Baltic Sea Region
Programme 2007-2013

Sub-regional risk of spill of oil and hazardous substances in the Baltic Sea (BRISK)

Model Scenarios Report

January 2012

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1 Introduction

1.1 BRISK Project setup

The project is defined in response to an increased concern about accidents and environmental damage in the Baltic Sea due to the significant increase of ship traffic, particularly the oil tanker traffic. Major oil spills can affect the economy of several countries and are hence a trans-national problem. The increased risk of oil spills is of great concern in the whole Baltic Sea region.

The objective of the project is to identify specific proposals for increased co-operation. The project will result in increased preparedness of authorities to respond to medium size oil spills and enhanced sub-regional co-operation. The network of responsible persons will be further developed. The project will promote building partnerships and co-operations among trans-national, national and regional authorities that are responsible for emergency and response operations in the Baltic Sea.

The BRISK project is partly financed by EU´s Baltic Sea Regional Programme 2007-2011with 3.3 million EUR for the period 2009 to 2012.The co-financing varies between 15 % and 25 %, depending on the home country of Project Partner.

The project partnership consists of the national authorities responsible for oil spill preparedness around the Baltic Sea together with HELCOM. The countries involved are: DK, SE, FI, EE, LT, LV, PL, DE, plus HELCOM. Russia in involved indirectly through the BRISK-RU project, which is financed by the Nordic Council of Ministers with 200.000 EUR. A list of the contracting authorities and the contact persons involved is given in the appendix.

The project activities are divided into the following 6 Work Packages (WP):
WP1: Management, responsible: LP (Lead Partner, Denmark)

WP2: Communication and information, responsible HELCOM

WP3: Risk assessment: Common methodology, unified data collection, common risk model, common assessment of risk of pollution and impact, Identification of additional response resources needed, resp. LP

WP4: Agreements: Development of proposals to remove administrative obstacles to the efficient response, resp.: LP

WP5: Investment plans: Preparation of integral and comparable investment plans for response resources, resp.: LP.

The structure of the project reports is given in below

Table 1-1 Document list of the BRISK project

Document number	**Document Title**
70618 3.1.1	Method Note
70618 3.1.2.1	Data Collection Note
70618-3.1.2.2	Data Collection Report
70618-3.1.3.0	Model Note,0- Introduction
70618-3.1.3.1	Model Note,1-Traffic
70618-3.1.3.2	Model Note,2- Transport
70618-3.1.3.3	Model Note,3- Vulnerability
70618-3.1.3.4	Model Note,4- Frequency
70618-3.1.3.5	Model Note,5- Spreading
70618-3.1.3.6	*Model Note,6- Numerical calculations*
70618-3.1.3.7	Model Note,7-Model modification
70618-3.2.1	Model scenarios
70618-3.2.2	Model results
70618-3.3	Response Resources
70618-4	Agreements
70618-5	Investment plans

1.2 The model scenario document

The report shall describe the scenarios that are selected within the present project and serve as documentation for why the scenarios are selected.

1.3 Method

The present data report is part of the Project on sub-regional risk of spill of oil and hazardous substances in the Baltic Sea (BRISK). BRISK work package 3 consists of the following work steps:

1. Method definition
2. Data collection
3. Model modification
4. Assessment of risk of pollution*(covered by the present report)*
5. Identification of need for adequate resources
6. Existing resources
7. Need for additional resources

The work step 4 on risk of pollution is reported in two documents:

1. 3.2.1 Model scenario Report: This note specifies the requirements to the suite of scenarios that are to be modelled in order to develop recommendations for the emergency response as well as for risk reducing measures to obtain a . *(covered by the present report)*
2. 3.2.2 Model result report: This report describes the model results that are obtained by applying the scenarios described in the 3.2.1 Model Scenario Report.

Further, the work of the experts of the Project Partners defining the model scenarios was structures in Working Groups. The outcome of these Working Groups was presented by the chair of each Group and is documented in the Appendix below.

1.4 Scope

Work step 4 (Assessment of risk of pollution)

Work step 4 (Assessment of risk of pollution) is based on the preceding work steps 1-3 (method definition, data collection, model modification).

The work step includes the definition of scenarios for changed response and risk reducing measures and the resulting effects on spilt oil amounts, affected areas, affected stretches of coastlines as well as relative extent of environmental damage.

The working step 4 is divided into the following reports:

- Model scenarios
- Model results

The present report describes the first bullet. It aims at providing the set of modifications and changes to the existing response capacities as well as to the exiting risk reducing measures. The scenarios have been developed among the experts of the Project Partners in different working groups.

Also input from experts from HELCOM Maritime is included.

2 Method

The method for selecting model scenarios is based on the project application form and hence the contract documents. Here, it is stated that the general objective of the project is to contribute to building up sufficient emergency response capacity and pollution response capability in the Baltic Sea region.

The risk analysis is a tool for strategic planning of emergency response and comprises among others the following specific objectives:

1 Development of the ship traffic

2 Development of the emergency response (5 scenarios)

3 Additional scenarios for navigational aids, describing measures for avoiding accidents (7 scenarios)

The scenarios that are selected are hence divided into the above three classes. Further, and in order to describe the existing situation it is necessary to establish a baseline or reference scenario.

The different scenarios are incorporated into different sub-modules of the model complex, see Figure 2-1. Here it is illustrated that the changed ship traffic will be included in the model at the left top side of the panel, whereas the modules for risk reducing measures are placed at the central top and the emergency response module is placed at the central bottom of the panel.

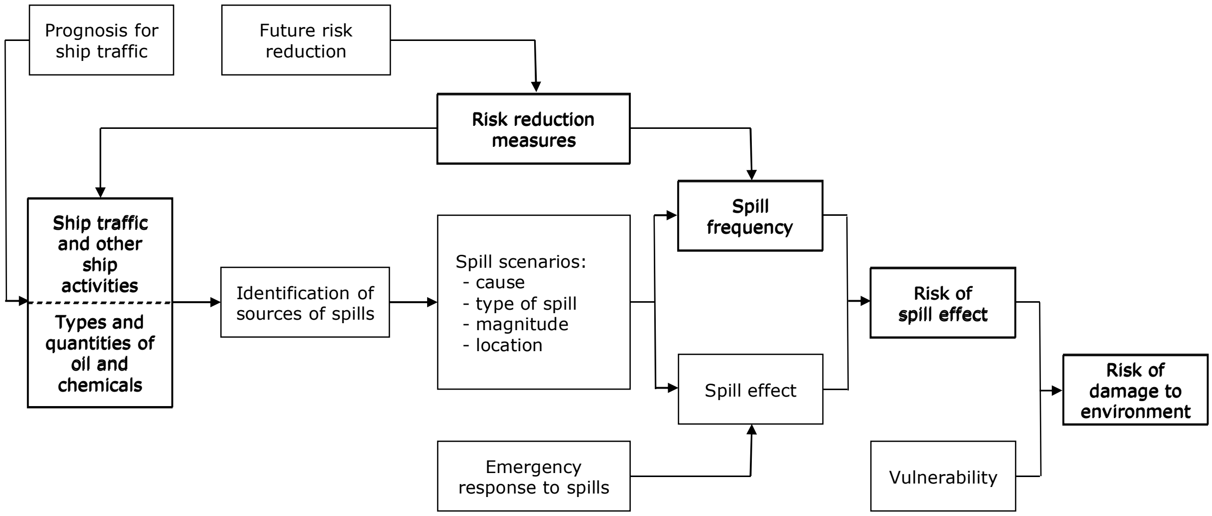


Figure 2-1 Illustration of model system with modules for different processes

3 Scenarios

The following chapters describe the different model scenarios.

3.1 Reference scenarios

The reference scenario shall be used to compare the modelled effect of the different future scenarios.

