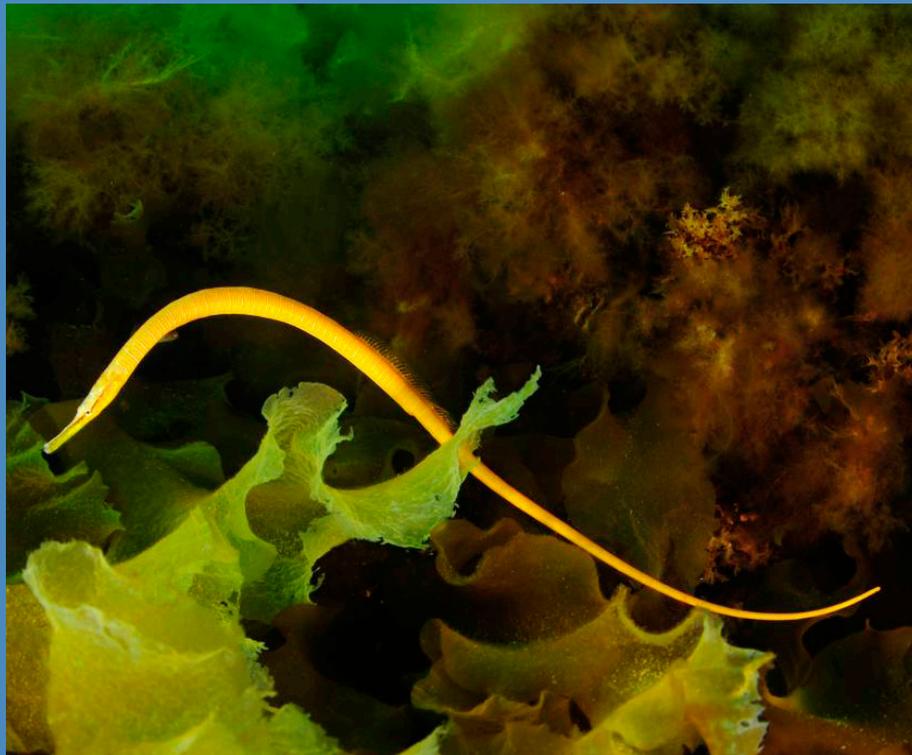




# PSSA IN THE BALTIC SEA :

PROTECTION ON PAPER OR POTENTIAL PROGRESS?



The World Maritime University (WMU) in Malmö, Sweden is a postgraduate maritime university founded by the International Maritime Organization (IMO), a specialized agency of the United Nations.

Established by an IMO Assembly Resolution in 1983, the aim of WMU is to further enhance the objectives and goals of IMO and IMO member states around the world through education, research, and capacity building to ensure safe, secure, and efficient shipping on clean oceans. WMU is truly an organization by and for the international maritime community.

The University operates on the basis of a Charter adopted by the IMO Assembly, and is accountable to the IMO Secretary-General, Council and Assembly, and to an international Board of Governors composed of representatives of some 50 different governmental, industry, labour and educational bodies. The University presents its annual report and budget to the IMO Council and also reports to the biennial session of the IMO Assembly. WMU receives the status, privileges and immunities of a UN institution in Sweden, and WMU degrees are recognized by the Swedish Ministry of Education and Research.



The WWF Baltic Ecoregion Programme is composed of WWF and nongovernmental-organization partners in each of the nine coastal Baltic Sea countries that are working together to conserve and restore the health of the Baltic Sea. Our work promotes a holistic and integrated approach to the conservation and sustainable management of the Baltic Sea while addressing the biggest threats facing this sensitive region, including eutrophication and overfishing. WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

# PSSA IN THE BALTIC SEA :

## PROTECTION ON PAPER OR POTENTIAL PROGRESS?

This report was prepared by Alina Prylipko. It was reviewed by Aref Fakhry, Olof Lindén and Jonas Pålsson. The views expressed in the report do not necessarily represent the official position of the World Maritime University or the International Maritime Organization.

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Snake pipefish (*Entelurus aequoreus*). Mölle, Sweden. Baltic Coastal Expedition.

Inside photo:

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Cargo ship and smoky chimneys near the shore with smoky chimneys. Hven Island, The Sound, Sweden. Oceana Baltic Sea Expedition II onboard the Hanse Explorer.

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# List of Abbreviations

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APM	associated protective measure
EEZ	exclusive economic zone
EMSA	European Maritime Safety Agency
EUROMOT	European Association of Internal Combustion Engine Manufacturers
HELCOM	Baltic Marine Environment Protection Commission
IMO	International Maritime Organization
IUCN	International Union for Conservation of Nature
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocols of 1978 and 1997 relating thereto
MEPC	Marine Environment Protection Committee
MSP	maritime spatial planning
NECA	NO <sub>x</sub> emission control area
NO <sub>x</sub>	nitrogen oxide
PSSA	particularly sensitive sea area
PSSA Guidelines	Revised Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas
SECA	SO <sub>x</sub> emission control area
SOLAS	International Convention for the Safety of Life at Sea, 1974
SO <sub>x</sub>	sulphur oxide
TSS	traffic separation scheme
UNCLOS	United Nations Convention on the Law of the Sea, 1982
VTS	Vessel Traffic System
WWF	World Wide Fund for Nature

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*The report is current as at February 28, 2014.*

# Executive Summary

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This report analyzes the effectiveness of the mechanisms of the particularly sensitive sea area (PSSA) and associated protective measures (APMs) as adopted and applied in the Baltic Sea and their contribution towards achieving sustainable shipping in future scenarios.

A total of 13 areas have been designated as PSSAs by the International Maritime Organization (IMO) worldwide.

The effectiveness of PSSAs has been the subject of debate amongst international lawyers and maritime experts, particularly in relation to legal and jurisdictional aspects.

The PSSA mechanism offers several benefits. It provides a comprehensive tool for evaluating and managing marine risks. Furthermore, a PSSA ensures global recognition of the significance and vulnerability of a designated sea area through identification of APMs on international marine charts, thereby informing seafarers of the importance of taking extra care when navigating through the region in question. Most importantly, the designation of an area as a PSSA provides coastal states and other authorities with the opportunity to adopt additional protective measures aimed at addressing the vulnerability of the region.

However, a PSSA yields no direct jurisdictional benefits or enforcement competence per se. It appears to be rather a tool for bringing together regimes of marine environmental protection from existing international conventions. For instance, the very core APMs—which would have to be adopted anyway in accordance with existing international legal instruments—could be technically introduced without resort to a PSSA, thus avoiding a relatively complicated and protracted promulgation process. Indeed, so far, all existing APMs adopted in PSSAs worldwide could have been adopted under the framework of an alternative IMO process.

In spite of successive amendments brought to the legal framework of PSSAs within IMO, the jurisdictional competence of coastal states in relation to PSSAs has remained somehow blurred. Being established by recommendatory IMO resolutions, PSSAs and APMs do not entail a change in the rights and duties of states as defined under international conventions. A strengthening of the jurisdictional basis of PSSAs would appear to be a desirable aim, but this could only be achieved as part of the progressive codification of the law of the sea, in particular with regard to the legal status of the exclusive economic zone. Otherwise, jurisdiction mechanisms available on the regional and national levels should be made use of since they allow for the protection of coastal waters to certain environmental and safety standards.

The Baltic Sea Area PSSA was created by IMO Resolution MEPC.136(53) in 2005. The relevant APMs came into force on July 1, 2006. The overall goal of the Baltic

Sea PSSA was to protect its unique and sensitive brackish-water ecosystem from international shipping activities, which were expected to intensify, especially insofar as the transportation of oil and other harmful substances is concerned. The APMs have attempted to target particular vulnerabilities from the risk of ship-source accidental pollution as follows:

- (a) Two traffic separation schemes (TSSs) were established, one in Bornholmsgat and another to the north of Rügen. Their aim was to improve maritime safety by directing traffic into the schemes, thereby reducing the risk of collisions pertaining to encounters and crossings and, correlatively, the risk of pollution.
- (b) An inshore traffic zone south of Gedser was introduced in order to guide transit traffic into the TSS south of Gedser and relocate transit traffic between the TSS and the German coast.
- (c) A deep-water route off Gotland Island was established in order to organize traffic of ships with a draught of more than 12 m.
- (d) Norra Midsjöbanken and Hoburgs Bank were designated as areas to be avoided in order to protect bird habitats, seals and mussel banks from oil spills.

On the positive side, the report observes that, since the adoption of APMs, the number of accidents and oil spills in the relevant areas as well as in the wider region has decreased. This evolution should be set against the backdrop of increasing maritime traffic. Thus, it may be recalled that, at the time of the establishment of the Baltic Sea PSSA, there were more than 2,000 ships en route in the area on an average day. Of these 2,000 ships, around 200 (10%) were oil tankers, some carrying a cargo of up to 150,000 tons. According to the Helsinki Commission, between 2006 and 2009, the number of ships entering or leaving the Baltic Sea via the Skagerrak increased by 20%. In 2009, approximately 21% of ships passing the Skagerrak consisted of tankers, carrying as much as 166 million tons of oil. In 2011, these figures were 18% and 250 million tons, respectively.

Nevertheless, challenges remain acute for policymakers and stakeholders in the pursuit of sustainable development. Some of these challenges could be addressed as part of a reinforcement of the APMs as well as other germane protective measures.

One of the suggestions contained in the report is thus to improve the implementation and enforcement of measures related to the Baltic Sea special area regimes established pursuant to Annexes I, IV and V of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocols of 1978 and 1997 relating thereto (MARPOL). For instance, it would be desirable that coastal states and authorities continue to unite their efforts in combating illegal oil

discharges. It is also recommended that coastal states and authorities strive towards ensuring that procedures for the adoption of sewage treatment plants are defined and that adequate port reception facilities are made available. Coastal states and authorities should, furthermore, encourage the development of appropriate and cost-effective technical on-board equipment to make meeting the sewage discharge standards possible. Moreover, better monitoring of garbage discharges would be beneficial. On the whole, it is emphasized that a particularly useful way in tackling MARPOL special area challenges would be through the pooling of national and other capabilities into a uniform information and monitoring system.

Additionally, consideration should be given to designating the Baltic Sea as an NO<sub>x</sub> emission control area pursuant to MARPOL Annex VI. In this regard, Baltic Sea states and other stakeholders would be well advised to continue pressing for the implementation of NO<sub>x</sub> tier III standards during the 66th session of IMO's Marine Environment Protection Committee.

It is, furthermore, observed that growing maritime traffic and the opening of new oil terminals are likely to create additional risks of oil spills due to collisions. In two areas, namely, in the vicinity of the Russian port of Ust'-Luga west of St Petersburg, and in the waters between the German island of Fehmarn and the Danish island of Lolland, such risks seem to pose particular concerns. One of the optimal solutions for managing risks in these areas would be to establish TSSs. In the former area, the TSS could be developed without resort to the PSSA framework, given that the Baltic Sea PSSA stops short of marine waters within the sovereignty, or subject to the sovereign rights and jurisdiction of the Russian Federation.

Another recommendation would be to elevate the status of the deep-water route off Gotland Island from recommendatory to compulsory.

Consideration should, moreover, be given for generalizing mandatory ship reporting across the Baltic Sea PSSA.

The report also suggests recommending the expansion of the list of vulnerable areas which should be avoided by shipping.

Lastly, a concrete measure could be the introduction of compulsory pilotage in deep-sea waters and in harbors.

All the above measures should ideally be referred to and considered by regional organizations and authorities. It is important to bear in mind the need for inclusive decision-making and implementation processes “by, for and with” the concerned states, authorities and stakeholders in the relevant region.

Cooperation between the Russian Federation and other Baltic Sea states, authorities and stakeholders should particularly be enhanced. The establishment of projects involving local networks would be welcome in this regard. Areas perceived with the most pressing needs include the human factor, illegal oil discharges, as well as oil spill prevention and response on board ships flying the Russian flag.

Last but not least, it is observed that conflicting interests are common in discussions regarding the introduction of new APMs. While some actors tend to focus on fast economic development, others advocate achievement of prosperity hand-in-hand with the protection of the environment. It is clear that there is a constant need for a holistic approach in considering problems of the Baltic Sea as a “whole.” The task of improving maritime environmental protection in the Baltic Sea should not be limited to the PSSA framework, but should also address the root cause of environmental stresses and challenges in the region, which may be linked fundamentally to increases in the overall amount of maritime activities and, in particular, maritime transportation. The feasibility of reducing or halting growth in the consumption and volume of cargo transported would need to be evaluated in line with the principle of sustainable development. It could be conceded, however, that application of this principle may be seen as difficult.

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# Introduction

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The International Maritime Organization (IMO) defines a particularly sensitive sea area (PSSA) in the following terms:

A PSSA is an area that needs special protection through action by IMO because of its significance for recognized ecological, socio-economic, or scientific attributes where such attributes may be vulnerable to damage by international shipping activities<sup>1</sup>.

The effectiveness of the PSSA mechanism has been discussed by scientists and maritime experts<sup>2</sup>. Although the theoretical debate has undeniable significance, evaluation of the effectiveness of the PSSA regime under particular circumstances provides an opportunity to scrutinize the validity of theoretical perspectives using concrete facts.

The Baltic Sea Area was designated as a PSSA by IMO's Resolution MEPC.136(53), adopted on July 22, 2005 and entitled "Designation of the Baltic Sea Area as a Particularly Sensitive Sea Area"<sup>3</sup>. Associated protective measures (APMs) were also established for the area, with effect starting from July 1, 2006<sup>4</sup>.

Almost 10 years have passed since the establishment of the Baltic Sea PSSA. During this time, use of the Baltic Sea has arguably expanded significantly with the emergence of transition economies from the former Soviet bloc, among other overarching factors. For its part, maritime traffic in the Baltic Sea has increased by 20% and the number of oil tankers transiting the area has grown by 21%<sup>5</sup>.

It does not appear that a comprehensive study of the effectiveness of the Baltic Sea PSSA and its APMs has as yet been carried out. No conclusive dialogue seems to have been held among members of local communities, policymakers, industry, scientists and other stakeholders to deliberate on new APMs or any other adjustments which might be desirable.

Bearing in mind the rapid increase of human activities in the Baltic Sea, including rapidly growing maritime traffic, PSSA measures should ideally be re-evaluated for their effectiveness in light of present conditions and expected future scenarios.

It is against this backdrop that this analysis was carried out at the request of the World Wide Fund for Nature (WWF) (Sweden). In general, the study seeks to find out whether the current measures within the Baltic Sea PSSA are conducive towards achieving sustainability in shipping in the Baltic Sea, and whether the PSSA mechanism allows tackling some of the most pressing issues in maritime safety and environmental protection, or whether other mechanisms are to be preferred.

In particular, the following objectives were set forth by way of terms of reference:

- o Review the original goals of the Baltic Sea PSSA, and look into the possibilities and limitations of the mechanism.
- o Analyze the current situation: What has been achieved, which APMs are in place, are they being implemented, how effective are they, and are there any obvious gaps?
- o In light of future shipping developments and spatial demands, review the need for future development of the PSSA: What further APMs should possibly be adopted?

Accordingly, the following tasks were developed for carrying out the study:

- o Analyze the benefits and limitations of the PSSA regime and possibilities for strengthening the relevant legal framework.
- o Appraise whether the initial goals of the Baltic Sea PSSA have been achieved.
- o Ascertain the implementation of APMs and their effectiveness in ensuring maritime safety and protection of the marine environment.
- o Assess the effectiveness of the present APMs in the context of foreseeable future developments.
- o Consider possibilities for introducing additional APMs in the Baltic Sea PSSA.
- o Suggest practical recommendations related to the above matters.

Given the above definition of a PSSA, the focus of this report will naturally be on evaluating the effectiveness of the PSSA regime in protecting the Baltic Sea environment from damage caused by international shipping activities. It is, however, important to emphasize that shipping is only one of numerous anthropogenic factors in the Baltic Sea. Agriculture, industry, land and air transport, fishing, energy production, mineral extraction, and tourism and recreation, among other activities, all contribute to the stress on the environment<sup>6</sup>. By definition, environmental problems have to be addressed holistically taking into account all existing threats and pressures from various sources. The outcome of this research could constitute a contribution towards an assessment of the issues affecting the Baltic Sea region in the context of maritime spatial planning (MSP).

