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South baltic oil spill response through clean-up with biogenic oil binders project : the SBOIL handbook

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South Baltic Oil Spill Response Through Clean-up with Biogenic Oil Binders Project: The SBOIL Handbook

Summarizing the essential information about oil spill contingency planning, regulations and oil spill exercises in the South Baltic Sea region, when using biogenic oil binders

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Summary

Without international cooperation, individual countries are usually lacking sufficient resources and assets for successfully responding to large-scale oil spill incidents. This end-result might be related to the vast quantities of oil involved in those incidents, or just to the fact that the necessary special equipment for dealing with the tasks at hand is not available/possessed by that one country under the need to respond, although it can be rather easily provided by a neighboring one. For successfully resolving oil spill incidents, close and effective international cooperation (especially between neighboring countries that usually face similar issues and "share the burden" of oil pollution in case the response is unsatisfactory) is obviously a vital necessity.

The contemporary world relies heavily on oil to cover its energy needs. Unfortunately, oil spills at the locations of production, or during the associated transport endeavors continue to be one of the major threats to both society and the environment at the global level. Oil spills actually pose a greater threat in areas associated with major shipping routes, areas around pipelines and onshore/offshore rigs, as well as in the vicinity of oil and gas processing infrastructures. The United Nations Sustainable Development Goal 14, requires protection of our ocean, marine life and resources; therefore, minimizing possible oil spill incidents and their adverse impacts should be deemed as a very high priority.

The project "South Baltic Oil spill response" (SBOIL) was co-funded by the European Union's (EU) South Baltic Program, covering the period from summer of 2016 to the end of 2019. The University of Rostock, as the leading partner, cooperated with the World Maritime University and the Maritime University of Szczecin on the issue of "*Oil Spill Response within the South Baltic Sea Region*", following the clean-up with biogenic oil binders perspective. SBOIL is a continuation of the project BioBind, which mainly focused on the creation and introduction into service of an oil recovery system designed for coastal waters, shallow areas and adverse weather conditions. The BioBind approach established a methodology relying on biodegradable oil binders that are deployed by airplanes and/or helicopters. The removal process involves a special net-boom, comprising of fishing nets and conventional containment booms. The project SBOIL aims to use this new "green" technology to improve present cross-border oil spill response capabilities.

This handbook will provide the reader with basic knowledge about oil spills, response measures and the structural approaches of the individual South Baltic (SB) countries of Sweden, Denmark, Germany, Lithuania, Poland and Russia. It aims to close an existing information gap in relation to oil spill response without contradicting existing regulations and already established policies and guidelines. Furthermore, it aspires to improve international collaboration between local and regional authorities and facilitate their better interaction with the respective national incident managers. A certain number of both national and international workshops, as well as an expanded portfolio of capacity building activities based on a table top exercise have been implemented as part of this project; their most important findings and recommendations are summarized in the sections that follow.

The SBOIL project has designed and implemented a very wide range of activities (various SBOIL spill response exercises, national workshops and an international table top exercise), developed spill response scenarios and a biogenic spill response training kit to inform and train people engaged with oil spill response during and after the project. Furthermore, a designated station to be used in the future during a relevant emergency situation was created. Additionally, a biogenic spill response training package in the simulator setting (via a nautical simulator) was developed to cover the needs of the people that will handle this new equipment/technique.

As a starting point, this handbook will focus primarily on providing a comprehensive overview on oil spills in the South Baltic (SB) Sea area, including the related response measures in general. It will also summarize the above mentioned Baltic Sea countries' structural approaches, as well as their respective legal frameworks in relation to the issue of oil spill response.

This handbook will also provide an insight into the lessons learnt from the tabletop exercise in Poland in 2018, as well those derived from the national workshops that took place during the 2017-2019 timeframe in Sweden and Poland.

Introduction

1.1 Purpose of this Handbook

The South Baltic Sea hosts rather dense shipping traffic, corresponding to the transport of both people and goods. This density poses great risks of maritime accidents which may result in heavy losses, damage to the environment and even injuries (or loss of life). Apart from the significant volume of crude oil transported in the area, ships' own bunkers (fuel used for their own propulsion needs) are another concern for possible oil spills. On the positive side, the Baltic Sea, despite being one of the busiest sea-transportation areas of the world, may still be considered one of the safest seas globally.

This is an outcome of the regulations and response techniques already in place, as well as the various existing national and international contingency plans produced in advance to deal with possible emergency incidents. The main criteria for assessing the efficiency of the present techniques for responding to oil spills are based firstly on the time required to reach the accident location and secondly on the meteorological and hydrodynamic conditions in the area. To lessen and overcome the existing limitations, new response techniques should be easily and rapidly deployable; above all, not dependent on an individual country. The above described approach was used within the Project BioBind, basically by utilizing a net-boom to remove biodegradable binders (deployed either by air, or with other appropriate means, such as a large barge/ship).

As a follow-up of the BioBind project, SBOIL achieved its goals -to enhance the existing response capacities in the region of interest by utilising the BioBind material and to improve the protection of the marine environment in the SB region from all sources of pollution including spills from maritime accidents- by using this new "green technology", since it is more environmental friendly when compared with the standing practice of using chemicals to deal with oil pollution at sea, in order to improve and enhance cross-border oil spill response capacities.

To address a wider audience, the handbook at hand was produced, mainly by summarizing the following:

1. Essential basic knowledge about oil spills, response measures and the structural approaches of the individual SB countries to close an information gap and increase their awareness in relation to responding to oil pollution, addressing local and regional authorities and helping national incident managers to deal more effectively with their associated tasks.

2. Discussing the outcome of the table top exercise and national workshops in order to assess the state of national preparedness and international cooperation and pave the way towards an improved level of cooperation.

1.2 How to use this Handbook

This handbook is presenting basic knowledge about oil spill and response measures (including the effective use of the new technology of biobinders), with its focus on local and regional authorities including national incident managers. The basic tool to achieve this aim is via cataloguing the administrative approaches of the SB countries and their established procedures for interaction in a reader-friendly way for non-specialists (people with very limited or without any experience in oil spill response at all).

With the English language being chosen as the main one of this handbook (and the respective summary section also provided in Swedish, German and Polish, as appendixes), it is envisioned that the use of this handbook will increase the transfer of knowledge between all the South Baltic countries. The target groups of this handbook are national authorities and governmental bodies, emergency response managers, hands-on responders, people who will participate in oil spill response teams and/or manage the logistics, as well as scientists with an interest in oil spills.

2. Oil Spill Contingency Planning in the South Baltic Sea Region

2.1 Introduction

This handbook has been developed under the framework of the SBOIL project. It aims to provide an overview of oil transportation patterns and recorded accidents involving oil spills in the South Baltic Sea Region and to outline the response capacities and organization in the respective countries involved in the Project.

Large oil spills at sea have occurred since ships started to rely on oil as fuel (propulsion needs). The largest and most renowned spills, such as the Torrey Canyon, Exxon Valdez, and Prestige, came from oil tankers. Spills of petroleum oil have severe negative effects on the environment, smothering and poisoning flora and fauna. Effects may remain for several years, depending on, for example, which environment is impacted, the type and amount of oil, and weather conditions. Oil spills can also impact socioeconomic interests such as fisheries, aquaculture, and tourism in affected areas.

Figure 1: Consequences of the oil spill from the Prestige accident

The Baltic Sea is located in northern Europe. It is relatively shallow and is divided into several basins: Kattegat, Western Baltic and the Sound in the West, the Baltic Proper in the South, The Gulf of Riga and Gulf of Finland in the East, and Bothnian Bay, Bothnian Sea and Archipelago Sea in the North (see Figure 2) (HELCOM, 2017).

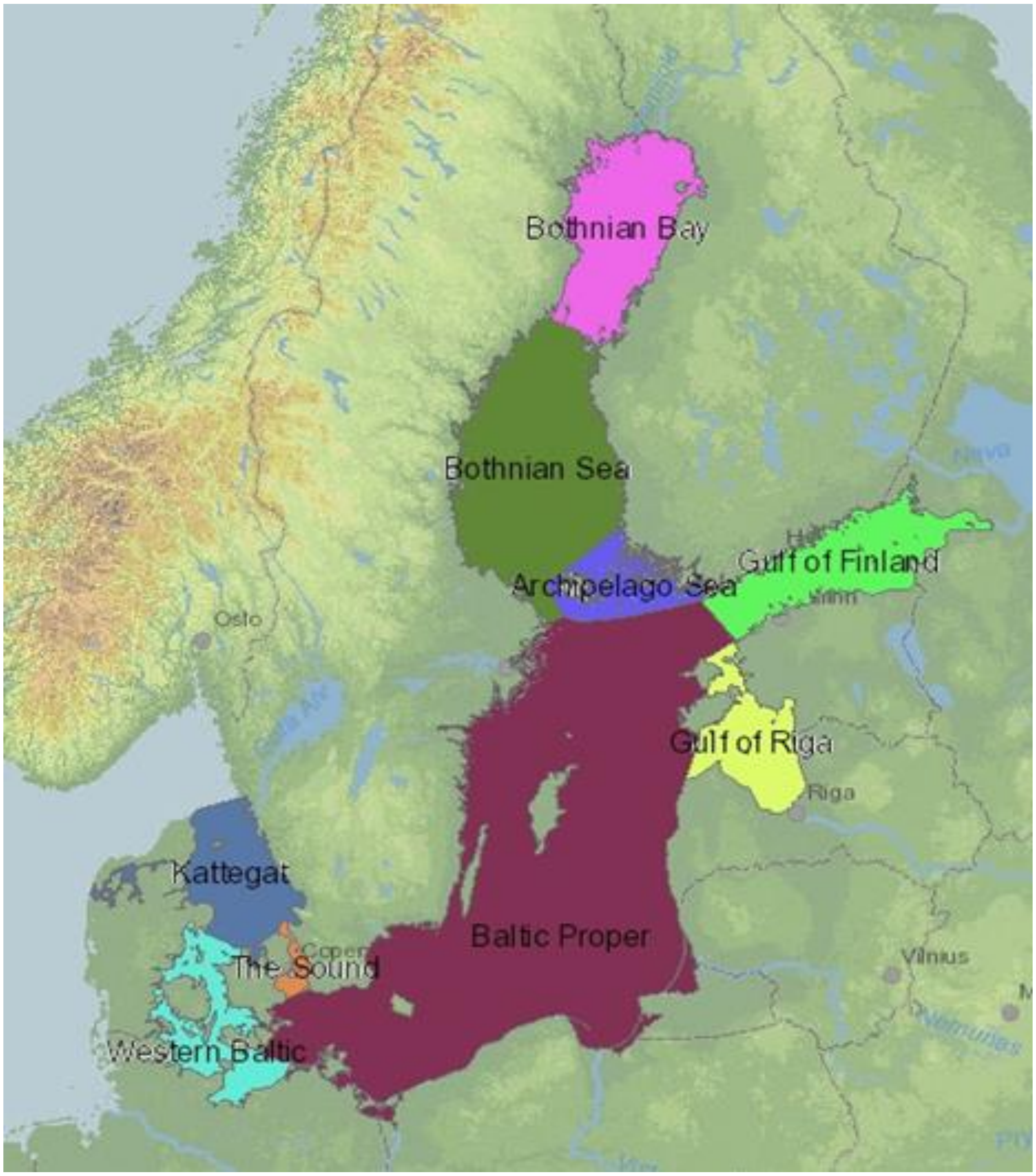


Figure 2: Baltic Sea basin divisions according to HELCOM

The Baltic Sea is one of the most heavily trafficked seas in the world, but recent years have seen a slight decline in the number of ships (probably associated with the recent global financial crisis around the end of the previous decade). A total of 350,392 ships crossed the fixed Automatic Identification System (AIS) lines in the Baltic Sea in 2013 (see Figure 3) (HELCOM, 2014). This is a 7% decrease from the 376,671 crossings in 2006, with a peak in 2008 at 430,064.

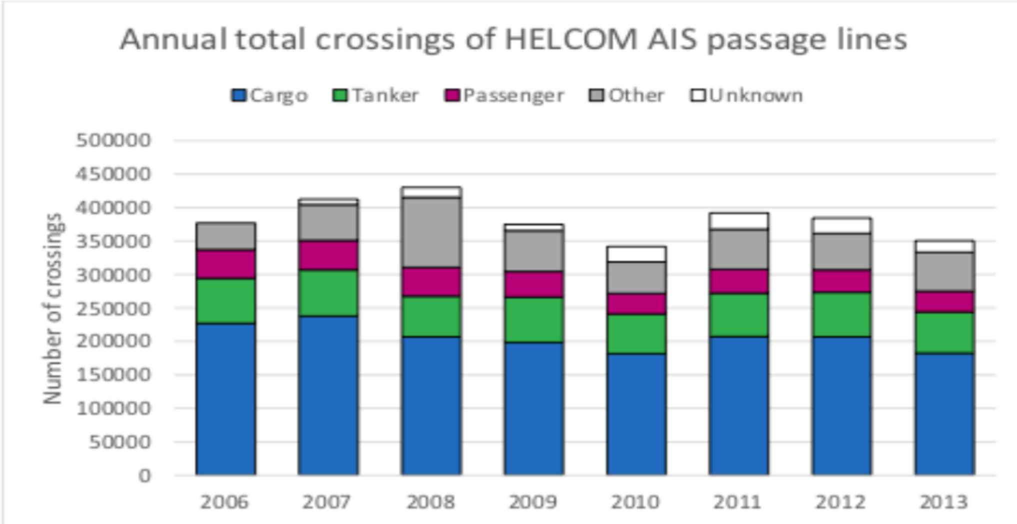


Figure 3: Number of ships crossing the HELCOM AIS passage lines between 2006 and 2013, divided by class

During the same time, oil transportation in the Gulf of Finland increased substantially, from 128 million tonnes in 2005 to 164 million tonnes in 2015, but with a slight decrease from the 2013 peak at 178 million tonnes (see Figure 4) (SYKE, 2016). This increase is primarily because of the expanded Russian port Primorsk and the new port Ust-Luga. The slight decline is likely a result of the ongoing economic sanctions against Russia. The majority of this oil is subsequently transported out of the Baltic Sea.

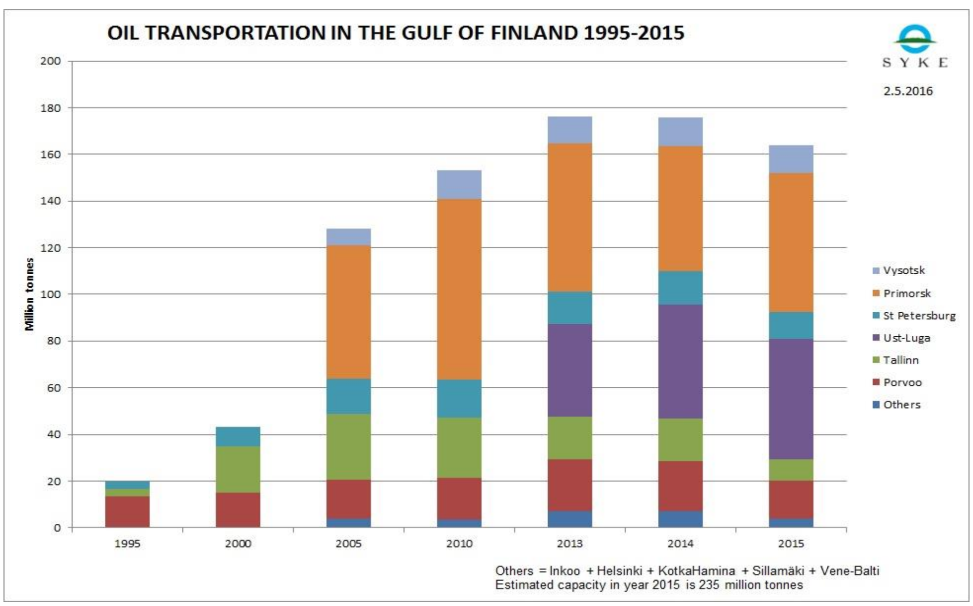


Figure 4: Oil transportation in the Gulf of Finland from 1995 to 2015, divided by port

In the Baltic Sea, few oil spills have occurred (Sveriges Riksdag, 1973; SST, 1983; 1985; HELCOM, 1998; 2001; Veiga & Wonham, 2002; Rylander, 2005; GESAMP, 2007; Rambøll Barents, 2010; Anders Jahres Rederi, 2012) (see Table 1).

Table1: List of the largest recorded oil spills in the Baltic Sea sorted by spilled volume (descending order)

Name	Year	Location	Spill size (tonnes)
Globe Asimi	1981	Klaipėda, Soviet Union (Lithuania)	16,000
Antonio Gramsci	1979	Ventspils, Soviet Union (Latvia)	5,500
Ludwig Svoboda	1985	Ventspils, Soviet Union (Latvia)	5,000
North Pacific	2001	Klaipėda, Lithuania	3,427
Baltic Carrier	2001	Kadetrenden, Denmark	2,700
Fu Shan Hai	2003	Ystad, Sweden	1,200
Jawachta	1973	Trelleborg, Sweden	1,000
Volgoneft 263	1990	Karlskrona, Sweden	1,000
Tsesis	1977	Stockholm, Sweden	1,000
José Martin	1981	Dalarö, Sweden	1,000
Irini	1970	Nynäshamn, Sweden	1,000
Golden Star	1976	Baltic Sea, Sweden	996
Sivona	1982	The Sound, Sweden/Denmark	800
Antonio Gramsci	1987	Vaarlshti, Finland	650
Esso Nordica	1970	Pellinki, Finland	600
Pensa	1970	Hailuoto, Finland	500
San Nikitas	1983	East of Söderhamn, Sweden	500
Irenes Sincerity	1976	Baltic Sea, Sweden	500
Sefir	1981	Öland, Sweden	498

Most of these ships were not tankers, but cargo ships that spilled fuel oil. The largest oil spill in the Baltic Sea was *Globe Asimi* that spilled 16,000 tonnes in the port of Klaipeda in Lithuania (then part of the Soviet Union) in 1981.