It is therefore evident that this scenario is based on the ship traffic as it is at present, i.e. as it was recorded by the AIS system in the one year period from July 2008 to June 2009, both month incl.

Further, the reference situation includes sub-divisions for not including risk reducing measures and for not including emergency response. These sub-scenarios will illustrate the effect that the model calculates for the existing measure sin place.

Table 3-1 Table for reference scenarios

Traffic	Risk reducing measures	Emergency response
As in 2008-9	non	As in 2010-15
As in 2008-9	As in 2008-9	Non
As in 2008-9	As in 2008-9	As in 2010-15

It is noted that the emergency response for the existing reference situation is represented by the years 2010-2015. This is so because several response vessels are purchased before the possible outcome of the present project will be implemented. Primarily, this applies to response vessels purchased by Finland, Sweden, Russia, Estonia, Latvia, Lithuania and Poland.

3.2 Future maritime traffic scenarios

The future marine traffic scenario is modelled for the year 2020. This year is chosen because it is so soon that a prognosis can be prepared with a relative high precision. Further, this time span will be relevant for the work package of this project that deals with possible investments.

Table 3-2 Table for future traffic scenario

Traffic	Risk reducing measures	Emergency response
As in 2020	As in 2010-2015	As in 2010-15

3.3 Response scenarios

Scenarios for response to oil spills have been developed by the Project Partners in different Working Groups. It was decided on the project meeting in Århus, 5-6 October 2010, that working groups shall develop different input to be used for modelling within the BRISK integral model. Each working group should concentrate on a specific type of input.

Each group has an appointed Lead Partner who shall take the initiative to promote the work in the group and who is the secretary of the group. The following groups are formed to describe response scenarios:

- WG3 Relocation of existing capacities (vessels)
  Lead: HELCOM; Group members: All Project Partners

- WG4: Additional response equipment
  Lead: POL(MOG); Group members: All Project Partners

- WG5: Night visibility
  Lead: SWE; Group member: DEN

- WG6: Recovery of oil from ice
  Lead: FIN; Group members: EST, RUS (via Brisk-RU)

One document for each working group is prepared that describes the terms, including output structure, time plan and a few choices/examples/guidelines.

The modelling will be carried out based on

- Traffic as modelled for 2020

- Existing level of emergency response (2010-15)

- The area of implementation is the entire Baltic Sea

Table 3-3 Table for response scenarios

No	Response scenario

No	Response scenario
4-1	Relocation of existing capacities (vessels)
4-2	1. Additional response equipment, as proposed by Project Partners 2. additionally 50% on boom lengths and on skimmer pumping rates
4-3	Night visibility
4-4	Recovery of oil from ice

3.3.1 Scenario 4-1: Relocation

The full report of Working Group 3 is given in appendix A.

Only Latvia and Poland (2 out of 3 vessels) indicated alternative home ports for their vessels. For the Latvian response capacity the relocation has little implications since the indicated alternative ports were the same as the current ports, only reshuffled between the vessels. In Poland, the indication of Kolobrzeg as an alternative home port for CZESLAW II (current home port is Swinoujscie), would improve the response capacity for the central coast of Poland.

Table 3-4 Scenario 5-1 for relocation of vessels: Selected vessels in Poland and Latvia are relocated.

Name of vessel	Location	Alternative home ports
CZESLAW II	Swinoujscie	Kolobrzeg
KAPITAN POINC	Gdynia	Swinoujscie
KA-14 ASTRA	Ventspils	Riga
A-90 VARONIS	Riga	Liepaja
JL - 1	Liepaja	None
RK-12 "VALPAS"	Riga	Ventspils

3.3.2 Scenario 4-2 and 4-3: Additional response equipment

The table prepared by Working Group 4 is given in appendix B.

The output of Working Group 4 is given as two different scenarios described in detail by two spreadsheets:

- Scenario 4-2: Describes the increase in boom length and skimmer capacity as proposed by the partners
- Scenario 4-3: Describes an 50 % extension of the length of applied booms and 50% increase of applied pumping capacity.

Table 3-5 Scenario 4-2 and 4-3 for more response equipment.

No	Scenarios for increased boom, skimmer and storage
4-2	Increase in boom length and skimmer capacity as proposed by the partners
4-3	50 % extension of Boom and skimmer capacity

Table 3-6 Increased recovery rates and boom lengths as proposed by the partners, scenario 4-2. The capacities below represent additions only, on top of the existing response capacities.

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage ca-pacity	Additional storage	Boom length	Additional boom length
Denmark	6	GUNNAR SEIDENF ADEN	Korsör	60	125	312		600	
Denmark	6	MARIE MILJÖ	Korsör	50	100	64		200	
Denmark	6	GUNNAR THORSO N	Frederik-shavn	60	125	312		600	
Denmark	6	METTE MILJÖ	Copenhagen	50	100	64		200	
Denmark	6	MS201	korsör		0		360		
Denmark	6	MS202	Copenhagen		0		360		
Denmark	6	MS203	Frederik-shavn		0		360		
Denmark		TOTAL			450		1080		0
Germany	5	KIEL	Kiel	160		325		600	200
Germany	5	SCHARHÖRN	Kiel	640		430		400	600
Germany	5	BOTTSAND	Rostock	320		790		0	200
Germany	5	VILM	Rostock	320		500		0	200

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage capacity	Additional storage	Boom length	Additional boom length
Germany	5	STRELASUND	Stralsund	160		200		0	600
Germany	5	ARKONA	Stralsund	640		400		800	1000
Germany	5	GERMANY ADD1	Flensburg		45				400
Germany	5	GERMANY ADD2	Heiligen-damm		45				200
Germany	5	GERMANY ADD3	Lübeck		45				400
Germany	5	GERMANY ADD4	Lübeck		45				200
Germany		TOTAL			180		0		4000
Poland	5	CZESLAW	Swinoujscie	40	250	20	50	340	1500
Poland	4/5	KAPITAN POINC	Gdynia	280	100	516		600	600
Poland	4		Gdynia		150		50		900
Poland	4		Leba		45				450
Poland	4		Ustka		45				450
Poland		TOTAL			500		100		3900
Lithuania	4	SAKIAI	Klaipeda	200	200	220	500	500	500
Lithuania	4	Soll Tengiz	Butinge	100	200	150	500	250	500
Lithuania		TOTAL			400		1000		1000
Latvia	3	KA-14 ASTRA	Ventspils	60	160	300			725
Latvia	3	A-90 VARONIS	Riga	160	160	30	101,5	800	1000
Latvia	3	JL - 1	Liepaja	0	100	100	16	400	
Latvia	3	RK-12 "VALPAS"	Riga	60		14		600	
Latvia		TOTAL			420		117,5		1725
Estonia	2	EVA-316	Tallinn	120	1000	200		0	10000
Estonia		TOTAL			1000		0		10000

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage capacity	Additional storage	Boom length	Additional boom length
Russia		TOTAL			0		0		0
Finland	2	FINLAND ADD1	Helsinki		78		1200		800
Finland	1	FINLAND ADD2	Turku		78		1200		800
Finland	1	FINLAND ADD3	Turku		60		80		0
Finland	2	FINLAND ADD4	Kotka		60		80		0
Finland	2	Stockpile shore based	Hanko		8			1600	2000
Finland	2	Stockpile shore based	Helsinki		26				4000
Finland	1	Stockpile shore based	Kalajoki		18			1600	2000
Finland	2	Stockpile shore based	Kotka		8			2800	1200
Finland	2	Stockpile shore based	Porvoo		18				800
Finland	1	Stockpile shore based	Turku		8		100		2000
Finland		TOTAL			362		2660		13600
Sweden	1	KBV 045	Gävle	50		150		300	
Sweden		KBV 010	Djurö		65		360		2400
Sweden	1	KBV 046	Södertälje	50		150		300	
Sweden	3	KBV 047	Kalmar	50		150		300	
Sweden	5	KBV 201	Karlskrona	50		104		300	
Sweden	5	KBV 202	Simrishamn	50		104		300	
Sweden	6	KBV 048	Helsingborg	50		150		300	
Sweden	6	KBV 051	Gothenburg	30		190		300	

