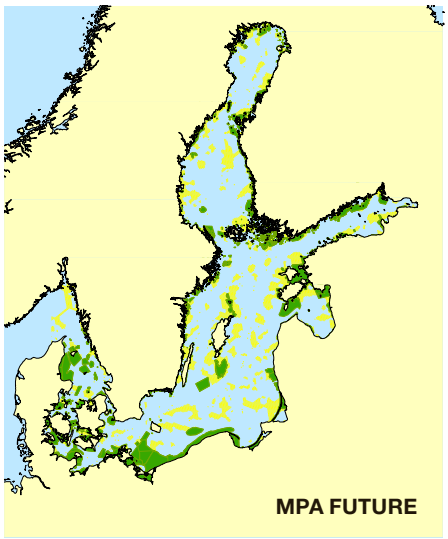
Impacts

There are many cases of conflicting interests between marine protected areas and different kinds of marine activities. Depending on the species and habitats present in a site, the sensitivity of the site and the level of threat, sectors such as fishing, shipping, tourism, wind farms, pipelines and cables may have to be prohibited inside the protected areas. Physical exploitation as well as sand, gravel and oil extraction are other sectors that are rarely compatible with marine protection. Areas in which marine protection interests collide with other interests and where there is a great risk of future conflicts, are coastal and archipelago areas in the vicinity of major cities, and shallow offshore banks.[102]

Photo: Hans Kautsky / azote

The Baltic Sea is a unique marine ecosystem and home to a rich biodiversity and wildlife that provide us with many valuable services including food, energy, recreational facilities and cultural heritage. More sites need to be protected to provide protection of the Baltic Sea ecosystem.





Data source: HELCOM/WWF

(NB! This map does not show the exact location of future Marine Protected Areas. It only provides the extent of such areas needed as well as some likely locations of these.)

Marine Protected Areas

- Exsisting sites (Natura 2000 + BSPA)
- Suggested sites

Photo: Witold Ryka

Common seal (Phoca vitulina) on a Baltic Sea beach in Poland. A guiding principle for sufficient protection, according to Helcom, is a minimum of 20 percent of each marine habitat and a minimum area of 1,000 hectares for a coastal site.

SECTORS

14. Agricultural Runoff

While not a marine activity, agriculture occupies space in the Baltic Sea by discharging phosphorus and nitrogen, which causes eutrophication. Since 1990, the total input of phosphorous into the Baltic Sea has decreased by 45% and nitrogen by 30%.[104] Despite this, eutrophication is still one of the most important threats to the health of the Baltic Sea and agricultural run-off contributes about half of the total nutrient input.[105]

There are 11 agricultural areas left on Helcom's hotspot list that discharge unacceptably large amounts of nutrients. These areas are located in Denmark, Sweden, Poland, Russia, Lithuania and Finland.[106]

The Helcom member states have agreed to reduce their nutrient emissions and discharges through the Baltic Sea Action Plan (BSAP). The goals regarding eutrophication in the BSAP are to achieve: concentrations of nutrients close to natural levels, clear water, natural levels of algal blooms and natural oxygen levels.[107]

We are, however, still far from a Baltic Sea unaffected by eutrophication. Additional reductions are required as well as patience, since improvements in agricultural practices need time before they take effect and result in lower nutrient loads.

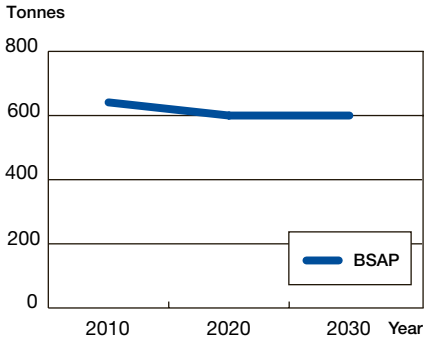


Figure 10. Input of waterborne nitrogen in the Baltic Sea 2010-2030 when applying the Baltic Sea Action plan scenario (BSAP).