It is noteworthy in this regard that the Baltic Sea ecosystem is protected by several complex mechanisms, including IMO and other UN instruments (e.g., the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocols of 1978 and 1997 relating thereto (MARPOL), the International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001 and the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004), regional conventions, regulations and initiatives (e.g., the Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992, European Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, 1992 and the Declaration on the Safety of Navigation and Emergency Capacity in the Baltic Sea Area, 2001), as well as national legislation and regulations adopted by the nine Baltic Sea countries. However, as stated above, this research is aimed at analyzing the effectiveness of the PSSA regime as an international framework for marine environmental protection. It should also be stated that this study does not consider the challenges posed to the Baltic Sea environment ship paints, or ballast water organisms and sediments, which are covered by the instruments already referred to.

The effectiveness of APMs in the Baltic Sea PSSA will be assessed by comparing initial goals with what has been achieved, taking into consideration developments since the PSSA creation, including increasing ship traffic and the evolution of shipping accidents in the area. Statistical data has been obtained using the Baltic Marine Environment Protection Commission's (HELCOM) Map and Data Service, electronic maps produced by BirdLife International as well as reports and scientific publications from universities, trustworthy organizations, projects and individual experts.

The study notes that, in the years since the creation in the Baltic Sea of the PSSA, the number of accidents and pollution incidents in the region has decreased. Nevertheless, it is observed that the implementation, enforcement and monitoring of APMs may need to be improved. In addition, enhanced cooperation among Baltic Sea countries is called for, with a view to a better harmonization of environmental regulations and their implementation. Finally, the study identifies new environmental risks, which would have to be appropriately addressed.

# 1. The Past

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This section of the report examines the history and concept of PSSAs, as well as the genesis and development of the Baltic Sea Area PSSA.

## 1.1. The PSSA regime

### 1.1.1. Genesis

The PSSA regime was developed by IMO in response to a resolution of the International Conference on Tanker Safety and Pollution Prevention, 1978 as a measure to protect particularly vulnerable sea areas against damage from international shipping activities<sup>7</sup>. Discussions culminated in 1991 with the adoption by the IMO of Resolution A.720(17), entitled “Guidelines for the Designation of Special Areas and the Identification of Particularly Sensitive Sea Areas.” The concept was further clarified and strengthened in IMO Resolutions A.885(21) and A.927(22), adopted in 1999 and 2001, respectively. The current legal framework for PSSAs is contained in Resolution A.982(24), entitled “Revised Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas” (PSSA Guidelines)<sup>8</sup>.

With a view to assisting governments in preparing PSSA proposals, the following documents were adopted by IMO’s Marine Environment Protection Committee (MEPC):

- “Guidance Document for Submission of PSSA Proposals to IMO” (IMO Document MEPC.1/Circ.510)
- “Uniform Format of the MEPC Resolution for the Designation of Particularly Sensitive Sea Areas” (IMO Document MEPC 54/21, Annex 11)
- “PSSA Proposal Review Form” (IMO Document MEPC 55/23, Annex 20)<sup>9</sup>

As defined in the PSSA Guidelines:

A PSSA is an area that needs special protection through action by IMO because of its significance for recognized ecological, socio-economic, or scientific attributes where such attributes may be vulnerable to damage by international shipping activities.

In order to prevent, reduce, or eliminate the vulnerability of the selected sea area, IMO may approve a set of APMs at the time of or following the PSSA creation. APMs usually address the area’s identified vulnerability and may include, for instance, designation of an area as a special area under MARPOL<sup>10</sup>, ships’ routing, reporting, discharge restrictions, operational criteria, prohibited activities and other measures.

A PSSA has to be distinguished from a marine protected area, which is another mechanism for the conservation of marine nature lying outside the IMO framework. A PSSA also differs from a MARPOL special area. However, PSSAs may encompass MARPOL special areas and marine protected areas, and vice versa<sup>11</sup>.

IMO has so far designated 13 PSSAs (Figures 1 and 2).

In a number of instances, PSSAs and APMs have been reviewed and amended.<sup>12</sup>

### 1.1.2. Jurisdictional benefits

The PSSA concept allows APMs to be introduced not only in the territorial sea, but also in sea areas beyond national jurisdiction, vis-à-vis all ships, irrespective of their flag<sup>13</sup>. As such, PSSAs are one of the mechanisms through which coastal states may exercise their jurisdiction in relation to the protection and preservation of the marine environment in the exclusive economic zone (EEZ), as provided for in Article 56(1)(b)(iii) of the United Nations Convention on the Law of the Sea, 1982 (UNCLOS). Coastal states may adopt additional protective measures, subject to the limitation that they must have due regard for the rights and duties of other states in those areas, including freedom of navigation, innocent passage and transit passage. The PSSA concept embodies certain other limitations.

Firstly, the implementation of a PSSA and APMs largely relies on flag states, which have to ensure that ships flying their flag comply with the adopted APMs. Upon receipt of information of an alleged violation of APMs by a ship flying their flag, states should provide the state which has reported the offence with the details of any appropriate action taken<sup>14</sup>. However, effective implementation of this provision may, in practice, be thwarted by lax maritime enforcement in certain countries of the world.

Secondly, effective implementation of APMs depends to a great extent on the cooperation and exchange of information between coastal states. For instance, UNCLOS Article 194 requires states to take, individually or jointly, as appropriate, all measures necessary to prevent, reduce and control pollution of the marine environment from any source. Furthermore, under Article 197, states must cooperate on a global basis and, as appropriate, on a regional basis, in the protection and preservation of the marine environment. Nevertheless, the practical mechanisms to implement these provisions are not identified.

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<b>PSSA</b>	<b>Proposing state(s)</b>	<b>APMs <sup>15</sup></b>	<b>IMO endorsement</b>
<b>Great Barrier Reef</b>	Australia	<ul style="list-style-type: none"> <li>• IMO-recommended Australian system of pilotage</li> <li>• mandatory ship reporting system</li> </ul>	MEPC.45(30), 1990
<b>including Torres Strait</b>	Australia, Papua New Guinea	<ul style="list-style-type: none"> <li>• IMO-recommended Australian system of pilotage</li> <li>• two-way route</li> </ul>	MEPC.133(53), 2005
<b>Archipelago of Sabana-Camagüey</b>	Cuba	<ul style="list-style-type: none"> <li>• area to be avoided</li> </ul>	MEPC.74(40), 1997
<b>Sea Area around Malpelo Island</b>	Colombia	<ul style="list-style-type: none"> <li>• area to be avoided</li> </ul>	MEPC.97(47), 2002
<b>Marine Area Around the Florida Keys</b>	United States	<ul style="list-style-type: none"> <li>• area to be avoided</li> <li>• mandatory no anchoring areas</li> </ul>	MEPC.98(47), 2002
<b>Wadden Sea</b>	Denmark, Germany, Netherlands	<ul style="list-style-type: none"> <li>• mandatory deep-water route</li> </ul>	MEPC.101(48), 2002
<b>Paracas National Reserve</b>	Peru	<ul style="list-style-type: none"> <li>• area to be avoided</li> </ul>	MEPC.106(49), 2003
<b>Western European Waters</b>	Belgium, France, Ireland, Portugal, Spain, United Kingdom	<ul style="list-style-type: none"> <li>• mandatory ship reporting system</li> </ul>	MEPC.121(52), 2004
<b>Canary Islands</b>	Spain	<ul style="list-style-type: none"> <li>• area to be avoided</li> <li>• traffic separation systems</li> <li>• recommended routes</li> <li>• mandatory ship reporting system</li> </ul>	MEPC.134(53), 2005
<b>Galapagos Archipelago</b>	Ecuador	<ul style="list-style-type: none"> <li>• area to be avoided,</li> <li>• mandatory ship reporting system</li> <li>• recommended tracks</li> </ul>	MEPC.135(53), 2005
<b>Baltic Sea Area</b>	Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Sweden	<ul style="list-style-type: none"> <li>• traffic separation schemes</li> <li>• deep-water route</li> <li>• area to be avoided</li> <li>• mandatory ship reporting system</li> <li>• MARPOL special area</li> <li>• MARPOL SO<sub>x</sub> emission control area (SECA)</li> </ul>	MEPC.136(53), 2005
<b>Papahānaumokuākea Marine National Monument (North-western Hawaiian Islands)</b>	United States	<ul style="list-style-type: none"> <li>• area to be avoided</li> <li>• recommended/mandatory ship reporting system</li> </ul>	MEPC.171(57), 2008
<b>Strait of Bonifacio</b>	France, Italy	<ul style="list-style-type: none"> <li>• recommendation on navigation</li> </ul>	MEPC.204(62), 2011
<b>Saba Bank (Caribbean Island of Saba)</b>	Netherlands	<ul style="list-style-type: none"> <li>• area to be avoided</li> <li>• mandatory no anchoring area</li> </ul>	MEPC.226(64), 2012

**Figure 1. PSSAs**

Source: IMO. (2012). MEPC.1/Circ.778/Rev.1, *List of special areas under MARPOL and particularly sensitive sea areas*. London: Author.



**Figure 2.** PSSAs global occurrence

*Source:* International Maritime Organization. (n.d.). *Explore the world of PSSAs*. Retrieved November 20, 2013 from <http://pssa.imo.org/#/globe>.

Giving a straightforward definition of the duty to cooperate is, furthermore, particularly challenging under international law, as it is complicated by conflicting national interests. This is apparent in the area of marine environmental protection, where disparities are usually caused by different levels of development among neighboring countries, which makes the strengthening of environmental regulations difficult.

Thirdly, the adoption of an APM is possible only if the measure in question has a legal basis in accordance with international instruments. In other words, the range of APMs is limited to the measures already adopted under existing conventions. Otherwise, if desired measures are not provided for, they would need to be incorporated in amendments to relevant conventions. On the one hand, this limitation safeguards freedom of navigation, and the rights of innocent passage and transit passage from illegal restrictions, and ensures that navigation in PSSAs is regulated in accordance with UNCLOS. On the other hand, the need to amend international instruments prior to the adoption of a new APM restricts the benefits of PSSAs.

Finally and crucially, the PSSA regime is established through a non-binding IMO Assembly resolution. It has thus been argued that the creation of a PSSA carries little or no legal significance<sup>16</sup>. For their part, APMs receive their mandatory or recommendatory status from their enabling legal instruments. For instance, the adoption of ship reporting systems is made in accordance with the International Convention for the Safety of Life at Sea, 1974 (SOLAS) and other relevant IMO instruments (Resolution MSC.43(64), as amended by Resolutions MSC.113(73) and MSC.189(79)). Therefore, it is questionable whether the PSSA regime offers any additional protection for marine areas<sup>17</sup>.

Nevertheless, it may be pointed out conversely that the PSSA regime is reflected in UNCLOS Article 221(6), and has thus a solid binding law basis. This argument suffers, however, from imprecision or gaps perceived in the UNCLOS text.

To conclude, the PSSA regime offers several benefits. For a particular area, it provides a comprehensive tool for the evaluation and management of environmental risks posed by international shipping activities. It ensures global recognition of the significance of a designated area through identification of APMs on international charts, and thereby informs seafarers of the importance of taking extra care when navigating through the area<sup>18</sup>. Most importantly, designation of an area as a PSSA provides coastal states and authorities with the opportunity to adopt additional protective measures addressing the vulnerability of the region. However, the PSSA regime bears no direct jurisdictional benefits or enforcement competence per se<sup>19</sup>. From the time of its establishment, the primary purpose of the PSSA regime has been to bring together marine environmental protection mechanisms already existing under international conventions under one umbrella<sup>20</sup>. This feature of the PSSA regime has not changed fundamentally.

## 1.2. The Baltic Sea PSSA

### 1.2.1. Creation

The Baltic Sea PSSA was created on July 22, 2005 by IMO Resolution MEPC.136(53), entitled “Designation of the Baltic Sea Area as a Particularly Sensitive Sea Area.” This followed a request presented by eight Baltic countries (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden). On December 1, 2005, the IMO Assembly promulgated a set of APMs, with effect from July 1, 2006.

According to the IMO Resolution, the Baltic Sea PSSA comprises the Baltic Sea proper, the Gulf of Bothnia, the Gulf of Finland and the entrance to the Baltic Sea bounded by the parallel of the Skaw in the Skagerrak at 57° 44.8' N<sup>21</sup>. Given that the Russian Federation did not take part in the request put forward by the other eight Baltic Sea countries for the creation of the PSSA and in light of UNCLOS Article 56 concerning the rights, jurisdiction and duties of the coastal state in the EEZ, marine areas within the sovereignty or subject to the sovereign rights and jurisdiction of the Russian Federation were excluded from the Baltic Sea PSSA.

### 1.1.2. Goals

It is understood that shipping activities may cause damage to the marine environment through operational discharges, which are introduced to the sea directly (oil, sewage, garbage, etc.) or indirectly, for instance, through the atmosphere (air pollution by sulphur oxide (SO<sub>x</sub>) emissions, nitrogen oxide (NO<sub>x</sub>) emissions, particulate matter, etc.). The marine environment may also be polluted accidentally in the event of a marine casualty. Additionally, marine habitats may be disturbed by physical damage in the event of groundings, etc. Furthermore, evidence points to the fact that noise from shipping could have major environmental implications.

The overall goal of designating the Baltic Sea as a PSSA was to protect its unique and sensitive brackish-water ecosystem from intensive international shipping activities, which were expected to increase, particularly in so far as the transportation of oil and other harmful substances is concerned. The Baltic Sea is a geologically young, semi-enclosed sea with narrow and shallow waters. Its limited and slow water exchange leads to long residence time of its waters<sup>22</sup>. As a result, the Baltic Sea’s marine environment has low biodiversity, simple food webs and a unique mix of marine and freshwater species, including species specially adapted to its brackish conditions. Accordingly, the disappearance or even reduction of any species could seriously affect the functioning of the whole ecosystem. Furthermore, the Baltic Sea harbors important breeding grounds, nurseries, shelters and feeding areas for coastal and migrating seabirds and waders.

At the time of the creation of the PSSA, the Baltic Sea was experiencing some of the densest maritime traffic in the world with more than 2,000 ships—including 200 oil tankers—estimated to be en route on an average day. The intensity of traffic together with hydrographical, meteorological and oceanographic factors considerably increases the risk of accidents and pollution. Recognizing that the Baltic Sea was vulnerable to international shipping activities, IMO Resolution MEPC.136(53) set forth the following APMs for the newly created PSSA:

- o a traffic separation scheme (TSS) in the Bornholmstrait and another in the waters north of Rügen
- o an inshore traffic zone in the TSS south of Gedser
- o a deep-water route off Gotland island
- o areas to be avoided in the southern Baltic Sea south of the island of Gotland (Norra Midsjöbanken and Hoburgsbank)

According to IMO Circular MEPC.1/Circ.778/Rev.1, “List of Special Areas under MARPOL and Particularly Sensitive Sea Areas”<sup>23</sup>, the Baltic Sea PSSA also includes such APMs as mandatory ship reporting systems<sup>24</sup>, MARPOL special areas<sup>25</sup> and a MARPOL SO<sub>x</sub> emission control area (SECA)<sup>26</sup>. It is observed, however, that neither Resolution MEPC.136(53), nor any other official IMO instrument defines mandatory ship reporting systems, MARPOL special areas or SECA as APMs per se in the Baltic Sea Area PSSA.

A more detailed explanation of the Baltic Sea PSSA goals may be found in the IMO *travaux préparatoires* NAV 51/INF.2, NAV 51/INF.3, NAV 51/3/6 and MEPC 51/8/1.

It is noteworthy that TSSs in Bornholmsgat and to the north of Rügen were aimed to improve maritime safety by directing traffic into the schemes, thereby lessening the risk of collisions pertaining to encounters and crossings, and ultimately the risk of pollution. The TSS to the north of Rügen was also designed to guide vessels at a safe distance from an environmentally sensitive and protected coast. Finally, the TSSs sought to improve pollution response in the event of an accident.

For its part, the inshore traffic zone south of Gedser was established to guide transit traffic into the existing TSS in the area, and relocate transit traffic between the TSS and the German coast. Vessels with a larger draught would be kept at a safe distance away from shallow waters, the Mecklenburg-Western Pomerania coast and nature reserves.

As for the deep-water route, its purpose was to organize the traffic of ships with a draught of more than 12 m<sup>27</sup>.

Lastly, Norra Midsjöbanken and Hoburgs Bank were designated as areas to be avoided as they are important habitats for seabirds and seals, and are covered with blue mussels. In particular, Norra Midsjöbanken has a very rich flora of red and brown algae, and the mussel banks are important habitats for juvenile fish. The area is also important for wintering long-tailed ducks, guillemots, black guillemots, razorbills, little gulls and several other bird species.

Hoburgs Bank has 17 species of red, brown and green algae, as well as a diverse benthic fauna with blue mussels. It is an important feeding ground for wintering long-tailed ducks, black guillemots and grey seals, and its banks are important as a reproductive area for fish<sup>28</sup>.

