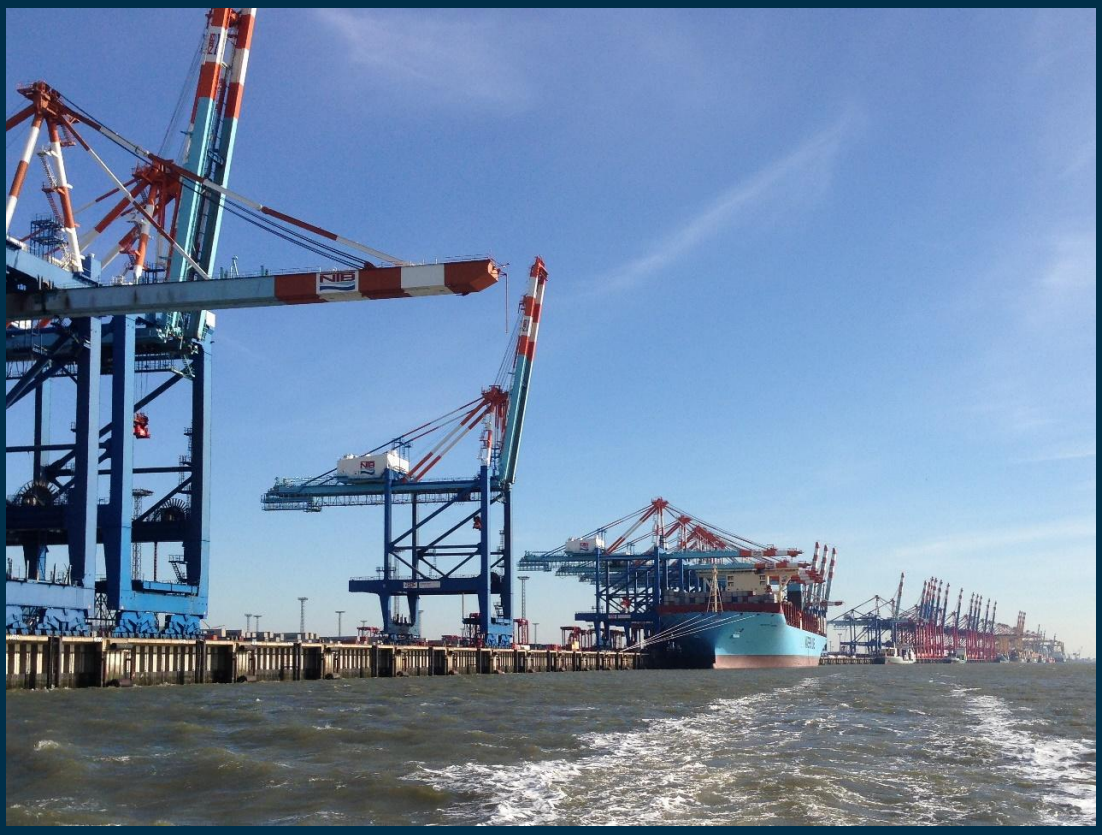


Photo: CWSS/ Bostelmann. Container terminal in Bremerhaven (DE).

Wadden Sea Quality Status Report

Harbours and shipping

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Common Wadden Sea Secretariat

1. Introduction

In order to address the Quality Status of the Wadden Sea with respect to the impact of ports and shipping, the present report examines the current situation and the anticipated developments, especially with regard to safety and environmental protection of the area, are assessed.

The Wadden Sea as part of the North Sea is adjacent to some of the busiest shipping routes in the world. Within and close to the Wadden Sea are some of Northern Europe's largest ports, which are of high economic importance for the region as well as internationally significant. The major ports within the Wadden Sea area are the German ports of Hamburg and Bremen/Bremerhaven, the oil refinery and port of Wilhelmshaven, as well as the ports of Esbjerg in Denmark and Delfzijl in the Netherlands. Additionally, the routes to the ports are used to connect the Baltic Sea via the Kiel channel with ports worldwide. The area seawards of the Wadden Sea is increasingly used to install offshore windparks – an activity which has generated much more ship traffic for maintenance than previously expected.