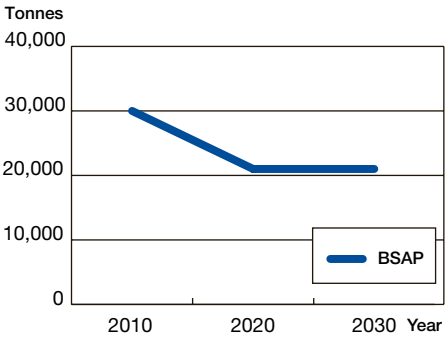


Figure 11. Input of waterborne phosphorous in the Baltic Sea 2010-2030 when applying the Baltic Sea Action plan scenario (BSAP).

As one of the commitments of the BSAP, Helcom member countries had committed to compile a list of agricultural point source hot spots (e.g. large animal production units) by 2010. This

Photo: Alexandr Ozerov

On the Danish island of Langeland, the fields lie close to the sea. Runoff from farming is the main source of the nutrients, nitrogen and phosphorous, that cause the eutrophication of the Baltic Sea.

commitment has not yet been fulfilled and now seems to be buried.

Future trends

In the period between 2001 and 2006, the average annual input of waterborne nitrogen and phosphorous were 641,000 tonnes and 30,000 tonnes respectively.[108]. These are the latest figures available for the region as a whole.

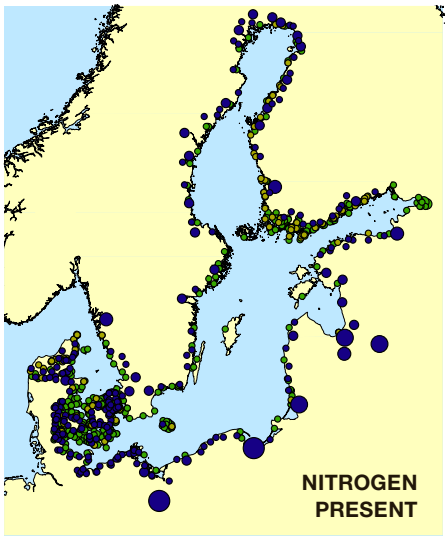
Agricultural production is expected to increase over the next 10 years in Poland, Estonia, Latvia and Lithuania. In Denmark, however, there has been a substantial decline during the last decade and a decrease in agricultural production is also expected in Germany.[109]

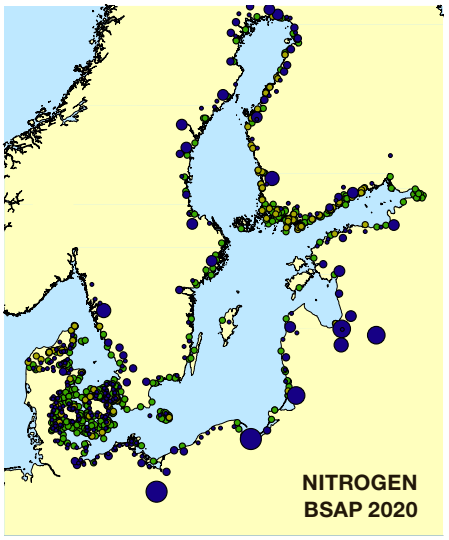
It is not possible to project the future levels of nutrient input from agriculture to the Baltic Sea. Climate change will increase rainfall and run-off from farm land. At the same time, crop productivity may increase with a potential to cultivate new areas and crops due to much longer and warmer growing seasons, with yields increasing by 40%.[110]

Increased livestock production may also be possible and increased episodes of heavy rainfall are likely to increase point source pollution, particularly in livestock production areas. The warmer climate could aggravate the problems of water quality in the Baltic Sea and enhance eutrophication.

Helcom has estimated that for good environmental status to be achieved in the Baltic Sea, the maximum allowable annual nutrient pollution inputs would be 21,000 tonnes of phosphorus and about 600,000 tonnes of nitrogen. BSAP has set a goal to reach these levels by 2021.