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage capacity	Additional storage	Boom length	Additional boom length
Sweden	1	KBV 050	Kungshamn	30		190		300	
Sweden	6	KBV 001 Poseidon	Göteborg	500	65	1150	300	600	2300
Sweden	3	KBV 002 Triton	Slite	500	65	1150	50	600	1800
Sweden	5	KBV 003 Amfitrite	Karlskrona	500	165	1150	300	600	2800
Sweden	1	Stockpile shore based	Härnösand		0		360		400
Sweden	1	Stockpile shore based	Härnösand						1500
Sweden		TOTAL			360		1370		11200
EMSA		TOTAL			0		0		0

Corrections: After running the model a check of the additional boom lengths gave rise to the following corrections in Table 3-7:

Table 3-7 Correction of additional boom length

Name of vessel	Wrong additional boom length (m)	Corrected additional boom length (m)
VILM	200	400
STRELASUND	600	1400

With the corrected boom length, the booms available in Germany are of 5000m length and not 4000m length as assumed in the model. The difference is not considered to give a qualitative different output to the analysis.

3.3.3 Scenario 4-4: Night visibility

The full report of Working Group 4 is given in appendix C

The following was concluded by the working group:

Existing systems have not been tested under real conditions
Detections are not always oil – could be algae's, ice or just bleach water

Use of IR and UV light is a way to keep in touch with an oil slick and so are the radar systems. This indicates the importance of aircrafts with remote sensors to lead the ships to high concentrations of spilled oil.
The use of sensors would probably increase the recovery rate, but only to a limited extent.
A qualified estimate from WG 5 is that recovery vessels with remote sensors installed will be able to work up to 85% of the time (24 hours) under certain conditions.
We do have to keep in mind that storage capacity and turn over time for vessels from starting recovery to offloading and back for new recovery still is a limitation factor.

In addition there are some other beneficial effects from having sensors of this type. They could be used in fire fighting (IR) to find the hot spot, SAR missions (IR and UV) looking for people in water or on shore, aids to navigation (IR and radar) looking for small targets and ice.

Expressed in other terms, it is expected that recovery would be possible in maximum 50% of the dark period.

Table 3-8 Scenarios for night visibility

No	Scenario for increased visibility at night
4-4	Down time due to night an bad visibility is reduced by 50%

3.3.4 Scenario 4-5: Recovery of oil from ice

Oil recovery in ice was investigated. The preliminary findings were presented at the Partner Meeting on 11-12 April 2011 in Copenhagen. The Meeting considered the outcome of Working Group 6 led by Finland (Presentation 4) and agreed on the presented approach on how to reflect the current efficiency of oil recovery in ice and that 20% of recovery rate in open waters, during a three-months period and in areas covered by ice during an average winter, would be a good estimate to reflect recovery in ice.

The Meeting agreed that the model should estimate how much could be gained if efficiency of oil recovery in ice is doubled.

Table 3-9 Scenarios for oil recovery from ice

No	Oil recovery in ice
4-5	Future scenario: 40% recovery compared to open water

3.4 Additional scenarios

This chapter gives a brief overview of the scenarios describing the possible effects of future introduction of navigational aids for reducing risk of accidents. The effects of possible additional risk reducing measures are mentioned in the contract documents. Further, a meeting of experts from HELCOM Maritime Working Group held at 07 March 2011 in Malmö provided valuable input and proposals for modelling different risk reducing measures.

The modelling will be carried out based on

- Traffic as modelled for 2020
- Emergency response capacities as for 2010-15

Table 3-10 Table for risk reducing measure scenarios

Scenario no.	Risk reducing measure	Area of implementation
3-1	Mandatory pilotage	Danish Straits
3-3	Maximum Vessel traffic system (VTS)	Fehmarn, Estonia, (Kattegat, Langelandsbelt, Bornholm, Gotland)
3-4	Traffic separation schemes (TSS)	Kattegat
3-5	Electronic chart display and information system (ECDIS)	All
3-6	Double hull at the cargo tank (<5000BRT)	All
3-7	Double hull at bunker tank	All
3-8	Escort towing in narrow shipping lanes	Where escort towing is practiced at present.

3.4.1 Scenario 3-1: Mandatory pilotage in Danish Straits

Free passage in the Danish Straits, without mandatory pilotage, is at present regulated by international law.

According to international laws (UNCLOS, etc.), a coastal state may declare its own rules for an innocent passage in a strait, used for international navigation, regarding the safety at sea and for traffic regulations, but never prevent or limit the transit passage. The Treaties of the Sound (“Oresundstraktaten” or “Traite pour l’abolition des droits du Sund et des Belts”) from 1857 mentions that the passages through the Great Belt and the Sound shall be done according to the traditional rules for innocent passage, meaning that as long as foreign state-owned vessels don't do anything hostile and that it can be apprehended as a threat, this passage will be supported by international law and its habitual practices. The coastal states are prevented by international law to make any mandatory rules in the Straits that could prevent the free innocent passages according to the existing international agreements. Any compulsory measures, including pilotage, etc. may be introduced in a legal way only in a form of special international convention.

IMO, the International maritime Organisation under the UN, has given a recommendation that large vessels make use of the pilot service during their passage through the Danish Straits. In praxis, this recommendation is followed by almost all vessels in question.

A requirement for compulsory pilotage is often been brought forward in the public discussion. Since the issue is a part of the public awareness, it is considered worthwhile by the majority of the Project Partners to include this scenario in the present study in order to clarify the order of magnitude of the effect of such an intervention.

The effect, however, will be limited to those few ships that at present do not use of the pilot services and hence represent an increased risk.

3.4.2 Scenario 3-2:

Void.
This scenario was deleted because it is included in scenarios 3-3.

3.4.3 Scenario 3-3: VTS

The Vessel Traffic System (VTS) is introduced in several areas of the Baltic Sea. Examples for existing VTS systems are: Great Belt, The Sound, Gulf of Finland, Gdansk Port area, St. Petersburg Port area. Further, it is anticipated that a VTS system will be established in the Fehmarn Belt during the construction of the future Fehmarn Belt Link.

Despite the significant risk reducing effect of the existing VTS systems, the analysis for risk of accidents and spills indicates that a considerable risk remains in Baltic Sea. Particularly, the main tanker rout legs in the Kattegat, the Fehmarn Belt, the waters around Bornholm and north-east of Gotland represent areas of significant risk for spills.

The present scenario shall investigate the potential risk reduction due to VTS systems in these tanker route legs, see the green lines in the Figure 3-1 below.