The number of reported accidents in the Baltic Sea increased from 130 in 2010 to 150 in 2013 (HELCOM, 2014). The 2004-2009 data cannot be directly compared to 2010-2013, because of differences in reporting procedures (see Figure 5).

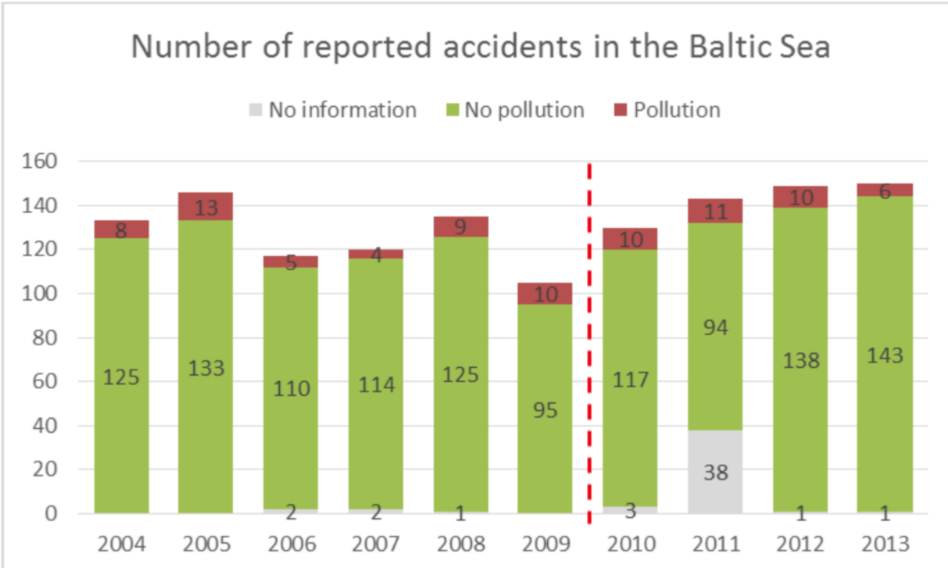


Figure 5: Number of reported accidents in the Baltic Sea between 2004 and 2013

This increased shipping traffic creates an additional risk of collision and oil spills. This risk was mapped by the project Sub-regional risk of oil spill and hazardous substances in the Baltic Sea (BRISK). BRISK estimated that an oil spill between 300 and 5,000 tonnes will occur every four years and an exceptionally large spill (5,000 tonnes and above) will occur once every 26 years (see Table 2) (BRISK, 2011; COWI, 2011).

Table 2: Calculated frequency of large and exceptional oil spill accidents in the Baltic Sea

Sub-region	Large accidents (300-5,000 tonnes)	Exceptional accidents (5,000 tonnes and above)
Gulf of Bothnia	36 years	600 years
Gulf of Finland	39 years	255 years
Northern Baltic Proper	30 years	175 years
Southeastern Baltic Proper	140 years	1,060 years
Southwestern Baltic Proper	17 years	97 years
Kattegat and the Sound	11 years	65 years
Entire Baltic Sea	**4 years**	**26 years**

One of the key issues to prepare for dealing with oil spills, is contingency planning. This is necessary in order to prepare response and management personnel and inform them of what their responsibilities are, how to act during a spill, and to train them properly. A well prepared and exercised response regime will likely save time and money, and decrease the impact of an oil spill on environment and society (IPIECA, 1994; ITOPF, 2011). The content of an oil spill contingency plan varies significantly due to differing policies and regulations (ITOPF, 2011). It commonly includes strategic policy (e.g. division of responsibilities, preferred response techniques, and training requirements), operational procedures (e.g. notification routes, waste management routines, and logistics), and an information directory (e.g. contact information, documentation support, and legislation). However, preparedness is often confused with a planning document. If the planned procedures are not known to the responders and regularly exercised, the plan will have little or no actual impact.

Around the Baltic Sea, much oil spill contingency planning has been done by the Helsinki Commission (HELCOM) (HELCOM, 2013a; 2013b) and in the last years primarily through EU-funded projects, for example BRISK, EnSaCo, and Baltic Master II. These projects have developed guides (MSB, 2011; Pålsson, 2011; Pålsson & Nilsson, 2011; Emmelin & Haglund, 2012), risk assessments (BRISK, 2011; COWI, 2011; Johansson & Molitor, 2011; Staskiewicz, 2011; Brunila & Storgård, 2012; Rådberg & Gyllenhammar, 2012; MSB, 2013; Viertola, 2013), and sensitivity mapping (Depellegrin, Blažauskas, & de Groot, 2010; Lundius, 2011; Staskiewicz, 2011; COWI, 2012; Emmelin & Haglund, 2012; Forsman, 2012a) to help the contingency planning process in the project partner countries. In addition, the plans have been tested during exercises (Ljungkvist, 2011; MSB, 2012; Forsman, 2012b). Much of the work within these projects has taken place in Sweden.

2.2 Country studies

Generally, oil spills at sea are the responsibility of the respective national government that "*controls*" the specific sea area that the spill took place. On land, it is often the local municipalities who are responsible for spills that impact its coastline. The national government most often assigns oil spill preparedness and response to an agency, such as the Coast Guard or Navy. This agency is often responsible for developing and maintaining a National Contingency Plan and for oil spill response at sea. However, oil spill contingency planning responsibility differs among the South Baltic Sea countries, regions, and municipalities (see Table 3). This information has been collected from email interviews sent to experts from the different countries.

Table 3: National Contingency Plan status and main responsible organisations for oil spill response.

Country	National Conting-ency Plan	Authority responsible for NCP	Main responsible organisation at sea	Main responsible organisation on land	Main responsible organisation in ports
Denmark	Yes	Defence Command Denmark	Defence Command Denmark	Municipalities	Local councils
Germany	Yes	Central Command for Maritime Emergencies	Central Command for Maritime Emergencies	Regional Environmental Authorities	Operators
Lithuania	Yes	Ministry of Environmental Protection	Navy	Federal Rescue Service	Port authority
Poland	Yes	Maritime Search and Rescue	Maritime Search and Rescue	Ministry of Internal Affairs and Administration	Port authority
Russia	Yes	Ministry of Transport, Ministry of Natural Resources, and Ministry of Defence, Emergencies and Disaster Response	Marine Rescue Service	Ministry of Defence, Emergencies and Disaster Response	Operators
Sweden	Yes	Coast Guard	Coast Guard	Municipalities	Operators

2.2.1 Denmark

Oil spills at sea are the responsibility of Defence Command Denmark (DCD), which primarily use response vessels owned/operated by the Navy. The Navy has four spill response vessels equipped with booms, skimmers, pumps, and other equipment. Two of them are ice capable and able to operate in open waters. Storage barges for oil are also maintained by the

Navy and based in Korsør and Frederikshavn. Aircraft from the Royal Danish Air Force can be used for surveillance purposes and enhancing situational awareness in case of an emergency. The Joint Operation Centre (JOC) of DCD is responsible for the National Contingency Plan and is in charge of pollution incidents. JOC also has the authority to assign an On-Scene Commander during a major incident.

Oil spills on land are the responsibility of local municipalities. These institutions are obliged to have available a contingency plan regarding oil pollution. DCD have stockpiled oil spill equipment at the Danish Emergency Management Agency (DEMA) centres in Thisted, Herning, Haderslev, Næstved, and Allinge. Each stockpile holds a variety of booms, towing and anchoring equipment, a power pack, sorbents, and Personal Protective Equipment (PPE) to be used for oil pollution incidents. DEMA is the governmental agency which is tasked with combating oil pollution in the shallow waters and other places where the oil pollution vessels are not able to sail, but can also provide operational assistance – upon request – to the local municipalities. Local councils are responsible for the restoration of beaches.

Oil spills in ports are the responsibility of the local councils. Oil companies must have their own Environment Protection Agency (EPA) approved contingency plans and equipment in place.

2.2.2 Germany

Oil spills at sea are the responsibility of the Federal Government and the designated agency for that purpose is the Federal Waterways and Shipping Board (WSV) of the Ministry of Transport. Oil spill response is coordinated by the Central Command for Maritime Emergencies (CCME or Havariekommando) based in Cuxhaven. CCME is a joint institution of the German Federal Government and the Federal Coastal States Bremen, Hamburg, Niedersachsen, Mecklenburg-Vorpommern, and Schleswig-Holstein. CCME coordinates oil spills offshore, in the waters of the five coastal states and the Wadden Sea. Staff from the CCME could act as the On-Scene Commander during a major incident, including the shoreline clean-up. CCME is also responsible for the National Contingency Plan and for maintaining the national response capability and has access to a wide variety of pollution response equipment and vessels, both dedicated response vessels and multi-purpose. These resources are located primarily in the major ports and along the coast. Two aircraft conduct regular surveillance operations. WSV will primarily act after the emergency situation has been settled (compensation, evaluation, payment of any contractors, etc.).

Oil spills on land are the responsibility of the Federal Coastal States in their respective regions. In case of a significant spill, the federal states can rely on the CCME for assistance (by putting formally forward a request). Then the CCME declares a “complex accident” and takes over organisational responsibility. The National Contingency Plan tools include a very comprehensive digital sensitivity mapping tool, which is not open/available to the public.

Oil spills in ports are the responsibility of the operators, who are required to maintain adequate contingency plans and response resources. There is also a limited number of oil spill clean-up contractors in Germany, with the vast majority of them being based in the major ports of the country.

2.2.3 Lithuania

Oil spills at sea are the responsibility of the Lithuanian Navy. The Lithuanian Coast Guard is responsible for the Curonian Lagoon. Oil spill response is coordinated by the Maritime Search and Coordination Centre (MRCC) of the Lithuanian Naval Force in Klaipeda. The Lithuanian Navy also has several vessels that could be called to assist during an oil spill.

Oil spills on land are the responsibility of the Federal Rescue Service (FRS). FRS has a general contingency plan for responding to crises, but no dedicated plan for oil spills. The National Contingency Plan is the responsibility of the Ministry of Environmental Protection. A small number of booms and skimmers for oil spill response is located at the MRCC in Klaipeda. The Civil Defence force can be called in to provide manpower for the shoreline clean-up.

Oil spills in ports are the responsibility of the respective port authority.

2.2.4 Poland

Oil spills at sea are the responsibility of the Ministry of Maritime Economy and Inland Shipping, who have delegated the responsibility to the Maritime Search and Rescue (SAR) service based in Gdynia. The national contact point for oil spills is the Maritime Rescue Coordination Centre (MRCC), operated by SAR. SAR is also responsible for the National Contingency Plan, which includes a sensitivity map. Several vessels equipped for oil spill response at sea are operated by SAR. Oil spill equipment stockpiles are located at Gdynia, Swinoujscie, and Ustka. Gdynia also hosts the European Maritime Safety Agency (EMSA) Equipment Assistance Service, which consists of a selection of oil spill response equipment, with specialist booms and skimmers.

Oil spills on land are the responsibility of the Ministry of Internal Affairs and Administration. This Ministry handles contingency planning, operational response and clean-up, and operates through three regional crisis management centers. The local contingency plans are coordinated by SAR and approved by the relevant maritime office. The local Fire Fighting Brigades are responsible for shore clean-up action and possess designated equipment.

Oil spills in ports are the responsibility of the port authority under the direction of the local maritime office. All major port operators are required to have their own contingency plans. The responsibility for port oil spill response coordination is the Port Captain. However, these plans may not be coordinated among the port operators. Ports have a variety of oil spill response equipment.

2.2.5 Russia

Oil spills at sea are the responsibility of the Ministry of Transport, delegated through the Federal Agency of Maritime and River Transport, to the Marine Rescue Service (MRS). MRS was previously named the State Marine Pollution Control, Salvage, and Rescue Administration (MPCSA). MRS has nine regional branches, previously called Basin (Regional) Salvage and Towage Companies (BASUs). These branches have dedicated vessels and equipment to handle oil spill response, search and rescue, and salvage and towing. In the Baltic Sea, one branch is located in Kaliningrad and one in Saint Petersburg. The regional oil spill communication focal point for oil spills is the Maritime Rescue Coordination Centre (MRCC).

Oil spills on land are the responsibility of the Ministry of Defence, Emergencies and Disaster Response (EMERCOM). EMERCOM is also responsible for leading and coordinating the organisations involved in a Tier 3, national level oil spill response. The National Contingency Plan is jointly developed by the Ministry of Transport, Ministry of Natural Resources, and EMERCOM. Planning is conducted at the national, regional, and local level. Russia has also regional plans for the Baltic Sea, Northwest Pacific Ocean, and the Caspian Sea. Regional plans for Sakhalin and Barents Sea have also been initiated.

Oil spills in ports and oil terminals are the responsibility of the operators. These operators must have their own contingency plans and oil spill response equipment provided by certified oil spill response contractors. These contractors can be established by the operators themselves or can be independent companies. The ports of Murmansk, Saint Petersburg, Vladivostok, and Sakhalin have specialized pollution response vessels and supply vessels.

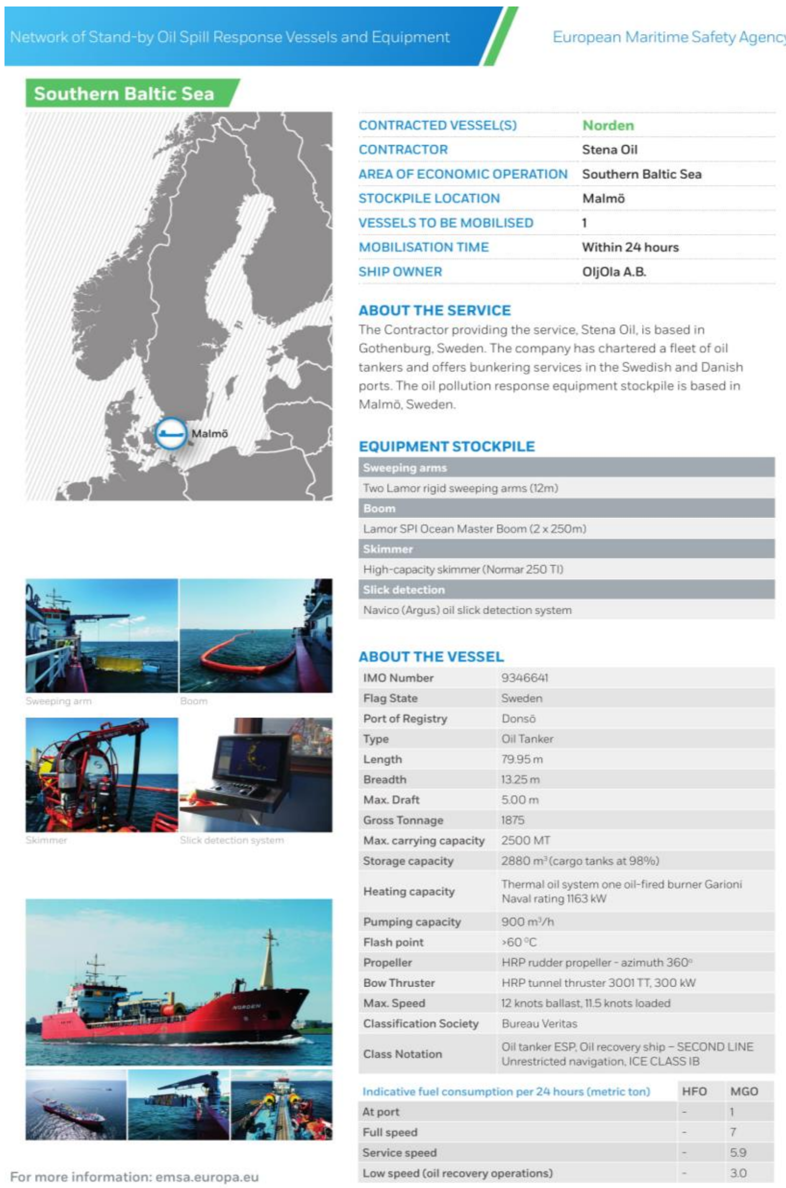
2.2.6 Sweden

Oil spills at sea are the responsibility of Swedish Coast Guard (Regeringen, 2007). This also includes the three largest lakes: Vänern, Vättern, and Mälaren. The Coast Guard has 26 stations along the coast. During large oil spills, the Coast Guard will assume the role of On-Scene Commander. The Coast Guard has a National Contingency Plan for the sea. The Coast Guard has over 30 vessels in its fleet, with a variety of oil spill response equipment and tank capacity. The Coast Guard also has three surveillance aircraft.

Oil spills on land are the responsibility of the local municipalities and their rescue services (Sveriges Riksdag, 2003; MSBHaV, 2014). This also applies to spills in lakes and streams, except Vänern, Vättern, and Mälaren. Many Swedish municipalities have combined their rescue services into rescue service associations covering more than one municipality, for economic reasons. Most of these municipalities have their own oil spill contingency plan, but not all municipalities have a plan (Pålsson, 2016). The County Administrative Boards are responsible for having an updated environmental sensitivity map. The major national oil spill equipment stockpiles owned by the Swedish Civil Contingencies Agency (MSB) are located at the Swedish Coast Guard stations in Gothenburg, Oskarshamn, Slite (on Gotland), Djurö (outside Stockholm), and Härnösand. There is also a central stockpile in Kristinehamn in the Vänern Lake, meant to supply the other stockpiles.

Oil spills in ports are the responsibility of the companies operating in the ports, with the exception of the smaller municipal ports. Oil terminals and commercial ports are required to have oil spill contingency plans and a reasonable amount of oil spill response equipment.

Finally, it is useful to note that European Maritime Safety Agency (EMSA) has chartered the tanker *Norden* to be on call to respond to oil spills in the Baltic Sea (and the eastern North Sea). *Norden* has a large tank capacity and is equipped with sweeping boom arms, skimmers, and pumps. The respective details of the ship and its associated equipment are presented in figure 6.



Network of Stand-by Oil Spill Response Vessels and Equipment

European Maritime Safety Agency

Southern Baltic Sea

CONTRACTED VESSEL(S)	Norden
CONTRACTOR	Stena Oil
AREA OF ECONOMIC OPERATION	Southern Baltic Sea
STOCKPILE LOCATION	Malmö
VESSELS TO BE MOBILISED	1
MOBILISATION TIME	Within 24 hours
SHIP OWNER	OljOla A.B.