On the whole, the creation of the PSSA in the Baltic Sea was driven mainly by ecological factors, which carry, nonetheless, economic, social, cultural, scientific and educational considerations<sup>29</sup>. The PSSA sought primarily to reduce the risk of accidental pollution from ships and thereby protect Baltic Sea habitats and species<sup>30</sup>.

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## 2. The Present

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This section of the report gives an overview of the current situation of marine environmental protection in the Baltic Sea with special reference to the PSSA. An assessment of the APMs' implementation and impact will first be carried out, nine years on from the PSSA establishment. The report will then consider the contribution of other measures of marine environmental protection in the Baltic Sea complementing the PSSA. The last two parts in this section will reflect on the overall trends that have been at work in the part of the seas under consideration, and their implications for marine environmental protection.

### 2.1. The Baltic Sea PSSA's implementation and achievements

#### 2.1.1. TSSs

TSSs may be adopted in accordance with Rule 10 of the Convention on the International Regulations for Preventing Collisions at Sea, 1972 and other IMO instruments (Resolutions A.572(14), MSC.71(69) and MSC.165(78)), which stipulate that ships' routing may be prescribed for the purpose of preventing or reducing the risk of pollution or other damage to the marine environment from ship collisions or groundings in or near environmentally sensitive areas.

Out of 15 existing TSSs in the Baltic Sea, three have been adopted as APMs as part of the PSSA. These concern the TSS in Bornholmsgat, the TSS to the north of Rügen and the inshore traffic zone in the TSS located south of Gedser (Figure 3). Since the adoption of these APMs, no accidents have been recorded in these areas. The only exception was a collision due to human factors near the TSS to the north of Rügen in 2008. Nonetheless, the TSS off Gedser continues to feature a high risk of accidents and resulting spills (Figure 4), which could pollute waters and the coast of Mecklenburg-Western Pomerania, including nature reserves there.

#### 2.1.2. Deep-water route

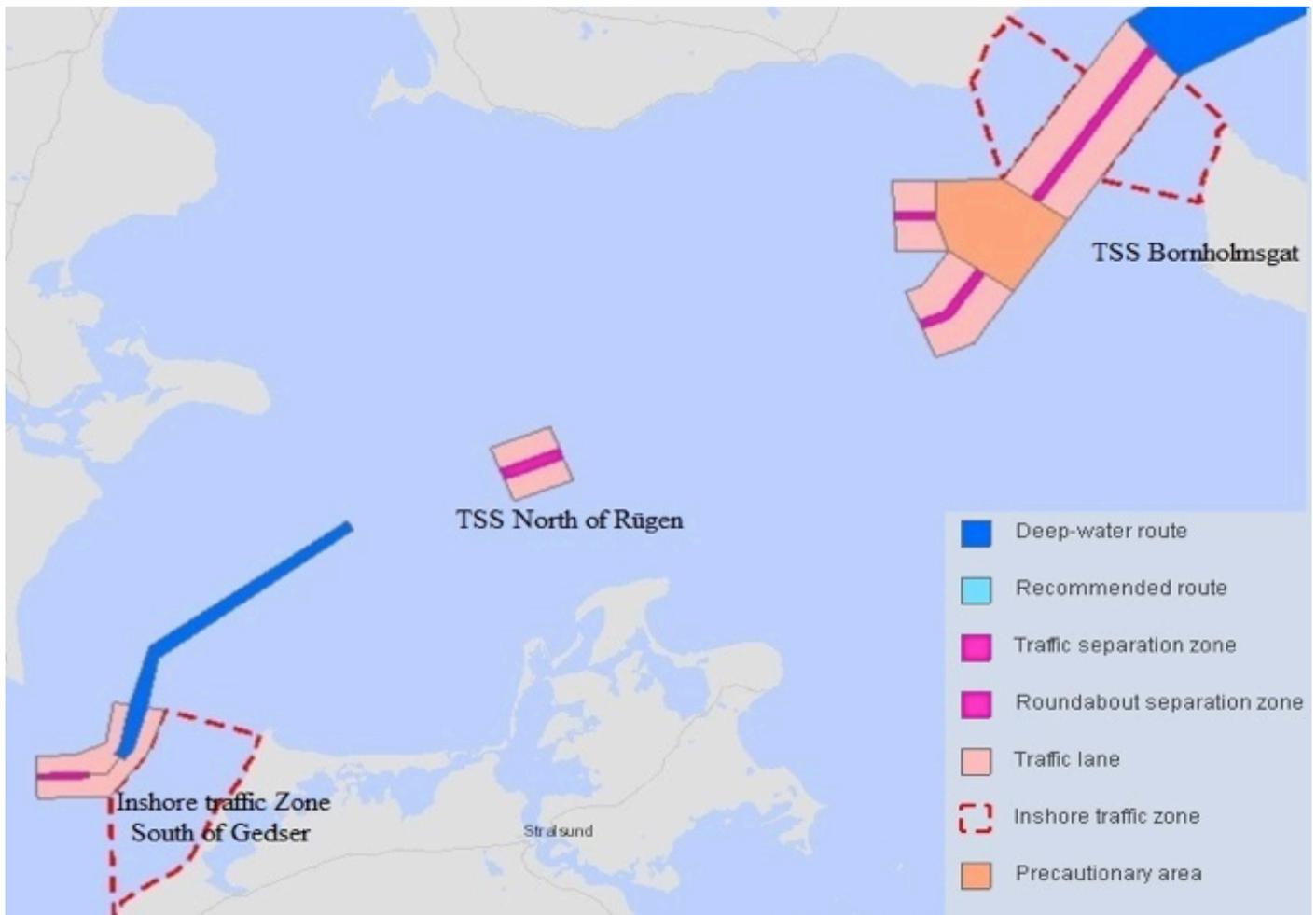
The deep-water route off Gotland Island is one of six deep-water routes adopted under the framework of the IMO in the Baltic Sea. It is recommended for all ships with a draught exceeding 12 m passing east and south of the island of Gotland and bound to or from the northeastern part of the Baltic Sea.

One of the benefits of the deep-water route is that it helps keep shipping away from vital seabird feeding grounds located on Hoburgs Bank.

No accidents have been witnessed on the route since its creation. The route has an average density of traffic. Nevertheless, the concentration of NO<sub>x</sub> is high; it is suggested that the promulgation of an NO<sub>x</sub> emission control area (NECA) in the Baltic Sea would have a positive environmental impact.

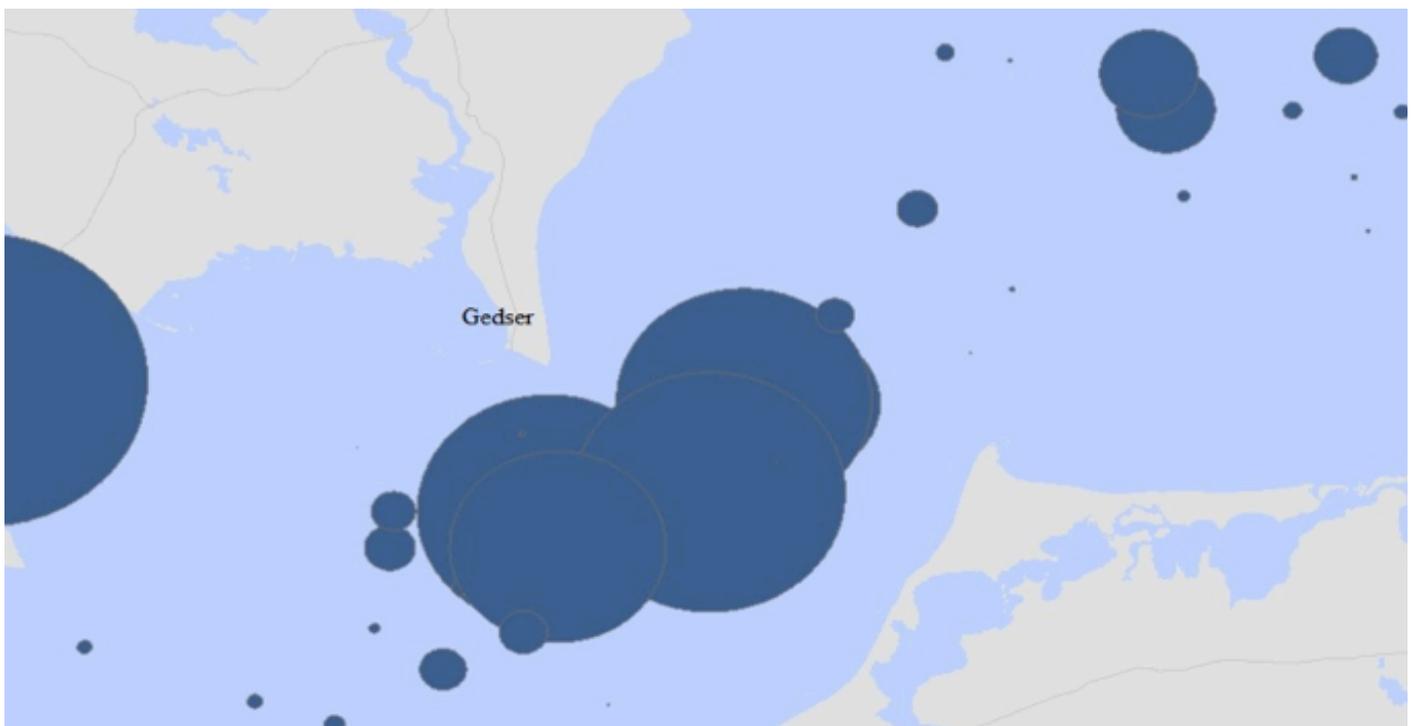
As it appears from Figure 5, the risk of oil spills from collisions on the route is considered high where traffic from the TSS off Öland Island and the TSS off Gotland Island enters the deep-water route. Consequently, the risk of environmental impacts from oil spills in these areas is also high (Figure 6).

One of the current shortcomings of the deep-water route is probably its non-binding status.



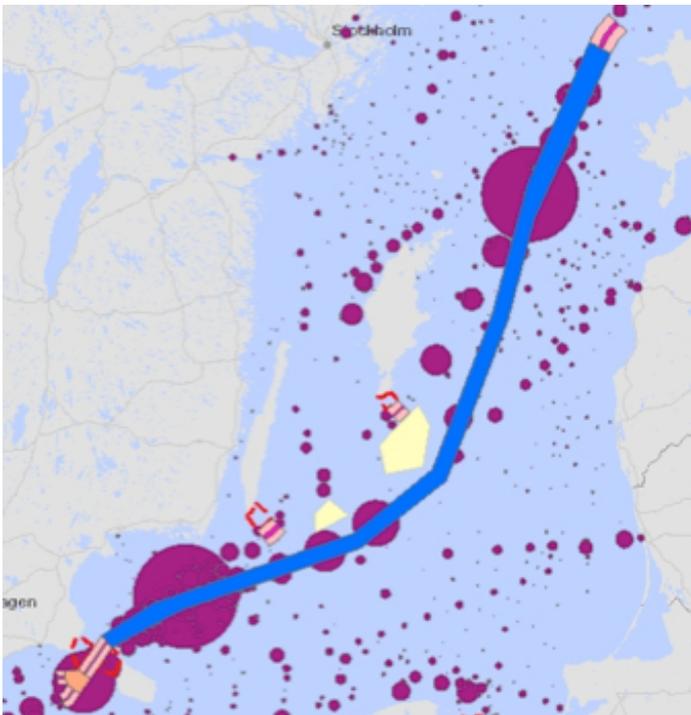
**Figure 3.** TSSs in the Baltic Sea PSSA

*Source:* HELCOM Map and Data Service

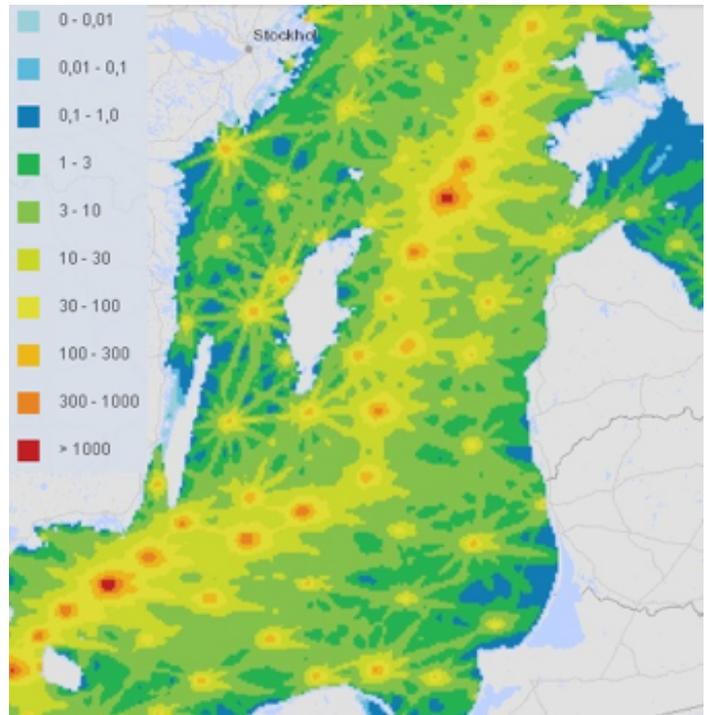


**Figure 4.** Risk of oil spills from intersection collisions in the TSS south of Gedser (projection till 2020)

*Source:* HELCOM Map and Data Service



**Figure 5.** Risk of oil spills from collisions along and near the deep-water route off Gotland Island (projection till 2020)



**Figure 6.** Risk of environmental impacts from oil spills along and near the deep water-route off Gotland Island

*Source:* HELCOM Map and Data Service

### 2.1.3. Areas to be avoided

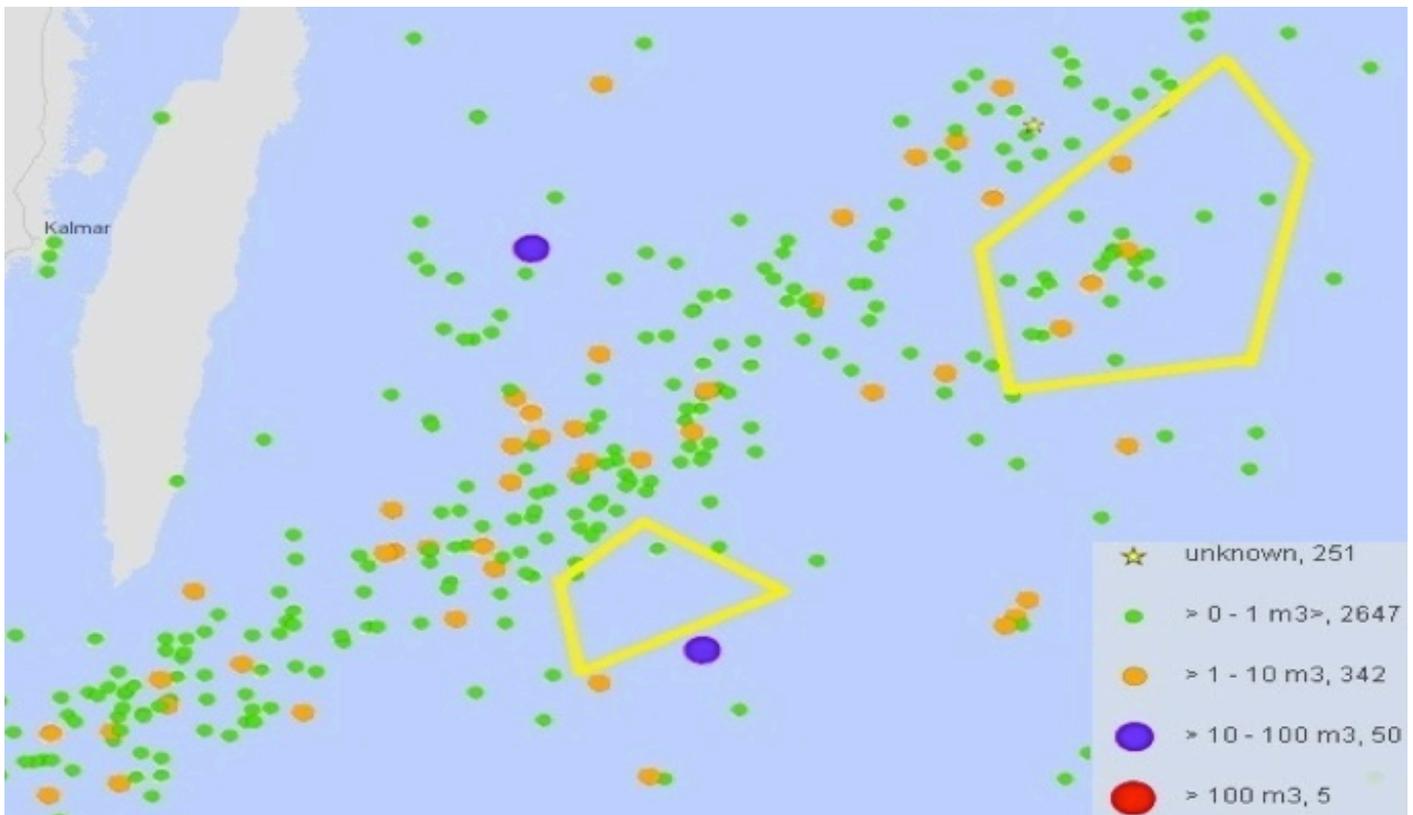
The Baltic Sea APMs provide that ships should avoid navigating in Norra Midsjöbanken and Hoburgs Bank, the aim being to limit the intensity of traffic in those areas.