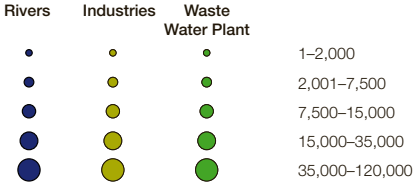
The target input levels indicated in the BSAP have so far not been reached for either nutrients and there are large variations from the input areas. Assuming that the HELCOM targets are reached by 2021, the nutrient pollution will decrease with 6% for nitrogen and 30% for phosphorus (fig. 10 and 11).

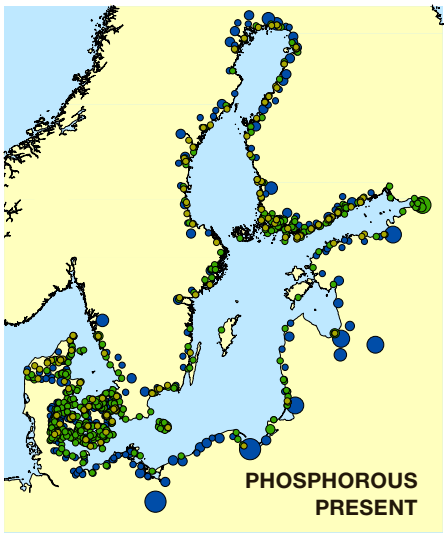


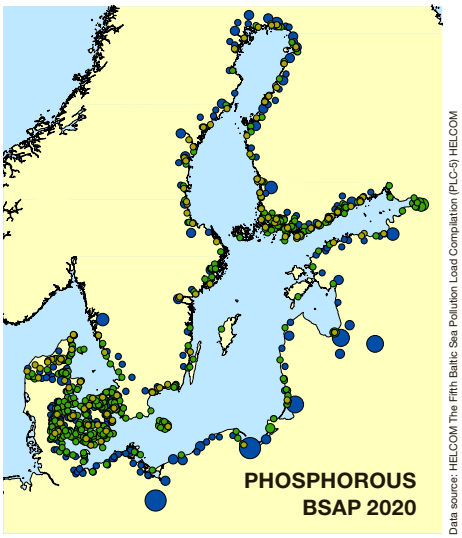


Data source: HELCOM The Fifth Baltic Sea Pollution Load Compilation (PLC-5) HELCOM

Average annual input (million tonnes)

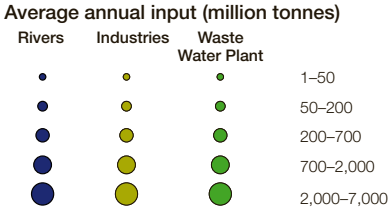






Data source: HELCOM The Fifth Baltic Sea Pollution Load Compilation (PLC-5) HELCOM

Average annual input (million tonnes)



Impacts

Agricultural run-off of nutrients causes eutrophication in the Baltic Sea, with intense algal growth, toxic cyanobacteria blooms, altered communities of flora and fauna, oxygen depleted sea bottoms and death of fish and benthic organisms. Consequently, commercial and recreational fishing are affected by eutrophication.

Eutrophication is also a huge problem for nature conservation since it affects the whole marine ecosystem. Another sector that is strongly affected by eutrophication is tourism since extensive or toxic algal blooms preclude bathing and boating tourism at the height of their season.

SECTORS

15. Climate Change

Mitigation of, and adaptation to, climate change is a global challenge that will need international cooperation and solutions. Still, climate change in the Baltic Sea region will present its own specific challenges. According to the Intergovernmental Panel on Climate Change (IPCC), air temperatures in the Baltic Sea region have increased over the past century by approximately 1°C in the northern areas of the Baltic Sea and by around 0.7°C in the southern areas[111]. The warming in the north of Baltic Sea is therefore greater than the global mean temperature increase of 0.75°C[112].

Future trends

A report based on Helcom's climate change project, BACC (Assessment of Climate Change for the Baltic Sea Basin)[113], states that unless adequate measures are taken to prevent global warming, air temperatures may rise by the end of the century by 4–6°C in the northern areas of the Baltic Sea region, and by 3–5°C in the southern areas. Water surface temperature in the Baltic Sea could increase by 2–4°C.

A milder climate could reduce the ice cover in the Baltic Sea by 50 to 80%. Precipitation is expected to change as well, with possible increases of 25–75% during winter and decreases of up to 45% during the summer season in some areas[114].