Because of the Wadden Sea's ecological importance and vulnerability on the one hand and its proximity to important and intensely used shipping routes on the other, the Wadden Sea was designated as a Particular Sensitive Sea Area (PSSA) in 1994, which allows the contiguous states to adopt measures intended to provide enhanced protection against marine pollution. Additionally, the region benefits from strengthened legislation in shipping in general and special initiatives aiming to further reduce the risk of marine pollution (e.g., BE-AWARE) in the wider area.

Despite the large-scale and almost constantly increasing shipping activities and the sometimes difficult navigational conditions due to strong tides, it is to be emphasized that major accidents have been very rare in the past – the last significant incident being the foundering of the MV Pallas in 1998.

2. Status and trends

Shipping in the Wadden Sea Region

Status Quo

Apart from casual downturns, during the last decades the world economy was constantly growing at an average rate of approximately 3 % per year. From the year 2000 to 2007, the world-wide volume of ship-borne exports increased nearly twice as fast, at an average of 5.5 % per year in tons, with over 80 % of goods moved by ship. However, after more of a decade of continuous growth, in 2009 the turnover in EU ports fell by more than 12 % on the average because of the negative effects of the economic crisis, which were visible in declining growth rates in the majority of the European ports. In particular, there was a 14 % decline in extra-EU transport, and an 11 % decline for intra-EU transport.

It was estimated that the North Sea has around 260,000 ship movements per year with an expected growth of between 14 and 31 % over the coming years (North Sea Commission, 2009). However, since the down-turn the shipping sector has recovered only slowly. By 2016 the gross weight of goods transported via EU ports (932 million

tonnes) has still not reached the volume of 2008 (989 million tonnes) (Eurostat, 2017). Also, contrary to earlier expectations, the size of ships continued to grow, especially in container ships, some of which meanwhile have a capacity of more than 20,000 TEU (Twenty-Foot Equivalent Units). On the other hand the trend toward faster ships has ended, mainly due to the associated high fuel consumption and the rise of costs for fuel for high-speed services. Accordingly, the services by high speed craft were almost completely discontinued.

Trends

As various environmental drawbacks of shipping increasingly became visible and criticized, public, international, national and local authorities as well as private initiatives started to develop systems to assess and acknowledge the environmental performance of individual ships.

These initiatives were meant to promote environmentally sound shipping, honouring the corresponding approaches either by granting awards or by providing financial support. Among these initiatives are the Differentiated Reduction on Fairway Dues of the Swedish Administration, which proved to be very successful, the Green Award initiated from Rotterdam as the forerunner, and the Blue Angel Award for Environmentally Conscious Ship-Operation, which was decorated with the Clean Marine Award of the European Union. Furthermore, initiatives like EcoPorts need to be mentioned. Under this umbrella, as from 1994, knowledge and experience was to be shared by participating ports in order to reduce their environmental footprint.

In 2012, the Environmental Ship Index (ESI) was launched to provide a common platform for ports and ships for the reduction of CO2, SOx, NOx and PM. Similarly to the Green Award, managers from shipping companies and from ports can use the system to either apply for or to grant a rebate on harbour fees on the basis of scores attained according to performance with regard to reducing the aforementioned emissions.

Nonetheless, compared to the 2005 level the forecasts of trans-tools by 2030 and the projections to 2050 anticipate a growth rate in billion tonne-km by about 100 % for Short Sea Shipping and about 150 % for overseas transport, which could outweigh the positive effects of regulations and technical measures on the reduction of environmental pollution (Sodhi, 2010; see Figure 1).