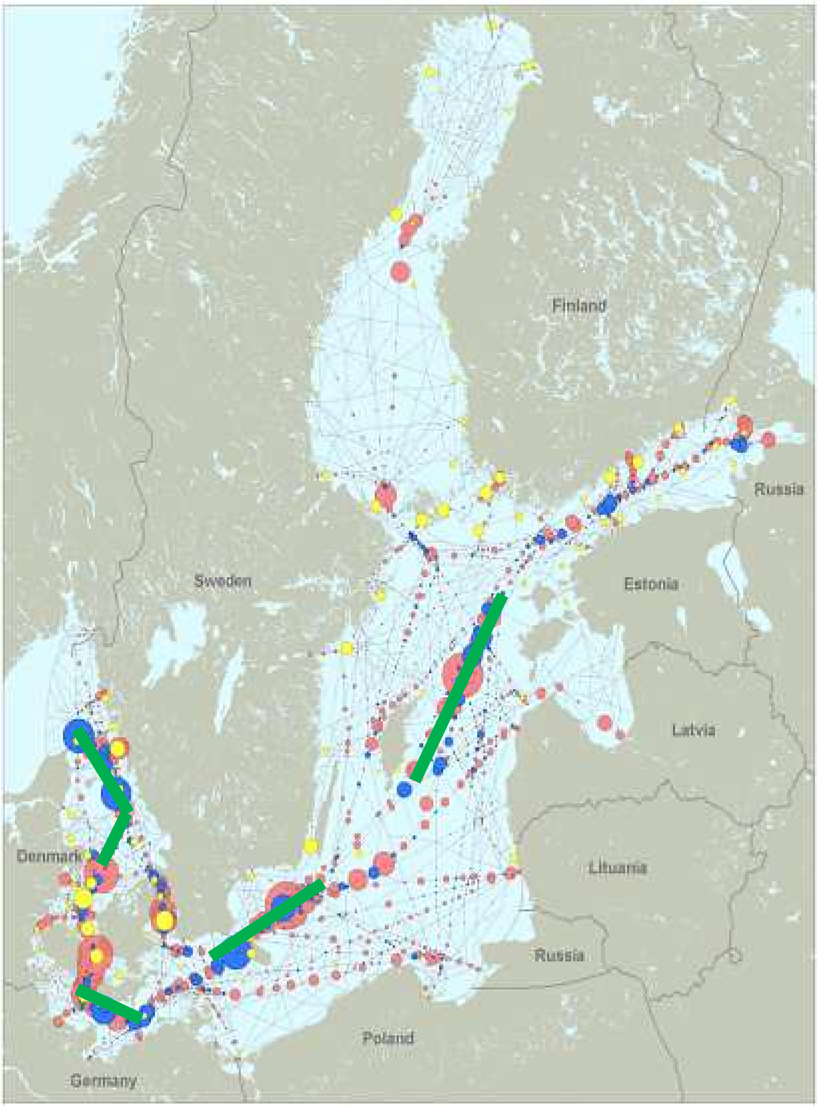


Figure 3-1 Illustration of additional VTS systems in Scenario 3.3. Note that VTS systems already are in place in Gulf of Finland, the Sound and the Great Belt.

Narrow and dense-traffic routes like the Great Belt, the Sound and the Gulf of Finland exhibit relatively low risks, most likely because of the effect of the existing VTS systems.

3.4.4 Scenario 3-4: TSS

The scenario for additional Traffic Separation Scheme (TSS) is received from the Danish Maritime Safety Agency (DAMSA). The scheme is considered for the Kattegat region.

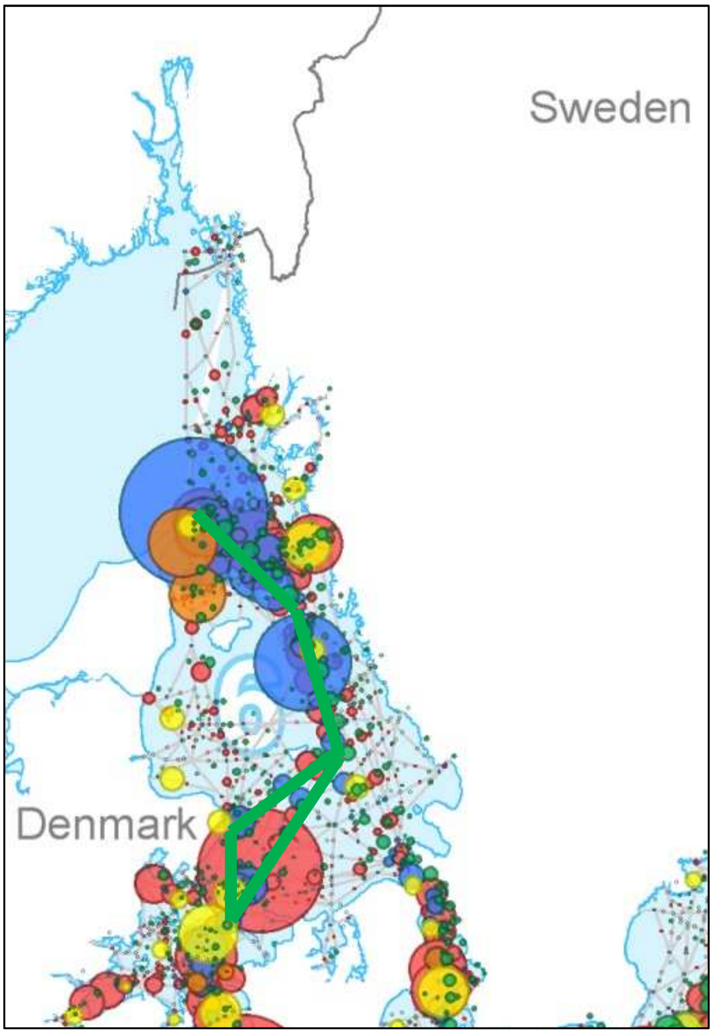


Figure 3-2 Illustration of additional TSS system for Kattegat in Scenario 3.4. The green line indicates where the new TSS is considered.

3.4.5 Scenario 3-5: ECDIS

An Electronic Chart Display and Information System (ECDIS) is a computer-based navigation information system that complies with International Maritime Organization (IMO) regulations and can be used as an alternative to paper nautical charts.

An ECDIS system displays the information from electronic navigational charts (ENC) or Digital Nautical Charts (DNC) and integrates position information from the Global Positioning System (GPS) and other navigational sensors, such as radar and automatic identification systems (AIS). It may also display additional navigation-related information, such as Sailing Directions and fathometer.

In relation to the discussion about how to include ECDIS in the scenarios of the BRISK project, the extracts/references to the HELCOM Ministerial Meeting/Recommendation are given below reflecting the requests of the HELCOM ministerial meeting:

- HELCOM Moscow Ministerial Meeting in May 2010 agreed "to undertake measures to improve mariners' abilities to assess and interpret hydrographic content in nautical charts and publications either in printed or digital form, especially in the Electronic Chart Display and Information System";

- The HELCOM Recommendation 28E/11 addresses ECDIS in the context of ice navigation: http://www.helcom.fi/Recommendations/en_GB/rec28E_11/

Based on the above and on the requirements of several Project Partners, it was decided to include the effect of ECDIS in the simulations.

3.4.6 Scenario 3-6: Double hull at the cargo tank (<5000BRT)

At the moment the requirement for navigation in the Baltic Sea is restricted to double hull at the cargo tanks for ships larger than 5000 BRT. Smaller tankers represent a potential risk for oil spills. The order of magnitude of this risk is therefore of interest for the study.

This scenario was agreed upon during the discussion among the Project Partners.

3.4.7 Scenario 3-7: Double hull at bunker tank

Double hull at the bunker tanks are not required for the Baltic Sea.

This scenario was agreed upon during the discussion among the Project Partners.

3.4.8 Scenario 3-8: Escort towing service

Escort towing for all major vessels in narrow shipping lanes are in include in the investigation. Shipping lanes are selected where escort towing is practiced from time to time at present.

This scenario was agreed upon during the discussion among the Project Partners.

3.4.9 Potential future scenarios

Some scenarios have been discussed among the experts at the different meetings. It was decided not to include them in the analysis but to mention them as possible measures that may play a significant role in the future. At present it is not considered that modelling of these measures is not possible to a satisfying degree. The scenarios are listed below.