No accidents have been registered on the banks since the creation of the PSSA. However, several minor illegal oil discharges have been recorded in recent years. The majority of these illegal oil discharges have taken place on the shipping routes along the TSSs off Öland Island and Gotland Island or in the waters to the east and southeast of the banks (Figure 7).

It is observed that there is a high risk of oil spills from groundings on Norra Midsjöbanken, and from collisions near the TSS off Gotland Island and the deep-water route. Consequently, the risk of environmental damage from spills is also high (Figures 8 and 9).

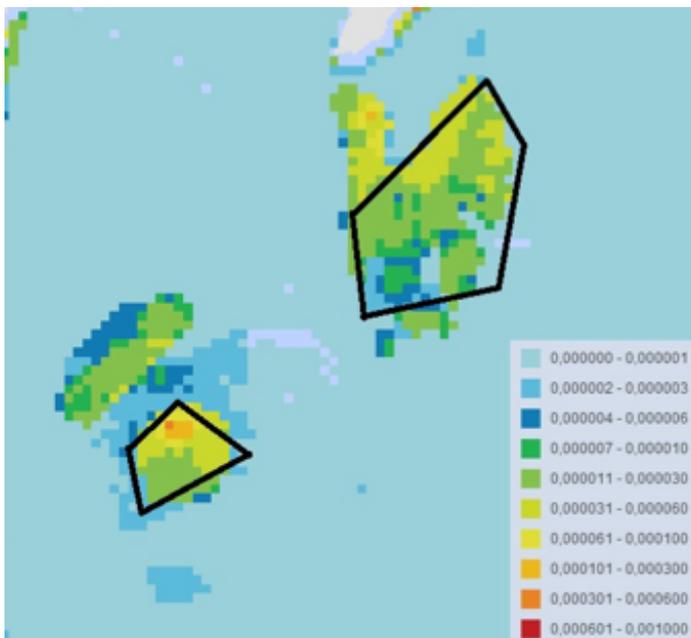
Prospects of strengthening the protection status of Norra Midsjöbanken and Hoburgs Bank by making avoidance of the areas mandatory, as opposed to simply recommended, are limited. The initial proposal sought a mandatory avoidance scheme. The proposal was, however, rejected on the view that such a scheme within Swedish EEZ waters would undermine freedom of navigation<sup>31</sup>.

It is suggested, however, that the protection status of these areas could be improved through enhanced monitoring and spill response preparedness.

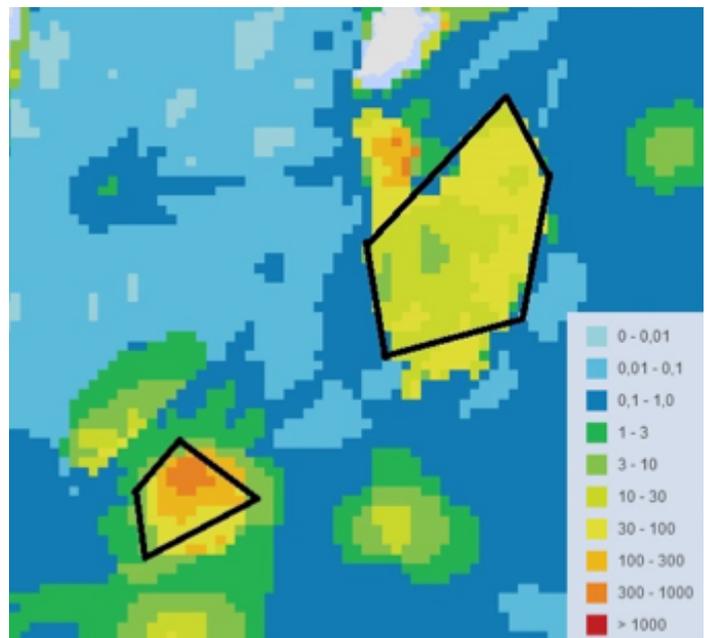


**Figure 7.** Illegal oil discharges in areas to be avoided

*Source:* HELCOM Map and Data Service



**Figure 8.** Potential environmental damage from chemical spills in areas to be avoided



**Figure 9.** Potential environmental damage from oil spills in areas to be avoided

*Source:* HELCOM Map and Data Service

## 2.2. Other marine environmental protection measures

### 2.2.1. MARPOL Annex I (oil) special area

Operational discharges of oil have been severely restricted in the Baltic Sea since 1983. A total ban is thus in place in relation to discharges from the cargo tanks of oil tankers and the machinery spaces of all ships. Discharges from the machinery spaces of ships of 400 gross tonnage and above are permitted, provided that the content of oil in the effluents does not exceed 15 parts per million. Ships must be equipped with oil-filtering equipment to ensure that discharges are automatically stopped when the oil content in the effluents exceeds the prescribed cap<sup>32</sup>.

In spite of these restrictions, illegal discharges from ships are frequently being detected. The number and size of such discharges have, nevertheless, been gradually decreasing (Figure 10). The volume of discharges in 2012 was 34% smaller than the figure in the previous year, and 68% smaller in comparison with 2010. In 2012, 99% of all illegal oil discharges were smaller than 1 m<sup>3</sup>, and none of the discharges were larger than 3.3 m<sup>3</sup>. However, the cumulative effect of discharges is still considerable. HELCOM estimates that 100,000–500,000 ducks, guillemots and other seabirds die each year as a result of oil discharges in the Baltic Sea<sup>33</sup>.

Considering growing trends in ship traffic in the region, a decrease in the number of illegal oil discharges reflects a positive trend. This appears to be linked to the improvement of monitoring capabilities. The European Maritime Safety Agency's (EMSA) satellite monitoring service CleanSeaNet, the establishment of surveillance flights and the use of remote sensing equipment are noteworthy in this regard. Nonetheless, addressing the root causes of illegal oil discharges<sup>34</sup>, improving the detection of polluters<sup>35</sup> and strengthening regulatory enforcement remain valid objectives.

### 2.2.2. MARPOL Annex IV (sewage) special area

Pursuant to the Baltic Sea's special area status under MARPOL Annex IV, any discharge of sewage from passenger ships in the Baltic Sea is prohibited unless sewage is processed through a sewage treatment plant which significantly reduces the nitrogen and phosphorous concentrations<sup>36</sup>. Otherwise, untreated sewage must be delivered to port reception facilities. However, these requirements will only enter into force on January 1, 2018 for existing passenger ships, and on January 1, 2016 for new passenger ships<sup>37</sup>.

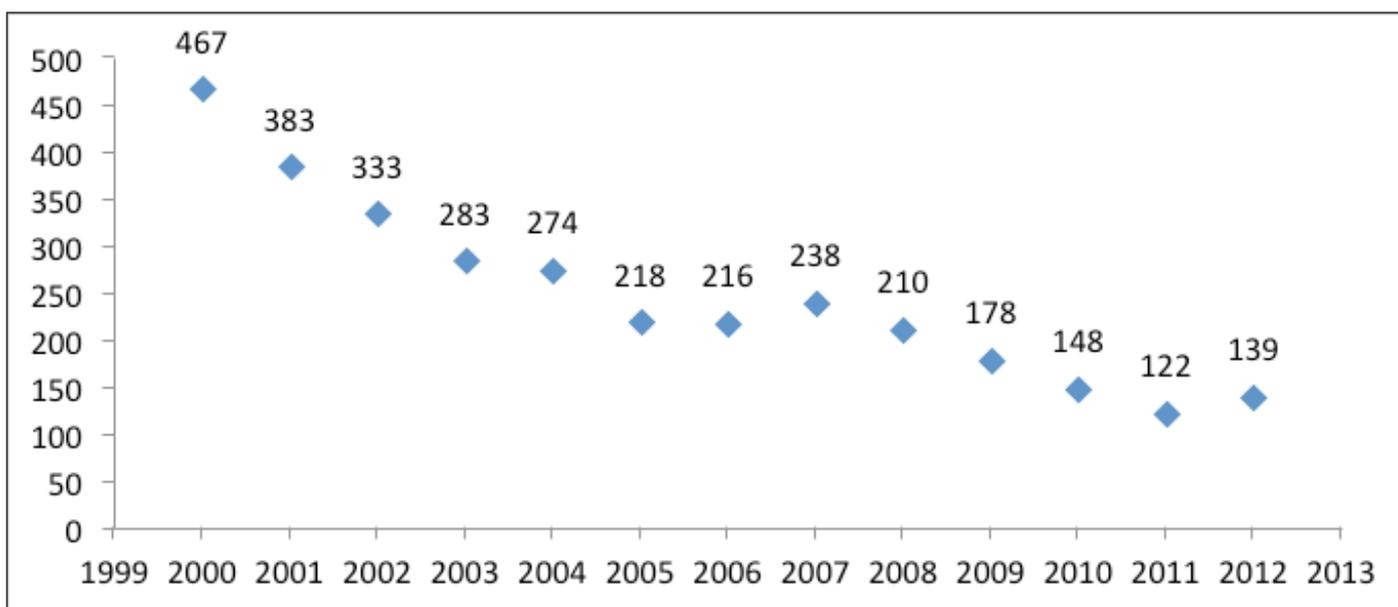


Figure 10. Illegal oil discharges from ships, 2000-2012

Source: HELCOM Map and Data Service

Therefore, an effective monitoring system should be established to allow for the future evaluation of sewage discharges and their environmental impact. Authorities such as national maritime administrations and environmental agencies should ensure that sewage treatment plants are functional and that adequate port reception facilities are available. Moreover, maritime administrations should take appropriate measures to encourage the development of appropriate and cost-effective technical on-board equipment allowing for compliance with discharge standards, as required by IMO Resolution MEPC.218(63).

### 2.2.3. MARPOL Annex V (garbage) special area

The discharge of garbage from ships in the Baltic Sea has been prohibited since 1988. Plastics, including synthetic ropes and synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products which may contain toxic or heavy metal residues, paper products, rags, glass, metal, bottles, crockery, dunnage, lining, packaging materials and other garbage may not be disposed in the Baltic Sea waters. Food wastes may be discharged at not less than 12 nautical miles from the nearest land.

In spite of these restrictions, the overall problem of garbage and marine litter may be commonly observed in the Baltic Sea and along shorelines. Because garbage in the sea may originate from both land-based and ship sources (passenger and other commercial ships, fishing vessels, pleasure craft, etc.), it is difficult to evaluate the contribution from shipping activities. Furthermore, there is currently no national monitoring in place for marine litter<sup>38</sup>.

#### **CASE STUDIES**

*Several ongoing projects address the problem of marine litter. These include MARLIN, GES-REG and MARLISCO. Such projects focus on raising public awareness, collecting information about sources, the amount and types of litter, and mitigating the negative effects of marine litter.*

*MARLIN targets the following sea-based sources: commercial fishing, shipping, tourism and recreation, and offshore operations. These sources account for approximately 20% of marine litter while land-based sources represent 80%. The project emphasizes the need to implement a marine litter monitoring system<sup>39</sup>.*

*MARLISCO streamlines information concerning marine litter in the Baltic Sea. The project has highlighted the lack of comprehensive and systematic assessment and monitoring of marine litter in the region. Another finding of the project is the absence of a common method of reporting. One of the project's conclusions is that the majority of marine litter comes from land-based sources, followed by fishing and dumping. In terms of sea-based sources, commercial shipping, recreational fishing boats and pleasure craft are considered as significant, but no figures are provided. Greater quantities of litter were found near particular point sources, such as shipping routes<sup>40</sup>.*

*Both studies concluded that the root cause of the Baltic Sea pollution from garbage is related to contemporary lifestyle, consumption and production patterns, as well as attitudes and behaviors concerning recycling and littering.*

#### **2.2.4. MARPOL Annex VI SECA**

SO<sub>x</sub> emissions arise from marine fuel combustion and are a function of the sulphur content of the fuel. SO<sub>x</sub> emissions are considered to be harmful to the environment as they lead to acidification of aquatic and terrestrial ecosystems, and negatively impact human health.

All Baltic Sea states are parties to the 1997 MARPOL Protocol, which introduced Annex VI into the Convention. The Baltic Sea SECA entered into force on May 19, 2006. SECA imposes stricter requirements on the quality of bunker fuel. The current concentration of sulphur in fuel is limited at 1.00% m/m. This cap will decrease to 0.10% m/m as of January 1, 2015. Limitations on SO<sub>x</sub> emissions apply to all fuel oils, combustion equipment, including main and auxiliary engines, boilers and inert gas generators.

In the two years following the implementation of the SECA, SO<sub>x</sub> emissions in the Baltic Sea decreased by 8%. Further reductions of emissions may be expected after 2015<sup>41</sup>.

#### **2.2.5. Mandatory ship reporting systems**

The legal basis for the adoption of mandatory ship reporting systems is to be found in SOLAS Regulation V/8.1 and the “Guidelines and Criteria for Ship Reporting Systems” (IMO Resolution MSC.43(64) as amended by MSC.113(73) and MSC.189(79)).

The aim of ship reporting systems is to inform coastal states of, inter alia, the presence in a defined zone of ships carrying dangerous or hazardous cargoes. Ship reporting systems may technically be promulgated for all ships or for only certain categories of ships presenting a particular environmental risk. Coastal states may use the information provided for the purpose of helping ships avoid collisions and groundings, e.g., by warning ships deviating from their voyage plans. Other benefits include the provision to seafarers of information about specific environmental conditions and hazards in the area, assisting in the enforcement of illegal oil discharges and helping to ensure timely reaction in the event of an accident or other casualty.

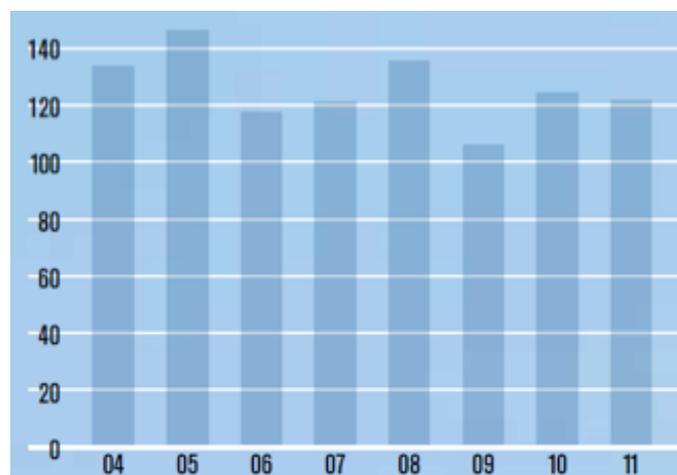
Four mandatory ship-reporting systems have been adopted under the framework of the IMO in the Baltic Sea. These are:

- o BELTREP in the Great Belt area, applying to ships of 50 GT and above, and all ships with an air draught of 15 meters and above;
- o SOUNDREP in the Sound between Denmark and Sweden, applying to ships of 300 GT and above;
- o GOFREP in the Gulf of Finland, applying to ships of 300 GT and above;
- o GDANREP on the approaches to the Polish ports in the Gulf of Gdańsk, applying to passenger ships, ships with a gross tonnage equal to or exceeding 150 GT and all vessels engaged in towing.

### **2.3. Shipping accidents analysis**

Analysis of shipping accidents is essential for the appreciation of overall maritime safety in the Baltic Sea. Dynamics of accidents over the years and especially following the adoption of the APMs may provide valuable information for the evaluation of their effectiveness and for suggesting further improvements.

The number of reported maritime accidents has remained fairly constant during the period 2004-2011, at around 120 per year (Figure 11). It should, nevertheless, be pointed out that traffic intensity increased up to the economic crisis in 2008. The interrelation between the number of shipping accidents and the amount of maritime traffic is well known<sup>42</sup>, and has to be taken into account for future scenarios.