Photo: Still Pictures / NordicPhotos

Impacts

Marine and coastal environments are particularly sensitive to climate variations. Higher water temperatures will have an impact on the Baltic Sea's flora and fauna, affecting the entire ecosystem, from bacteria and plankton all the way up to commercially important fish species such as cod.[115] Many maritime sectors are affected by climate change and as a consequence of sea level rise, floods, erosion, or extreme weather events, there may be dramatic impacts on coastal areas, harbours and tourism activities.[116] As a consequence, some of these sectors will probably need an even larger area of the Baltic Sea in the future (Tab. 2).

While ice-free conditions would be beneficial for shipping in the Baltic Sea, they would threaten populations of animals such as the Baltic ringed seal, an endemic species to the Baltic region that is dependent on firm ice surfaces for their reproduction.

Increased rainfall and freshwater inflow could lead to a decrease in the Baltic Sea's mean salinity and also to increased eutrophication and algal blooms.[117]

SECTOR	CLIMATE CHANGE EFFECTS	CONSEQUENCES FOR THE SECTOR	CHANGE IN AREA SIZE NEEDED FOR THE SECTOR
Tourism	Rise in temperature, more rainfall, increase in nutrient loads to the sea.	Longer summer season and warmer temperature attracts more tourists. Increase in algal blooms threatens beach tourism.	Increase/decrease.
Physical exploitation	More extreme weather including storms with more coastal erosion as a consequence.	More coastal defence structures will be needed.	Increase.
Extraction of gravel and sand	Increased beach erosion due to more extreme weather with storms and floods.	More sand will be needed to replenish eroded beaches.	More area needed.
Fishing and aquaculture	Warmer temperature, increase in rainfall and riverine flow in the north, less algal growth in the north, more in the south, change in salinity.	Fresh water species expand while marine species are wiped-out.	Possible decrease.
Marine Protected Areas	Impacts in the whole ecosystem from changes in circulation, salinity and plankton species composition to fish, mammals and birds.	The ecosystem needs enhanced protection to cope with the stress.	More area needed.
Industrial pollution	Higher temperatures and lower salinity could affect species' ability to deal with toxic substances. The uptake of metals by organisms increases at lower salinity.	Higher impacts on the ecosystem from a lower amount of hazardous substances.	As the impacts from pollution increase, the area occupied by industries must be considered to increase.
Agriculture	Increase in rainfall and increase in nutrient loads to the sea.	Enhanced eutrophication.	Impacts of agriculture in the Baltic Sea will increase.

Table 2. Expected impacts of climate change on different sectors regarding the area the different sectors use.[118]

Photo: Jakub Chomicki

Conflicts and compatibility between sectors

Many of the sectors described in this report cannot co-exist in the same area. In some cases this is due to the fact that their physical structures, such as wind power stations or oil rigs, block specific areas, hindering other activities to be performed within it, and in some cases the sectors cannot co-exist in the same area due to the negative impact one sector has on another, for example the impact of industrial pollution on an aquaculture site.

As can be seen in the table below, there are activities that may be in conflict of interest with a number of other sectors. One example is oil and gas extraction. Sand and gravel extraction can either have a negative impact on other sectors (e.g., marine protected areas) or can not be performed where physical structures exist (e.g., wind farms) or certain other activities (e.g. shipping) take place. Marine protected areas and military zones can potentially exclude a number of other sectors as protecting the areas from certain human activities is the main reason for their establishment.

Agriculture and industrial pollution do not block marine space physically and are therefore excluded from the table. Although they have limited impact on sectors like shipping, ports, cables and pipelines, many other sectors are, however, severely affected by agricultural and industrial pollution, in particular fishing, aquaculture, tourism and recreation, and nature conservation.

However, as shown by the table, many sectors are potentially compatible with better planning. With more integrated planning and management, many conflicts can be resolved and synergies be identified. In areas where there are pipelines or cables, bottom trawling cannot be performed, but other types of fishing can be carried out without affecting the cables or pipelines, or vice versa.