ABOUT THE SERVICE

The Contractor providing the service, Stena Oil, is based in Gothenburg, Sweden. The company has chartered a fleet of oil tankers and offers bunkering services in the Swedish and Danish ports. The oil pollution response equipment stockpile is based in Malmö, Sweden.

EQUIPMENT STOCKPILE

Sweeping arms
Two Lamor rigid sweeping arms (12m)
Boom
Lamor SPI Ocean Master Boom (2 x 250m)
Skimmer
High-capacity skimmer (Normar 250 TI)
Slick detection
Navico (Argus) oil slick detection system

ABOUT THE VESSEL

IMO Number	9346641
Flag State	Sweden
Port of Registry	Donsö
Type	Oil Tanker
Length	79.95 m
Breadth	13.25 m
Max. Draft	5.00 m
Gross Tonnage	1875
Max. carrying capacity	2500 MT
Storage capacity	2880 m³ (cargo tanks at 98%)
Heating capacity	Thermal oil system one oil-fired burner Garioni Naval rating 1163 kW
Pumping capacity	900 m³/h
Flash point	>60 °C
Propeller	HRP rudder propeller - azimuth 360°
Bow Thruster	HRP tunnel thruster 3001 TT, 300 kW
Max. Speed	12 knots ballast, 11.5 knots loaded
Classification Society	Bureau Veritas
Class Notation	Oil tanker ESP, Oil recovery ship – SECOND LINE Unrestricted navigation, ICE CLASS IB

Indicative fuel consumption per 24 hours (metric ton)	HFO	MGO
At port	-	1
Full speed	-	7
Service speed	-	5.9
Low speed (oil recovery operations)	-	3.0

For more information: emsa.europa.eu

Figure 6: Technical specifications of the oil recovery vessel Norden

Source: http://www.emsa.europa.eu/oil-spill-response/oil-recovery-vessels/vessel-technical-specifications/item/2819-norden.html

2.3 Conclusion

In recent years, the South Baltic Sea Region has seen few oil spills. However, thanks to several regional agreements and frequent exercises, the region is well prepared for oil spills at sea. Unfortunately, this is not the case on land. The very limited number of oil spills that have occurred over the years have made most local and regional responsible organisations rather unaware of the risk of oil spills and how to effectively respond to them. A certain number of these entities is also unaware of the division of responsibilities between the national authorities and themselves when an oil spill occurs. In the most extreme case, the municipalities will assume that the national authorities have full responsibility for the oil spill, even on land. In the cases of the countries with a national coordinating organisation, this may also create a situation where the municipality will incorrectly defer completely to the national responsible authority.

This is also true for contingency planning. Most countries only cover the marine areas with their National Contingency Plan. Few countries include provisions and regulations for the shoreline clean-up. In most countries, there is a lack of proper instruction and knowledge on how a clean-up should be performed; familiarization with the relevant regulations is also rather limited.

But having a plan is not enough, as the plan itself is nothing more than just words on paper. The foundation work with consulting stakeholders, finding information, and prioritising sensitive areas is crucial when developing a contingency plan. Most importantly, the plan needs to be tested through exercises. A lack of coordinated exercises onshore, means that few municipalities and countries have a preparedness level on land as good as they have at sea in the South Baltic Sea Region. Exercises raise awareness among and educate the civil servants on their roles and responsibilities during an oil spill response, and make them familiar with response procedures. Consequently, regular and frequent exercises are needed to raise awareness of oil spills and their potential impacts.

3. International Regulations for Sorbent Use and Exchange of Oil Spill Equipment in the Baltic Sea Region.

3.1 Introduction

The principal aim of this legal analysis is to promote international cooperation in the domain of oil spill management; this is achieved via the examination of the regulatory framework concerning sorbent application and exchange of equipment in the relevant international conventions and regional agreements. More specifically, the focus is on multilateral agreements on international assistance; the most important and relevant provisions of the examined international conventions and regional agreements have been appropriately highlighted. The workflow first examines the general obligations as stipulated in the international framework, and proceeds with a brief analysis of the status quo of the specific conventions and guidelines of the International Maritime Organization (IMO). It also briefly explores regional agreements regarding sorbents and exchange of oil spill equipment in the event where a Baltic Sea country is in need of such assistance.

An important focus of the analysis in hand is to examine international law and guidelines with reference to sorbent application and the permissible limits. Currently, the authorities of two of the South Baltic States (namely, Denmark and Poland) are authorized to use sorbents and dispersants in accordance with the national regulations and as such, the usage of sorbents and dispersants is not prohibited. Moreover, usage of chemical dissolvent is also permitted, but requires prior decision before application. For example, in Poland, usage of sorbents and chemical dissolvent requires a decision from the Polish Search and Rescue authorities. However, mechanical methods could be applied without any prior decision. In Denmark, chemical dispersants are allowed as a last resort following prior authorization from the Danish Environmental Protection Agency (EPA). With regard to Germany, dispersant application is currently prohibited “within shallow coastal waters (less than 10 m deep) and in locations with limited water exchange”. Dispersants could only be used in a restricted manner in waters deeper than 20 meters, and in an unrestricted manner in waters deeper than 20 meters. In contrast, dispersant or sinking agents are not used in Sweden where mechanical recovery methods are used in oil-spill response.

The latter study corresponding to international regulations and guidelines stems from the fact that the notion concerning “exchange of equipment and cooperation” does not apply to land based organizations, e.g. fire fighters and rescue services that take proactive measures with regard to emergency management operations on land. The provisions of international law concerning those specific actions are aimed at national authorities that are empowered by law and engaged in operations and management of oil spill response. Land based operations are guided by national law whereby the focus of international regulations and guidelines are implemented with the objective to promote cooperation among states that are geographically located in the same region. This cooperation could be strengthened by cooperation-based exercises – a subject matter that is explicitly highlighted in the 2011 report titled BOILEX 2011. The report considers lessons learned from oil spill exercises held yearly in different parts of Sweden between 2008 and 2012, which in turn have provided valuable insight when developing the shoreline oil spill exercise titled "BOILEX". It is noteworthy that the aim and objective of BOILEX was to increase knowledge with regard to managing oil spills that affect the coastline in conjunction with achieving a well-functioning international cross-border cooperation in terms of management, assessment and decision making in the preliminary stage of an oil spill.

The 2011 BOILEX report further notes that the "stakeholders involved in a shoreline oil spill response is far larger than the ones operating at sea which leads to a more complicated operation", and therefore, requires international aid and assistance in the response process. As clearly indicated in that report, Baltic Sea States have "expressed uncertainty on how aid would be transferred" coupled with the fact that "nobody really knew how to help in a timely manner". The report further delves into very crucial matters, such as: a) command-system including technology; b) co-operation including land-land cooperation, land-sea cooperation, and sea-sea cooperation; d) decision support tools with a special focus on the command-system in Sweden; and finally e) drawbacks identified during the pre-exercise "Olivia". With reference to pre-exercise "Olivia", the evaluators note that "jurisdictions need to be outlined, where there is overlap, decisions must be made as to who has the lead" taking "international resources" into consideration. This consideration, according to the report, necessitates the need for international cooperation on a cabinet/minister level that needs to be incorporated in the incident command structure. As such, the recommendations advanced by the report include, *inter alia*, cross-border exercises on a regular basis with levels of management.

3.2 International Conventions and Guidelines

3.2.1 General Framework under the UN Convention on the Law of the Sea, 1982

The provisions of the United Nations Convention on the Law of the Sea of 1982 (UNCLOS) on marine protection are of significant importance in the context of oil pollution and the development of contingency plans at the national level. The over-arching characteristic of UNCLOS has helped the Convention to earn the title "umbrella convention". UNCLOS structured a "charter of the ocean", that acts as a general framework for concerned states to tackle major detriments within the entire ocean space. In this analysis, the framework of UNCLOS has been examined under four main categories: general obligations, Flag State jurisdiction, Coastal State jurisdiction, and multilateral agreements. A brief examination of these categories is conducted and intended as a foundation for the discussion of other relevant conventions and multilateral agreements. It is important to stress that all Baltic Sea States (Sweden, Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Russia) are Parties to the UNCLOS Convention.

3.2.1.1 General obligations pursuant to part XII

Articles 192 and 194 as embodied in Part XII of UNCLOS provide a general obligation for every State to protect and preserve the marine environment from intentional vessel-source pollution, balanced with the reaffirmation of the right of States to exploit their natural resources subject to adopting adequate measures to prevent, reduce and control such pollution. It should be noted that article 194(3) is central to any analysis concerning a State's obligation under UNCLOS to adopt any measures designed to minimize all forms of threat from all sources of pollution to deal with:

> (a) the release of toxic, harmful or noxious substances, especially those which are persistent, from land-based sources, from or through the atmosphere or by dumping;
>
> (b) pollution from vessels, in particular measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea, preventing intentional and unintentional discharges, and regulating the design, construction, equipment, operation and manning of vessels;
>
> (c) pollution from installations and devices used in exploration or exploitation of the natural resources of the seabed and subsoil, in particular measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea, and regulating the design, construction, equipment, operation and manning of such installations or devices;
>
> (d) pollution from other installations and devices operating in the marine environment, in particular measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea, and regulating the design, construction, equipment, operation and manning of such installations or devices.

3.2.1.2 Flag State Jurisdiction

From an academic viewpoint, "Flag State" is defined as the "State, which has granted a ship the right to sail under its flag". From an UNCLOS standpoint, it is explained as the State in whose territory a ship is registered. Relevantly, Flag State prescriptive jurisdiction consolidated in Article 211(2) acts as a foundation of the binding obligation for all Flag States. This obligation is an explicit reference for constituting laws and regulations to protect the marine environment from vessel-source pollution. In accordance with Article 221(2), a Flag State must ascertain that they have given effect and adhered to "generally accepted international rules and standards" as implemented via "competent international organization or general diplomatic conference". This rule of reference to international law developed by a competent organization is not an effort to bring international cohesion with regard to strategies and methods. In addition, it aims to minimize environmental threats from vessel-source pollution. Moreover, it refers to the need for adaptability since IMO norms comprised in relevant conventions are revised through an implicit acceptance amendment procedure.

For Flag State enforcement jurisdiction, article 217 obliges Flag States to ensure compliance through the implementation of laws and regulations, and regulates compliance with such norms "irrespective of where a violation occurs". This duty also envisages that the Flag State should exercise its jurisdiction to ensure that each ship is operated by personnel that are fully conversant with international regulations concerned with prevention, reduction, and control of marine pollution.

3.2.1.3 Coastal State Jurisdiction

Within internal waters, a Coastal State enjoys prescriptive jurisdiction for establishing particular requirements as a condition for the entry of foreign vessels. This is subject to due publicity of such requirements and communication to a competent international organization. The prescriptive jurisdiction of the Coastal State extends to the Exclusive Economic Zone where adoption of laws and regulations "conforming to and giving to generally accepted international rules and standards" is endorsed by UNCLOS.

The enforcement jurisdiction of Coastal States with regard to the territorial sea is embedded in article 220 (2) where the concerned Coastal State may take up enforcement measures, e.g. a physical inspection of the vessel, and institute proceedings and detain the vessel. Detention is subject to the condition that a Coastal State has "clear grounds for believing that a vessel navigating in the territorial sea" has acted in contravention to the laws and regulations adopted in accordance with UNCLOS or any relevant international rules and standards related to prevention, reduction, and control of pollution. It is noteworthy that most of the enforcement mechanisms available to the Coastal State in the Exclusive Economic Zone relate to illegal discharges or non-compliance with navigational standards. Although the aforementioned provisions of UNCLOS are founded on a Coastal State's inherent right to monitor and enforce laws and regulations against Flag State vessels, article 221 is nonetheless, observed as empowering the Coastal State to take proactive measures:

"… beyond the territorial sea proportionate to the actual or threatened damage to protect their coastline or related interests, including fishing, from pollution or threat of pollution following upon a maritime casualty or acts relating to such a casualty, which may reasonably be expected to result in major harmful consequences." (art. 221, UNCLOS)

3.2.1.4 Port State Control and Multilateral Agreements

International cooperation lies at the epicenter of UNCLOS. From an analysis of the substance of Article 211(3), it is clear that UNCLOS has given due consideration to cooperative arrangements between two or more Coastal States against foreign vessels in their ports. In the context of vessel-source pollution, it is clear that States are encouraged to enter into bilateral or multilateral agreements, or develop existing agreements, e.g. memorandum of understanding for the prevention, reduction, and control of pollution of the marine environment. Article 211(3) further provides that:

“…*Whenever such requirements are established in identical form by two or more Coastal States in an endeavour to harmonize policy, the communication shall indicate which States are participating in such cooperative arrangements. Every State shall require the master of a vessel flying its flag or of its registry, when navigating within the territorial sea of a State participating in such cooperative arrangements, to furnish, upon the request of that State, information as to whether it is proceeding to a State of the same region participating in such cooperative arrangements and, if so, to indicate whether it complies with the port entry requirements of that State* …” (art. 211(3) UNCLOS)

Again, multilateral arrangements or agreements are not only efficient in improving the effectiveness of Port State control, they are also a unique mechanism to assist Member States of such agreements to comply with environmental, safety, and other relevant obligations to minimize vessel-source pollution. The result is that a foreign Flag State vessel is subject to compliance with the generally accepted international laws and regulations of the Coastal State.

3.2.1.5 Annex 1 and SOPEP Guidelines of MARPOL 73/78

The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) superseded the International Convention for the Prevention of Pollution of Sea by Oil of 1954 (OILPOL 54). This was a response to the opinion that OILPOL 54 was deficient, due to very low compliance level. After entering into force in 1983, MARPOL 73/78 outlined a preventive regime against vessel-source pollution, whereby the Convention is much stronger and has a wide acceptance of its Annexes. In this context, it is relevant to mention that MARPOL 73/78 has six Annexes highlighted in Table 4.

Table 4: MARPOL 73/78 list of Annexes and date of entry into force

Annex	Title	Entry into Force
Annex I	Prevention of pollution by oil & oily water	2 October 1983
Annex II	Control of pollution by noxious liquid substances in bulk	6 April 1987
Annex III	Prevention of pollution by harmful substances carried by sea in packaged form	1 July 1992
Annex IV	Pollution by sewage from ships	27 September 2003
Annex V	Pollution by garbage from ships	31 December 1988
Annex VI	Prevention of air pollution from ships	19 May 2005

With regard to state Parties to MARPOL 73/78, the following table lists the Baltic States that are Parties to individual Annexes of the Convention:

Table 5: Baltic Sea States that are Parties to Various Annexes of MARPOL 73/78

MARPOL 73/78 Annex	Name of the Baltic Sea State Party
Annex I	Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden **(All states)**
Annex II	Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden **(All states)**
Annex III	Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden **(All states)**
Annex IV	Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden **(All states)**
Annex V	Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden **(All states)**
Annex VI	Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden **(All states)**

Source: Status of Conventions, online at IMO's website:
http://www.imo.org/en/About/Conventions/StatusOfConventions/Pages/Default.aspx

"Regulations for the Prevention of Pollution by Oil" as encapsulated in the title of Annex I is pertinent in the context of vessel-source pollution from oil. Annex I is divided into 7 chapters comprised of 36 regulations and 2 appendices. Pursuant to regulation 37 of Annex I, oil tankers of 150 Gross Tonnage (GT) and above, as well as all ships of 400 Gross Tonnage (GT) and above, must carry an approved Shipboard Oil Pollution Emergency Plan (SOPEP), which shall comprise of:

1. The procedure to be followed by the master or other persons having charge of the ship to report an oil pollution incident, as required in article 8 and Protocol I of the present Convention, based on the guidelines developed by the Organization;
2. The list of authorities or persons to be contacted in the event of an oil pollution incident;
3. A detailed description of the action to be taken immediately by persons on board to reduce or control the discharge of oil following the incident; and

4. The procedures and point of contact on the ship for coordinating shipboard action with national and local authorities in combating the pollution.

In order to meet the requirements of regulation 37, IMO has developed a “Guideline for the development of Shipboard Oil Pollution Emergency Plans” (SOPEP Guideline), which was an outcome of MEPC 54(32). The main objective of the SOPEP Guideline is to “assist ship owners in preparing shipboard oil pollution emergency plans” in accordance with MARPOL 73/78 (Resolution MEPC.54(32), 1992). The SOPEP Guidelines are divided into mandatory and non-mandatory provisions with 2 appendices, whereby Appendix II outlines an “example format for shipboard oil pollution emergency plan”. At this juncture, it is important to extract the crucial details of the mandatory provisions that highlight the steps that are relevant and should be included in the SOPEP to control discharge of oil, both unexpected and operational:

Table 6: Substance of Operational Spills and Spills Resulting from Casualties

Section	Substance
2.5.2.1: Operational Spills	The Plan should outline the procedures for removal of oil spilled and contained on deck. This may be through the use of on-board resources or by hiring a clean-up company. In either case the Plan should provide guidance to ensure proper disposal of removed oil and clean-up materials: 1. Pipe leakage 2. Tank overflow 3. Hull leakage
2.5.2.2: Spills Resulting from casualties	Each of the casualties listed below should be treated in the Plan as a separate section comprised of various checklists or other means which will ensure that the master considers all appropriate factors when addressing the specific casualty: 1. grounding; 2. fire/explosion; 3. collision; 4. hull failure; 5. excessive list.

Source: MARPOL 73/78

In terms of the non-mandatory provisions, the most relevant provision to this report is “response equipment”, which provides the following:

> “Some ships may carry on board equipment to assist in pollution response. The type and quantity of this equipment may vary widely. The plan should indicate an inventory of such equipment, if carried. It should also provide directions for safe use and guidelines to assist the master in

determining when such use is warranted. Care should be exercised to ensure that the use of such equipment by the crew is practical and consistent with safety considerations. When such equipment is carried, the Plan should establish personnel responsibilities for its deployment, oversight, and maintenance. In order to ensure safe and effective use of such equipment, the Plan should also provide for crew training in the use of it. *The Plan should include a provision that no chemical agent should be used for response to pollution on the sea without authorization of the appropriate Coastal State* and that such authorization should also be requested, when required, for use of containment or recovery equipment." (Resolution MEPC.54(32), 1992)

It is important to stress that reporting of the usage of chemical dispersant (or, degreasant) as a course of action employed as a part of the emergency plan is an important part of SOPEP that needs to be reported by the master or the designated crew member.