Table 3-11 Table for risk reducing measure scenarios that may be implemented in a later stage

Risk reducing measure	Area of implementation
Ice training fro navigators	All
Regular emergency response exercises	All
Icebreaker convoys	All

The response to major oil spills in the Baltic Sea meets natural limitations as the sea area is confined by coast lines, some areas are even very narrow. This means that the time and space window where efficient recovery can take place is limited compared to open ocean conditions. Rapid response actions over large areas often imply use of dispersants or use of in-situ burning techniques. Use of these methods implies other risks for environment as well as for safety and no agreement could be found.

For Russian arctic waters, dispersants are included as a measure for response. In the Norwegian and Danish waters of the Arctic, experiments and scientific investigations have been conducted with in -situ burning. These two options have been discussed in the project group and it was decided not to include these measures in the study, mainly because they are not recommended by Helcom.

3.4.10 Not invested scenarios

Some scenarios have been discussed and requested by some Project Partners but could not be investigated due different reasons. These scenarios are listed below together with the reason, why they not could be investigated:

Table 3-12 List of scenarios not investigated and the reasoning for disregarding them

Risk Reducing Measures	Reason for excluding scenario in analysis
Systematic calls to vessels (add. to 2020 RRM)	Effect will only be in areas with recommended pilotage = DK. In DK systematic calls are practiced already, therefore no effect expected.
Bridge Navigational watch alarm system (BNWAS)	IMO requires that ship s shall be equipped with BNWASbefore 2020.
Surveillance of potentially haz-ardous ships (add. to 2020 RRM)	Few countries have reported that they survey danger-ous ships. It is expected that all countries survey these ships.

Alcohol limits (add. to 2020 RRM)	After 2012 the 0,5 promille limit will be introduced. Effect of additional limitation is questionable and very difficult to model.
International reporting system (SafeSeaNet) (add. to 2020 RRM)	SafeSeaNet is valid for entire Baltic Sea and introduced already (1/1-2011)
Emergency towing of damaged ships (add. to 2020 RRM)	Emergency towing shall be operational before 2020 according to HELCOM Recommendation.

4 Summary

4.1 Scenarios

Summarising the above scenario descriptions the following list of scenarios is investigated:

Table 4-1 Overall list of scenarios

No.	ID	Traffic	Risk Reducing Measures	Response capacity	Analysis
1	1-1	2008/9 traffic	No RRM	Exist. response	Comparison to 1-3
2	1-2	2008/9 traffic	Exist. RRM	No response	Comparison to 1-3
3	1-3	2008/9 traffic	Exist. RRM	Exist. response	Reference
4	2-1	2020 traffic prognosis	2020 RRM (already decided upon)	Exist. response	Comparison to 1-3
5	3-1	2020 traffic prognosis	Mandatory Pilotage in the Danish Straits (add. to 2020 RRM)	Exist. response	Comparison to 2-1
6	3-2	2020 traffic prognosis	Minimum Vessel traffic system (VTS) only at Gotland hotspots (add. to 2020 RRM)	Exist. response	Comparison to 2-1
7	3-3	2020 traffic prognosis	Maximum Vessel traffic system (VTS), Kattegat, Fehmarn, Bornholm and Gotland hotspots (add. to 2020 RRM)	Exist. response	Comparison to 2-1

No.	ID	Traffic	Risk Reducing Measures	Response capacity	Analysis
8	3-4	2020 traffic prognosis	Traffic separation schemes (TSS) (add. to 2020 RRM)	Exist. response	Comparison to 2-1
9	3-5	2020 traffic prognosis	Electronic chart display and information system (ECDIS) for all large ships(add. to 2020 RRM)	Exist. response	Comparison to 2-1
10	3-6	2020 traffic prognosis	Double hull at the cargo tank (<5000BRT), (add. to 2020 RRM)	Exist. response	Comparison to 2-1
11	3-7	2020 traffic prognosis	Double hull at bunker tank (add. to 2020 RRM)	Exist. response	Comparison to 2-1
12	3-8	2020 traffic prognosis	Escort towing for all tankers in narrow shipping lanes where towing is done now (add. to 2020 RRM)	Exist. response	Comparison to 2-1
13	4-1	2020 traffic prognosis	2020 RRM	Relocation of existing capacities (vessels)	Comparison to 2-1
14	4-2	2020 traffic prognosis	2020 RRM	Additional response equipment, as proposed by partners	Comparison to 2-1
15	4-3	2020 traffic prognosis	2020 RRM	50% more response equipment	Comparison to 2-1
16	4-4	2020 traffic prognosis	2020 RRM	Night visibility (0.85)	Comparison to 2-1
17	4-5	2020 traffic prognosis	2020 RRM	Recovery of oil from ice (from 20% to 40%)	Comparison to 2-1

4.2 Output

The outputs of the scenarios are presented in the result report.

For each sub-region, each spill class (less and more than 5000t) and each scenario the following questions are answered:

- What is the change in annual amount of spilt oil?
- What is the change in annual amount of recovered oil (remaining)?
- What is the change in annual env. damage?
- What is the change in annually impacted coastline?

The above results are also given for the entire Baltic Sea and for all spills.

Each scenario result will be given as difference to the reference scenario.

The result description will feed into the investment plan where the benefits (analysed above) will be compared with the respective costs and ranked according to their cost-benefit.

Appendix A: WG 3: Relocation of existing response capacities

Final report 28 March 2011

Main aims and organisation of the work

At the BRISK Project meeting in Århus, 5-6 October 2010, working groups were established to develop different inputs to be used for modelling within the BRISK integral model. Working Group 3 has been tasked to describe the response scenario on relocation of existing capacities. The Working Group has been chaired by HELCOM and the list of participants is given in **Annex 1**.

The Working Group was to prepare and agree on 2-3 new lists where the response capacities, represented by the respective vessels, were distributed differently and, if possible, in a more efficient way. The new distributions were to be proposed based on the risk distribution, and in order to increase total response capacity and minimise the total cost for preparedness in the HELCOM area.

The summary of the main results of the work by WG 3 is presented below:

1. Information on vessels to be delivered and become operational within the next three years has been collected (see the attached excel file, “yellow” highlight). Countries are improving their response capacity by purchasing new vessels. In the report, these vessels have been taken into account as part of the existing capacities.
2. The WG has considered how to relocate vessels of each Project Partner. Most of the countries have reported that relocation of vessels is in many cases impossible due to the fact that many vessels are multi-functional, having dedicated tasks others than environmental surveillance. The current situation, as shown in the figures 1, can therefore be seen as the optimal situation and relocation of capacities cannot be considered as a practical way of improving the response capacity in the Baltic Sea. **Nevertheless, one theoretical scenario on some response vessels distributed differently in Germany, Sweden, Finland, Latvia, Poland has been created, following the risk pattern and suggestions by Poland and Latvia on their alternative home ports (the excel file)**. This alternative scenario could be used to “validate” the existing distribution of the vessels from the overall Baltic Sea point of view.
3. Additionally, the Working Group has considered the actual mobilization time of existing vessels, in comparison to the response time recommended by HELCOM (Recommendation 31/1). The actual mobilization time of the vessels is indicated in the attached excel file. The cruising speed, instead of maximum speed, has been used for each vessel (the reported maximum speed minus

ten percent). **Similar correction to the vessels speed is recommended to be used in the model.**

4. The Group has investigated the importance of prompt alarming of neighboring countries in case of a spill in a theoretical case. Prompt alarming of vessels from neighboring countries will improve the possibility to recover oil substantially at the early stage of accident. In reality the recovery rate is reduced from 100% e.g. by weather conditions, quality of oil etc. **Therefore, it is recommended to decrease the recovery capacity of the vessels in the modeling by 25%-50%.**
5. Some additional information has been collected to find out which vessels can handle high-viscosity oil (see the excel file). The capacity of vessels able to handle HVO should be improved, e.g. in the Baltic Proper. **It is recommended to include in the model a case of a spill of high-viscosity oil whereby only these vessels are used, and their recovery rate is decreased by 50%-75%.**
6. Storage capacity becomes a factor only after some time from the operation start. None of the response times included in the above scenarios is long enough to consider storage capacity.