Table 3. Indication of compatibility between sectors.
Green = Compatible interests, Red = Conflicting interests, Yellow = Potentially compatible with proper planning.

	Shipping	Ports	Tourism and Recreation	Oil and Gas extraction	Pipelines and Cables	Military activity	Physical exploitation	Sand and Gravel extraction	Fishing	Aquaculture	MPA:s
Wind energy											
Shipping											
Ports											
Tourism/ Recreation											
Oil/Gas extraction											
Pipelines and Cables											
Military activity											
Physical exploitation											
Sand and Gravel extraction											
Fishing											
Aquaculture											
MPA:s											

Photo: Mattias Rust / Azote

Conclusions

The Baltic Sea, home to about 90 million people in its catchment area, is a region characterized by relatively high economic wealth, a high level of education and an equally high level of environmental awareness among its inhabitants. Looking ahead to the future, the region is of comparably high economic stability and prospects for further growth look promising.

Photo: Jānis Ratnieks

Integrated Sea Use Management provides a strategic, integrated and forward-looking framework to help achieve both sustainable development and nature conservation. In the picture we see the place where river Daugava meets the sea, Riga, Latvia.

As one consequence of this economic growth, the demand for marine space and resources is likely to increase with a steadily growing risk of different interests acting against each other, rather than synergistically. The total pressure from all sectors together on the Baltic Sea ecosystem is increasing. This raises questions of how much pressure the Baltic Sea can take.

It should also be noted that the joint effect of some projects, such as wind parks, can be larger than the effect of the sum of each individual installation. Still, environmental impact assessments are done separately without considering the combined and cumulative effect.

Looking at the aggregated need for space and resources together with visions of growth for the future, it is obvious that conflicts over marine space and resources will intensify within sectors, between sectors and with the environment (Fig. 12). The report has shown that the Baltic Sea is facing an extensive expansion of human activities within the coming 20 years with a projected growth of several hundred percent for some sectors (such as wind energy and shipping).

One of the main findings of this study is that many sectors and countries do not have goals or strategies for the time perspective analysed, and that there is a deficiency of plans and strat-

egies, even for the relatively short perspective of the next ten years. For some sectors, such as tourism, we have had to extrapolate existing information for the past 10 years to get a fair estimation of projections for the next two decades.

The plans that do exist are mainly for single sectors and in most cases made country by country. There is a large lack of long term visions, goals and projections, not to mention coordination, for the future use of the space and resources of the Baltic Sea. So far, there has been no attempt to do a holistic and strategic plan for all sectors and human uses of the Baltic Sea combined. The lack of integrated planning and management in many cases results in counteracting decisions that hinder sustainable development in the region.

The challenge now is to coordinate and integrate all these individual sector plans in all the Baltic Sea countries, including developing plans for sectors where these are lacking. WWF believes that a more integrated, ecosystem based planning and management would be beneficial for the environment as well as for economic development by providing greater certainty for future investments. There is a lot of work ahead of us. While actions to protect ecosystem services may be costly, non-action will lead to even higher costs in the future.

Integrated Sea Use Management – ISUM

As an alternative to the "patchwork approach" we have today, Integrated Sea Use Management (ISUM) provides a strategic, integrated and forward-looking framework to help achieve both sustainable development and nature conservation.

One underlying principle of ISUM is the ecosystem approach to planning, management and regulation of all human activities in a sea area to ensure long term sustainable development and a healthy, resilient marine environment with the capacity to provide social and economic benefits now and in the future.

To achieve this, ISUM works towards vertical integration among different regulating frameworks and governance levels and horizontal integration between countries and sectors as well as between ministries and agencies with different mandates.

One central component of ISUM is spatial planning, aiming at allocating space (and resources) in a rational manner to minimize conflicts of interest and maximize synergies among sectors.

A study commissioned by the European Commission, DG MARE shows that by applying Maritime Spatial Planning (MSP) on a European level, significant economical benefits can be made, ranging from € 170 million to € 1.3 billion in 2020 and € 418 million and € 1.8 billion in 2030.[119]

Maritime spatial planning can support ecosystem based management but will also lead to integrated decision making and lower costs for companies operating in the maritime arena. Society as a whole will benefit from the enhanced certainty in a better investment climate and the environmental benefits of marine spatial planning."