**Figure 11.** Reported accidents in the Baltic Sea, 2004-2011

*Source:* HELCOM. (2012). *Activities report 2012*. Retrieved January 16, 2014 from <http://helcom.fi/Lists/Publications/BSEP134.pdf><sup>43</sup>.

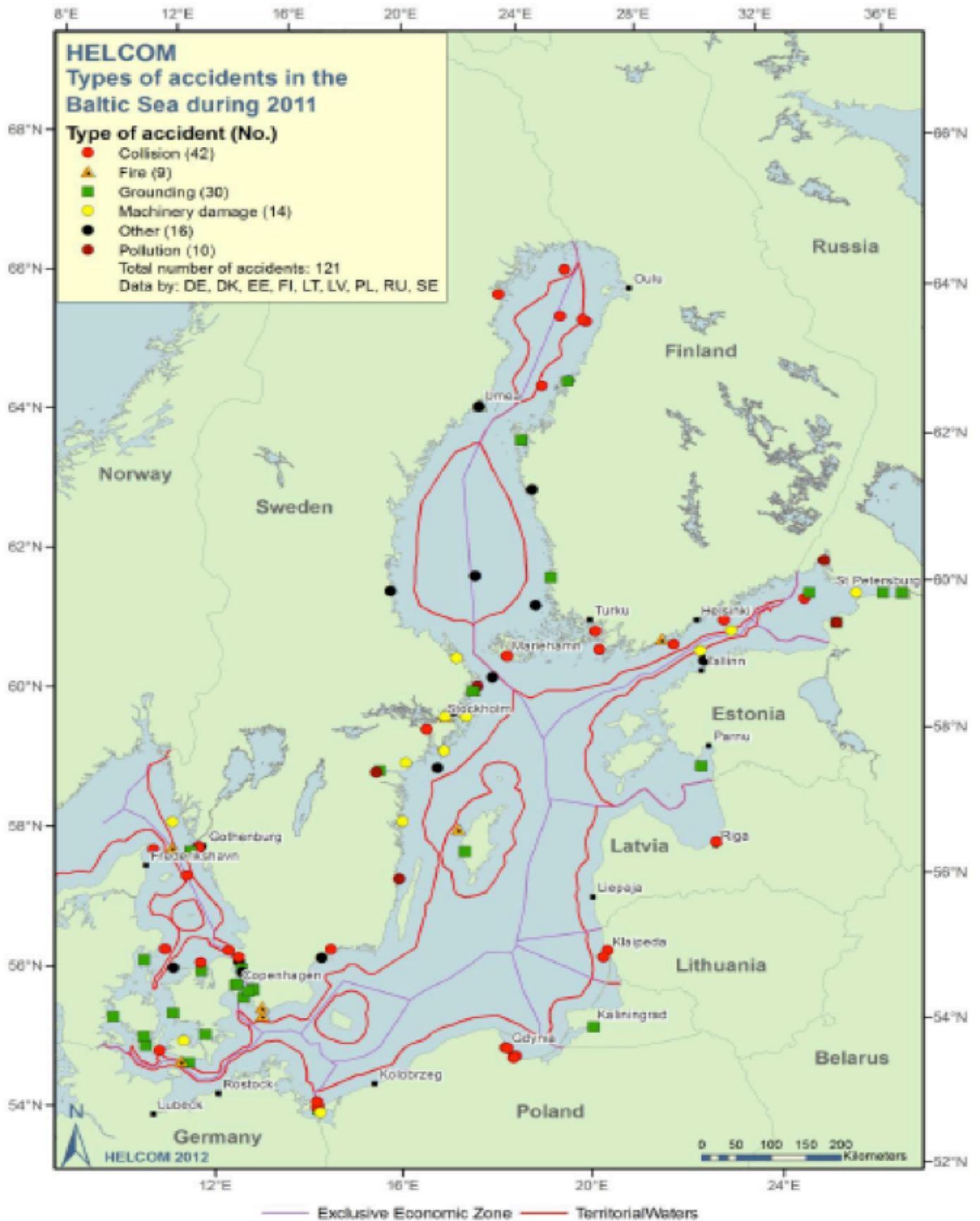
Collisions and groundings are traditionally the most frequent types of accidents, and represented in 2011 35% and 25%, respectively, of all accidents. The overall share of collisions in 2011 was almost the same as that occurring during the period 2002-2011 (34%), while the share of groundings in 2011 (25%) was significantly lower as compared with figures during the previous 10-year period (39%)<sup>44</sup>.

Spatially, collisions in 2011 occurred primarily in nearshore areas (Figure 12). Areas at highest risk include the southwestern Baltic Sea, comprising the Danish straits and ports, where 33% of overall collisions took place.

For their part, groundings are a primary concern in the Danish straits, the Gulf of Finland, the Åland/Archipelago Sea area, the Swedish coast of the Baltic Sea proper, and in ports<sup>45</sup>.

It is noteworthy that, in the case of groundings, a majority of ships (64%) did not have a pilot on board. Furthermore, most groundings (60%) involved vessels with a draught of less than 7 m. Small vessels, it is recalled, are not covered by IMO recommendations on the use of pilotage<sup>46</sup>.

In general, the most risky areas in terms of density of traffic are located in the southwestern approaches between Denmark and Sweden, the Finland-Åland-Stockholm corridor and the Gulf of Finland, with a combined share of 73% of all accidents in the region<sup>47</sup>.



**Figure 12.** Types of accidents in the Baltic Sea, 2011

Source: HELCOM. (2013). *Report on shipping accidents in the Baltic Sea area during 2011*. Retrieved January 31 from [http://helcom.fi/Lists/Publications/Shipping\\_accidents\\_2011.pdf](http://helcom.fi/Lists/Publications/Shipping_accidents_2011.pdf).

Approximately 7% of all accidents in the period 2002-2011 resulted in pollution<sup>48</sup>. The number of accidents causing pollution slightly increased in 2011 to 11 out of a total figure of 121<sup>49</sup>. According to HELCOM, “all the incidents occurred during fuel transfer except for one which was caused due to machinery damage. The type of vessels involved in pollution accidents included six tankers, four cargo ships and one passenger ship”<sup>50</sup>. Seven pollution accidents involved Russian vessels and were due to human factors. The remaining four pollution incidents concerned Swedish ships and were caused by technical or other factors.

The human factor remains the main cause of accidents, accounting for 50% of all casualties in 2011, which is still less than the average world figure (85%). The contribution of technical factors, external factors and other factors was 22%, 17% and 5%, respectively. In 6% of the cases, no data was available on the cause of the accident<sup>51</sup>.

It is suggested that the best course for addressing the human factor as the main cause of accidents consists in improving seafarers’ training and working conditions, and enhancing the services of manning agencies (EU Social Agenda for Maritime Transport).

To conclude, the number of shipping accidents in the Baltic Sea has been decreasing. HELCOM points out that there has been no increase in the level of risk from accidental oil spills. Yet, collisions remain the most common type of accidents in the region, and may get worse with rising maritime traffic. The vast majority of accidents occur close to the shore and in harbors, that is, in waters where coastal states may arguably have jurisdiction to expand if necessary on international standards. It may be difficult, however, to analyse the impact of APMs on the incidence of accidents given the important role played by numerous other safety measures introduced following the creation of the Baltic Sea PSSA.

#### **2.4. Challenges in the Baltic Sea**

Maritime traffic in the Baltic Sea is in constant growth. The recent rise in shipping activities in the area may be linked to the economic expansion of Baltic Sea countries, general economic recovery following the 2008 crisis, and increasing oil production and trade by the Russian Federation.

At the time of the creation of the Baltic Sea PSSA, more than 2,000 ships (excluding ferries, small fishing vessels and leisure craft) were estimated to be en route in the area on an average day. Of these 2,000 ships, around 200 were oil tankers (10%), some carrying a cargo of 150,000 tons<sup>52</sup>. According to HELCOM, the number of ships entering or leaving the Baltic Sea via the Skagerrak in 2009 witnessed a 20% increase from 2006. In 2009, approximately 21% of shipping consisted of tankers carrying as much as 166 million tons of oil<sup>53</sup>; those figures were 18% and 250 million tons, respectively, in 2011.

Oil transportation is predicted to increase further, especially in the Gulf of Finland, as a result of the construction and expansion of oil terminals in Russia. The export of Russian oil alone through Baltic ports has reached 111 million tons and is expected to increase to 180 million tons by 2020<sup>54</sup>.

It is noteworthy that oil pollution, which is a major environmental concern in the Baltic Sea, may originate not only from oil tankers, but also from other types of ships carrying large quantities of bunker fuel. Currently, the primary source of oil pollution consists of operational, rather than accidental, discharges. Although a major oil tanker casualty could have catastrophic environmental consequences on the sensitive Baltic Sea ecosystem, the day-to-day challenge consists in combating illegal operational discharges from all ship types.

Transportation of chemicals by sea is also constantly growing in both the number of chemicals and the volume of goods transported<sup>55</sup>. However, the number of large-scale chemical releases has declined<sup>56</sup>. Interestingly, the ChemBaltic Project concluded that the threat of operational discharges was greater for the marine environment from oil originating in oil tankers rather than from chemicals. Nevertheless, risk assessment conducted during the Project demonstrated the importance of prewashing cargo tanks ashore before the main washing, as it helps reduce the impact of vegetable oils on seabirds. It was recommended that prewashing should be mandatory for category Y cargoes, as these substances may significantly damage the Baltic Sea ecosystems over time<sup>57</sup>.

According to WWF research, total anthropogenic pressures on the Baltic Sea continue to rise<sup>58</sup>.

Conflicting interests are common in discussions regarding the introduction of new APMs. While some actors tend to focus on fast economic development, others advocate achievement of prosperity hand-in-hand with the protection of the environment. It is clear that there is a constant need for a holistic approach in considering problems of the Baltic Sea as a “whole.” It could be conceded, however, that application of this principle may be seen as difficult.

While significant efforts and investments have been spent on reducing the negative environmental impact of shipping and increasing efficiency, the problem of the continued growth in marine transportation does not appear to have been given sufficient attention. Growth and transportation are not considered separately. The basic approach of sustainable development, namely, “reduce, reuse, recycle,” is overlooked, as little or insufficient consideration is given to the reduction of consumption (and therefore trade and shipping) and the sourcing of goods and wares from local producers, which could indeed address one of the root causes of environmental concerns in the Baltic Sea.

Modest levels of engagement by the Russian Federation in strengthening regional environmental standards pose another challenge. Bearing in mind opposition by the Russian Federation to the creation of the Baltic Sea PSSA as well as the adoption of the PSSA Guidelines, the likelihood of success of future proposals should be assessed against the odds of resistance from that country. At IMO meetings, concerns were raised by the Russian Federation with respect to the principle of consensus in creating PSSAs, the size of PSSAs, the impacts of APMs on international shipping activities as well as the ability to introduce additional APMs. Therefore, cooperation with the Federation, as one of the major producers of oil in the Baltic Sea, is seen as crucial for the future clarification and strengthening of the Baltic Sea PSSA, as well as the implementation and enforcement of adopted measures.

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## 3. The Future

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The previous section of this report described current dynamics in the Baltic Sea Area PSSA, and highlighted existing challenges confronting enforcement authorities, policymakers and stakeholders in the marine environment and safety sectors. In the pursuit of sustainability, it is crucial not only to evaluate the effects and implications of current marine traffic conditions, but also to consider foreseeable future pressures<sup>59</sup>. This section of the report undertakes to look ahead and assess the ability of the PSSA scheme and current APMs to fulfill changing demands for sustainability. In some ways, the APMs could be improved or even expanded, while additional remedial measures may well have to be crafted outside the PSSA framework altogether, lest such a framework were to be reinforced - a seemingly unrealistic aim, at least in the near future.

### 3.1. Projections

Before analyzing the effectiveness of the Baltic Sea Area PSSA scheme and its APMs in future scenarios, it is important to emphasize the limitations of the attempted exercise. Projections and conclusions would largely depend on the methodology applied and the value given to certain factors. For instance, predictions relating to increases in oil transportation may well underrate the possible scarcity of oil reserves<sup>60</sup>.

WWF has analyzed future trends in the Baltic Sea up to 2030 and predicted considerable overall growth of maritime activities, including shipping<sup>61</sup>. The number of ships is expected to double by 2030, particularly in the passenger and oil trades.

Building on WWF's projections as to growing maritime activities, the risk of accidents and pollution would be likely to increase. Furthermore, larger ships create a threat of bigger accidents and consequent impacts<sup>62</sup>. For its part, weather unpredictability due to climate change may bring about additional safety and environmental risks<sup>63</sup>. Such a picture of traffic, operational and meteorological conditions may not be very good news for the sustainability of the region.

Nevertheless, according to HELCOM, there does not appear to be a fear of a dramatic increase in risks. It is thus believed that the threat of oil spills from groundings will somewhat decrease until 2020. Moreover, the incidence of collisions between ships or with fixed objects appears to be generally stable. A notable exception may be found, however, in the Gulf of Finland, particularly along the route to the new Russian port of Ust'-Luga, where there are fears of a heightened risk of oil spills from collisions (Figure 13).

### 3.2. PSSA effectiveness in future scenarios

The foreseeable state of affairs just sketched begs the question of the ability of the PSSA scheme and existing APMs to cater for emerging threats.

Existing APMs within the Baltic Sea PSSA, such as TSSs, the deep-water route and areas to be avoided, are expected to retain their usefulness with increasing maritime traffic. Nevertheless, it is suggested that their efficiency could be improved. As was mentioned above, the TSS off Gedser presents a high risk of oil spills from collisions, and that risk is not expected to decrease in the future (Figure 5). An accident in the area could pollute waters and the coast of Mecklenburg-Western Pomerania, including its nature reserves. Furthermore, a high risk of oil spills from collisions has been highlighted at the point of entry of traffic from TSSs off Öland Island and Gotland Island into the deep-water route off Gotland Island (Figure 6). It is suggested that the HELCOM Maritime Group could discuss whether and how to improve the performance of the mentioned APMs.

### 3.3. Introduction of new marine environmental protection and safety measures

Under the PSSA Guidelines, APMs may be adopted to cater for future international shipping activities that are expected to cause damage to the proposed area (paragraph 7.5.1(3)). It has already been explained that new APMs may technically be added to an existing layer operating in a given PSSA.

Whether emerging challenges should be addressed by way of additional APMs or by resort to the more traditional frameworks of international conventions is an open question. This section of the report examines principal challenges facing the Baltic Sea in the near future, and suggests measures that could be tackled from either perspective.

For instance, turning to the risk of illegal oil discharges, projections place it on an upward trend (until 2020) along the main shipping routes. Remedial actions here would consist of improvements and tightening across the board of traditional MARPOL Annex I implementation and enforcement tools, including: raising awareness and the safety culture among ship operators, ship masters and crews; availability of adequate port reception facilities at reasonable cost; observation, detection and monitoring.

As for the risk of operational pollution under other MARPOL Annexes, it is feared that the expected growth in passenger transportation and recreation could well generate an increase in sewage and garbage discharges. Here again, stepping up the implementation, enforcement and monitoring capabilities would be called for. This would include the provision of adequate reception facilities. A further specific recommendation would be for national maritime administrations and environmental agencies to promulgate procedures for the adoption of sewage treatment plants.

#### 3.3.1. MARPOL Annex VI NECA

International shipping activities are known to contribute to one of the most critical environmental problems facing the Baltic Sea, namely, eutrophication. It is estimated that shipping contributes about 25% towards nitrogen deposition in the Baltic Sea<sup>64</sup>. Growth of ship traffic shown as part of future projections would only exacerbate such a situation. While excessive input of nitrogen and phosphorus from ship-generated sewage has been addressed by the designation of the Baltic Sea as a MARPOL Annex IV special area, attempts to limit nitrogen coming from ships' diesel engines by implementing a NECA have not been successful.

A primary reason for failure to progress on the NECA designation so far appears to have been skepticism by the Russian Federation on the availability of technologies complying with Tier III NO<sub>x</sub> standards. This was manifest at MEPC 65 in May 2013, and during the HELCOM ministerial meeting held at Copenhagen in October 2013. Future progress will depend on the outcome of discussions at MEPC 66 in March/April 2014.