Existing response resources

Response resources in the Baltic Sea countries as well as EMSA chartered vessels have been used (as updated by the Contracting Parties after the HELCOM RESPONSE 13/2010 meeting). The countries were further requested for some updates and additional information (**Annex 2**). A separate excel file attached to this report indicates which information has been updated.

The scenarios are analyzing the sub-regional capacities in the Baltic Sea, meaning that only vessels which have oil response equipment and can be sent abroad are taken into account ("dedicated" resources), unless something else is mentioned. Consequently, smaller vessels with recovery equipment, only meant for national use, have not been included. For example, Finnish regional rescue authorities have 31 boats with recovery equipment which are not taken into account. This will to some extent underestimate the national capacities, which should be kept in mind.

The scenarios represented in this report are not only showing the current response capacity situation in the Baltic Sea, but also taking into account the following large response vessels which are delivered and becoming operational within the next three years in the Baltic Sea countries:

- Sweden will have a total of four new ships for response purposes in the near future. The first ship will be delivered in early summer 2011 and the three remaining in 2012. The home ports for the new ships will be Stockholm, Kungshamn, Kalmar and

Härnösand. Sweden also reported that some relocation of the existing vessels will occur when the new ships become operational.

- Finland will have one new ship delivered for response purposes during year 2011. The home port for this multi-functional ship will be Kirkkonummi.
- Estonia will have one new vessel for response purposes by the end of 2012 with Tallinn as its home port.

Re-location of resources

Relocating response vessels is a way of optimizing the coverage of the response capacity in the Baltic Sea. Therefore, the countries were requested to indicate possible alternative home ports for their response vessels. Many countries stated that in reality, relocation of vessels into new home ports is a challenging task and even impossible due to the fact that many vessels are multi-functional, having dedicated tasks others than environmental surveillance. Thus, only Latvia and Poland (2 out of 3 vessels) indicated alternative home ports for their vessels. For the Latvian response capacity the relocation has little implications since the indicated alternative ports were the same as the current ports, only reshuffled between the vessels. In Poland, the indication of Kolobrzeg as an alternative home port for CZESLAW II (current home port is Swinoujscie), would improve the response capacity for the central coast of Poland.

As a theoretical scenario, alternative home ports have also been suggested for four vessels in Germany (re-shuffling of vessels - strengthening capacities in Stralsund and Kiel while decreasing capacities in Rostock), for two vessels in Finland (one vessels from Kirkkonummi moved to Kotka, and one vessel from Turku moved to Vasa), and for two vessels in Sweden (one vessel from Kungshamn moved to Härnösand to strengthen capacities in the GoB, and one vessel from Karlskrona moved to Slite to strengthen capacities near Gotland). The list of alternative home ports is included in the excel file. No new home ports have been proposed for vessels in Estonia (all ships close to the high-risk areas), Denmark, Lithuania (very short coastline) and Russia. This theoretical scenario could be used to validate the existing distribution of ships from the overall Baltic Sea point of view.

Response time

HELCOM Recommendation 31/1 “Development of national ability to respond to spillages of oil and other harmful substances” requires that “Governments of the Contracting Parties to the Helsinki Convention should, in establishing national contingency plans, aim at developing the ability of their combating services:

(i) to keep a readiness permitting the first response unit to start from its base within two hours after having been alerted;

(ii) to reach within six hours from start any place of a spillage that may occur in the response region of the respective country;

(iii) to ensure well organized adequate and substantial response actions on the site of the spill as soon as possible, normally within a time not exceeding 12 hrs".

Thus, according to the Recommendation mobilization time (MT) of vessels should not exceed 2 hrs, within 8 hrs (2 MT and 6 "travelling" time (TT)) ships should be able to reach any place within the national waters, and within 12 hrs (2 MT+10TT) be able to mobilize international response on the spill side.

According to the information collected from the countries, the real mobilization time sometimes differs from the recommended one for some of the vessels.

Scenarios

There is some difference between the recommended and actual mobilization time, with some vessels having shorter and some longer mobilization time. However, taking only area coverage of vessels into account, the current situation is satisfactory. In 8 hrs most areas in the Baltic Sea are covered, but for example no vessels will reach the Bothnian Bay within this time. When modeling the response time, it has not been taken into account that at any time some of the response vessels are under repair and cannot be used for response purposes, therefore the picture of the response capacity is overestimated. The following assumptions were made for the modeling the response time scenarios:

Denmark: Of the six ships with home port Korsör, three are at one time at sea 24/7. These three ships were selected randomly and given a MT of 0 hrs with Korsör as the starting point. GUNNAR SEIDENFADEN and GUNNAR THORSON were given a 12 hr MT according to the comment on question five, annex 2.

Germany: The ships SCHARHÖRN and ARKONA were given a MT of 0 hrs since these ships are at sea 24/7. The starting point for SCHARHÖRN is a position westerly of island FEHMARN and for ARKONA a position between Kadetrinne and island Rügen.

Finland: The ships TURSAS, UISKO and MERIKRAHU were given a MT of 0 hrs since the ships are at sea 24/7. The starting point for these ships is their home ports. All three naval forces ships (HALLI, HYLJE and new vessel) were given a 4 hr MT even though only one of the three has a MT of 4 hrs at one time. Of the nine Meritaito Oy ships, three ships with homeports in Oulu, Turku and Helsinki were given a 6 hr MT, the others were given a MT of 48 hrs.

Sweden: To reflect the one ship being at sea 24/7 in each Swedish coast guard region (totally four regions), the ships with the following home ports were given a MT of 0 hrs; Södertälje, Karlskrona, Göteborg and Härnösand. The starting point for these ships is their home ports. The other Swedish ships were given a MT of 2 hrs.

Lithuania: A MT of 3 hrs was given to Soll Tengiz even though the vessel has limited possibilities to be engaged in oil recovery since it is engaged in many other duties.

Latvia: The non-propelled barge JL-1 was not taken into account in the modeling since the vessel is only meant for national purposes.

Estonia: All Estonian ships were given a one hour MT even though it can be less (15 minutes -1 hour according to inner regulations).

Russia: All Russian ships were given a MT of zero even though the MT varies between zero hours in the summer and 2 hrs wintertime. Russian vessels with the home port reported as the Gulf of Finland were given St. Petersburg as their homeport. Additionally, seven Russian vessels without both recovery systems and booms have been excluded from the scenarios. Russian vessels, which are meant for national use were excluded from simulating international response. These vessels however are substantially increasing resources available for response in Russian national waters which has been depicted in map 6.

The figures are based on the cruising speed of the vessels, calculated as the reported maximum speed minus ten percent. The reported cruising speed of the vessels varied between 5-20 %. The assumption of a 10 % reduction of the maximum speed can therefore be acceptable. By using the cruising speed, weather and ice conditions, obstacles and other factors preventing the vessels from moving with maximum speed are taken into account. No speed has been reported for Russian vessels and therefore the speed calculation made by COWI was used as the maximum speed. The reported cruising speed was used for the Russian vessels YASNYY and TOPAS.