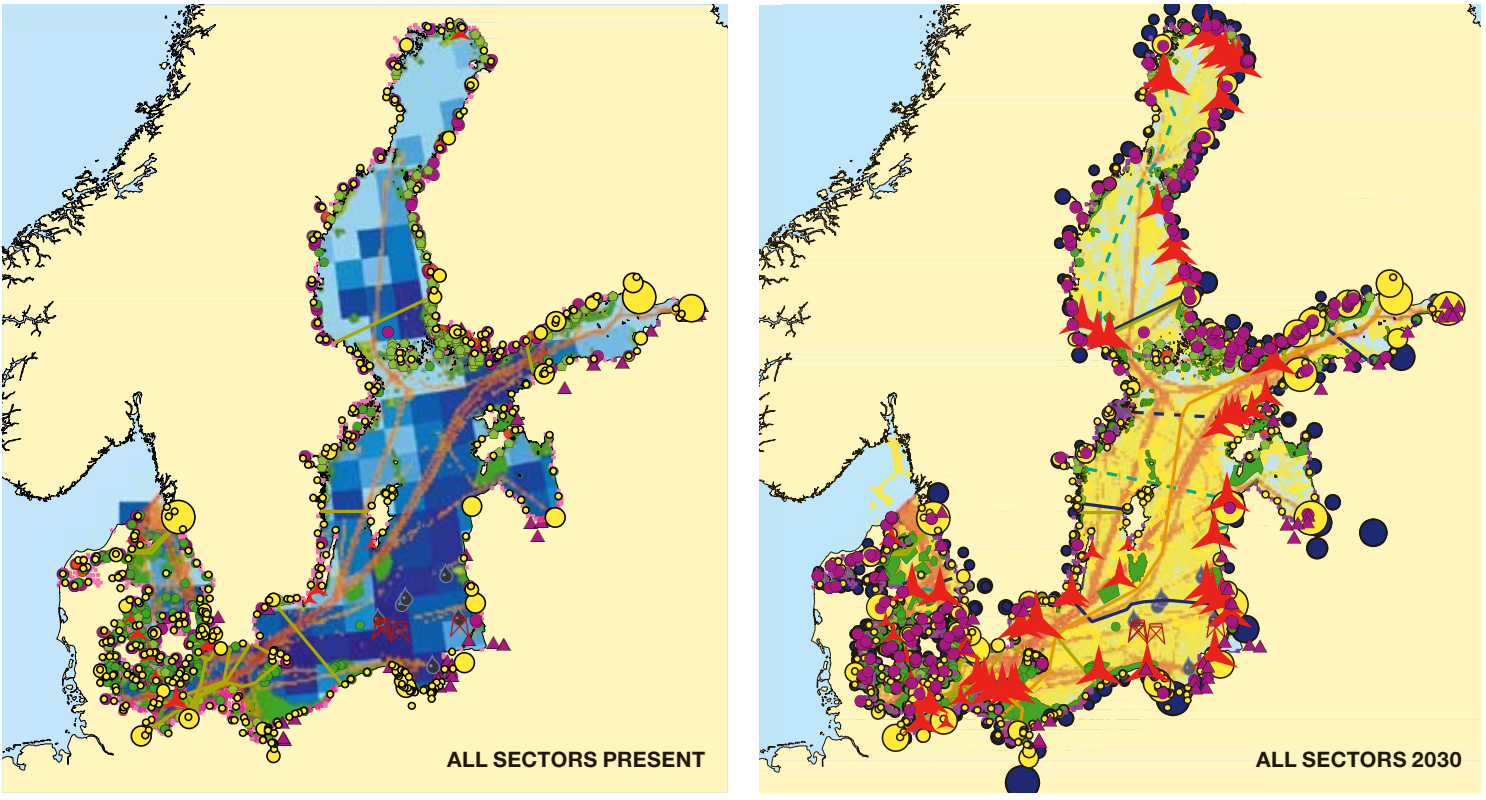


Figure 12. A map with the trend to date and in 2030 for all the sectors presented in this report. Please see individual sector map for reference on symbol and scale.