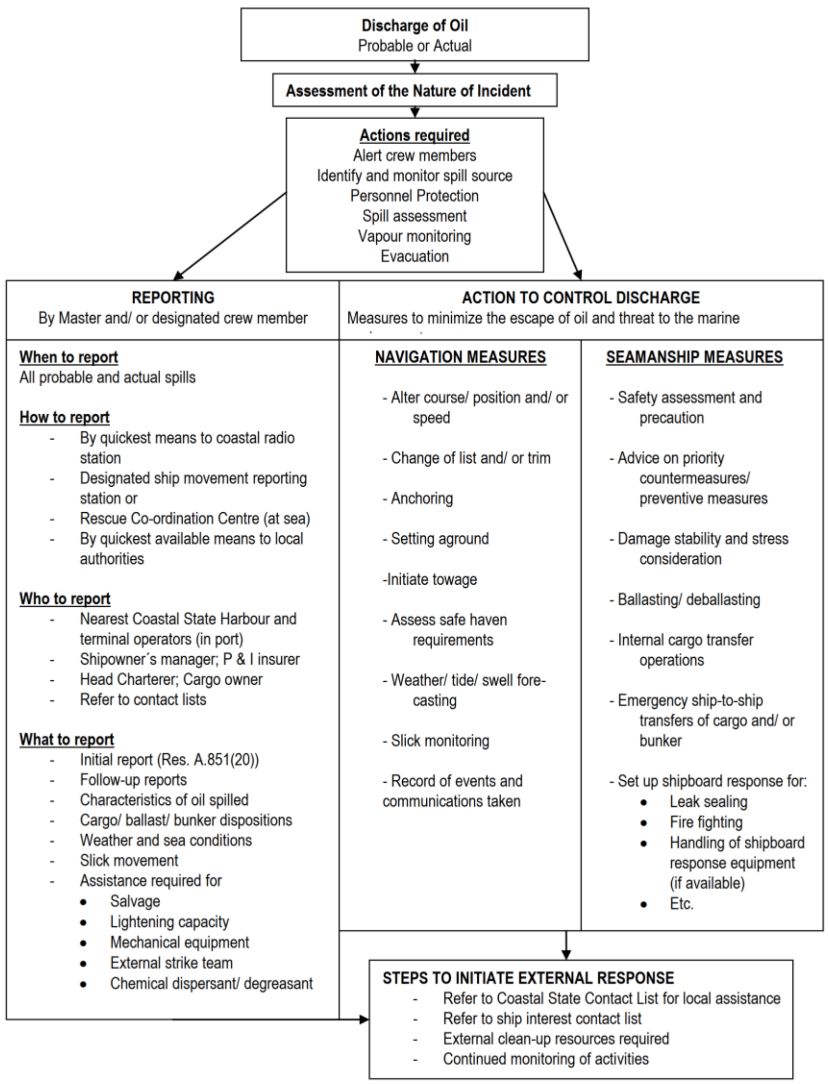


Figure 7: SOPEP – summary flowchart

Source: Guideline for the development of Shipboard Oil Pollution Emergency Plans (Resolution MEPC.54(32), 1992)

3.2.1.6 OPRC 1990: Oil Spill Combating Equipment and Exercise

The International Convention on Oil Pollution Preparedness, Response and Cooperation of 1990 (OPRC 1990) is a highly acknowledged international agreement on oil spill response cooperation that resulted from the Exxon Valdez incident (OPRC, 1990). OPRC 1990 was adopted on the 30th of November in 1990 and entered into force on the 13th of May 1995. All of the Baltic Sea States are currently Parties to the OPRC 1990. Although the ORPC 1990 takes into account the "polluter pays" principle for channeling liability to the master or the registered owner of the ship, it, nonetheless, emphasizes the importance of bilateral and multilateral agreements or arrangements and promotes international co-operation to enhance all existing capabilities to combat oil pollution via well-developed preparedness and response schemes.

Pursuant to Article 3 of OPRC 1990, each state Party is required to have a shipboard oil pollution emergency plan generic to the SOPEP endorsed by MARPOL 73/78 (OPRC, 1990). The same is required by offshore installations under the jurisdiction of any of the Parties. These plans must be coordinated with respective national plans and approved in accordance with procedures established by the competent national authority to be able to have an effective oil pollution response capacity in case of an incident (OPRC, 1990).

It is important to stress that a special focus on "oil spill combating equipment" is found in Article 6 of the OPRC 1990, under the title "National and regional systems for preparedness and response". The most significant provisions are as follows:

> "*In addition, each Party, within its capabilities either individually or through bilateral or multilateral co-operation and, as appropriate, in co-operation with the oil and shipping industries, port authorities and other relevant entities, shall establish:*
> *(a) a minimum level of pre-positioned oil spilt combating equipment, commensurate with the risk involved, and programmes for its use;*
> *(b) a programme of exercises for oil pollution response organizations and training of relevant personnel;*
> *(c) detailed plans and communication capabilities for responding to an oil pollution incident. Such capabilities should be continuously available; and*
> *(d) a mechanism or arrangement to co-ordinate the response to an oil pollution incident with, if appropriate, the capabilities to mobilize the necessary resources*". (OPRC, 1990)

> "*… (3) Each Party shall ensure that current information is provided to the Organization, directly or through the relevant regional organization or arrangements, concerning:*
> *(a) the location, telecommunication data and, if applicable, areas of responsibility of authorities and entities referred to in paragraph (l)(a);*
> *(b) information concerning pollution response equipment and expertise in disciplines related to oil pollution response and marine salvage which may be made available to other States, upon request; and*
> *(c) its national contingency plan*". (OPRC, 1990)

Co-operation in pollution response is also highlighted in Article 7 of the OPRC 1990, whereby state Parties are under an obligation to co-operate and provide all services necessary, including equipment exchange for the purpose of responding to oil pollution incidents. The noteworthy provision with regard to exchange of equipment stipulates that each party should take necessary administrative measures to facilitate:

> (a) the arrival and utilization in and departure from its territory of ships, aircraft and other modes of transport engaged in responding to an oil pollution incident or transporting personnel, cargoes, materials and equipment required to deal with such an incident;
>
> (b) the expeditious movement into, through, and out of its territory of personnel, cargoes, materials and equipment referred to in subparagraph (a).

Article 8 of OPRC 1990 can be marked with all-embracing characteristics as it focuses on co-operation in "research and development" programs concerning "enhancement of the state-of-the-art of oil pollution preparedness and response, including technologies and techniques for surveillance, containment, recovery, dispersion, clean-up and otherwise minimizing or mitigating the effects of oil pollution, and for restoration" (OPRC, 1990). However, the focus on equipment exchange is further strengthened in later parts of Article 8:

> "*Parties agree to co-operate directly or through the Organization or relevant regional organizations or arrangements to promote, as appropriate, the holding on a regular basis of international symposia on relevant subjects, including technological advances in oil pollution combating techniques and equipment*".
>
> "*Parties agree to encourage, through the Organization or other competent international organizations, the development of standards for compatible oil pollution combating techniques and equipment*".

Similar emphasis has been given to "technical co-operation" in respect of oil pollution preparedness and response in Article 9 of OPRC 1990. Article 9 lays down an obligation on State Parties to facilitate necessary support to other State Parties, which request technical assistance:

> (a) to train personnel;
> (b) to ensure the availability of relevant technology, equipment and facilities;
> (c) to facilitate other measures and arrangements to prepare for and respond to oil pollution incidents; and
> (d) to initiate joint research and development programs.

3.2.1.7 IMO Operational Guideline on Sorbent Usage in Oil Spill Response

The 2016 Guideline titled "Use of Sorbents for Oil Spill Response" (2016 Guideline) was published by the Centre of Documentation, Research and Experimentation on Accidental Water Pollution (CEDRE) and approved by the Marine Environment Protection Committee of IMO, at its 63rd session (IMO, 2016a). The contents of the 2016 Guideline are very practical and aimed at operators that are under an obligation to use sorbents as a part of response to accidental oil and chemical pollution. The 2016 Guideline is divided into 4 main parts, and the main guidance with regard to use of sorbents is found in Parts A, B and C.

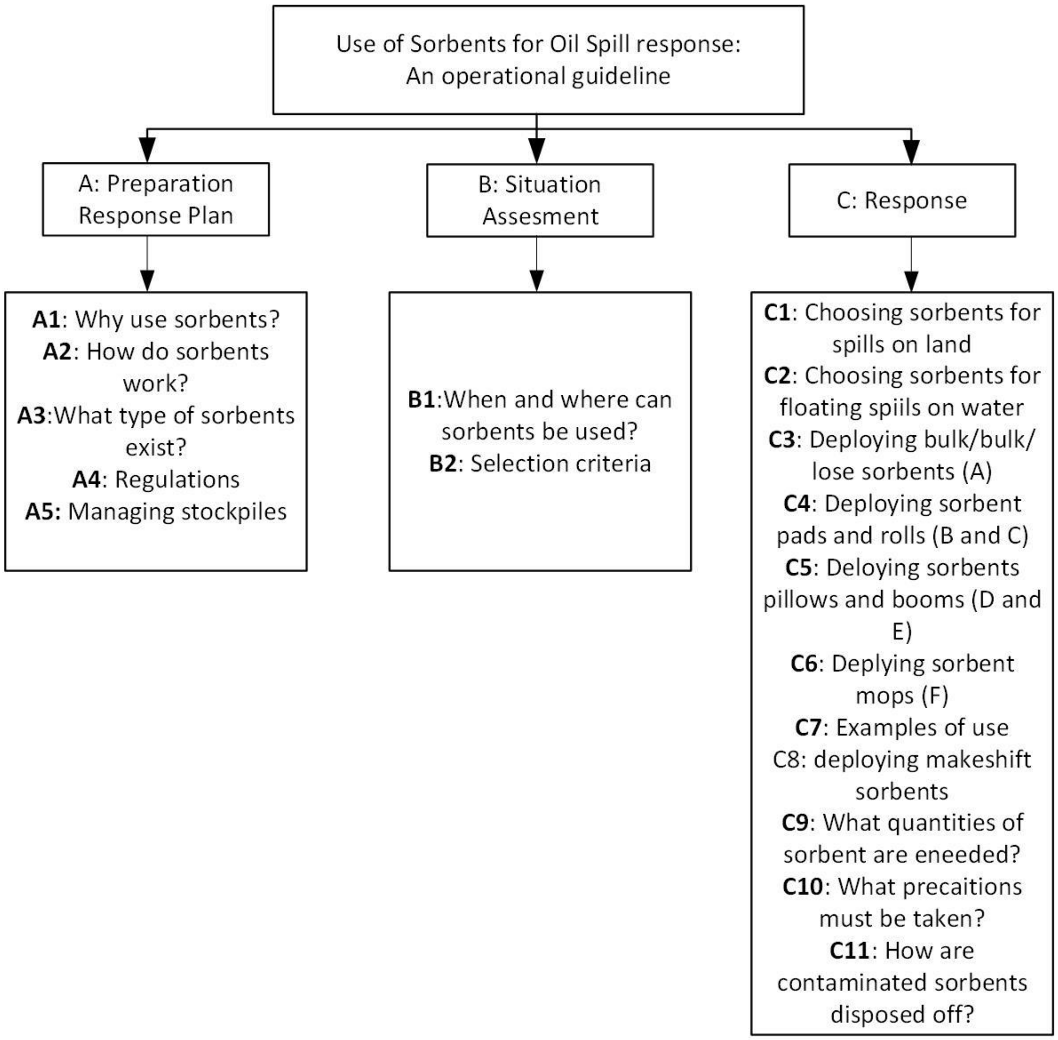


Figure 8: Parts A, B and C of the 2016 IMO Operational Guideline on Sorbent Usage in Oil Spill Response

3.2.1.8 IMO Guidelines on Assistance in Oil Pollution Incident

In 2016, IMO issued the Guidelines on International offers of Assistance in Response to a Marine Oil Pollution Incident (2016 Guidelines) (IMO, 2016b). The 2016 Guidelines are designed for use by any country, and more specifically for state Parties of the OPRC 1990 Convention. In short, the 2016 Guidelines:

> "…*provide a framework for the establishment of an incident-specific, comprehensive international offers of assistance (IOA) system within the Requesting Country's response structure, which effectively coordinates and manages requests and/or offers of assistance, and which may*

supplement processes already covered by existing national, regional, bilateral, multilateral and other mutual aid agreements …" (IMO, 2016b)

The important provisions with regard to equipment exchange are summarized in the following table:

Table 7: Oil spill Response Equipment and source considerations

Part & Section	Substance
Part 3: Recommended considerations for parties involved in IOA s. 3.5 – 3.9[1]	**3.5** It is recommended that general arrangements and compensation for sending, receiving and returning of equipment requested or offered be identified and agreed upon quickly once the IOA process has started. **3.6** Following the detailed evaluation of the situation, it is recommended that the requesting Party specify, as precisely as possible, the type and quantity of equipment and products needed, using the terminology in the common lexicon (appendix 5). **3.7** It is recommended that the Assisting Party attach in its reply a detailed list of the equipment system or product available, including necessary shipping details to include dimensions, the type of fuel, and envisaged transport modalities. It is recommended that the list also indicate the equipment needed for handling such material in the port or airport of entry, the number of people required for offloading operations, and the necessary means of transportation of response material to the site of the incident. **3.8** In order to put such equipment in use as soon as possible, it is recommended that the requesting Party take the necessary measures for: **1** immediate customs clearance of all arriving material and, if needed, authorize their use (e.g. authorization to navigate); and **2** immediate clearing of immigration formalities for personnel needed for operating the equipment. **3.9** It is recommended that the requesting Party makes arrangements with the provider to return the equipment as soon as the operations are terminated, or under some other pre-defined condition if requested to do so by the supplier.

Part 10: Response equipment stockpiles and source considerations s. 10.1 – 10.6[2]	**10.1** Spill response equipment is generally arranged in three tiers, consisting of local equipment staged for rapid response generally at oil transfer locations (Tier 1), mobilization of enhanced response resources from a broader area, regional stockpile, or other arrangement (Tier 2), and national or global stockpiles (Tier 3) (IPIECA, 2007). When sourcing equipment for large, complex or significant Tier 3 type responses, once internal and regional sources have been exhausted or are expected to be exhausted, consideration should be given to the current range of dedicated oil spill response equipment sources, including a number of significant equipment stockpiles located around the world. Most of these significant equipment stockpiles typically have a manager well-versed in their equipment inventories. Though a dedicated equipment stockpile may initially appear to present a myriad of equipment choices, equipment managers should be readily able to match equipment they manage to the specific type of spill response equipment requested. Equipment managers also likely understand regulatory requirements governing the extent to which their inventory can be drawn down and still meet contractual and regulatory obligations. Moreover, equipment managers can ascertain costs, conditions, and logistics of supplying equipment to a requestor, indicating that existing oil spill response stockpiles are, in most cases, the best source to obtain needed critical spill resources when the use of the IOA process is necessary. **10.2** In addition to large stockpiles of dedicated spill response resources, other equipment sources include equipment manufacturers, government agencies or facilities, and private parties (including oil company facilities and stockpiles). Though these entities may have the needed resources, they may not operate in an emergency response timeframe. When implementing the IOA guidelines, expectations may need to be appropriately adjusted that such sources may not be able to provide response assets immediately. There may be additional time required for these entities to determine exact quantities and types of equipment that could be released in order to remain compliant with contractual or regulatory obligations. Also, these entities may not have established mechanisms for issues such as compensation, transportation and other necessary aspects of transferring needed equipment to the affected country. **10.3** Spill response equipment is, for the most part, very specialized. During a large, complex or significant oil spill when a country needs to utilize the IOA process to obtain critical, limited response resources, the needs will be highly specific and likely limited to a small range of equipment types in most cases. For this reason, not all equipment offered will be useful, so not all items of equipment offered should be

	accepted. Acceptance of unsuitable equipment typically results in overwhelming the logistics supply chain as well as staff and responders working on equipment acquisition. During a Tier 3 response, time to obtain these critical resources is extremely limited. It is important to strike the right balance by prioritizing efficient procurement of highly beneficial equipment over less critical items that may require more complex supply-chain arrangements in order to achieve the most beneficial outcome overall. **10.4** Multiple international offers from foreign countries and entities, while generous and in cases very helpful, each should be evaluated for efficiency and amount of effort needed to accept and deploy the assets offered. **10.5** As an example, if 80,000 feet of oil spill boom is needed for the response, the costs, logistics and timing issues can vary greatly according to the range of sources offering that equipment. In one case, this boom could be purchased from one international manufacturer and loaded onto a cargo plane for immediate delivery. In another case, this boom could be acquired from 16 separate international sources offering 5,000 feet of boom each, to achieve the necessary 80,000 feet. Those personnel tasked with acquiring this set of necessary equipment are faced with a challenge. The simplest and most expeditious choice would appear to be ordering a single consignment from the manufacturer; however, there may be other considerations or factors that influence the final decision. The IOA technical personnel should have the discretion to accept offers or decline offers as appropriate. **10.6** Regardless of the source selected, an important component of the overall IOA guidelines is the recommendation that an appropriate and timely acknowledgement to those international entities offering assistance be completed in a manner that is consistent with maintaining good will.