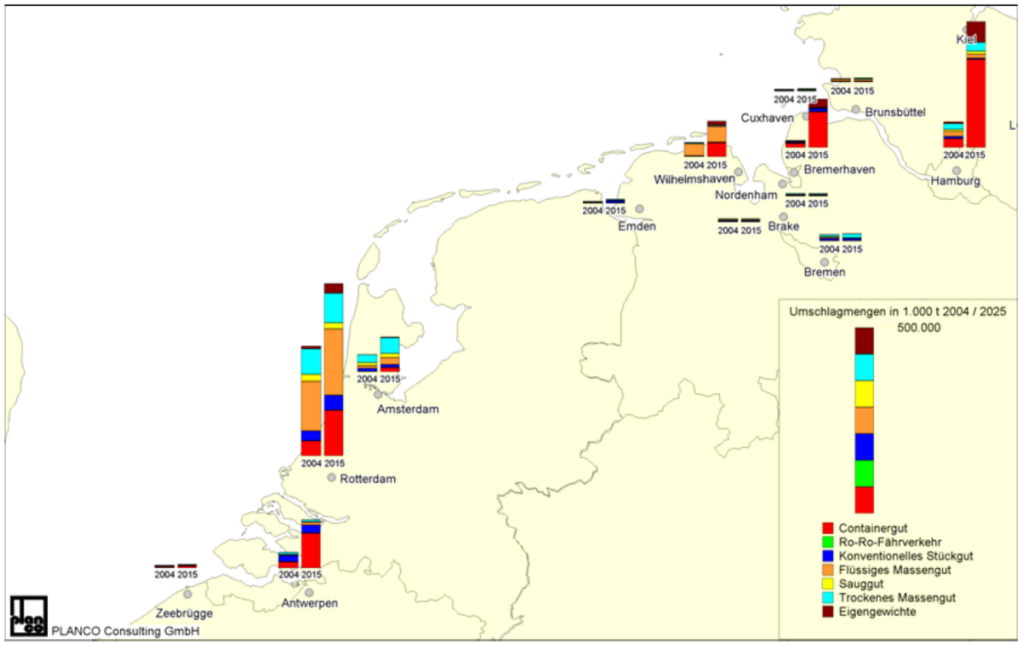


Figure 1. Turn-in North Sea Ports acc. to categories of cargo in 2004 and 2025 in 1,000t (Source: Planco Consulting GmbH, 2007).

It is assumed and politically intended that Short Sea Shipping and feeder shipping will increasingly become efficient as inland transport is getting more congested, and/ or appropriate rail services are not available (Enei, 2010). The anticipated growth in shipping traffic has implications on the safety of shipping and raises concerns about the impact to the marine environment in general. With regard to the rising fuel consumption and the respective exhaust emissions in particular, projections indicate a growth of emissions in the range of about 30 % by the year 2020 (OECD, 2008). In order to assess and subsequently reduce CO2 emissions the EU adopted the MRV-Regulation, which becomes fully mandatory for ships >5,000 GT by January 2018 (EU-regulation 2015/757).

Due to several drawbacks of the various existing approaches for the reduction of the environmental impact of shipping, the overall success is often questioned by experts. Inter alia, this is due to the limited focus, which is mainly restricted on gaseous emissions, the uncertainty concerning the reliability of some initiatives and the small rebates on harbour fees granted to the participating ships.

Ports in the Wadden Sea Region

Status Quo

Some of the ports in the Wadden Sea Area are multi-functional with the capacity to handle all types of goods whereas others are specialized. The three major ports in the Wadden Sea are Hamburg, Bremen/ Bremerhaven and Wilhelmshaven including the new deep-water Jade-Weser-Port, which started operation in September 2012. Wilhelmshaven is one of the largest oil terminals in the region. Smaller, more specialized ports include Delfzijl, Den Helder, Eemshaven and Harlingen in the Netherlands, Brunsbüttel and Emden in Germany, and Esbjerg, which is the only Danish port in the Wadden Sea.

The traditional tasks of some of these ports are presently changing, as almost all of them compete with regard to the provision of services for the activities for offshore wind farms and the anticipated decommissioning of oil and gas platforms in the future. The figures in Table 1 illustrate the development of the most import harbours, which also shows a considerable growth.

Table 1. Traffic for selected European ports in the Wadden Sea Area (1000 tonnes) (Source: ESPO, 2015).