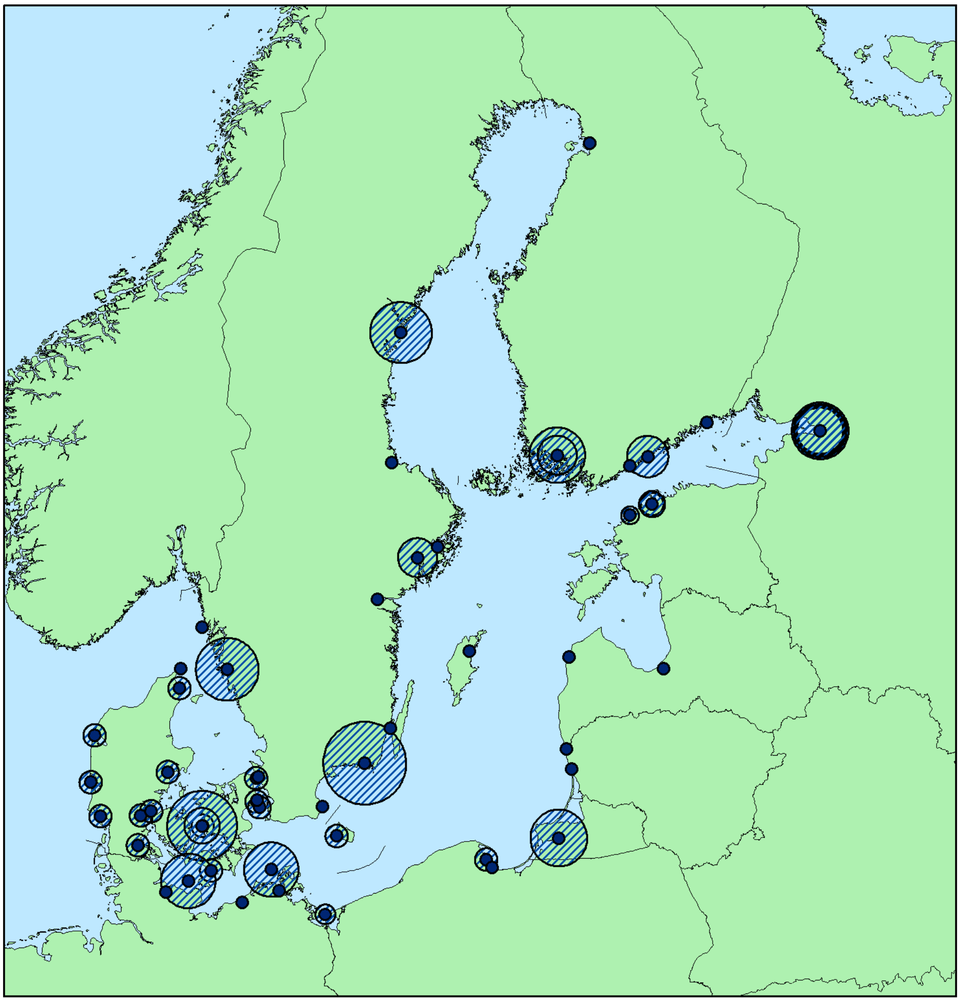
In the following maps different scenarios of response times (response time radius), both using the recommended MT and the actual MT, have been visualized.The maps are showing with circles how far a response vessel has reached within the given time. One circle may represent two or more ships having the same home port and mobilization time. Many circles around one port indicate ships with the same home port but different mobilization times.

Map 1. Reported Mobilization Time < 2 hrs

The map shows the situation up to two hrs after vessels have been alerted, according to the reported mobilization time. Some vessels are already at sea. Vessels with MT of 2 hrs and more are still in home ports. Please note that four vessels in Sweden, three vessels in Denmark and two vessels in Finland are 24/7 at sea; however their starting points have been assumed to be their home ports. Two vessels in Germany are also at sea 24/7 but their starting points have been assumed to be a position westerly of island Fehmarn and a position between Kadetrinne and island Rügen. Several vessels in the south-western Baltic Sea, along the Swedish coast and in the Gulf of Finland have MT shorter than required by Recommendation 31/1.

Draft 03.03.2011

Scenario of area coverage of response vessels
with mobilization time < 2 hours reported by countries



Response vessel starting point

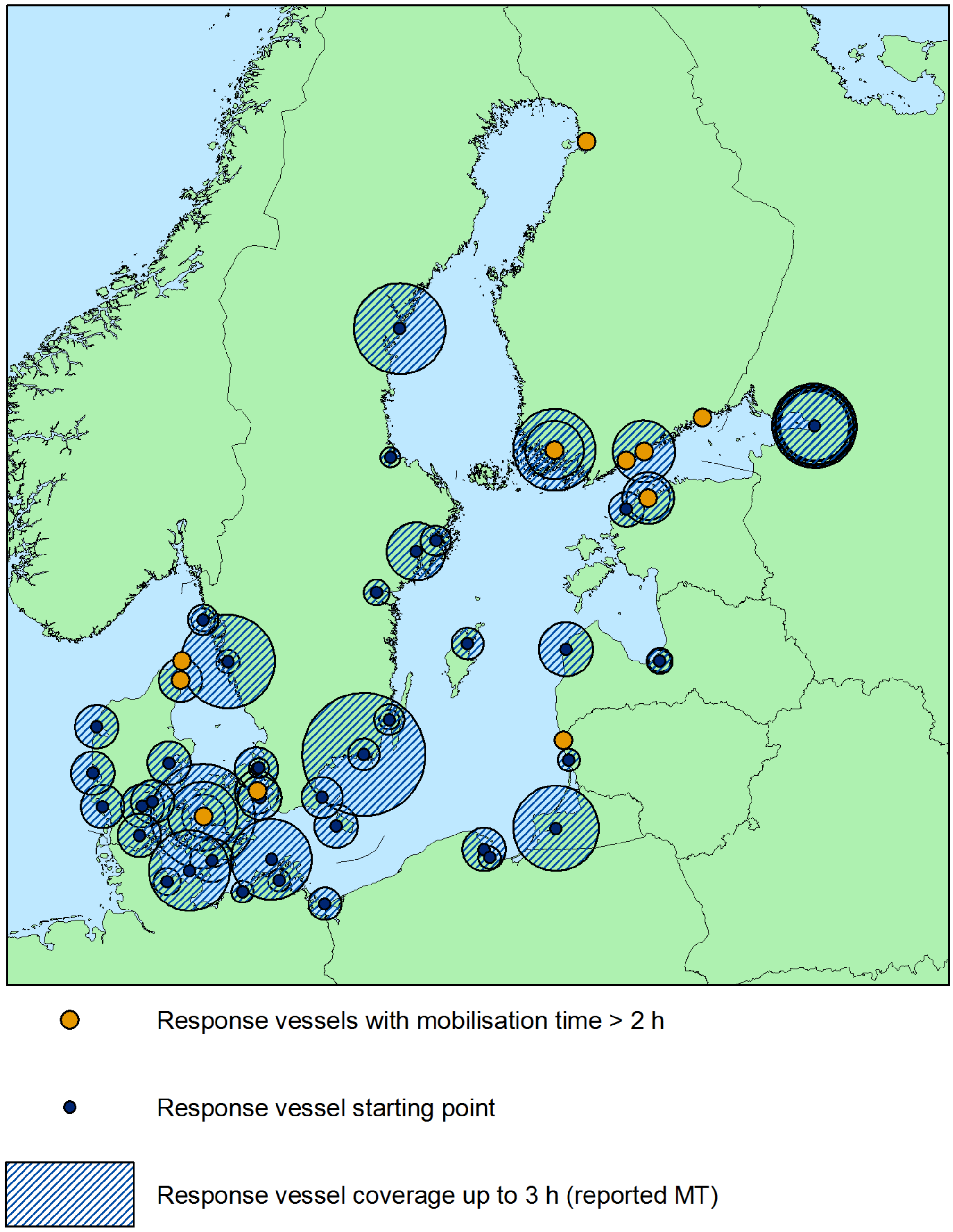
Response vessel coverage up to 2 h (reported MT)

Map 2. Reported Mobilization time 2 hrs

The maps shows how the situation has evolved, comparing to map 1, after 2 hrs from alerting the ships. This scenario corresponds to the requirements of Recommendation 31/1. Response vessels with mobilization time longer than 2 hrs (16 ships) are still in home ports.