Part 12: High-capacity Spill Response Equipment Categories s. 12.1 – 12.2[3]	**12.1** The world's supply of oil spill response equipment is finite. High-capacity response equipment such as oceangoing skimming vessels, long-range aerial dispersant aircraft, fire resistant boom, etc. is limited. In the case of a Tier 3 response that exhausts local and regional equipment, typically the high-capacity equipment types and competent personnel to operate them will be sought in order to supplement in-place expended resources and exhausted workforce in the affected area. The ability to move equipment and personnel rapidly into the spill area exemplifies an aggressive response posture. Understanding the process required to move this equipment/personnel long distances would then establish and define the logistics pipeline to allow movement of additional lower-efficiency (yet still critical) equipment needs as the spill unfolds. **12.2** The list of Equipment Categories (Types) for large, complex or significant spills requiring a Tier 3 response chosen to develop common lexicon (see full lexicon in appendix 5) is: 1. aircraft; 2. boom; 3. communication equipment; 4. dispersants; 5. in situ burn; 6. oily water separators; 7. pumps; 8. remote sensing/surveillance/tracking/detection; 9. shoreline cleaners; 10. sorbent types; 11. specialist vehicles; 12. subsea equipment; 13. temporary storage; 14. vessels (non-skimming); 15. vessels (skimming); and 16. personnel.

Source: Guidelines on International offers of Assistance in Response to a Marine Oil Pollution Incident (IMO, 2016)

3.3 Multilateral Agreements

3.3.1 Helsinki Convention

The Convention on the Protection of the Marine Environment of the Baltic Sea Area, also known as the Helsinki Convention was drafted in 1992 and entered into force on 17 January 2000. The Contracting Parties are the States of the Baltic Sea area, i.e. Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. The Baltic Marine Environment Protection Commission, commonly known as HELCOM, governs the Helsinki Convention (HELCOM). It is important to stress that HELCOM ensures the effective implementation of the Helsinki Convention with regard to the protection of the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation. It strives for a healthy Baltic Sea environment supporting a wide range of sustainable economic and social activities, made concrete in the Baltic Sea Action Plan (HELCOM, 2013a).

The Helsinki Convention is divided into 38 Articles. It is noteworthy that the Helsinki Convention stresses joint initiatives to prevent and eliminate pollution – a State obligation that lies at the heart of a significant number of articles that comprise the Convention itself (HELCOM, 2013b). To that end, the fundamental obligations are incorporated in Article 3 in conjunction with Article 7, 14 in the following manner:

"…*The Contracting Parties shall individually or jointly take all appropriate legislative, administrative or other relevant measures to prevent and eliminate pollution in order to promote the ecological restoration of the Baltic Sea Area and the preservation of its ecological balance*…".

"…*In order to prevent and eliminate pollution of the Baltic Sea Area the Contracting Parties shall promote the use of Best Environmental Practice and Best Available Technology. If the reduction of inputs, resulting from the use of Best Environmental Practice and Best Available Technology, as described in Annex II, does not lead to environmentally acceptable results, additional measures shall be applied*…".

"…*Whenever an environmental impact assessment of a proposed activity that is likely to cause a significant adverse impact on the marine environment of the Baltic Sea Area is required by international law or supra-national regulations applicable to the Contracting Party of origin, that Contracting Party shall notify the Commission and any Contracting Party which may be affected by a transboundary impact on the Baltic Sea Area*…".

"…*Where two or more Contracting Parties share transboundary waters within the catchment area of the Baltic Sea, these Parties shall cooperate to ensure that potential impacts on the marine environment of the Baltic Sea Area are fully investigated within the environmental impact assessment referred to in paragraph 1 of this Article. The Contracting Parties concerned shall jointly take appropriate measures in order to prevent and eliminate pollution including cumulative deleterious effects*…".

"…*The Contracting Parties shall individually and jointly take, as set out in Annex VII, all appropriate measures to maintain adequate ability and to respond to pollution incidents in order to eliminate or minimize the consequences of these incidents to the marine environment of the Baltic Sea Area*…".

It is also important to note that HELCOM has an established Baltic Sea Cooperation on Pollution Preparedness and Response since 1977, when the "Expert Group on Oil Combating" was established under the HELCOM Interim Commission (1974-1980). This group is now called the HELCOM Response Group and is comprised of the Baltic Sea states' competent pollution response authorities. This group created and adopted the HELCOM Response Manual in 1983, which includes operational, administrative and financial procedures in case of a large international oil spill or Hazardous and Noxious Substance accident. The HELCOM Response Manual is based on the Helsinki Convention, HELCOM Recommendation 28E/12 and HELCOM Recommendation 31E/6. At this juncture, it is important to note that the HELCOM Recommendation 28E/12 emphasises the fact that "every sub-region should have adequate equipment and trained personnel to protect the coast, especially vulnerable habitats and areas (Baltic Sea Protected Areas, BSPAs) and to ensure immediate and appropriate action on shore" (HELCOM Recommendation 28E/12, 2007).

Although the Helsinki Convention and the HELCOM Response manual provide a guide to co-operation aspects of oil spill response in the Baltic Sea, neither the Convention nor the Manual specifically cover the use of sorbents or exchange of international equipment. However, based on the given provisions of the Helsinki Convention, it is implied that the stipulated provisions do not interfere with either of those actions, and there is a possibility to adopt both via consultation with state Parties.

3.3.2 Copenhagen Agreement of 1971 and the 1993 Update

The Nordic Agreement on Cooperation Regarding Pollution at Sea from Oil and Other Substances, also known as the Copenhagen Agreement, was signed on 16 September 1971. It is a Nordic marine pollution response agreement between Denmark, Iceland, Norway, Finland and Sweden, agreed in 1971 and updated in 1993. The new and updated agreement encompasses co-operation with regard to the measures to deal with oil pollution, as well as other harmful substances. The important and noteworthy trait of the 1993 Agreement is "assistance", clearly articulated in Article 8 of the Agreement in the following manner (Nordic Agreement, 1971; 1993):

"…*A Party that needs help with pollution control within its waters in the event of contamination of the sea by oil or other harmful substances can request assistance from the other Parties. A Party that receives a request for assistance will do what is possible in order to render such help*…".

"…*The authority of a Party that is responsible for pollution control after contamination of the sea by oil or other harmful substances can request assistance direct from the competent authority of another Party. The authority that receives the request for assistance decides if this can be rendered*…".

"…*The authority of the Party requesting help bears the full responsibility for the direction of the effort within its waters. Personnel from the helping Party are at disposal under the direction of their own supervisors and perform the duty in the territory of the Party seeking help in accordance with the service regulations which are in force in their own state..*.".

With regard to exchange of equipment, the 1993 Agreement stipulates the following:

"*It is the responsibility of the Party seeking help to ensure that vehicles, rescue equipment and other materials that are used in connection with an effort can cross the frontiers without import and export formalities and without having to pay customs duties, taxes and other duties. Vehicles, rescue equipment and other materials can be used in accordance with the regulations in force in the helping state without special permission*".

A similar provision is found regarding exchange of information in the 1993 Agreement:

"*The Parties will inform each other of:*

a) Their organisation and preparedness and the authorities whose business it is to implement pollution control of contamination of the sea by oil or other harmful substances and who are in charge of monitoring,

b) their experience with the use of means and methods by pollution control of contamination of the sea and the result of the monitoring activity, and

c) their technological research and development".

Other than the aforementioned articles on equipment, no provisions exist in the 1993 Agreement concerning use of sorbents.

3.3.3 SweDenGer Agreement

The scope of the 2002 Joint Swedish-Danish-German Response Plan to Maritime Incidents Involving Oil and Other Harmful Substances and Co-operation in Aerial Surveillance (SweDenGer Agreement) covers the southwestern part of the Baltic Sea. The agreement deals with co-operation in responding to oil pollution and other dangerous substances, and comprises in part the bilateral component of the DenGer Agreement that was developed among Denmark and Germany. The SweDenGer Agreement includes:

Annexes I: Map of Response Regions in the Baltic Sea
Annex II: National Contact Points and Responsible Authorities
Annex III: Scheme of Communication
Annex IV: Special regulations "Aerial Surveillance" and Appendix I: "Communication plan for aircraft during surveillance operation"
Annex V: Exercises
Annex VI: Ships and aircraft with diplomatic clearance in advance.

To the best of our knowledge, no information has been provided in this agreement with reference to sorbents or exchange of equipment in oil spill response situations. It is observed that the SweDenGer Agreement is generic to the 1991 Sub-regional Contingency Plan between Denmark, Germany and Netherlands.

3.4 Conclusion

With reference to the general obligations of UNCLOS, the Baltic Sea States have given effect to the generally accepted international rules and standards to deal with pollution from vessels. This undoubtedly, includes vessel-source oil pollution. Whether it is a Baltic Flag State or a Baltic Coastal State, it is empowered by UNCLOS to have in place pragmatic measures to minimize the threat posed by discharge of oil, whether intentional or unintentional.

In terms of the subject matter of this work package i.e., sorbents and exchange of international equipment, the SOPEP Guideline for Annex I of MARPOL 73/78 briefly highlights that the master of the vessel should include in the assessment-report as to whether assistance of chemical dispersant or degreaser is required. There are no specific stipulations on exchange of equipment. This, however, can be found in Article 6 of the OPRC 1990 that requires the Baltic Sea States to co-operate through bilateral or multilateral agreement to establish pre-positioned oil spill combat equipment. Moreover, Article 6 also advises the state Parties to establish a mechanism to co-ordinate the response to an oil pollution incident with the capabilities to mobilize the necessary resources.

For more insight on the usage of sorbents and exchange of equipment, it is necessary to delve into the two existing IMO guidelines i.e., the 2016 Guidelines on usage of sorbents and the 2016 Guidelines on assistance in oil pollution incident. In the context of the 2016 Guidelines related to usage of sorbents, it is observed that the Guidelines acts as an instruction manual for the Baltic Sea States in so far as it covers preparation response plan, situation awareness and response via sorbents. As for the 2016 Guidelines concerning assistance in oil pollution incident, it includes relevant specifications with respect to equipment-exchange as a part of international offers of assistance. These specifications range from primary considerations and source considerations to high spill capacity spill response equipment categories. These provisions are deemed important for Baltic Sea States in oil spill response situations. Moreover, the notion of assistance as embedded in this guideline could potentially help accelerate a specific state's preparedness and response actions in oil spill situations by deploying available and effective equipment offered by another state.

Parallel to the international conventions and guidelines, there exist a few multilateral agreements that endorse legislative and administrative co-operation in pollution response. While the Helsinki Convention serves as a foundation of co-operation among the Baltic Sea States, HELCOM ensures the effective implementation of the Convention. To that extent, the HELCOM Response Manual of 1983 emphasizes the need for adequate equipment and trained personnel for response operation purposes. However, there are no specific provisions on the usage of sorbents or the exchange of equipment in the Manual of 1983. Similar traits are observed in the 1993 Copenhagen Agreement, whereby the Agreement furnishes only a short provision on exchange of equipment, which can be deemed as cursory without any detailed advice on how the exchange procedure could be implemented. Finally, the SweDenGer Agreement is generic in nature, and does not provide any specific guidance on how the Parties should proceed with regard to sorbent usage or exchange of equipment in the event of vessel source oil pollution.

Following a comprehensive overview of international regulations and guidelines for Sorbent Use and Exchange of Oil Spill Equipment as well as multilateral agreements in the South Baltic Sea area in relation to the issue of oil spill response, an additional aim of this handbook will be to provide an insight into the lessons learnt from the table top exercise in Poland in 2018, as well those derived from the national workshops that took place during the 2017-2019 timeframe in the countries of Germany, Sweden and Poland for the preparedness and implementation of BioBind as a response option to support the South Baltic Oil Spill Response through clean-up with the Biogenic Oil Binders (SBOIL) project within the region.

4. Experiences learned from National workshops

4.1 Executive Summary

Two national workshops took place during 2016-2019 and different experiences were gathered from each country. The relevant information is summarized below.

4.2 Poland

The first practical exercises in use of a boom placed in a container took place on 20 April 2018 by the Maritime University of Szczecin in the northern part of the Polish Channel. During the exercises the following equipment was used:

- HDS type crane with a minimum lifting capacity of 4t and an extension of at least 15m;
- floating pontoon;
- inland waterway pusher "Łoś 02";
- a motorboat as a second unit for deploying and towing the boom.

The main aim of these exercises was to:

- verify the possibilities of the use of the developed technology in real conditions;
- train the staff in the use of the equipment produced in the project.

Figure 9: The boom in operation

The national workshop was arranged by the Maritime University of Szczecin with the participation of the Polish SAR service from 27-28 June 2018 in Swinoujscie and Szczecin.
On the first day of the workshop, field exercises were conducted on the open sea using a boom. The units of the Polish SAR service took part in the exercises:

- m/v „Kapitan Poinc";
- m/v „Czesław II";
- fast rescue boat „R-2".

These exercises allowed to:

- test the possibility of transferring the container with boom to the SAR unit and using it in action;
- test the possibilities of the boom in sea conditions.

Figure 10: The boom is discharged from container

Figure 11: M/v "Kapitan Poinc" tows boom

On the second day of the workshop there was a practical demonstration of the use of a boom in the Szczecin harbour, a presentation of the objectives of the project and the results achieved.

Figure 12: Presentation of the SBOIL project results to the public

Figure 13: The boom discharging

The second part of the meeting was held in the Senate Hall of the Maritime Academy in Szczecin and was devoted to a discussion on:

- practical exercises (conducted on the PISCES II simulator);
- the cooperation of Polish services in the event of oil spillage.

Figure 14: Discussion on the assumptions of the oil spill scenario

Figure 15: Simulation of the removing oil spills action – PISCES II simulator in use

4.3 Sweden

The National workshop in Sweden was held on 29 August 2017 by the World Maritime University together with Malmö City and the County Administrative Board of Skåne. The main aim of the workshop was to allow municipalities and county administrative boards from southern Sweden to discuss the level of preparedness in their respective organisations as well as to discuss the legal implications local and regional organisations are facing in compensation and claims processes after an oil spill. Several useful insights were brought to attention during the workshop:

- Regarding ***improved cooperation and coordination*** between local and regional contingency plans, it was discussed that general parts of the plans could be synchronised, but organisation specific parts would be needed in addition.
  It was also suggested that different department heads of each organisation (health, environment, etc.) should come together and discuss cooperation within their specific fields, rather than just representatives from the rescue service.
  Within the same field of improved cooperation, it was highlighted that due to the limited amount of equipment available in the respective organisations, a discussion is encouraged on how these could be better shared in order to find mutual benefits for all organisations involved.

- During the discussion on ***organisations' vulnerability*** in case of an oil spill it was highlighted that one of the biggest challenges is to make available staff to work with the oil spill clean-up, in addition to their daily work, and for the organisation to endure this pressure on its personnel throughout the entire clean-up phase.

- During the final discussion on what is ***needed to strengthen the response capacity in southern Sweden*** it was pointed out that continuous exercises between all organisations involved in an oil spill is needed. Given the intense and increasing maritime traffic around the coasts of southern Sweden it was also discussed that it would be desirable to allocate one of the national storages of oil spill equipment to this part of the country.

5. Experiences learned from the Table Top Exercise

Executive Summary

The World Maritime University (WMU) contracted Oil Spill Response Ltd (OSRL) to help along with carrying out a Table Top Exercise, based on a realistic oil spill scenario in the Baltic Sea region, for the preparedness and implementation of BioBind as a response option to support the South Baltic Oil Spill Response through clean-up with the Biogenic Oil Binders (SBOIL) project within the region. The exercise took place on the 8th November 2018 in Swinoujscie, Poland and was attended by representatives from Poland, Germany and Sweden. The objectives of the exercise were to test the compatibility of regional and national plans to identify the various countries' actions in response to an oil spill incident, to prove cross border Command and Control (based on the information from the regional and national plans) and to work through a realistic scenario to identify the challenges of using BioBind as a response option. This was achieved by separating the attendees into two groups and allowing them to work through a problem and solution 'facilitated' exercise based around a scenario and then conducting 'hot-washes' after each session, which allowed for all salient points to be noted.

Throughout the exercise the consensus from the participants was that BioBinds was a very interesting concept but it would be very difficult to implement it offshore from fixed wing aircraft, partly due to the amount required to absorb a large volume of oil, increasing the waste volume, and partly due to the ability to source suitable aircraft at short notice to deploy the BioBinds. Although the waste issue continued as each area of the response was considered, the participants became more open to the ideas of how to use the BioBinds and explored the challenges of their use. If these challenges, which are not insurmountable, could be alleviated and the issues that were raised, solved, then implementation of BioBinds in the Baltic Sea region may become an additional 'response tool' in the responder's toolbox.

This report covers project background, delivery of the exercise and recommendations based on OSRL's experience and Industry good practice when faced with the complexities of dealing with an oil spill, and the logistical challenges faced by governments and industry during oil spill incidents and exercises.

5.1 Introduction

Oil spills pose a significant threat to the environment and society in all parts of the world. Even with more robust legislation and an increased awareness of the dangers, there is a greater chance of major oil spills in areas with shipping, pipelines and/or offshore oil and gas exploitation. Minimizing the risk of oil spills and their negative impacts is a priority under United Nations Sustainable Development Goal 14, concerning the conservation and sustainable use of the oceans, seas and marine resources.

South Baltic Oil Spill Response (SBOIL) builds on the BioBind project, which focused on developing a fast and effective oil spill recovery system for coastal shallow water areas even in adverse weather conditions. The BioBind concept was based on biodegradable wood-based oil binders, deployed by plane and removed by a specially designed net boom, a combination of fishery nets and conventional oil containment booms. SBOIL aims to take up this innovative green technology to strengthen existing cross-border spill response capacities.

This project has been investigating the feasibility of using biodegradable binders to mitigate the consequences of spilled oil. Advantages of these products include their low production costs, small environmental impact, and potential for use in adverse weather conditions and in shallow waters.

One of the main outputs of the SBOIL project is 'National and international workshops, table top exercises and awareness raising campaigns'. The Client therefore asked Oil Spill Response Limited (OSRL) to develop, observe and evaluate a table top exercise to assist the Client to:

1) Learn, test, and train the mobilisation and management of the BioBind system in a transnational setting, in line with existing oil spill response cooperation arrangements.

2) Test the compatibility between different oil spill contingency plans in the South Baltic at international, national, regional and local levels.