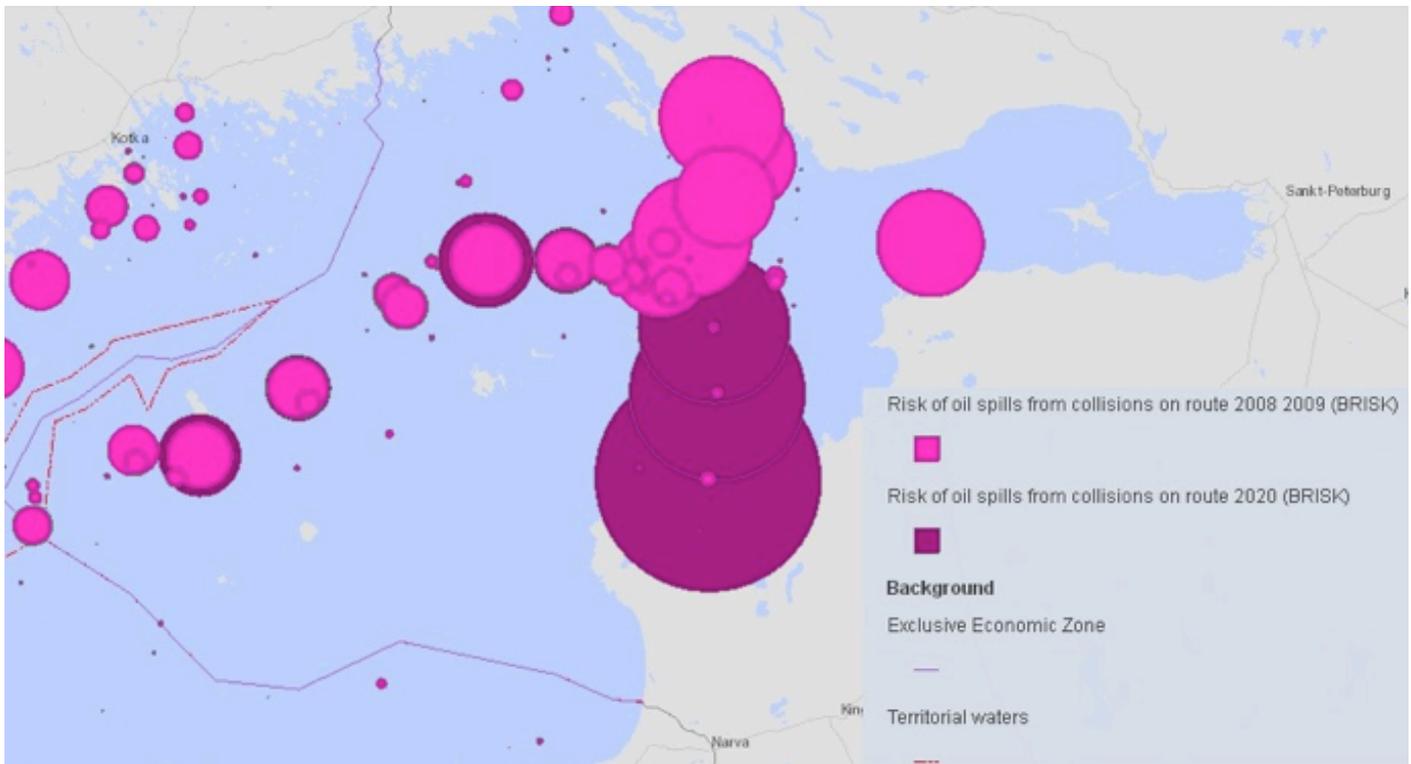
Canada, Denmark, Germany, Japan and the US have argued in favor of an implementation date of January 1, 2016 for NO<sub>x</sub> Tier III standards<sup>65</sup>. The European Association of Internal Combustion Engine Manufacturers (EUROMOT) has also presented information about existing Tier-III-compliant technologies (selective catalytic reduction, exhaust gas recirculation, liquefied natural gas), stating that those technologies are mature for use on board ships<sup>66</sup>. However, the Russian Federation has continued to insist on moving forward the effective date of the standards to January 1, 2021<sup>67</sup>. Meanwhile, the Marshall Islands and Norway have suggested a compromise solution<sup>68</sup>.

Tier II NO<sub>x</sub> emission limits, which entered into force on January 1, 2011, require new ships to reduce emissions by 20% in relation to Tier I. It is estimated that NO<sub>x</sub> emissions will increase to 500,000 tons by 2040, side-by-side with a 2% yearly increase of maritime traffic<sup>69</sup>. It is suggested that, in order to avert such a scenario, and elevate current standards to Tier III, the Baltic Sea should be designated as a NECA. This would mean that ships built after January 1, 2016 would have to reduce NO<sub>x</sub> emissions by an additional 75%. If the NECA were achieved, emissions would be expected to decrease to 160,000 tons by 2040<sup>70</sup>.

However, effective implementation of Tier III NO<sub>x</sub> standards on January 1, 2016 alone might not be sufficient. Complementary voluntary measures, such as economic incentives (taxation of marine fuels, port dues, tonnage tax etc.) could usefully be considered as part of the initiation of reductions to NO<sub>x</sub> emissions even before regulatory requirements would enter into force<sup>71</sup>.

### 3.3.2. TSSs

As mentioned earlier, the route to the Russian port of Ust'-Luga is under increasing risk of oil spills from collisions (Figure 13). The port has new oil and gas terminals with constantly increasing turnover. Crude oil turnover in the port increased by 63% in 2013, reaching 23.3 million tons. A 30% increase (16.4 million tons) was furthermore registered in refined oil products, contributing almost 40% to the overall growth of the port in 2013. This growth seems to be related to redistribution of cargo flows between the ports of Primorsk, Vysotsk and Ust'-Luga<sup>72</sup>.

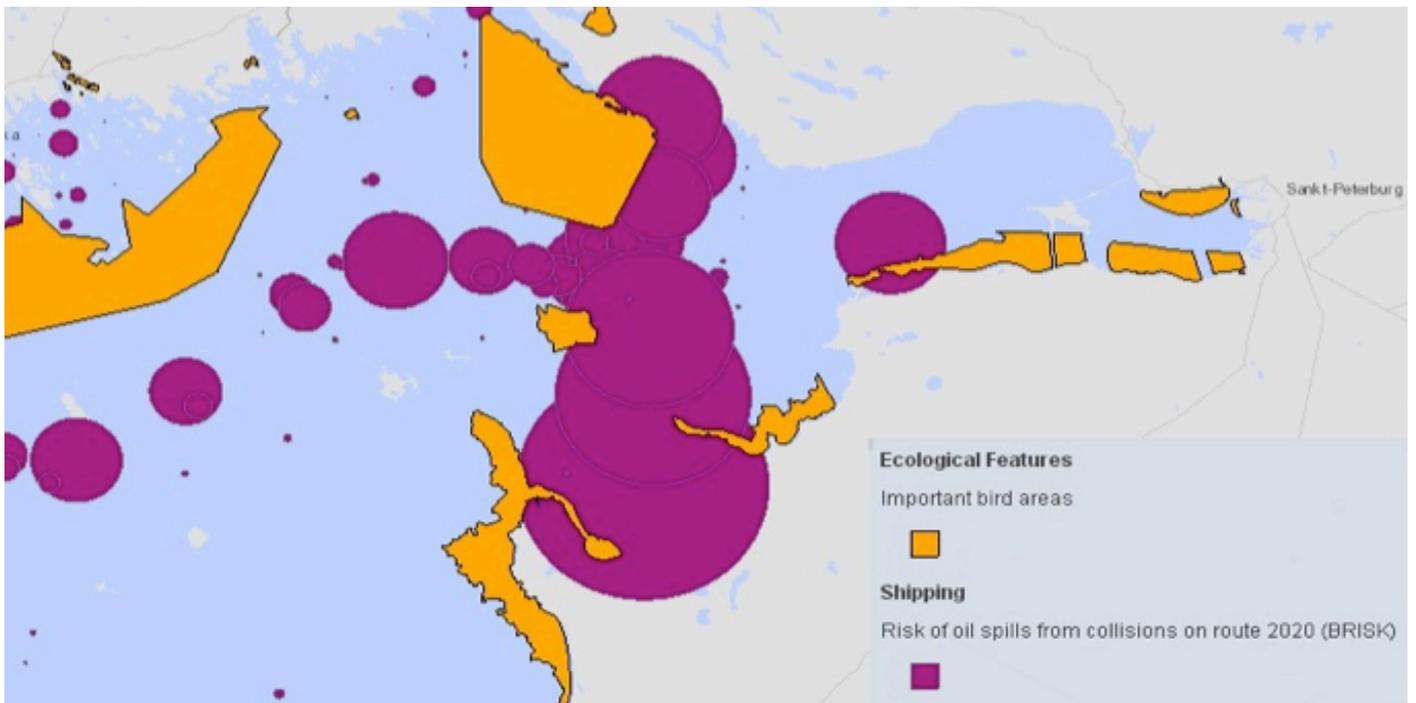


**Figure 13.** Risk of oil spills from collisions on the route towards the port of Ust'-Luga, 2008-2009 and 2020 projection

*Source:* HELCOM. Map and Data Service

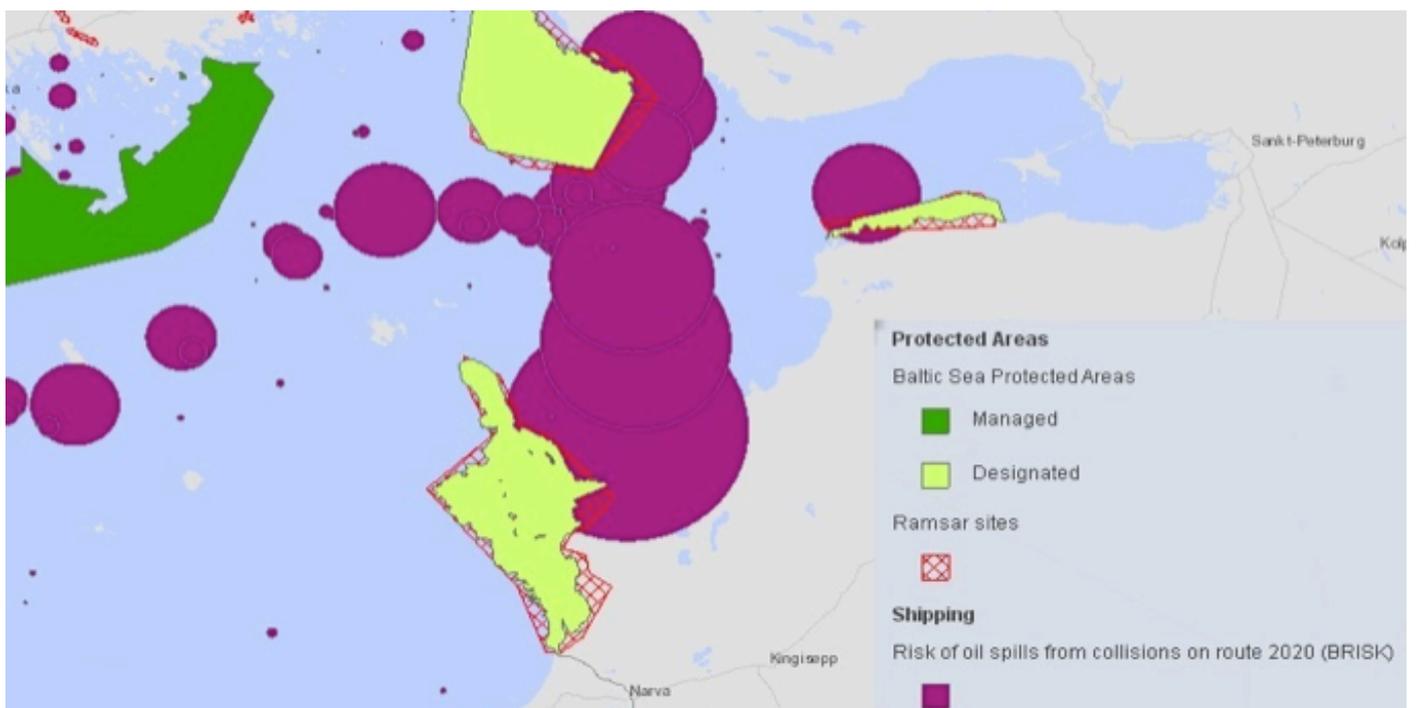
Whether the area would qualify scientifically for designation as a PSSA is one matter (Figures 14 and 15). For instance, it may be necessary for the area to have a well-defined ecological value, for example, as a nesting or feeding ground for rare or vulnerable bird species. Another matter is the obstacle emanating from the Russian Federation's opposition to extension of the Baltic Sea Area PSSA to its waters. It is thus believed that extension of the PSSA to the area in question and the introduction of an APM such as a TSS would be unrealistic in the foreseeable future.

In another part of the Baltic Sea, it is noteworthy that the area between the German island of Fehmarn and the Danish island of Lolland features a high risk of collisions due in part to high traffic density (Figure 16). The area has a history of collisions, including one in 2009. The environmental impact of an oil spill is significant as the area serves as an important habitat for several bird species (red-breasted merganser, red-throated loon, arctic loon, red-necked grebe, great cormorant, black guillemot, greater scaup, common eider, black scoter, common goldeneye, mew gull, sandwich tern<sup>73</sup>) (Figures 16 and 17) and a spawning ground for cod (Figure 18). The area is managed and designated as a Baltic Sea protected area (Figure 19). Moreover, there are Ramsar sites on Lolland Island. An optimal solution to address the vulnerability of the area and to decrease the risk of oil spills would be to implement a TSS in the area.



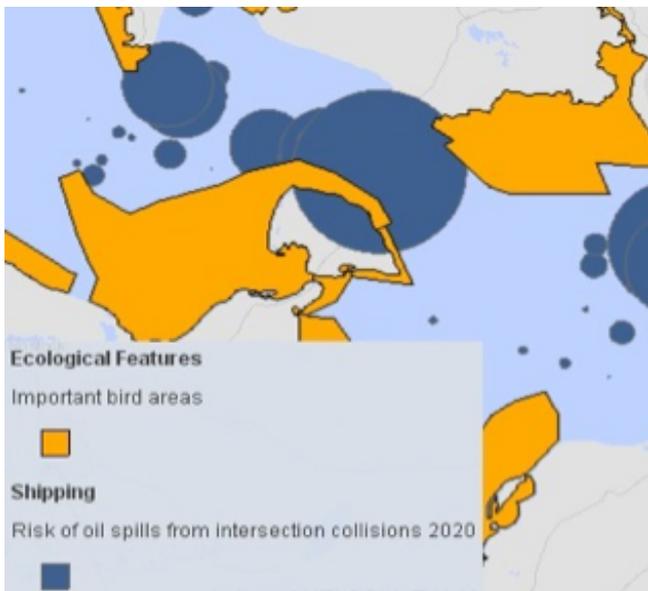
**Figure 14.** Important bird areas in the vicinity of the port of Ust'-Luga

*Source:* HELCOM. Map and Data Service



**Figure 15.** Baltic Sea protected areas<sup>74</sup> and Ramsar sites<sup>75</sup> in the vicinity of the port of Ust'-Luga

*Source:* HELCOM. Map and Data Service

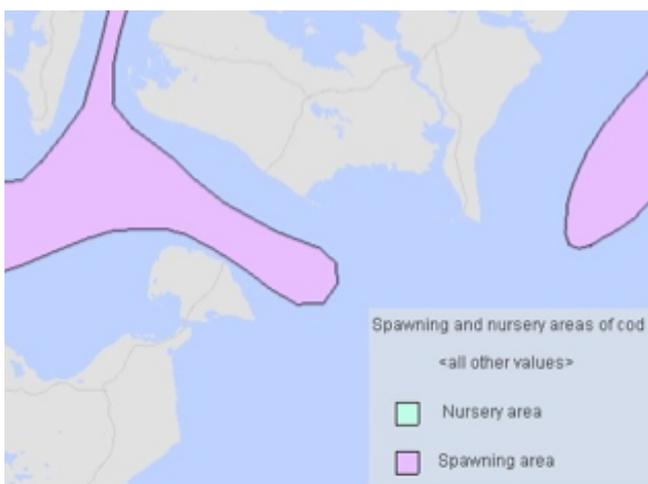


**Figure 16.** Important bird areas between Fehmarn and Lolland



**Figure 17.** Wintering grounds of sea birds between Fehmarn and Lolland

Source: HELCOM Map and Data Service



**Figure 18.** Cod spawning and nursery grounds between Fehmarn and Lolland



**Figure 19.** Baltic Sea protected areas near Fehmarn and Lolland

Source: HELCOM Map and Data Service

### **3.3.3. Deep-water route**

It has already been pointed out that the deep-water route is an appreciable conduit for diverting traffic from sensitive seabird feeding areas, and consideration should be given to rendering it not merely recommendatory, but compulsory in the future, given that SOLAS Regulation V/10(1) provides for the possibility of establishing mandatory routing measures.

Currently, the only mandatory deep-water route implemented as part of a PSSA exists in the Wadden Sea PSSA, which is located within the territorial sea of coastal states. Taking into consideration that the deep-water route off Gotland Island is located mainly within Swedish and Estonian EEZs, and on the basis of previous instances within IMO, it is believed that an attempt to raise the deep-water route's status to mandatory would probably be opposed by IMO member states as limiting freedom of navigation.