Recommendations

Despite the fact that the Baltic Sea is one of the busiest maritime areas in the world, no Baltic Sea nation has fully applied an integrated sea use management approach to their national sea area. The breadth and depth of initiatives working towards a more integrated management of the sea varies widely among the nine Baltic Sea countries as was revealed in the WWF 2009 Baltic Sea Scorecard report. [120]

Very few Baltic Sea countries have relevant legislation and management organisations in place to efficiently carry out sea use planning and management of their entire sea area, including their Exclusive Economic Zones (EEZs).

From an ecosystem perspective, a relatively small sea like the Baltic Sea cannot be treated as simply a collection of national marine areas. It constitutes, in almost all respects, one single marine ecosystem and should be managed as such.

For that reason WWF believes that we have to move towards a more integrated approach to sea use management in the Baltic Sea region.

Photo: Konrad Weiss

WWF hopes that this report will encourage leaders on the national as well as European level to support a more integrated approach to sea use management.

As the next steps, WWF recommends:

■ That the **highest level of government** take the lead in developing an integrated sea use management. As long as the process continues to be conducted sector by sector, ministry by ministry, true integration can never happen.

■ That heads of governments take part in defining **common integrated and ecosystem based goals** for the management of the Baltic Sea. This includes setting realistic goals for all sectors that together fit within the capacity boundaries of the ecosystem.

■ That governments take action to clearly **define the ecosystem capacity boundaries**. These can be based on HELCOM's BSAP and the Initial Holistic Assessment of the ecosystem health of the Baltic Sea, as well as the EU definition of Good Environmental Status.

■ That governments take part in creating national, regional and international **governance structures** that can ensure that maritime policies and decisions are integrated and synergistic. This includes:

■ That the Baltic Sea states work to create a **regional platform** to facilitate and ensure cooperation and integration of sea use planning and management between national bodies.

■ That every Baltic Sea state appoint **one national body** to have the overarching responsibility and mandate to coordinate and balance between different interests, policies and jurisdictional arrangements for the entire sea, its resources and the activities occurring in the sea.

■ That every Baltic Sea state adopt **legislation** that ensures that ISUM processes are organised across sectoral, administrative and national levels, cover all sea areas, and include all stakeholders at all relevant stages.

EU Strategy for the Baltic Sea

WWF regards the EU Strategy for the Baltic Sea Region as a major step forward in addressing the problems of regional coordination and ongoing management of the Baltic Sea. Meeting the ecological challenges of the Baltic Sea can become a driving force behind an even stronger integration of the Baltic Sea Region and the engine of sustainable prosperity. United we will be stronger and a role model for the rest of Europe and the whole world to follow. WWF sees Integrated Sea Use Management as a long term, strategic, inclusive and transparent process to minimize environmental impacts from resource use and to maximize benefits to society.

WWF hopes that this report will encourage leaders on the national as well as European level to support a more integrated approach to sea use management, and more importantly, to create a Baltic Sea we can all be proud of.

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The MW-value for the 25 wind farms planned between 2020–2030 is so far only decided for 15 of them which produce 8,110 MW, or 540.7 MW each. 540.7 x 25 = 13,517.5.

The MW produced by offshore wind farms in the Baltic Sea 2030 is thus estimated as: 1,357.5 + 11,279 = 24,796 MW. (Facts and figures according to www.4coffshore.com. 19 April, 2010)

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[94] In order to be ecologically coherent the network should 1) be adequate in terms of MPA size, shape and quality to fulfil its aims, 2) ensure representation of the full range of conservation features (species, habitats or landscapes) in a region, 3) include replicates of each feature to ensure protection of the natural variation of the features it aims to protect and to give insurance against catastrophic events, and 4) ensure connectivity by enabling dispersal and migration of species within and between MPAs.

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WWF Baltic Ecoregion Programme is part of WWF, set up to save the Baltic marine environment and restore vitality and beauty to the surrounding region.

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