3) Enhance awareness and knowledge of oil spill response and contingency planning among key organisations involved in preparedness and response to oil spills.

The exercise revolved around the logistical and procedural arrangements for the exchange of BioBind equipment across the project countries. The main target group(s) of the exercise will be the organisations involved in the national oil spill response operations in these countries, specifically those that are responsible for requesting and accepting oil spill equipment from neighbouring countries.

5.2 Exercise Delivery

5.2.1 Exercise Scope

The original scope for the exercise was to test the participating countries' collaboration in mobilising and responding to an offshore oil spill incident within the Exclusive Economic Zone (EEZ) of one country that then migrates across to another EEZ of an adjoining country.

BioBind is a new response option for mitigating a surface oil spill at sea. It was identified that if the participating countries were not given guidance as to what and how they were to mobilise, then they would likely only consider conventional response options. Therefore, the ability to test the usefulness of BioBind as a complementary response option would not be proven.

Therefore, at the preliminary meeting held in Malmo the concept of a "Facilitated" Table Top Exercise was discussed. The intention of this type of exercise was not to ignore the primary response options but to focus on the use of BioBinds so that the process of mobilisation, deployment, recovery and waste management could be considered. Based on these considerations the objectives for the exercise did not alter significantly but made specific reference to the use of BioBind. The objectives agreed were:

- Test the compatibility of International Legislation/National Plans and Regional Plans from notification to material recovery and disposal.
- Prove Command and Control of a cross-border incident.
- Identify Tactical decision making – focusing on the use of BioBind
- Pinpoint actions and solutions using Time-outs to discuss and agree on options

Figure 16. Interacting with the attendees

The room was arranged so that two groups could be established; this was to allow the participants to 'mix' and use their experience to work through the exercise and reach agreements based on their knowledge of each country's legislation and procedures. As people arrived for the exercise, the two groups arranged themselves with the Polish contingent on one table and the German/Swedish contingent on the other. However, this did not hinder the collaborative approach of the exercise.

Figure 17. The attendees in working groups during the introduction

5.2.2 Exercise Delivery - Preparedness and Scenario

Introductions and Preparedness

Prior to the participants working through Incident Preparedness and a scenario-based exercise, personal introductions were made and the concept of BioBinds as a response option was introduced. Some attendees were unfamiliar with how BioBinds work and how they are expected to be used so University of Rostock, Chair of Geotechnics and Coastal engineering staff, Marcus Siewert, covered this in detail.

This included the various modes of deployment of BioBinds. They can be deployed from an aircraft or helicopter of opportunity directly onto the oil slick, from a suitable vessel where the BioBinds will be deployed manually onto the oil, or onshore so that the oil impregnates the BioBinds rather than coating the shoreline. The recovery of the binders by floating net offshore or vacuum systems on the shoreline was also communicated.

In order to prepare for an incident in the exercise, the participants contemplated and assessed areas of response that could be pre-arranged, for example:

- Notifications – in the event of an incident, knowing who to contact and how is essential to ensure that sufficient resources can be directed to deal with the incident.

- Understanding the incident will help determine its complexity; knowing the multitude of various sources to obtain relevant information will then lead to justifiable assumptions on the response options available to use.

- To aid an efficient and effective response, many things can be prearranged to avoid hindering the speed of response. These include knowing how equipment is to be deployed, the timescales from mobilisation to operation, who has authority to make the decisions and whether everything complies with local and regional legislation – this becomes even more apparent during a multi-country cross border incident.

The first objective of the exercise was initially covered by incident preparedness, as discussions that took place considered the notification process of the participant countries in case of an incident. This gave a greater understanding of the compatibility of each country's procedure.

Notification process – both groups agreed that they would use the IMO Standard Notification Forms to inform the relevant stakeholders of an incident in their waters. The POLREP form would be used by the "Competent Authority" to other countries on the details of the incident. This form can be separated, depending on the incident, into a POLWARN (warning or threat of pollution), a POLINF (detailed supplementary information) and a POLFAC (Facilities – matters relating to assistance).

These forms may be used differently internally (within each nation), as different countries have different Competent Authorities to manage the oil spill depending on whether it is an offshore response, a shoreline response or inland response. There are also various methods of dissemination of incident information either by phone to a dedicated number/position, by Fax (Russia) or by use of the EU SafeSeaNet managed by the European Maritime Safety Agency (EMSA).

Within Poland there is an Emergency Exchange System that is designed to ensure the correct authorities are contacted in the event of an incident (including Aerial Surveillance, EMSA Satellite Surveillance, and wildlife organisations). In Sweden the competent authority for offshore response is the Coast Guard, who has the responsibility to inform internal stakeholders of an incident. In Germany, the Havariekommando takes the lead through the Central Command for Maritime Emergencies (CCME). The CCME will inform offshore and onshore pollution response groups to respond to the incident using identified available resources.

Oil Spill Contingency Plans are linked to the respective National Contingency Plan (NCP); the NCP's are based on compliance with the HELCOM Plan.

Other stakeholder notification considerations discussed were the potential of dealing with contractors, impacted businesses, the media, pressure groups and the public, and how each could impact how the response progressed. Although each group confirmed that they have a media group that would deal with press releases, the appreciation of having to deal with these additional stakeholders was welcomed.

INCIDENT PREPAREDNESS

- How is the BioBind to be deployed onto the spill:

- Aerial deployment
  - ✓ What type of aircraft?
- Vessel deployment
  - ✓ What size/type of vessel?
- Shoreline deployment

- Where are the stockpiles of BioBind held:

- Who is the contact to mobilise the equipment?
- What additional resources are required to prepare the aircraft/vessel to deploy the BioBind?
- Who has authority to mobilise these resources?

INCIDENT PREPAREDNESS

- What section/person would have responsibility for the mobilisation?

- Is a contract in place for transport?
  - ✓ How many vehicle movements will there be?
- How would the BioBind be loaded for transport?
- Are there any transportation restrictions? (weekend driving etc.)
- What resources are needed for unloading?
- Who is responsible for chartering vessels or aircraft?

- What legislation is required to deploy the BioBiond?

- What can be prepared prior to the incident
- What can only be agreed during the incident
- Are specific flights permits/clearances needed to deploy BioBind?
- Can any pilot deploy BioBind?

Oil Spill Response

Figure 18. Slides used to aid discussions between attendees

Scenario

The exercise scenario was based on two vessels colliding within Polish waters (a container vessel and a tanker), close to the EEZ of Germany. There were no casualties but a significant loss of crude oil into the water was reported.

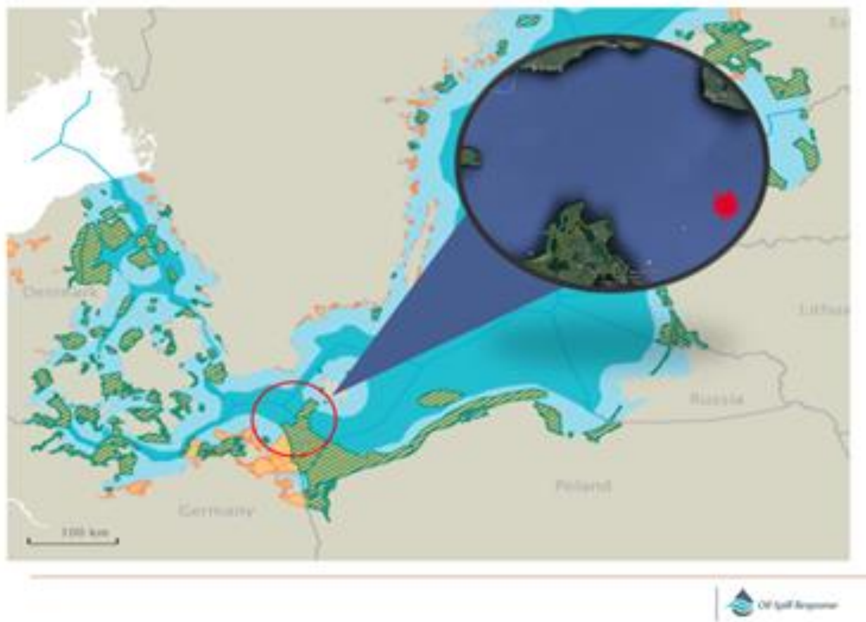


Figure 19. Incident site with the likely impact coasts of Poland, Germany and Sweden dependent on prevailing conditions

For this exercise the prevailing winds and currents meant that the oil was heading towards the German coast. This was proven using the OSRL Oil Spill Modelling software (Oilmap). However, it was pointed out that any tactical response should not be reliant on modelling alone as any changes in the weather would change the fate of the oil slick.

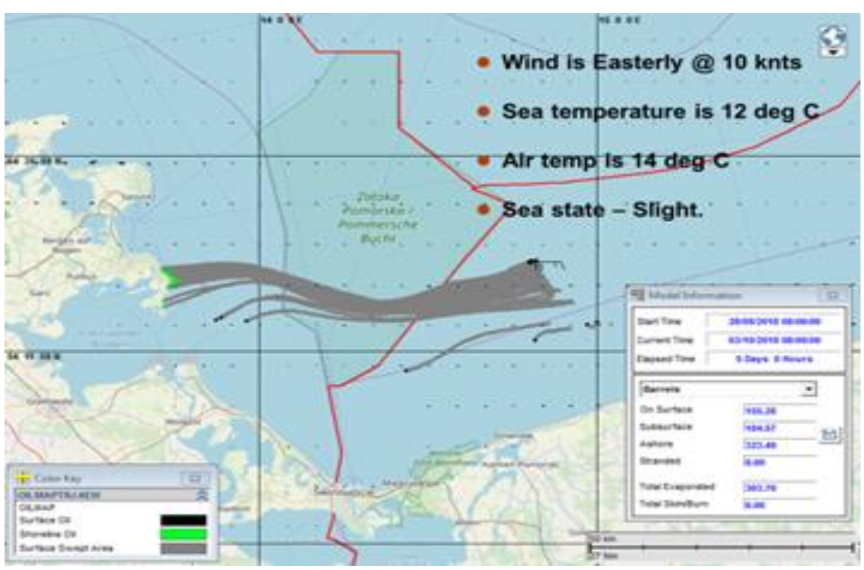


Figure 20. Prevailing weather conditions and modelling results if conditions remained constant

An initial response assessment of the incident was worked through as this is an important part of understanding the scale and complexity of the incident. The use of response tools was considered by the groups and other suggestions for gathering further information were discussed. These included aerial surveillance and satellite surveillance, together with the information that could be obtained by personnel at the incident site, including the magnitude of the incident, the hazard and safety concerns, initial priorities and who takes primacy of the response would be decided.

INITIAL RESPONSE ASSESSMENT

Initial report:

- Nature and magnitude of the incident
  - The collision has ruptured bulk storage tanks – initial estimates of released oil is 1000 barrels
  - The oil is Aasgard Blend which has a low Asphallene content and therefore will not emulsify and be amenable to the use of sorbent products
- Hazards and safety concerns
  - Response personnel need to be adequately protected due to the potential release of harmful VOC`s
  - The crew are safe and there are no reported casualties
  - Shipping Warnings have been released to keep clear of the area
- Initial priorities
  - Safety of Response Personnel
  - Minimise environmental impact
  - Efficient and effective use of response capability
- Location of incident Command Post – who is the lead authority?

Oil Spill Response

Figure 21. Initial incident report and incident priorities

When the response strategies and tactics were covered, the assumption that the groups would only consider the tactical operations that they are familiar with was proved correct. In a reactive mode people will tend to go with those options they know well and that have been proven. Thus, aerial delivery of BioBinds was ruled out and Offshore Containment and Recovery were the preferred offshore response options for this incident. However, the objectives for this exercise meant that the facilitators asked the groups to consider BioBinds as the primary offshore and shoreline response to this scenario and to plan the mobilisation and operations for its use. As a complementary response option, the use of BioBinds could be used in conjunction with other response options; therefore, the use of simultaneous operations (SIMOPS) was introduced as a method to manage multiple operations in response to the same incident.

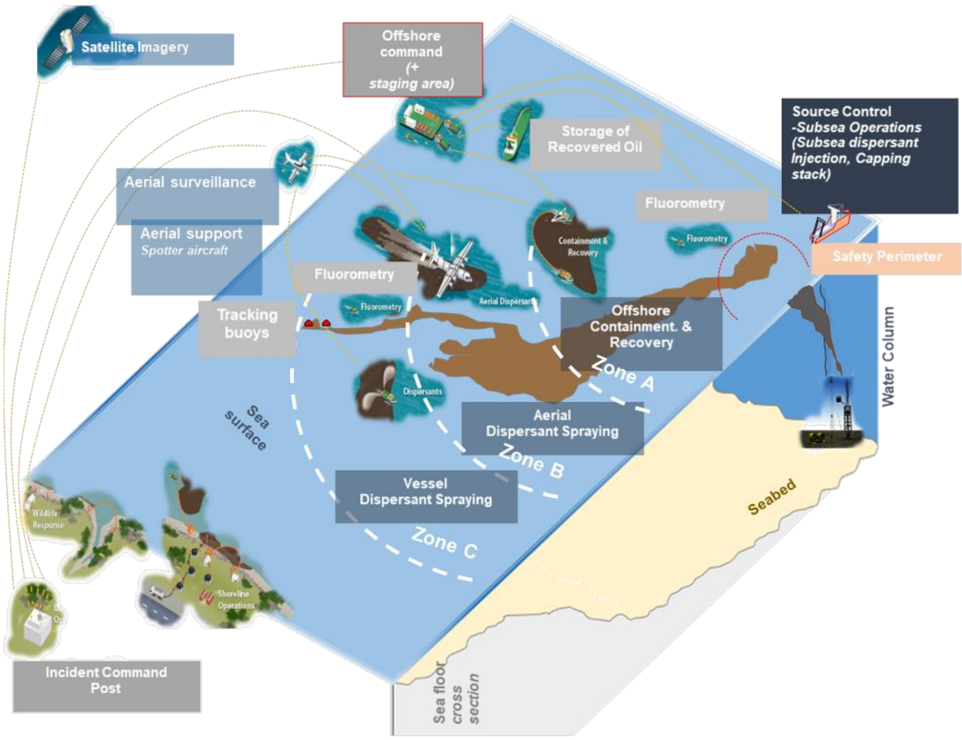


Figure 22. Managing multiple operations without confliction
Source: At-sea Containment and Recovery, IPIECA, p. 13

Response Options

Once the initial assessment was conducted, the exercise was split into two areas of operations:

- ✓ Offshore Operations – mobilisation, deployment & recovery and waste management
- ✓ Shoreline Operations – mobilisation, deployment & recovery and waste management

As expected, when the groups were asked what response option they would use in the event of an offshore oil spill, they all agreed that Offshore Containment and Recovery would be their first choice. There is limited use of Chemical Dispersant, but this would need regulatory approval before use and there is not a significant amount held. This led to the introduction of the 'Cone of Response' concept. The cone of response is the idea of using multiple response options in a single incident, managed correctly to ensure that no two operations interfere with each other. This helped the participants to comprehend the idea of BioBind as a complementary response tool rather than a 'stand-alone' option.

Having agreed the use of BioBinds as a response option, the method of deploying the binders was addressed. Initially it was considered for offshore operations with deployment by fixed-wing aircraft, helicopter and/or vessels.

- *Fixed-wing aircraft* – both groups considered the quantities of BioBind required for a significant offshore response and the type of fixed-wing aircraft that may be available to deploy BioBinds onto an oil spill. It soon became apparent that storage, mobilisation of suitable assets and sufficient BioBinds, along with aircrew that are trained to fly at low levels, the legislation and permits from multiple countries to allow this operation to proceed, inhibit its suitability as an option.

- *Helicopter* – unlike the fixed-wing aircraft in the region, there are many types of helicopters that can be deemed suitable to deploy BioBinds. The product is delivered in $5m^3$ & $10m^3$ packages and as such is of a sufficient size to be underslung from a helicopter. What is not known at present is how the actual deployment method can be achieved as the operator would need to be in the helicopter. However, the potential to hover over a slick and release the BioBind directly onto the oiled surface makes this more efficient, especially when dealing with fragmented slicks.
- *Vessels* – these are readily available and pre-identified for response use. Unfortunately, there will be competing priorities between offshore containment and recovery operations, BioBind deployment and offshore BioBind recovery operations using net booms. Vessels have the ability to carry significant loads of BioBind and at present the BioBind is deployed by manual means. As a vessel moves through an oil slick the bow wave will tend to move the slick away from the side of the vessel and the BioBind will need to be manually thrown further than may be anticipated. A better method of deploying the product over the sides of the vessel and onto the slick would improve the efficiency of this type of deployment.

Based on the outputs of this session, it was suggested that the stockpiles of BioBind would need to be within, or near, ports and harbours, for rapid loading onto vessels. If helicopters are to be used, either a nearby heli-landing area can be arranged or a local airport utilised for air operations. The stockpiles can be kept in 10- or 20-foot standard containers as these would have the ability to be loaded onto trailers and moved rapidly. This also has the added advantage of being sealed, reducing the chance of the BioBinds degrading due to inclement weather or wildlife.

Offshore Operations – Aerial Operations

Both groups were fully aware of the resources in place to respond to an oil spill incident within the Baltic; however, when the use of BioBinds was suggested, as this was an innovation, there was a reluctance to consider it as an option. When the deployment of BioBinds by air was discussed, there was an initial conversation around the type of aircraft that has the potential to deploy them, as there would be a need to carry significant quantities and deploy the binders at low levels above the oil spill to increase their efficiency and effectiveness. As no major deployment by air has taken place, the limited availability of suitable large aircraft was raised. Most attendees agreed that this option would probably not be a realistic choice, mainly due to the difficulty of obtaining aircraft and the unlikelihood of being able to source a suitably trained crew with experience of low-level equipment deployment. Loading and deploying by air with a potentially small window of opportunity based on the weathering properties of the oil would further hinder the viability of this option and a decision would need to be made on whether this constitutes an efficient use of resources.

Figure 23. Aerial deployment during the research phase of the project

Another consideration is the limited use of chemical dispersants, a well-understood response technique with many examples of the benefits and drawbacks for its use. The use of dispersants in addition to offshore containment and recovery may define the binders as an unnecessary use of resources until the concept has been proven.