		2011	2012	2013	2014	13/14	Nov 14
Esbjerg	Liquid bulk	566	606	513	708	38.0%	25.0%
	Dry Bulk	1 310	1 484	1 752	1 318	-24.7%	0.6%
	General Cargo	269	366	397	530	33.5%	97.2%
	RoRo	1 762	3 523	3 513	3 592	2.3%	103.9%
Bremen	Liquid bulk	1 237	1 144	1 344	1 399	4.1%	13.2%
	Dry Bulk	7 682	8 621	8 053	7 352	-8.7%	-4.3%
	General Cargo	3 886	3 679	3 078	3 980	29.3%	2.4%
Bremerhaven	RoRo	3 723	4 022	3 964	3 943	-0.5%	5.9%
	General Cargo	929	1 015	1 033	1 219	18.0%	31.2%
Emden	Liquid bulk	883	1 107	1 027	976	-5.0%	10.5%
	General Cargo	799	603	685	478	-30.2%	-40.2%
	RoRo	1 854	3 709	3 739	3 703	-1.0%	99.7%
Hamburg	Liquid bulk	14 053	14 014	14 541	14 237	-2.1%	1.3%
	Dry Bulk	25 418	25 357	27 702	28 388	2.5%	11.7%
	General Cargo	1 956	1 409	1 204	1 316	9.3%	-32.7%
	RoRo	567	1 134	1 351	1 279	-5.3%	125.6%
Wilhelmshaven	Liquid bulk	20 746	22 815	19 150	19 419	1.4%	-6.4%
	Dry Bulk	3 622	3 321	4 381	3 735	-14.8%	3.1%
	General Cargo	20	20	43	45	6.7%	125.0%
Delfzijl/ Eemshaven	Dry Bulk	1 926	1 988	1 747	2 327	33.2%	20.8%
	General Cargo	309	781	827	999	20.8%	223.1%
Den Helder	General Cargo	48	150	153	191	24.8%	302.1%

According to Makait et al. (2014), the total turnover in the North Sea ports from 2010 to 2030 will continue to grow, however not as fast as before the year 2008. The transport patterns will change. It is expected that the rate (excluding trans-shipment) will be approximately 2,5 % per year, whereas German ports will have a slightly higher level, due among other things to the rising volume in the port of Wilhelmshaven with an envisaged final capacity of 2.7 Mio. TEU (Hamburg: 12 Mio. TEU, Bremerhaven: 7 Mio. TEU). The expected growth rates are depicted in Figure 2.

As previously mentioned, ports increasingly provide incentives for contributing to the improvement of the environmental situation. The best known are the Green Award, initiated by the port of Rotterdam in 1994 and the Environmental Ship Index (ESI), which has been administered by the International Association of Ports and Harbour (IAPH) since 2012. These systems offer rebates on harbour fees or other port services on the basis of measures taken to protect the environment beyond existing legal requirements on board of the vessels. The focus of the ESI, for instances, is on gaseous emissions and meanwhile about 45 harbours grant various rebates on port charges for environmental protection measures on ships worldwide. However, due to the voluntary participation of ships and ports, the system is said to be used mainly for marketing purposes. The effectiveness of this approach is therefore sometimes doubted.

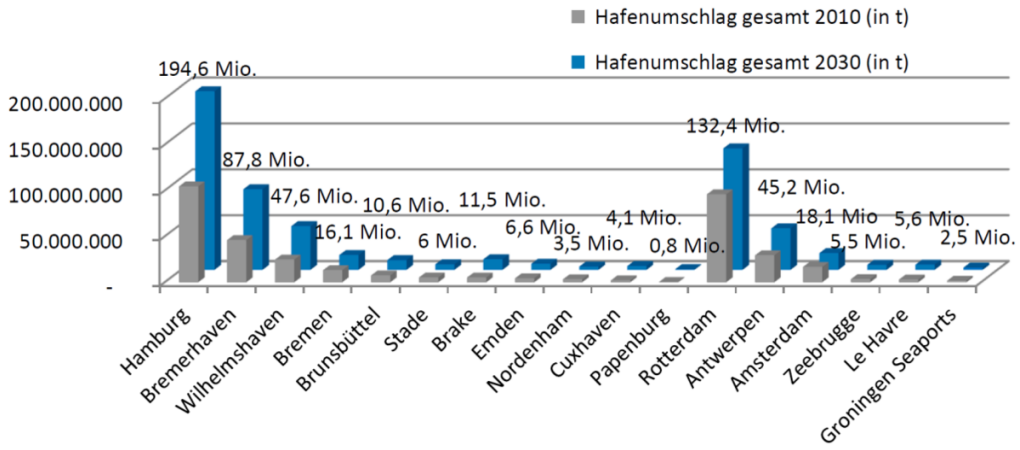


Figure 2. Turnover of North Sea ports in 2010 and 2030 (t) (Source: Makait et al., 2014).