### **3.3.4. Mandatory ship reporting**

National statistics show significant improvements in areas implementing mandatory ship reporting. It is believed that a unified mandatory ship reporting system across the entire Baltic Sea PSSA would go a long way towards strengthening environmental protection in the region. Such a system would alleviate burdens on ships, by releasing them from the obligation to report to each of the different mandatory areas currently in existence. Setting up land-based guidance capability to help seafarers in case of any difficulties would also be desirable. Such a system would furthermore benefit various law enforcement and rescue organizations, since it would allow for aberrant behavior among ships to be more easily detected. A large number of difficulties arising on board which might lead to such a behavior could in such a way be responded to through radio and by rescue organizations, which would be able to deploy on location much earlier in time and perhaps even early enough to avoid a serious accident altogether.

### **3.3.5. Areas to be avoided**

Taking into consideration current and possible future maritime traffic density, it is suggested that the following important bird habitat grounds could be considered for designation as areas to be avoided by shipping:

- the waters north of the Finnish port of Rauma
- the area near the Ibre Strait leading to the Gulf of Riga
- the area near the German port of Wismar
- the area near the Polish port of Swinoujscie
- the sea area west of Kattegat

It is not expected that designation of the above areas would impair the effectiveness of shipping activities.

### **3.3.6. Pilotage**

As already stated, grounding is the second most frequent type of accident in the Baltic Sea. Analysis of shipping accidents in 2011 shows that 64% of grounded ships did not have a pilot on board at the time of the accident. Most of these accidents occurred with ships of less than 7 m draught (60%) and none of the grounded ships had a draught size of more than 11 m<sup>76</sup>.

IMO requirements regarding pilotage in the Baltic Sea are to be found in Resolution MSC.138(76), "Recommendation on Navigation through the Entrance to the Baltic Sea," and Resolution A.1081(28), "Recommendation on the Use of Adequately Qualified Deep-Sea Pilots in the Baltic."

Under these instruments, compulsory pilotage is recommended in Route T for vessels with a draught of more than 11 m or vessels carrying highly radioactive material and in the Sound for vessels with a draught of more than 7 m or vessels that carry oil, chemicals, gas or highly radioactive material. Small vessels not carrying dangerous and hazardous cargoes are outside the framework of measures envisaged in these instruments. The resulting threat concerns primarily the Danish straits, the Gulf of Finland, the Åland/Archipelago Sea area as well as the Swedish coast of the Baltic Sea proper<sup>77</sup>.

It is noteworthy that pilotage is compulsory in all the ports of Denmark, Estonia, Germany, Finland, Poland and Sweden. Latvia and Lithuania have compulsory pilotage only in some ports<sup>78</sup>. Pilotage is also compulsory in all Baltic Sea ports of the Russian Federation with minor exceptions for small ships, warships and pleasure yachts<sup>79</sup>. National requirements on compulsory pilotage in ports vary between and within countries and often depend on such factors as the type of cargo, and the size and nationality of the ship. Vessels carrying dangerous or hazardous goods are almost always subject to compulsory pilotage<sup>80</sup>. A survey has shown that ports and pilots are usually in favor of mandatory pilotage. On the other hand, the opinion amongst shipping companies and masters is that mandatory pilotage should be justified on a case-by-case basis in light of the specific local conditions<sup>81</sup>.

Taking these points into consideration, it would be desirable that Baltic Sea states envisage the possibility to expand compulsory pilotage in the Danish straits and other risk areas for smaller ships and ships carrying large amounts of bunker oil. Amendments to IMO Resolution MSC.138(76), referred to above, could also be considered. In addition, national requirements on compulsory pilotage could be strengthened, particularly so as to expand pilotage requirements in ports.

### **3.4. Strengthening the legal framework**

As already explained, the PSSA mechanism does not seem to provide an added legal basis or jurisdictional benefit for the protection of the marine environment, but constitutes rather a management tool that allows available marine environmental protection regimes under international conventions to be brought together under one banner. Therefore, in order to strengthen the environmental protection of vulnerable marine areas from international shipping activities, it would be highly desirable that amendments are introduced to the relevant international regulatory instruments.

In the meantime, clarification of the PSSA mechanism, particularly its legal basis for the development and adoption of additional APMs, could be beneficial. In this regard, the possibility of requesting technical assistance from IMO should be considered as envisaged in paragraph 3.3 of the PSSA Guidelines.

The effectiveness of APMs largely depends on the availability of appropriate monitoring tools, the systematic analysis of information on hand, strict enforcement measures and effective cooperation between all interested stakeholders. IMO suggests that an effective compliance program should incorporate all of the following elements:

- o compliance monitoring through routine inspections, surveys and/or examinations
- o detection and policing patrols
- o reporting procedures and incentives, including incentives for self-reporting
- o adequate investigations of violations reported or otherwise detected
- o a system of adequate sanctions in respect of violations
- o education and public awareness programs
- o cooperation and coordination with other states<sup>82</sup>

The monitoring and detection of oil spills have been considerably enhanced with the help of the EMSA satellite-based service CleanSeaNet. This system identifies and traces oil pollution on the sea surface. It thus contributes to the identification of polluters and assists in the enforcement of regulatory instruments. CleanSeaNet provides recipient states with primary information for follow-up actions, such as spill verification and response, and inspection of the vessel upon entry into port. CleanSeaNet also carries out oil drift modeling, which is crucial for effective response operations.

Marine environmental protection is one of the core objectives of another EMSA vessel traffic monitoring and information system, SafeSeaNet, which is designed to help identify high-risk vessels and improve pollution emergency response.

It may also be noted that Baltic Sea states have by and large solid monitoring capabilities in regard to marine pollution from hazardous and noxious substances. This includes aircraft with remote sensing equipment for aerial surveillance, specialized vessels, various forecasting models, devices for measuring toxicity in the atmosphere, bottom sampling devices and other measuring instruments (see Annex). These surveillance capabilities and accumulated experience should be brought to bear when addressing the Baltic Sea challenges, including illegal discharges of oil, sewage and garbage. Detection and policing patrols could also be introduced in the most polluted and vulnerable sea areas.

Nevertheless, it is safe to add that not all of the IMO recommended actions referred to above are properly applied in the Baltic Sea PSSA. Further improvements may, for instance, be considered in regard to reporting incentives, which should not concern solely merchant ships, but also seaports and terminals. Cooperation among Baltic Sea states and specifically with the Russian Federation is another matter of priority.

### **3.5. PSSA, MSP and governance**

The Baltic Sea is poised to witness a general surge of maritime activities in the coming decade<sup>83</sup>. As a consequence, demand for marine space and resources will grow, and so will competition among various national, regional and global actors. MSP and maritime governance are earmarked as strategic tools for helping address some of the main pressures stemming out of forthcoming trends.

The Regional Baltic Maritime Spatial Planning Roadmap 2013-2020<sup>84</sup> undertakes to introduce MSP throughout the Baltic Sea region by 2020.

The benefit of MSP as a tool to deal with pertinent issues is well understood internationally (UNESCO initiative on MSP<sup>85</sup>), regionally (HELCOM Baltic Sea Action Plan) and nationally among most Baltic Sea countries. Applying MSP methodology in decision-making has the potential of resolving conflicting interests among various parties and even encouraging the latter to work synergistically.

The PSSA does not contradict the MSP concept. The PSSA regime is aimed toward the protection of a vulnerable sea area from damage caused by international shipping activities. As such, the PSSA regime is designed to reduce overall pressures in the Baltic Sea. Additionally, the PSSA regime ensures that information about APMs is displayed on international sea charts and thus brought to the attention of all maritime stakeholders. Additionally, the PSSA process engages stakeholders in its creation, evaluation and implementation phases.

Both the PSSA mechanism and MSP are management tools, which help in coordinating matters relating to marine activities in the territorial sea and the EEZ, without creating additional rights or duties. The two concepts may thus be seen as complementary mechanisms for achieving optimal environmental, economic and social development.

Considering the relationship between APMs and MSP, the level of interrelation varies depending on the specific APM. Restrictions on the discharge of oil, sewage, garbage, air pollution, and requirements concerning mandatory ship reporting schemes, as well as on-board equipment and port reception facilities are related to the operation of ships. Therefore, these measures do not have a direct impact on the distribution and use of maritime space, and do not affect other activities closely.

TSSs, deep-water routes and areas to be avoided are more closely related to MSP as they direct and organize maritime traffic, and thus affect the use of maritime space. These APMs should not be considered as limiting maritime traffic. They do not influence the volume of shipping directly, but rather organize traffic and contribute to the protection of sensitive marine areas.

MARPOL requirements (related to oil, sewage, garbage and air pollution) as well as ship reporting schemes are mandatory. However, TSSs, deep-water routing and areas to be avoided are recommendatory measures as they generally operate in EEZ waters, where coastal state rights are limited. In order to enhance the effective implementation of these recommendatory measures, it would be advisable to integrate them within MSP for the Baltic Sea. This may be important as the recommendatory character of these measures could lead some parties to disregard them.

The Baltic Sea region presents good conditions for constructive maritime governance. There is a high level of public awareness about marine environmental threats. Shipping companies and ports strive towards decreasing their environmental footprint. Influential non-governmental environmental organizations in the area are very active and possess significant expert knowledge. In addition, governmental authorities are generally supportive of the strengthening of environmental standards. In conclusion, environmental protection initiatives in the Baltic Sea have good local and regional backing<sup>86</sup>.

Nevertheless, pressure on the maritime industry, including shipping companies and ports, should be maintained in order to ensure that its efforts go beyond a simple greening of its image. If the industry were to adopt a negative attitude, regional and global initiatives for the strengthening of environmental standards would be more difficult. Governmental and non-governmental organizations should always emphasize the importance of supporting the part of the business community that is the most progressive when it comes to environmental management. Attention has to be paid in the industry to proper and equitable internalization of environmental costs. Financial responsibility for implementing improved environmental standards should not be shifted towards the more progressive parts of the industry, but should rather be shared in order not to cause negative effects on competition.

The maritime industry has announced a vision that environmental costs should be “shared by society, rather than pushed only on to the shipping industry”<sup>87</sup>. This interpretation of the internalization of environmental costs may be seen as distorting the concept’s true meaning. Such an interpretation finds supports in an IMO document: “the burden and cost for compliance with the stringent emission control standards, such as the sulphur regulations, should be shared by society equitably rather than be pushed onto the users, i.e. the shipping industry”<sup>88</sup>. Although environmental costs were widely popularized following release by the World Commission on Environment and Development in 1987 of its report “Our Common Future,” known as the “Brundtland report”<sup>89</sup>, impact assessment studies have found that no internalization had been made in maritime transport<sup>90</sup>. The European Commission thus concluded that “charges and taxes do not fully reflect the societal costs of transport [...] Attempts to internalise transport externalities and to remove tax distortions have so far been unsuccessful”<sup>91</sup>.

Another area calling for action is environmental awareness among mariners. It has already been stated that one of the important benefits of the PSSA creation is the provision of information to maritime personnel on the vulnerability of the sea area being navigated in. However, identification of the area on charts may not be sufficient in the absence of appropriate appreciation on the part of crews and shipping companies. Roberts et al. (2008) emphasizes the value of targeted campaigns focusing on education and training of seafarers<sup>92</sup>.

Essential factors in achieving the goals of the Baltic Sea PSSA are regional support and efficient cooperation among neighboring countries. Despite the substantial contribution from HELCOM and other regional organizations and programs, further improvements may be deemed necessary, particularly in establishing constructive dialog with the Russian Federation. Involving local networks in cooperation programs may be particularly useful in this regard and is optimal in long-term perspectives for capacity building. Partnerships with such networks, which retain local culture and knowledge, offer a good chance of approaching national stakeholders and rising awareness locally, not to forget that the benefit of local knowledge is widely recognized within the sustainability paradigm<sup>93</sup>.

# Conclusions and Recommendations

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The research carried out for the purpose of this study should be placed within the overall ongoing debate about sustainable shipping. Reference should be made in this respect to the various initiatives undertaken recently both globally – for instance, at IMO-level<sup>94</sup> – and within the Baltic and European contexts<sup>95</sup>.

The PSSA regime in the Baltic Sea has strived to reduce negative impacts from growing international shipping activities. Currently, consumption patterns are often taken as an axiom, and means to reduce or halt growth may not be given proper consideration. As a result, significant investments are made to reduce secondary effects while the central issue is hardly addressed, and basic tenets of the sustainable development principle, such as “reduce, reuse, recycle,” are not adequately pursued. The feasibility of reducing consumption and volumes of trade should ideally be scientifically evaluated in line with such a principle.

Accordingly, the core maritime environmental challenges facing the Baltic Sea reside primarily on the paradigmatic level, and are related to existing models of development. It is suggested that any significant strengthening of environmental standards in the future will not be possible without a paradigmatic change at society and government levels. This is a complex and tedious process, and may not even be possible.

For such a reason, linear solutions including additional regulatory requirements may not be fully effective for the protection of the marine environment in the long term. Without due consideration to the sustainability concept, such solutions could even create additional problems. The maritime industry is already experiencing, for instance, a number of serious challenges, including increase of the administrative burdens caused by new regulatory requirements, criminalization of seafarers, as well as human factor problems induced by reduction of manning levels, to mention only a few.

This being said, the report has developed practical recommendations to enhance environmental protection of the vulnerable Baltic Sea ecosystem using solutions from within and outside the PSSA regime. It does not seem that the full potential of available measures is being utilized at this stage.

Bearing in mind that the PSSA regime does not provide substantive jurisdictional benefits, but rather serves as a maritime environmental management tool, it would appear that challenges related to strengthening marine environmental protection in international waters reside fundamentally in the current limitations of the international law of the sea. A drastic change on the level of legal concepts and principles appears unlikely in the foreseeable future. This does not mean that Baltic states would have no means to influence or at least initiate codification processes, particularly with respect to the strengthening of the PSSA and APMs’ legal regime.

An encouraging element in this context concerns developments relating to the legal regime of the EEZ in many parts of the world.

Improving maritime environmental standards in the Baltic Sea may sometimes be achieved using jurisdiction mechanisms available at the national level. While pushing for improved protection measures within IMO, Baltic Sea states whose environmental standards are higher than global standards may sometimes be able to reach the desired protection level through adequate regional and/or national actions outside the IMO system. Such actions could include improvements to the satellite-based detection services for oil spills and polluting vessels, as well as to response resources. Another recommendation would be to ensure that economic benefits are in place for early compliance with new environmental standards.

Having said that, particular issues identified in the Baltic Sea appear to be a result of insufficient implementation of existing measures, both within and outside the PSSA framework. Implementation imperfections by way of monitoring and enforcement are not unknown in the international legal framework, where implementation is seen as a continuous process.

It is recommended that implementation of all MARPOL special areas in the Baltic Sea is tightened. Baltic Sea states should also introduce a monitoring system for the evaluation of sewage and garbage discharges, and their environmental impacts. States should also ensure that procedures for the adoption of sewage treatment plants are defined and that adequate port reception facilities are available. Encouraging the development of appropriate and cost-effective technical on-board equipment meeting sewage discharge standards is also desirable.

Baltic Sea states have solid monitoring capabilities in regard to marine pollution from hazardous and noxious substances. This includes aircraft with remote sensing equipment for aerial surveillance, specialized vessels, various forecasting models, devices for measuring atmospheric toxicity, bottom sampling devices and other measuring instruments. These surveillance capabilities and accumulated experiences should be brought to bear when addressing the Baltic Sea challenges, including illegal discharges of oil, sewage and garbage. Detection and policing patrols could also be introduced in the most polluted and vulnerable sea areas.

Baltic Sea states and other stakeholders would be well advised to initiate a review of APMs applied in the Baltic Sea PSSA. Evaluation of the feasibility of introducing TSSs on the route to the Ust'-Luga port and between Fehmarn and Lolland would be welcome. Another suggested recommendation is to evaluate the feasibility of raising the status of the deep-water route off Gotland Island from recommendatory to compulsory. It is also recommended that consideration is given to generalize mandatory ship reporting across the Baltic Sea PSSA. In addition, new areas to be avoided may be in the waters north of the Finnish port of Rauma, the area near the Ibre Strait leading to the Gulf of Riga, the area near the German port of Wismar, the area near the Polish port of Swinoujsciet and the sea area west of Kattegat.

Baltic Sea states should consider expanding compulsory pilotage in the Danish straits and other risk areas for smaller ships and ships carrying large amounts of bunker oil. Relative amendments to IMO Resolution MSC.138(76) would be needed. In addition, national requirements for compulsory pilotage may be strengthened, in particular through the expansion of pilotage requirements within ports.