The use of helicopters for aerial deployment was also discussed and, due to the abundance of helicopters within the region, it was agreed that this has the potential for implementation. The sea may break up large slicks into multiple smaller, harder to target, slicks. A helicopter has the ability to hover and treat smaller slicks and be a much more focused and efficient use of binders (more binders hitting and absorbing the oil, not just adding to the waste stream). Further investigation would be needed into how to carry an underslung load of BioBinds in quantities sufficient to treat smaller oil slicks. Also, the method of releasing the binders from the load remotely from the cockpit would need to be considered along with compliance with any legislative agreements.

Offshore Operations – Vessel Operations

Due to the size of the incident and the expectation of the slick to impact the German coastline after five days, both groups recognised the need to mount an offshore response and began to consider the vessels available and the timescales to implement operations. Some participants were able to readily identify the vessels that are equipped to respond in the event of an incident and quickly worked out estimated timeframes for travelling to the scene and beginning operations. It was also pointed out that a list of identified vessels and surveillance aircraft capable of providing international assistance in an oil spill situation in the Baltic Sea area is provided by the Response Working Group for the Baltic Marine Environment Protection Commission (*HELCOM, 2017*).

Vessels identified from Poland would take approximately 6 hours to arrive on scene and an estimated additional hour to begin operations to recover oil. At this point the slick would still be in Polish waters; therefore, Poland was leading the response. It was anticipated that vessels from Germany would also be sent to the scene but would arrive several hours later. At this point a discussion of the roles of the offshore vessels was led by the facilitators and it was found that these vessels were to be designated to conduct containment and recovery operations. A suggestion was made to the groups to use some of these vessels, or additional vessels, to deploy BioBinds onto the oil.

Figure 24. NetBoom used for the collection of oiled Binders

Poland: As BioBind is not a proven technology, there was a reluctance to use it as an option. Poland has a robust and well supported containment and recovery option already in place and the priority would be to use vessels for this rather than an untested method of response. It was suggested that if sufficient vessels were available it would be prudent to deploy both methods, but there was still reluctance as binders are not part of the contingency plan and, therefore, not readily accepted as an option.

Germany: Germany appeared more open to the use of BioBinds and not as restrictive in the use of materials that act as sorbents. However, as there is nothing in the German legislation that considers BioBinds as a response option, this method would probably not be considered in the event of an oil spill. Another issue that was raised was the transfer of command when the incident leaves Polish waters and enters German waters. If Germany is to take the response lead, then a formal handover would need to take place. Ideally this should be face-to-face, but this may be impractical. Therefore, a time and method for the transfer of command should be formally agreed by both parties to ensure that cross-border collaboration is effective, and that the efficiency of resources is maximised (maybe added to the National Plans).

Sweden – The Coast Guard has authority but limited knowledge of the use of BioBinds and was, therefore, unable to definitely state that they would be prepared to use them as a response option. As with Poland and Germany, there is a reluctance to use them as the quantities needed are unknown and they may need a change in legislation to prompt a change of attitudes before these countries exercise with BioBinds for offshore incidents.

Offshore Waste Challenges

Poland: Dedicated vessels from Świnoujscie and Gdynia would be activated to respond (Navy and other Agencies) as well as vessels of opportunity (VOO) that could support the response. For this scenario the vessels would be on-scene in 6 hours, supported by vessels from Germany within 24 hours. These vessels would concentrate on the primary method of recovery (containment & recovery) using vessel storage to contain the liquid waste. Using the VOO for deploying and recovering BioBind was discussed, but dismissed by the Polish contingent as an unproven option. This then opened the discussion on dealing with waste; Poland has legislation and facilities in place to deal with liquid waste but very limited ability to deal with oiled solid waste. It appeared that this was the main driver of their reluctance to use BioBind, as their perception was that it would produce a vast quantity of hazardous waste with little ability to dispose of it except in a landfill.

Germany: Vessels from German ports would support the operations and, with this scenario, the lead authority would pass from Polish authorities to German authorities during the second day (the oil travels into Germany's EEZ after 1.5 days). Germany would also use its primary response method (containment and recovery) as it is tried and tested, and the use of BioBinds is not integrated into the country's legislation as an option. German waste regulations are the same no matter if the waste is liquid or solid, and Germany has many incineration plants that can be used to deal with solid waste. This led to a discussion about 'circular economies' and the use of oil-impregnated BioBinds as 'waste for energy'. If this was not an option, but a secondary use of oil impregnated BioBinds could be explored, this could help alleviate waste 'costs' and make it more attainable for governments to implement as a viable option.

Shoreline Operations

No definitive answer on the use of BioBinds on the shoreline was possible as the participants were not responsible for the shoreline clean-up operations. The Polish group suggested that they might be more open to the use of the binders on the coast, but the Local Authorities have the resources to deal with the clean-up. They would still have the issue of how to dispose of the waste generated. At this point in the exercise they could see the drawbacks of using this material which, in their opinion, outweighed the benefits.

The German group too, were not in a position to agree to the use of binders on the shoreline as the Local Authorities have the responsibility. However, it was suggested that the authorities were more open to ideas that would benefit the environment. This together with the ability to manage the generated waste may allow BioBinds to be more willingly used as a response option. Dealing with a shoreline response added more challenges for its use but not any additional challenges for disposing of the waste.

In Poland, the Municipalities, Fire Service and Maritime Organisations have the responsibility to respond to a shoreline impact. In Germany, the Local Authorities have responsibility and would use volunteers to support the clean-up. It was agreed that on a shoreline the most effective deployment of BioBinds would be by manually spreading on the shore prior to impact, and recovery would be by a vacuum system that would collect the impregnated BioBinds into a collection net. Both groups agreed that using BioBinds would increase the volume of waste generated, especially if the oil is so weathered that instead of reducing the impact on the shore it just adds to the waste. This raised a very good question of viscosity of oil and the upper limit that the BioBinds can absorb. This may be exhaustive work, but understanding the 'window of opportunity' for the use of BioBinds can effectively reduce the needless additional waste issue. Another consideration that would be beneficial for cross-border collaboration during a significant incident was the ability to transfer oiled waste cross-border. This may be complicated to achieve, and legislation and agreements would need to be agreed between the countries involved, but this may alleviate some of the waste issues and differences between countries.

A final question was raised as to whether the BioBind can be treated by bioremediation. As the binders are a natural product, if nutrients were added, would this 'kick-start' the growth of microbes that would then 'eat' the oil? If this occurs, would the binders then be able to be disposed of by incineration without the added hydrocarbon emissions that cause regulatory issues? This is not fully understood at this time and further research is needed.

Shoreline Waste Challenges

As discussions continued on the waste problem, there was a proposition to look at the option of the 'Circular Economy' and bioremediation of contaminated binders as methods to help reduce the burden of waste disposal and consideration of reusing the waste.

Figure 25. The Waste Hierarchy

The option to reuse waste is higher up the Waste Hierarchy and, therefore, a more desirable if potentially decisive option in either allowing or refusing the use of BioBinds as a clean-up tool (European Union's Waste Framework Directive (1975/442/EEC)). Another challenge raised was the 'window of opportunity' for the use of the binders on the oil. As the oil weathers in the environment, its physical properties change. One property that will affect the use of the binders is the viscosity of the oil, which is influenced by how long the oil has been exposed to environmental conditions and the make-up of the oil (asphalt content). As the viscosity increases, the ability of the oil to absorb into the binders will significantly decrease, which will negate the use of binders as an option.

Another consideration is the 'reasonableness' of the use of binders when it comes to compensation from the available schemes. For countries to be reimbursed for the response that they have mounted to respond to an oil spill, their actions must be deemed 'reasonable'. The concept of using an absorbent to soak up the oil before shoreline impact to reduce the environmental damage that could be caused would probably be deemed reasonable. However, if the method is not successful then the effort employed and the increase of waste to be disposed of may be deemed unreasonable and thus not reimbursable (*Ref: ITOPF TIP – Page 7 Use of Sorbents on or near shore*).

Alternative Response Technologies

The groups were posed a question about other uses they would consider now that they have a greater understanding on the abilities of BioBind. After some deliberation several ideas were given which include:

- Waste Water Treatment Plants – most plants have filtration systems that can be harmed if impacted with oil and hence have permanent booming in place, BioBinds could be a fast 'First Strike' capability to contain the oil within the binders before recovery operations take place.
- Port & Harbour incidents – within a port or harbour many minor spills can become a common occurrence due to equipment failure or human error. If the binders are used when the oil enters the water, even if it is not contained in containment booms, the oil will migrate to a collection point where flotsam and jetsam congregate. If the oil is contained within the binders it will not adhere or get mixed with the flotsam and jetsam, which would ordinarily increase the contaminated waste.
- Inland Pipelines – a spill from a pipeline will pool in the vicinity of the incident and if the substrate is permeable it will begin to impregnate the soil. Using binders will substantially reduce the amount of oil entering the substrate thus reducing the amount of soil that would need to be removed for disposal/bioremediation.
- Swamp Areas, Salt Marshes and Mangroves – both areas are very environmentally sensitive and response options are limited due to the diversity of the habitat and the need to carefully treat these types of shorelines. If binders were used on impacted areas any free-floating oil will impregnate the binders and not the shorelines, thus reducing the damage.
- Upstream waterways – where waterways have businesses adjacent to the water's edge or use the river for cooling/processing there is a potential to contaminate the water with an oil release. Having binders immediately available will reduce the impact downstream.
- Other ideas were used by road tankers, ships for deck spills, and strategically placed stockpiles for use by Local Authorities; however, all these options should already have sorbents in place for immediate deployment for minor spillages and are, thus, a more limited option.

5.3 Exercise Recommendations

5.3.1 Incident Preparedness

Notification

This is a tried and tested procedure which is regularly exercised either by countries or regionally. As such, there would be no need to reconsider the notification process. The participants did find it useful to hear how the notification process was utilised in the different countries and were capable of comparing it to their own procedures to increase clarity. This may be something that can be emphasised during future major BALDEX exercises.

Assessment

The groups knew what was required to be able to assess the current situation and the tools that were available to them to help support justifiable decision making. The various countries have access to Oil Spill Modelling, aerial surveillance and satellite surveillance (through EMSA), but it may not have been widely known that the oil industry will also have access to these types of tools (especially if they are members of OSRL). Moreover, if they are the ‘Responsible Party’, access may be faster and mobilisation/reports more readily available. This will allow the management teams another flow of information to support any response action plans that are developed.

5.3.2 BioBind as an Offshore Aerial Response Option

To be able to use either fixed-wing aircraft or helicopters to deploy BioBinds, more work is recommended on the ‘proof of concept’. The reluctance of countries to use BioBinds appeared due to the current perception of the use of sorbent binders and the inherent waste issue; therefore, if the intention is to use binders from any platform, including aerial, then additional work would need to be undertaken for countries to agree to this as a response option. It would be necessary to determine:

- The viscosity range wherein the BioBinds are effective – this would then help determine the window of opportunity for use. Adding binders that cannot physically absorb oil will only add to the problem.
- The quantities needed to treat numerous sizes of slicks – during the course of the exercise and based on conversations a rough estimate is 1-part oil: 2-parts BioBinds (by volume); knowing the quantity available will lead planners to the most efficient use.
- Size and position of suitable stockpiles – for mobilisation, understanding where the logistical ‘bottlenecks’ are, and speed of deployment will support the planning decisions when considering the ‘window of opportunity’.
- Availability of pre-determined aircraft and tested methods for efficient mobilisation of resources – preparedness should identify the resources that are required and how they are mobilised.
- Suitably trained air crews and pre-arranged permits – this is a very limiting factor; crews need to have experience (training). There would also need to be several crews for rotations due to flying hours and the need for continuous operations. Pre-defined

permits and passing these through the respective countries' government departments for approval will help facilitate a faster response.

- Tested methods for the deployment and recovery of oil binders – delivery and recovery will need to be effective and efficient (binders not in contact with an oil slick becomes a wasted effort), both operations will need Standard Operating Procedures (SOP's) written so that people know what to do consistently.

5.3.3 Offshore Mobilisation Response Challenges

Offshore containment and recovery is the primary response option within the Baltic Sea and the specific capability is tested on a regular basis. As such, trying to implement a new method which would limit the number of vessels that can be used for the primary response option may not get easily approval from the planners. The binders are stored in containers and deployed by manual means. This, in itself limits their use, due to the minimum size of vessel that would be needed to load the container onto. Moreover, the "manual" means of deployment translates into additional workload for the crew, or additional personnel to supplement the existing crew; as it is a manual operation, consideration of the crew fatigue should also be factored in. An additional consideration is <u>suitably trained crew for the vessels that will be deployed</u>. This would need to include dedicated Oil Spill Recovery vessels and a plan in place to train crews of vessels that may be used as a VOO.

Smaller VOOs could be employed that would not detract from the main offshore and containment operations. These smaller vessels would need the container of binders broken down into smaller quantities so that they can be stored on the vessel decks and a more efficient method to deploy the binders to reduce manpower would be advantageous. These smaller vessels could also work in tandem with a smaller NetBoom to recover oiled binders; in a comparable way, fishing boats were utilised during the Macondo incident (Gulf of Mexico, 2010; Fig 26). These vessels can be used to treat the smaller slicks rather than use the larger offshore vessels with dedicated containment boom and recovery systems. Allowing the larger vessels to target the main, larger slicks will promote a more efficient offshore recovery operation.

Further challenges would be:

- How to identify these vessels and their capability and how quickly they can be mobilised with the resources onboard to conduct delivery and recovery tasks.
- How to deal with the expected waste generation and methods for re-use/disposal was the biggest hurdle for the use of BioBinds. Plans to manage the generated waste from 'cradle to grave' would need to be considered and developed. If NetBooms are to be used, the method of recovering binders nets or sea surface should be better understood. 'Off the shelf' adapted systems or bespoke systems should both be investigated. Once collected onto the recovery vessel, an understanding of what offshore storage facilities need to be arranged, transfer from vessel to shore, and transport to a waste reception facility prior to disposal, is required.

Figure 26. Fishing vessels with booms and sweeps to collect surface oil (Macondo Oil Spill)

5.3.4 Offshore Recovery and Waste Challenges

If binders are to be used at sea, there are numerous challenges that will need to be overcome for the operation to be successful. Initially the method to recover the binders from the boom or sea surface should be considered. There are very few, if any, existing recovery systems that will effectively recover small squares of solid material off the surface of the water. A vacuum system would be the most effective, but these systems are generally used on coasts or inland incidents. At sea, the wave action would induce more sea water to be recovered rather than the binders.

Once recovered the binders would need to be stored on the recovery vessel. This storage may be quickly overwhelmed, and recovery operations would cease until the waste is transferred. If a larger storage vessel is available, then the binders can be moved from the recovery vessels onto the storage vessel. Once done, the recovery vessel can continue to recover in a shorter timeframe.

This storage vessel would need to discharge the recovered oiled binders, which would take place at a port. At this point it is worth noting that the oiled materials are deemed to be Hazardous Waste and will need to abide by all relevant regulations for carriage and disposal of hazardous materials. A ‘Waste Management Plan’ should be developed that takes into account the regulations and guidance. This should include the use of known hazardous material-handling specialists and methods of disposal.

Normally sorbents are notoriously difficult to dispose of; however, due to the nature and composition of the binders it would be worth investigating methods of re-use rather than disposal, which could include bioremediation and using the oiled binders as a fuel for heating or generation of power.

5.3.5 Shoreline Mobilisation, Recovery & Waste Challenges

The use of binders on shore would need to take into consideration the viscosity of the oil and if it would be effective on the oil (window of opportunity). Adding binders onto a shoreline that would not absorb the oil would be wasting time and effort. It would also make little sense to use significant quantities of binders on the shore if the oil has already impacted. Using the binders in a more targeted approach to absorb the 'free floating oil' will not remove oil from an already oiled shoreline but will reduce the impact of the floating oil from causing further damage to other areas of the shore that are not impacted (ref; longshore currents that convey the floating oil along the shore).

Therefore, if BioBinds are to be used, it would be preferable if they were deployed on shores that are expected to be impacted, or near shore so that the binders absorb the oil prior to impact. For nearshore operations the smaller vessels identified for offshore operations can continue to be utilised for nearshore deployment and any binders not recovered from the sea surface would reach the coast, but the oil would not impact the shoreline as it would be contained in the binder. Recovery would be by vacuum systems that are readily available but rather than be held within a tank (which would be used for liquids) the vacuum storage could be adapted to contain the binders into a net bag. This would contain the binders and allow any water to drain away, maximising the storage of the bag. These bags (once full) could then be transferred into leak-proof containers (e.g. waste skips) for transfer to waste reception facilities.

Waste generated by shoreline operations would need to be managed and disposed of using the same methods as waste from offshore operations.

5.3.6 Alternative Response Techniques

There are a multitude of diverse types and shapes of sorbents that are already in the commercial market and available for use in different scenarios. For BioBinds to become another option in a very crowded market its advantages over other absorbents will need to be highlighted.

As a 'loose' sorbent, speed of deployment, if available at the scene of the incident, is always a benefit but the benefit of BioBind over other loose sorbents is its ability not to allow the oil to leach out and impact areas once absorbed into the binder. An example of this is when a vessel is bunkering, and a leak occurs, if the oil gets into the water it may spread quickly and if booms are not already in place, will migrate before booming contains the oil. If BioBinds are deployed into the oil, even if the booms are not in place and the oil migrates, the binders will hold the oil in the binders thus eliminating any further impact to surrounding areas. This speed of deployment and the subsequent absorbed containment of the oil limits the environmental contamination. The fact that the BioBind material is a 'friendly' material and produced at a low cost are additional benefits that supplement the operational ones.

5.4 Conclusion

The exercise was focused on an in-depth look at the operational aspects of using BioBinds as a response option and in doing so was always likely to raise more questions than answers, especially considering preparedness for a new technology. However, raising questions at every step in the mobilisation, deployment and recovery would lead the project into specific areas that require further consideration for the next stage of the program.