Offshore Activities

Status Quo

In the Wadden Sea Area a new and significant influence from shipping may arise from the installation of offshore-wind farms, especially in the German part of the North Sea. In 2015, as many as 668 plants with a combined power of 2.8 GW were installed. By 2020 facilities with a total of 6.5 to 7.7 MW are planned to be operational. The Netherlands have already established a wind farm in the south-west of the Wadden Sea and Denmark operates the wind farm Horns Rev in the north. Wind farms with an additional 3.5 MW located southwest of the Wadden Sea area are approved according to the National Water Plan for the period up to 2023. By contrast, in Denmark none of the offshore wind farms projected in 2012 were set up, as they seemed to be too expensive. However, new projects are underway throughout the entire North Sea, especially near the German coast (see Figure 3).

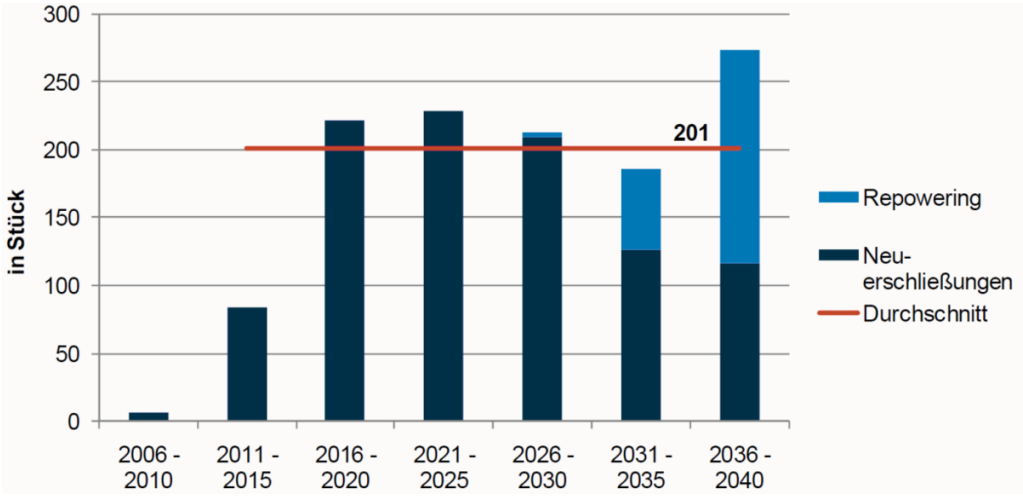


Figure 3. Average yearly installation of windmills in the German North Sea until 2040 (Source: Kaiser, 2011).

The related traffic for construction and maintenance and the dismantling at a later stage will partly have to transit the PSSA and cross the main shipping routes to, e.g., Hamburg/ Bremerhaven or to the Baltic Sea.

Throughout the life cycle of the plants from the installation to the operation, the maintenance and the dismantling of the wind farms there a variety of service vessels are required. These services are meanwhile provided by vessels specially designed for these tasks. The respective shipping and the operation of the plants have to meet high requirements: statistically only one collision with a ship could occur in one hundred years. For many of the plants this can be achieved only if, e.g., a special monitoring of ships is provided, tug boats are available within the vicinity etc. However, the sheer number of farms/ plants with the associated traffic is a reason for an on-going assessment and improvement of the development.

Trends

Next to the handling of pre-fabricated offshore-wind installations in an operating range of a maximum of 300 nautical miles the terminals will also be used for the export/ transport of parts or components to other wind farm sites worldwide (Source: Butt et al., 2009). Almost all of the North Sea ports strive to secure a substantial share of this rising market. Despite the anticipated decrease in new offshore wind installation in the German Bight from 2030 onwards it is expected that the specialised ports will continue to serve as hubs for a supra-regional development.

In order to prevent a situation where all ports compete against each other for the acquisition of shares on the forthcoming need on services, the German administration has allocated certain functions to the ports along the coast (Brunckhorst & Sollfrank, 2015), i.e.: ports for (large) components including “installation”, “production”, “import/export” and “shelter” (highlighted in blue); ports for services including “reaction” and “supply” (highlighted in red); ports for research including training etc. (www.zds-seehaefen.de; see Figure 4).