Finally, Baltic Sea states and other stakeholders should endeavor to improve cooperation with the Russian Federation using local networks. Projects could thus address the issue of human factors on ships flying the Russian flag, particularly as concerns illegal oil discharges, and oil spill prevention and response.

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## The Baltic Sea States Monitoring Capabilities for Hazardous and Noxious Substances Marine Pollution

**Denmark** does not have any specialised equipment for the monitoring of marine spills of hazardous and noxious substances (HNS), but the Danish Emergency Management Agency (DEMA) has measuring instruments that can monitor HNS on ships and on the sea surface, and sampling devices. Aircraft from the Royal Danish Air Force can carry out aerial surveillance. The planning of aerial surveillance is done in direct coordination between the Royal Danish Air Force and the Admiral Danish Fleet.

Denmark has the following specialised devices for surveillance, monitoring and evaluation of HNS releases in the marine environment:

- o Aerial surveillance;
- o HNS forecasting models: DEMA laboratory (air), SEATRACK-WEB;
- o Devices for measuring toxic atmosphere: DEMA personnel;
- o Sample devices (including bottom sampling devices): DEMA personnel;
- o Other measuring devices (e.g. oxygen meter, pH meter, flash point meter, etc): DEMA personnel

**Estonia** has some specialised equipment for the monitoring of marine spills of HNS: a LET-410 aircraft is available for surveillance and is equipped with SLAR (Side Looking Airborne Radar), FLIR (Front Looking Infrared Radar) and a search and weather radar RDR-1400c.

**Finland** has some specialised equipment for the monitoring of marine spills of HNS floaters at the sea surface and evaporators/gases above the sea surface. Finland has the following specialised devices for surveillance, monitoring and evaluation of HNS releases in the marine environment:

- o Aerial surveillance: two surveillance aircraft with remote sensing equipment (optical instruments and scanners). Infrared/ultraviolet might be applicable for observation of floating substances at the sea surface;
- o Vessel surveillance: oil detection radar has been installed in two response vessels, these radars might have capability to detect also other floating substances;
- o Devices for measuring toxic atmosphere: gas detection systems on board vessels are mainly for alarming and self-protection purposes;
- o Other measuring devices (e.g. oxygen meter, pH meter, flash point meter, etc): portable meters;
- o Sampling devices: the available vessels can take air and water samples, also sediment sampling is possible by core and box samplers;
- o Other devices: sonars for location of sinkers and packaged sinkers.

**Germany** has the following specialised devices for surveillance, monitoring and evaluation of HNS releases in the marine environment:

- o Vessel surveillance: ZMGS (German part of Safe Sea Net);
- o HNS forecasting models: Gas clouds, some drifters;
- o Devices for measuring toxic atmosphere;
- o Other measuring devices (e.g. oxygen meter, pH meter, flash point meter);
- o Sampling devices (including bottom sampling devices): only air and water sampling devices.

**Latvia.** Complete set of HNS surveillance, monitoring and evaluation devices available at NAF Chemical, Biological, Radiological, and Nuclear (CBRN) battalion. Latvia has the following specialised devices for surveillance, monitoring and evaluation of HNS releases in the marine environment:

- o HNS forecasting models: e.g. Aloha Specialised forecasting models of NAF CBRN battalion;
- o Devices for measuring toxic atmosphere: e.g. OrionPlus ex/ox/CO/H<sub>2</sub>S/CO<sub>2</sub>;
- o Complete set of toxic atmosphere measuring devices of NAF CBRN battalion;
- o Other measuring devices (e.g. oxygen meter, pH meter, flash point meter): e.g. Ex-Ox-Meter IIP Nonan.
- o Complete set of environment safety measuring devices of NAF CBRN battalion;
- o Sampling devices (including bottom sampling devices): standard sampling devices for water column and bottom sediments.

**Lithuania** does not have any specialised equipment for monitoring of marine spills of HNS.

**Poland** has the following specialised equipment for the monitoring of marine spills of HNS:

- o Aerial surveillance: without remote HNS sensing equipment;
- o Vessel surveillance: stationary gas detection system for oxygen, hydrogen sulphide, carbon monoxide, ammonia, explosives, photoionization detector (PID);
- o HNS forecasting models: only for floaters (there is no 3-D model);
- o Other measuring devices: pH meter, dose rate meter, conductivity meter;
- o Sampling devices (including bottom sampling devices): portable tube dragger system.

The monitoring is an integral part of the response action, appointed in the national contingency plan. Sampling and chemical analyses should be done both by responders for operational purposes and the State Monitoring System for the consequences assessment purpose. Air and water surveillance systems are in place similarly to oil incident surveillance systems, but their presence has to be preceded by the safety assessment. The monitoring capability of the National System for Detection and Warning of Hazardous Contamination (SWS) is still unknown as the system itself is under development.

**Sweden** has specialised equipment for monitoring of marine spills of HNS:

- o Aerial surveillance;
- o Devices for measuring toxic atmosphere: one vessel is equipped with devices for measuring gases outside the ship;
- o Other measuring devices: one vessel is equipped with devices for measuring gases outside the ship;
- o Sampling devices (including bottom sampling devices): Sampling equipment for oil samples can be used in some HNS incidents.

*Source: EMSA. (2013). Inventory of EU Member States' Policies and Operational Response Capacities for Hazardous and Noxious Substances Marine Pollution 2013. Lisbon: Author.*

# Notes

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- <sup>1</sup> IMO. (2006). Resolution A.982(24), *Revised guidelines for the identification and designation of particularly sensitive sea areas* (Doc. A24/Res.982). London: Author, Annex, sec. 1.2.
- <sup>2</sup> Roberts, J. (2007). *Marine environment protection and biodiversity conservation: the application and future development of the IMO's particularly sensitive sea area concept*. Wollongong: Springer, p. 4; Lindén, O., Chircop, A., Pourzanjani, M., Schröder, J. U., & Raaymakers, S. (2006). *PSSA in the Baltic Sea: present situation and future possibilities*. Malmö: World Maritime University, p. 19.
- <sup>3</sup> IMO. (2005). Resolution MEPC.136(53) (Doc. MEPC 53/24/Add.2, Annex 24). London: Author.
- <sup>4</sup> IMO. (2006). Resolution A.977(24), *Ship's routing* (Doc. A 24/Res.977). London: Author.
- <sup>5</sup> HELCOM. (2010). *Maritime activities in the Baltic Sea: an integrated thematic assessment on maritime activities and response to pollution at sea in the Baltic Sea region*. Retrieved January 16, 2014 from <http://helcom.fi/Lists/Publications/BSEP123.pdf>.
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- <sup>7</sup> IMO. (2007). *PSSA: particularly sensitive sea areas*, 2007 edition. London: Author, p. 1.
- <sup>8</sup> IMO. (2006). Resolution A.982(24), *Revised guidelines for the identification and designation of particularly sensitive sea areas* (Doc. A 24/Res.982). London: Author, Annex.
- <sup>9</sup> A broader historical overview may be found in Lefebvre-Chalain, H. (2007). Fifteen years of particularly sensitive sea areas: a concept in development. *Ocean and Coastal Law Journal*, 13:1, 47-68; Roberts, J. P., & Pullen, J. S. H. (2008). A review of global experience with particularly sensitive sea areas (PSSAs). In O. Nilufer, & F. Simard (Eds.), *Legal mechanisms to address maritime impacts on Mediterranean biodiversity* (pp. 50-96). Malaga: IUCN Centre for Mediterranean Cooperation, p. 54.
- <sup>10</sup> MARPOL Regulation I/1.11 provides a typical definition of such a special area (for purposes of pollution by oil):  
Special area means a sea area where for recognized technical reasons in relation to its oceanographical and ecological condition and to the particular character of its traffic the adoption of special mandatory methods for the prevention of sea pollution by oil is required.
- A similar definition of special area is to be found in MARPOL Annexes II (pollution by noxious liquid substances), IV (pollution by sewage) and V (pollution by garbage). MARPOL Regulation VI/2.8 defines the similar regime of emission control area for purposes of ship-source pollution from NO<sub>x</sub>, SO<sub>x</sub> and particulate matter.
- <sup>11</sup> IMO. (2007). *PSSA: particularly sensitive sea areas*, 2007 edition. London: Author, p. 1.
- <sup>12</sup> The following list compiles amendments to existing PSSAs and APMs:
- The Great Barrier Reef PSSA created by Resolution MEPC.45(30) was extended by Resolution MEPC.133(53). The mandatory ship reporting system was amended by Resolutions MSC.52(66), MSC.161(68) and MSC.315(88). At MEPC 65, the delegation of Australia communicated its intention to seek an extension of the existing Great Barrier Reef PSSA into an area of the southwest Coral Sea that is at risk from international maritime activities.
  - The mandatory ship reporting system set up in the Western European Waters PSSA by Resolution MSC.190(79) was amended by Resolution MSC.301(87).
  - The APM regarding area avoidance established in the Galapagos Archipelago PSSA by Resolution MEPC.135(53) was adjusted by Resolution A.976(24), supplementing a new area to be avoided, and by Resolution MSC.229(82), setting up a new mandatory ship reporting

- The mandatory ship reporting system set up in the Western European Waters PSSA by Resolution MSC.190(79) was amended by Resolution MSC.301(87).
  - The APM regarding area avoidance established in the Galapagos Archipelago PSSA by Resolution MEPC.135(53) was adjusted by Resolution A.976(24), supplementing a new area to be avoided, and by Resolution MSC.229(82), setting up a new mandatory ship reporting system.
  - The ship reporting system established by Resolution MEPC.171(57) in the Papahānaumokuākea Marine National Monument PSSA was amended by Resolution MSC.279(85). At MEPC 65, the United States delegation indicated its intention to seek review of the Papahānaumokuākea Marine National Monument PSSA, as well as the Marine Area around the Florida Keys PSSA.
- <sup>13</sup> The environmental impact of domestic shipping is dealt with under national law.
- <sup>14</sup> PSSA Guidelines, sec. 9.3.
- <sup>15</sup> This table lists APMs that have been identified as such in MEPC.1/Circ.778/Rev.1. There may be other IMO-adopted measures in the individual PSSAs. In some cases, national measures may also be relevant. It is observed, however, that neither Resolution MEPC.136(53), nor any other official IMO instrument defines mandatory ship reporting systems, MARPOL special areas or SECA as APMs per se in the Baltic Sea Area PSSA.
- <sup>16</sup> Ndiaye, T. M., & Wolfrum, R. (Eds.). (2007). *Law of the sea, environmental law and settlement of disputes*. Leiden: Martinus Nijhoff, p. 801.
- <sup>17</sup> Lefebvre-Chalain, H. (2007). Fifteen years of particularly sensitive sea areas: a concept in development. *Ocean and Coastal Law Journal*, 13:1, 47-68, p. 51.
- <sup>18</sup> Ndiaye, T. M., & Wolfrum, R. (Eds.). (2007). *Law of the sea, environmental law and settlement of disputes*: Leiden: Martinus Nijhoff, p. 801. See also Roberts, J. P., & Pullen, J. S. H. (2008). A review of global experience with particularly sensitive sea areas (PSSAs). In O. Nilufer, & F. Simard (Eds.), *Legal mechanisms to address maritime impacts on Mediterranean biodiversity* (pp. 50-96). Malaga: IUCN Centre for Mediterranean Cooperation.
- <sup>19</sup> The enforcement of APMs is governed by the general rules of UNCLOS related to maritime enforcement by the coastal state in the EEZ. See Churchil, R. R., & Lowe, A. W. (1999). *The law of the sea*. Manchester: Manchester University Press, p. 395; Ndiaye, T. M., & Wolfrum, R. (Eds.). (2007). *Law of the sea, environmental law and settlement of disputes*: Leiden: Martinus Nijhoff, p. 801.
- <sup>20</sup> Roberts, J. (2007). *Marine environment protection and biodiversity conservation: The application and future development of the IMO's particularly sensitive area concept*. Wollongong: Springer, p. 4.
- <sup>21</sup> IMO. (2005). Resolution MEPC.136(53), *Designation of the Baltic Sea area as a particularly sensitive sea area* (Doc. MEPC 53/24/Add.2, Annex 24). London: Author.
- <sup>22</sup> *Ibid.*
- <sup>23</sup> IMO. (2012). MEPC.1/Circ.778/Rev.1, *List of special areas under MARPOL and particularly sensitive sea areas*. London: Author.
- <sup>24</sup> IMO. (2006). Resolution MSC.230(82), *Adoption of amendments to the existing mandatory ship reporting system in the Storebælt (Great Belt) traffic area*. London: Author;
- IMO. (2006). Resolution MSC.231(82), *Adoption of amendments to the existing mandatory ship reporting system in the Gulf of Finland*. London: Author;
- IMO. (2007). Resolution MSC.249(83), *Adoption of a new mandatory ship reporting system on the approaches to the Polish ports in the Gulf of Gdańsk*. London: Author;
- IMO. (2010). Resolution MSC.314(88), *New mandatory ship reporting system "In the Sound between Denmark and Sweden" (SOUNDREP)*. London: Author.

- <sup>25</sup> IMO. (1980). Resolution MSC.6(XIV), *Application of the provisions of Annex I of the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto on the discharge of oil in the Baltic Sea area*. London: Author; IMO. (1988). Resolution MSC.31(26), *Establishment of the date of application of the provisions of Regulation 5 of Annex V of the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto on the discharge of garbage in Baltic Sea area*. London: Author; IMO. (2011). Resolution MSC.200(62), *Amendments to the Annex of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (Special Area provisions and the designation of the Baltic Sea as a Special Area under MARPOL Annex IV)*. London: Author.
- <sup>26</sup> MARPOL Regulation VI/14.3.1.
- <sup>27</sup> IMO. (2003). MEPC 51/8/1, *Identification and protection of special areas and particularly sensitive sea areas*. London: Author.
- <sup>28</sup> *Ibid.*
- <sup>29</sup> MEPC 51/8/1 sets out economic considerations, including fishing, aquaculture and shipping activities. It also refers to recreation, human dependency of the sea, research and education.
- <sup>30</sup> WWF. (2003). *More maritime safety for the Baltic Sea*. Retrieved January 14, 2014 from <http://www.wwf.se/source.php/1116893/wwf-1074785.pdf>, p. 15.
- <sup>31</sup> Ndiaye, T. M., & Wolfrum, R. (Eds.). (2007). *Law of the sea, environmental law and settlement of disputes*: Leiden: Martinus Nijhoff, p. 806. However, other authors argue that measures regarding the avoidance of certain areas may be made mandatory stress that area to be avoided as a type of routing measures could be adopted as mandatory under SOLAS, provided adequate justification is provided. See Roberts, J. P., & Pullen, J. S. H. (2008). A review of global experience with particularly sensitive sea areas (PSSAs). In O. Nilufer, & F. Simard (Eds.), *Legal mechanism to address maritime impacts on Mediterranean biodiversity* (pp. 50-96). Malaga: IUCN Centre for Mediterranean Cooperation, p. 70.
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- <sup>35</sup> In 2012, polluters were identified only in 14 (10%) out of 139 cases of illegal discharges. See HELCOM, (2013). *Annual 2012 HELCOM report on illegal discharges observed during aerial surveillance*. Retrieved January 16, 2014 from <http://helcom.fi/Lists/Publications/Other%20publications/Report%20on%20illegal%20discharges%202012.pdf>, p. 2.
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- <sup>43</sup> There are discrepancies in the statistics emanating from different organizations, such as EMSA and HELCOM. This is due, for instance, to the fact that EMSA data does not cover regions of the Russian Federation such as the eastern end of the Gulf of Finland and Kaliningrad (see EMSA. (2010). *Maritime accidents review 2010*. Lisbon: Author, p. 27.) Given that these regions are the most prone to ice conditions and, thus, to the risk of accidents, HELCOM data on accidents has been used in this report.
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- <sup>46</sup> *Ibid.*, p. 16.
- <sup>47</sup> EMSA. (2010). *Maritime accidents review 2010*. Lisbon: Author, pp. 27-28.
- <sup>48</sup> HELCOM. (2013). *Report on shipping accidents in the Baltic Sea area during 2011*. Retrieved January 31, 2014 from [http://helcom.fi/Lists/Publications/Shipping\\_accidents\\_2011.pdf](http://helcom.fi/Lists/Publications/Shipping_accidents_2011.pdf), p. 16.
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- <sup>75</sup> Ramsar sites are designated according to the Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971 (Ramsar Convention). According to Article 1 of the Ramsar Convention, wetlands are defined as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exclude 6 m.
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