The exercise participants from Germany, Poland and Sweden came with differing levels of knowledge and backgrounds. Some knew about the project and were aware of the capabilities of the binders, while others knew less about the technology, but knew their roles in a response. This led to varied and good discussions, along with open dialogue between the groups, which helped to ensure that the exercise objectives were met. It also helped to identify several areas that will need considerable effort to ensure the project continues to move forward.

The main outcomes can be defined as:

1) Fixed-wing aircraft deployment of BioBinds is unlikely to happen due to the lack of aircraft, regulations and other considerations. It was felt by all parties that the effort required to implement this as an option outweighed the benefits.
    a) Although the opinion of the participants was relatively negative, Biobinds should remain an option due to the ability of the binders to retain oil without leaching. For this response option to move forward as a technique, there is further work to complete (as per recommendation) before governments believe this method to be viable. Sorbents do not have a great reputation as the perception is that dealing with the oiled waste is more problematic and costly than using conventional methods of clean-up.

2) Helicopter deployment of BioBinds would be more efficient and effective (especially on small slicks) and for use on hard-to-access areas where standard equipment is difficult to use.
    a) This may be a far more efficient use of BioBinds offshore and gain more traction with governmental implementation. Helicopters are more readily available; they can treat smaller slicks (targeted deployment), do not use existing response resources, can be used closer to shore and are not hindered by sea depth. Therefore, they can be deployed just prior to shoreline impact, minimising shoreline contamination.

3) Vessel deployment is a far better option; however, until it is proven and written into contingency plans, there will always be a reluctance to use this over more conventional tried and tested methods.
    a) As containment and recovery is, at present, the primary offshore response option in the Baltic, there would be a reluctance to use vessels for an unproven technology. Therefore, sourcing additional vessels and using them for the deployment and recovery near-shore, would not diminish offshore operations but add a complementary response using the ‘cone of response’ concept.

4) Waste was BioBind's biggest disadvantage as, like all sorbents, it produces a vast amount of contaminated waste that must be disposed of.
   a) Ways that waste can be reduced, reused or become part of the cyclic economy need to be addressed so it does not become a burden to the governments. Options for re-use of oiled binders can be researched and, once an option is defined, an agreement in principle can be sought. At this point, implementing BioBinds can become a viable response option, which would be easier to pass through legislation and gain approval within the South Baltic Sea Region.

5) Biobinds were regarded as a useful option for Ports and Harbours, shallow and sheltered waters and shorelines prior to impact if the oil is still of a low enough viscosity for the binders to be used.
   a) BioBinds are a 'loose' sorbent (i.e. not confined like a sorbent boom or pad) that contain the oil without leaching. This is important to realise as it has the ability to be deployed very quickly without the need for immediate containment, as the oiled binders will not cause any additional contamination to non-oiled surrounding areas.

Before closing the exercise, the participants were asked to consider one aspect of the exercise they felt worked well and one that can be improved upon. All the participants felt the exercise was useful with good interaction and moderation. There was some doubt if the objectives would be achieved; however, the progress was quicker than expected and, overall, the consensus was that it was a good exercise.

Throughout the exercise, the feasibility of using BioBinds as a response option for the mitigation of the consequences of spilled oil was investigated, including the logistical and procedural arrangements for the exchange of BioBind equipment across the project countries. The mobilisation and management of the BioBind system in a transnational setting and the compatibility between different oil spill contingency plans in the South Baltic at international, national, regional and local levels were tested.

The consensus from the participants was that BioBinds was a very interesting concept but it would be very difficult to implement it offshore from fixed wing aircraft, partly due to the amount required to absorb a large volume of oil, increasing the waste volume, and partly due to the ability to source suitable aircraft at short notice to deploy the BioBinds. Despite the identified challenges, the participants became more open to the ideas of how to use the BioBinds and explored the opportunities of their use. If these challenges, which are not insurmountable, could be alleviated and the issues that were raised, solved, then implementation of BioBinds in the Baltic Sea region could become an additional 'response tool' in the toolbox of the organisations involved in the national oil spill response operations in these countries. The use of Biobinds remains a realistic option due to the ability of the binders to retain the oil without leaching and can be used by the relevant authorities if they are willing to prepare themselves for that scenario.

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Appendices

Swedish summary

Utan internationellt samarbete står enskilda länder ofta utan tillräckliga resurser för att på egen hand kunna möta oljeolyckor av större slag. Otillräckligheten kan vara relaterad dels till att volymen av spillet är väldigt stort, och att det av den anledningen är svårt att hantera, eller av att oljeskyddsutrustning anpassad till stora spill inte finns att tillgå inom landet. Denna situation skulle dock kunna förbättras genom ett utökat samarbete internationellt samarbete generellt och ett utökat samarbete mellan grannländer i synnerhet.

Världen som den ser ut idag är starkt beroende av olja för att täcka våra energibehov. Oljeolyckor såväl vid produktionsställena i sig själv som under transporter till andra länder fortsätter dock att utgöra potentiella hot mot både miljö och samhälle. FN’s hållbarhetsmål nr 14 – Hav och Marina Resurser – syftar till att öka skydd av våra hav och den marina miljön. Således bör arbete kring oljeolyckor och dess konsekvenser ses som ett högprioriterat område för att bidra till att uppnå mål 14.

Projektet ”South Baltic Oil spill Response” (SBOIL) delfinansierades av EU’s regionala program för södra Östersjön under perioden 2016-2019. Projektet leddes av universitetet i Rostock som tillsammans med World Maritime University och det maritima universitetet i Szczecin jobbade tillsammans kring ”Oljeskydd i södra Östersjön” och mer specifikt kring saneringsmetoden biogena oljesorbenter. SBOIL är en fortsättning på projektet BioBind vilket framförallt fokuserade på introducering av ett nytt sanerings system utarbetat specifikt för kust och grunda områden samt svåra väderförhållanden. BioBind projektet etablerade en metod för hur man använder nedbrytningsbara biogena sorbenter (små filtplattor med stor uppsugningsförmåga), vilka sprids ut i havet där det finns ett oljespill och samlas in med hjälp av en speciell sorts länsar som består av dels fiskenät och dels konventionella länsar för oljesanering. SBOIL projektet syftade till att använda denna nya gröna teknologi för att förbättra gränsöverskridande saneringssamarbete.

Denna handbok syftar till att ge läsaren en grundläggande kunskap om oljespill, sanerings metoder och strukturella tillvägagångssätt för oljeskydd i Sverige, Danmark, Tyskland, Litauen, Polen och Ryssland. Vidare syftar den också till att överbygga det befintliga informations glapp som idag finns inom oljeskydd utan att motsäga befintliga regler och etablerade policys och guidelines. Därtill är handboken också tänkt att förbättra samarbete mellan lokala och regionala myndigheter och underlätta deras samarbete med nationella räddningsledare. Under projektets gång har ett antal kapacitetsuppbyggnads aktiviteter implementerats bla nationella och internationella workshops samt en simulerad oljeolycka genom en table top övning. De främsta resultaten av dessa presenteras i följande stycken:

SBOIL projektet har utarbetat och implementerat ett antal olika aktiviteter, en scenario övning för oljespill och ett tränings kit för att informera personer inom såväl som efter projektets slut. Vidare har också en station som kan användas vid framtida krissituationer tagits fram. Slutligen har också ett träningspaket för användninga av biogena sorbenter tagits fram i en nautisk simulator för att kunna utbilda personer som i framtiden ska arbeta med den nya tekniken som krävs vid användning av biogena oljesorbenter.

Inledningsvis ger denna handbok en övergripande bild av oljespill i södra Östersjön, tillsammans med relaterade oljeskydds resurser. Vidare summerar handboken strukturella tillvägagångssätt för oljeskydds hantering, samt regler och lagar för detta, inom de olika länderna i södra Östersjön som nämns ovan.

Vidare beskriver handboken också resultat och lessons learned från den table top övning som gjordes inom projektet i Polen 2018 samt resultaten från de nationella workshopparna i Polen och Sverige under 2017-2019.

Polish summary

Bez międzynarodowej współpracy poszczególne kraje zazwyczaj nie dysponują wystarczającymi zasobami i aktywami, aby skutecznie reagować na incydenty związane z rozlewem ropy naftowej na dużą skalę. Ten wynik końcowy może być związany z dużą ilością ropy zaangażowanej w te incydenty, lub po prostu z faktem, że dany kraj nie dysponuje/jest w stanie dysponować specjalnym sprzętem koniecznym do wykonania danych zadań, mimo że może on być łatwo zapewniony przez kraj sąsiedni. Dla skutecznego rozwiązywania problemów związanych z rozlewami ropy naftowej, ścisła i skuteczna współpraca międzynarodowa (zwłaszcza pomiędzy krajami sąsiednimi, które zazwyczaj borykają się z podobnymi problemami i "dzielą się ciężarem" związanym z zanieczyszczeniem ropą naftową w przypadku niezadowalającej reakcji) jest oczywiście niezbędną koniecznością.

Współczesny świat w dużym stopniu polega na ropie naftowej w celu zaspokajania swoich potrzeb energetycznych. Niestety, rozlewy ropy naftowej w miejscach wydobycia lub w trakcie związanych z tym przedsięwzięć transportowych nadal stanowią jedno z głównych zagrożeń zarówno dla społeczeństwa, jak i środowiska naturalnego na poziomie globalnym. Rozlewy ropy naftowej stanowią większe zagrożenie w obszarach związanych z głównymi szlakami żeglugowymi, obszarach wokół rurociągów i platform lądowych/morskich, a także w pobliżu infrastruktury przetwórstwa ropy naftowej i gazu. Cel 14 ONZ w zakresie zrównoważonego rozwoju wymaga ochrony oceanu, życia morskiego i zasobów, dlatego też zminimalizowanie ewentualnych rozlewów ropy naftowej i ich negatywnego wpływu należy uznać za bardzo wysoki priorytet.

Projekt "South Baltic Oil spill response" (SBOIL) był współfinansowany przez program Unii Europejskiej (UE) South Baltic Program, obejmujący okres od lata 2016 do końca 2019 roku. Uniwersytet w Rostoku, jako partner wiodący, współpracował ze Światową Akademią Morską (World Maritime University) i Akademią Morską w Szczecinie w kwestii "Reagowania na rozlewy ropy naftowej w regionie Południowego Bałtyku", z wykorzystaniem biogenicznych środków wiążących olej. SBOIL jest kontynuacją projektu BioBind, który koncentrował się głównie na stworzeniu i wprowadzeniu do użytku systemu odzysku oleju przeznaczonego dla wód przybrzeżnych, obszarów płytkich i niekorzystnych warunków pogodowych. Podejście BioBind stworzyło metodologię opartą na biodegradowalnych nośnikach wiążących ropę naftową, które są stosowane przez samoloty i/lub śmigłowce. Proces usuwania obejmuje specjalną zaporę sieciową, składającą się z sieci rybackich i konwencjonalnych zapór ograniczających. Projekt SBOIL ma na celu wykorzystanie tej nowej "zielonej" technologii do poprawy obecnych możliwości reagowania na transgraniczne wycieki ropy naftowej.

Podręcznik ten dostarczy czytelnikowi podstawowej wiedzy na temat rozlewów ropy naftowej, środków reagowania i podejścia strukturalnego poszczególnych krajów Południowego Bałtyku (SB) - Szwecji, Danii, Niemiec, Litwy, Polski i Rosji. Jego celem jest wypełnienie istniejącej luki informacyjnej w odniesieniu do reagowania na rozlewy ropy naftowej, bez pozostawania w sprzeczności z istniejącymi przepisami oraz już ustanowionymi strategiami i wytycznymi. Ponadto dąży do poprawy międzynarodowej współpracy między władzami lokalnymi i regionalnymi oraz ułatwienia ich lepszej interakcji z odpowiednimi krajowymi organami zarządzającymi incydentami. W ramach tego projektu zrealizowano szereg warsztatów krajowych i międzynarodowych, jak również rozszerzone portfolio działań w zakresie budowania potencjału w oparciu o ćwiczenie "Table Top"; ich najważniejsze wnioski i zalecenia zostały podsumowane w poniższych sekcjach.

W ramach projektu SBOIL zaprojektowano i wdrożono bardzo szeroki zakres działań (różne ćwiczenia SBOIL w zakresie reagowania na rozlewy, warsztaty krajowe i międzynarodowe ćwiczenia "Table Top"), opracowano scenariusze reagowania na rozlewy oraz przygotowano zestaw szkoleniowy w zakresie reagowania na rozlewy z użyciem biogenicznych środków wiążących olej, aby informować i szkolić osoby zaangażowane w reagowanie na rozlewy oleju podczas trwania projektu i po jego zakończeniu. Uruchomiono również wyznaczoną stację, z której będzie można korzystać w przyszłości w sytuacji kryzysowej. Ponadto, za pomocą metod symulacyjnych (za pośrednictwem symulatora morskiego), opracowano pakiet szkoleniowy w zakresie reagowania na rozlewy olejowe w celu zaspokojenia potrzeb osób, które będą obsługiwać ten nowy sprzęt/technikę.

Niniejszy podręcznik koncentruje się przede wszystkim na zapewnieniu kompleksowego przeglądu rozlewów ropy naftowej w obszarze Morza Południowego Bałtyku (BSR), w tym ogólnie na związanych z tym środkach reagowania. Podsumowane zostały również wyżej wymienione podejścia strukturalne krajów nadbałtyckich, a także ich ramy prawne w odniesieniu do kwestii reagowania na rozlewy ropy naftowej.

Podręcznik ten umożliwi również wgląd we wnioski wyciągnięte z ćwiczeń przeprowadzonych w Polsce w 2018 r., a także we wnioski z warsztatów krajowych, które odbyły się w latach 2017-2019 w Szwecji i w Polsce.

German Summary

Die Ostsee gehört zu den am stärksten befahrenen Gewässern der Welt. Der Transport von Rohöl auf der Ostsee ist durch die Erweiterung des Umschlaghafens Primorsk in Russland seit 15 Jahren signifikant gestiegen. Pro Jahr passieren mehr als 8.000 Tankschiffe unterschiedlicher Größe die gedachte Linie zwischen Rostock und Gedser. Eine Schiffshavarie und der damit verbundene mögliche Austritt von Rohöl stellt ein erhebliches Risiko für das Ökosystem und den Wirtschaftsraum Ostsee dar.

Vor diesem Hintergrund wird seit vielen Jahren auf nationaler und internationaler Ebene an Schutzkonzepten für die Ostsee gearbeitet. Mit der Einrichtung des Havariekommandos 2003 wurde die Ölhavariebekämpfung in Deutschland neu organisiert und für den Einsatz im Katastrophenfall vorbereitet. Die fünf Küstenbundesländer und die dazugehörigen Landkreise halten verschiedene Mittel und Geräte zur Bekämpfung von Ölverschmutzungen auf See und an der Küste vor. Aus organisatorischer Sicht kann der Vorsorgestatus der deutschen Küste im internationalen Vergleich als gut eingestuft werden. Technisch gesehen verfügt Deutschland über aktuelle Bekämpfungstechnologien, die weltweit in den Depots vieler Länder zu finden sind.

Die heute verfügbaren Technologien internationaler Hersteller zur Aufnahme von Öl von der Wasseroberfläche haben sich aber in den letzten Jahrzehnten wenig verändert. Die effektive Bekämpfung von Ölhavarien auf dem Wasser ist noch immer im starken Maße von den lokalen Wetter- und Seegangsbedingungen abhängig. Trotz moderner Geräte, geschultem Personal und effektiver Kommando- und Kommunikationsstrukturen sind dem Einsatzteam unter bestimmten Umständen die Hände gebunden. Ein Blick auf die Seegangsstatistik der Ostsee zeigt allerdings, dass diese Umstände häufiger der Fall sind als man gemeinhin annehmen würde.

Im Sommer 2016 ist ein EU-finanziertes Kooperationsprojekt mit dem Namen SB-OIL unter der Leitung der Universität Rostock (Professur Geotechnik und Küstenwasserbau) gestartet.
Ziel des Projektes ist es eine in Deutschland entwickelte Technologie zur Ölhavariebekämpfung im südlichen Ostseeraum zu erproben und Möglichkeiten und Grenzen der Integration in bestehende Strukturen auf nationaler und internationaler Ebene zu untersuchen. Weitere Projektpartner sind die Maritime Universität Stettin und die World Maritime University aus Malmö. Das Projekt hat eine Laufzeit von drei Jahren und ein Gesamtbudget von 1.2 Millionen Euro.

Im Vorhaben SB-OIL liegt der Fokus auf zwei Schwerpunkten:
1. Bewusstseinsbildung zum Thema Ölhavariebekämpfung auf unterschiedlichen administrativen Ebenen und in der Öffentlichkeit
2. Beförderung der Bekanntheit des BioBind Konzeptes durch Schulungen

Um die tatsächliche Integration der neuen Technologie in bestehende Strukturen möglich zu machen müssen eine Vielzahl von Behörden und Institutionen beteiligt werden. Aus diesem Grund gibt es im Projekt assoziierte Partner, die das Projekt im Rahmen ihrer Möglichkeiten unterstützen. Dazu gehören: Landkreis Vorpommern-Rügen, Umweltamt Rostock, Polish Search and Rescue, West Pomeranian State Fire Brigade, Port of Gdynia Authority, Swedish Coast Guard, Danish Emergency Management Agency - Bornholm Unit und Klaipeda State Seaport Authority. Weitere Projektinformation sind unter www.sboil.eu verfügbar.

Dieses Handbuch ist eine Zusammenfassung der geltenden offiziellen Regularien zum Thema Ölhavariebekämpfung im Ostseeraum. Es ist kein Ersatz für Diese. Das Handbuch erhebt keinen Anspruch auf Vollständigkeit.

Für eine effektive Ölhavariebekämpfung, egal mit welchen Methoden, ist Vorsorgeplanung und die Erprobung der erstellten Pläne von grundsätzlicher Bedeutung. Nur so, kann im Schadens- bzw. Katastrophenfall sachlich und ergebnisorientiert gearbeitet werden.