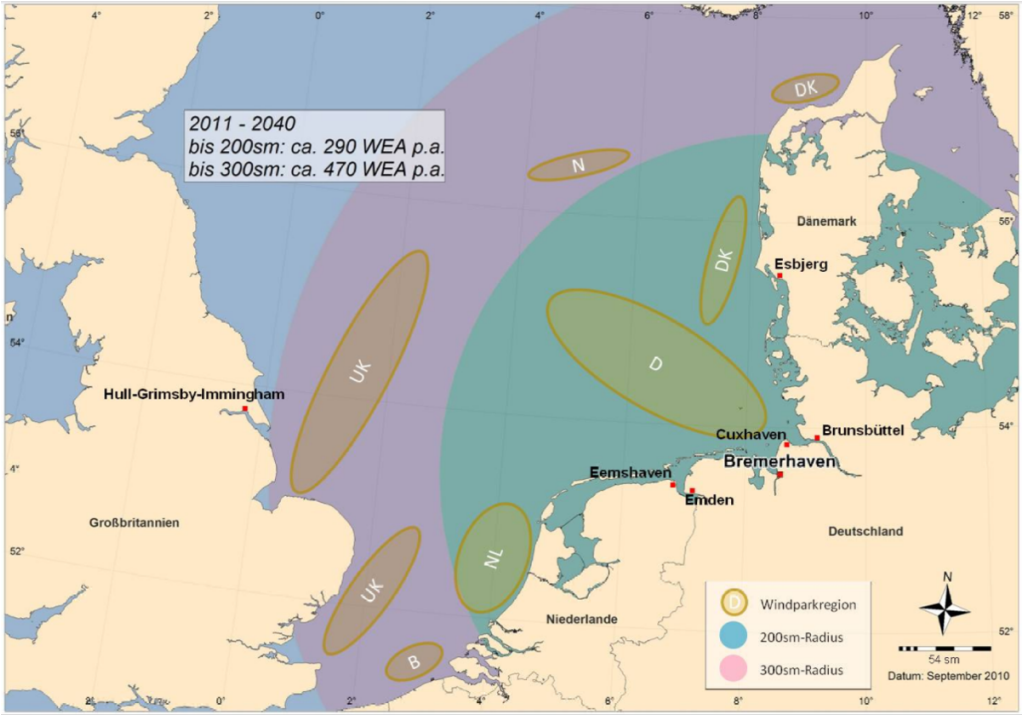


Figure 4. Deployable radius (200 / 300 nm) for installation ships from Bremerhaven (Source: Kaiser, 2011).

3. Assessment

Impact and necessary advancement

Status Quo

Due to a number of ship losses with sometimes severe environmental pollution and the stringent enforcement of stricter regulations, accidents and accidental impacts on the environment have meanwhile reached a very low level. Under certain aspects shipping is considered to be the most environmentally conscious form of transport, especially with regard to the emission of greenhouse gases on a tonne per mile basis.

Being the latest of its kind, the European Third Maritime Safety Package* (Tzarnoretchka, 2015), adopted in 2009, provides “improved transparency on the performance of vessels, improvement of quality checks on port state control, increased pressure on substandard ships, increased knowledge on maritime traffic, and increased cooperation between Member States in accident investigation” (Tzarnoretchka, 2015).

Substantial improvements concerning various kinds of impacts have undoubtedly been achieved in recent years. However, due to illegal disposal and the accumulated amounts of oil, sewage, garbage, air contaminants etc., which is currently still legally permitted in shipping negative impacts on the marine environment still exist and must be further reduced.

* The First Maritime Safety Package (2001) addresses issues on port state control, classification societies and double-hull oil tanks. The Second Maritime Safety Package (2002) established requirements regarding monitoring of maritime traffic and established EMSA.

Accidental pollution and illegal disposal

Although numbers are declining, accidents at sea and the illegal disposal of harmful substances still constitute a potential danger to the environment – especially due to the drift caused by currents and tides along the coastlines of the Wadden Sea Area. The impacts may result in physical damage, contamination of the water column, the sea bed, plants and animals or the coastline. Possible paths may be the release of oil as bunker fuel or cargo, the loss of hazardous solid or liquid substances in bulk or packaged form or the adverse effects of sewage, waste or the unintentional release of neobiota through ballast water.

According to CNSS (2014), about 400 discharges of oil and oily wastes have still been reported by aerial observations in the North Sea, which is assumed to be just a part of the actual number of incidences of pollutions. Whilst not causing major harmful effects, several accidents and illegal disposal have also been reported in the area adjacent to the Wadden Sea. In German waters in 2009 about 140 incidents were reported, which however is a decline of 67 % against the year 1999.

Operational pollution

During the last decade, international legislation increasingly influenced shipping activities, especially with regard to the protection of the marine environment. The prohibition of TBT as an antifouling substance in Europe since 2003 and the adoption of the Ballast Water Convention in 2004, which entered into force on 8 September 2017 are very important with regard to Wadden Sea wildlife. Furthermore, besides the tightening of the existing global limits for sulphur and nitrogen oxides under the regime of Marpol I – VI this applies particularly for the installation of the Sulphur Emission Control Area (SECA) in the North Sea with even stricter limits i.e. the threshold of max. 0.1 % sulphur content in the fuel oil used as of 2015. As mentioned above, additionally to the IMO, the European Union launched various laws with special requirements to enhance safety and environmental protection. Possible further improvements are being discussed especially in the following areas:

- Despite the aforementioned improvements the emissions of ships usually still contain substantially higher levels of pollutants compared to transports on shore. This is mainly the fact with regard to sulphur and nitrogen oxides and particle matters. Various techniques for the achievement of lower levels are available, however they are normally only used when legally required.
- The implementation of Directive 2000/59/EC on port reception facilities has shown positive results. In general the discharge of ship-generated waste and cargo residues to PRF has increased substantially. The evaluation of the Directive showed, however, that improvements are still possible. It is expected that the EC will make a proposal for a revision of the Directive in 2017.
- 2/3 of all non-indigenous species in the North Sea stem from the ballast water from ships (BMU, 2012). In 2016, in the trilateral Wadden Sea 90 such species were monitored. The actual implementation of the Ballast Water Convention could be a start to tackle the problem – however the internationally accepted standards should be tightened, e.g., according to those applied for ships sailing in American waters.
- Shipping is a main vector for underwater noise which in some areas presents a permanent background level. Techniques for improvements are meanwhile

available, however, in order to identify harmful levels, further research is necessary.

Trends

Today, in spite of the unquestionable progress with regard to the legislation for the reduction of ship-generated pollution the environmental performance of shipping in many respects is still in need of improvement. At the European level some of the drawbacks are addressed in the Maritime Strategy Framework Directive (MSFD), which was adopted in June 2008. The Directive provides a framework for measures to achieve or to preserve a „favourable status“ of the marine environment at the latest in the year 2020 and to avoid a future deterioration of the marine environment.

According to the assessment of a set of characteristics, the state of the North Sea in 2011 was not good at that time. This needs to be changed – also by means of improvements in the shipping sector.

Overall the Directive defines eleven qualitative descriptors, with reference especially to shipping. The following points are among those mentioned: (2) Non-indigenous species do not adversely alter the ecosystem (i. e. such species in ballast water); (5) Eutrophication is minimized (NOx emissions); (8) Concentrations of contaminants have no effects (sewage, antifouling, SOx); (10) Marine litter does not cause harm (ships waste); (11) Introduction of energy does not adversely affect the ecosystem (ships engine/propeller).

As all of these goals are difficult to address by mandatory international rules in the short term, incentive systems are increasingly being used to change the situation. However, as it turns out that the instrument currently preferred - the granting of rebates on harbour dues for ships which voluntary go beyond legally required limits - is not effective in its present form, new instruments should be considered in order to improve this situation.

These instruments could include the pursuit of defined environmental goals, stipulated in the Marine Strategy Framework Directive of the EU, the use of a comprehensive assessment of the environmental performance of ships, provided, for instance, by the Blue Angel Award for the new-building of ships and the operation of ships and the implementation of effective incentive schemes based on the European Program to internalize infrastructure costs and differentiate the resulting fees according to the environmental performance of individual ships*.

* A proposal on this approach was developed in the research project “Quality Shipping and Fair Pricing in Transport - Recommendations for an integrative and internationally applicable Incentive System”.

4. Summary

Technical advancements and shore-side surveillance have reduced the environmental impact of shipping and substantially improved the safety of ships in the region. However, due to the high and especially anticipated growth of traffic the advancements achieved will require a follow-up in the future. In this regard, the ongoing international development of standards will contribute to further improvements. Even so, due to the special and recognized importance of the Wadden

Sea Area additional regionally focused efforts, based, for example, on the provision of more effective incentives for commendable performance in shipping should be further envisaged.

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