Draft 03.03.2011

Scenario of area coverage of response vessels
3 h from alert and according to reported mobilisation time

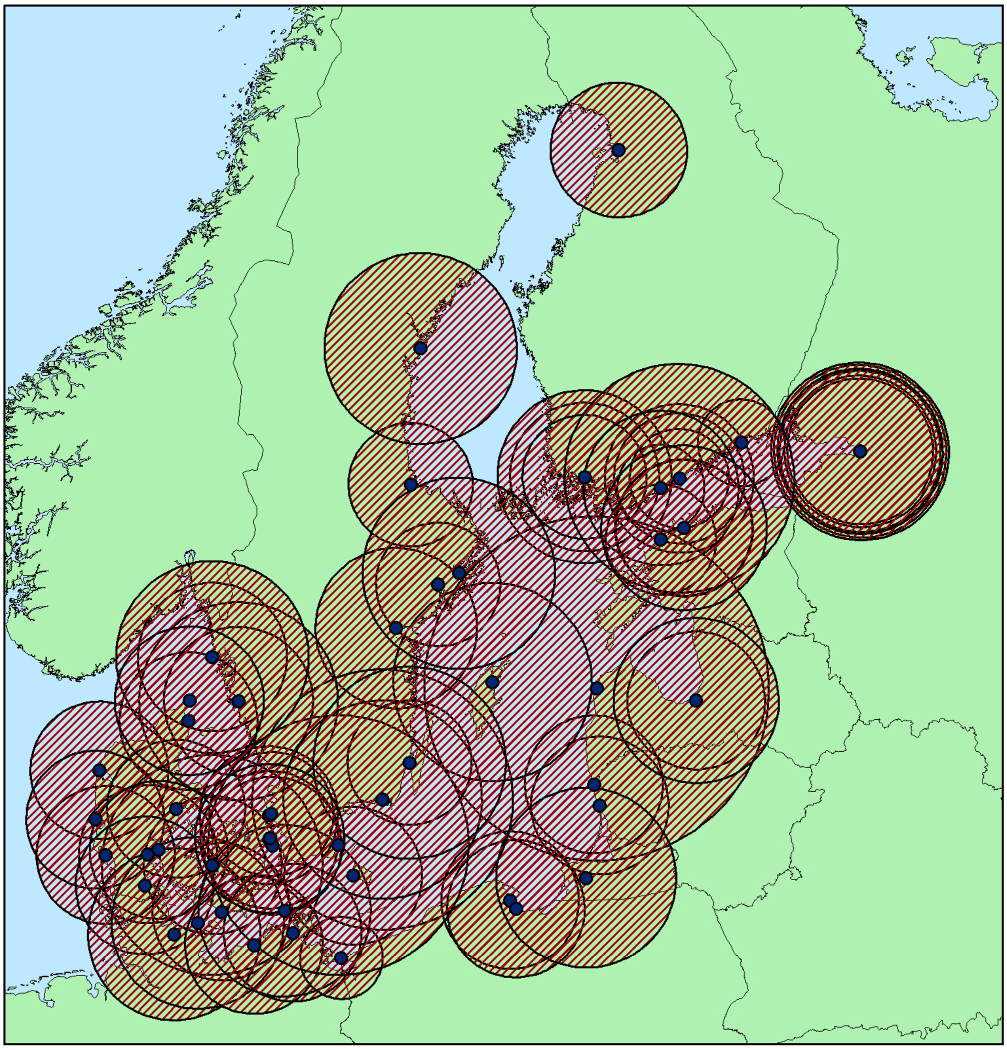


Map 3. Theoretical scenario - 2 MT and 6 TT

The map shows the area coverage of response vessels after 8 hrs from the alert. This scenario is a theoretical one, where all vessels have been given a 2 hr MT, corresponding to Recommendation 31/1. Only some areas in the Gulf of Bothnia are not covered by any ship's range.

Draft 03.03.2011

Scenario of area coverage of response vessels after traveling time of 6 hrs



Response vessel starting point

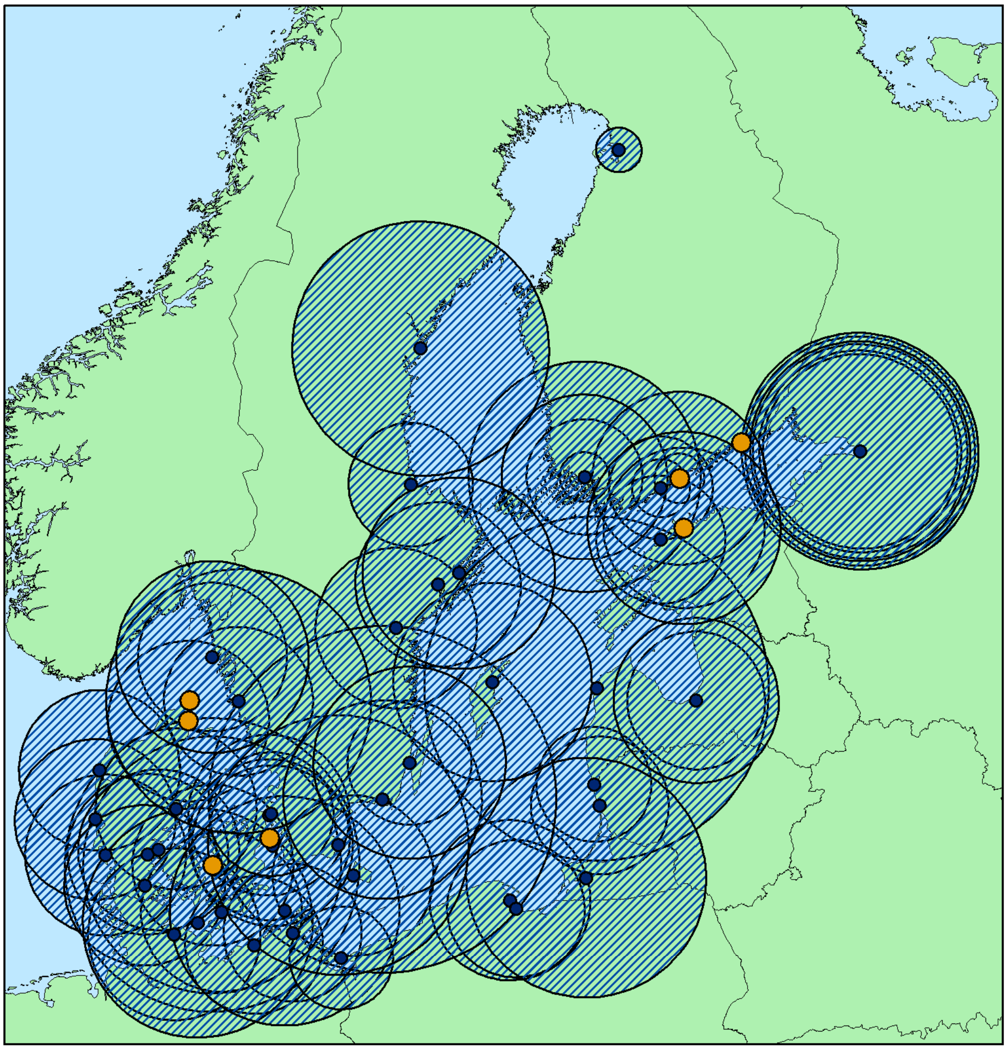
Response vessel coverage after 6 h traveling

Map 4. Reported Mobilization Time + 6 hrs

This map illustrates the same response time as in map 3, but according to the reported mobilization time. Most of the ships are at sea, and few ships are still in their home ports.

Draft 03.03.2011

Scenario of area coverage of response vessels
8 h from alert and according to reported mobilisation time



Response vessels with mobilisation time > 8 h

Response vessel starting point

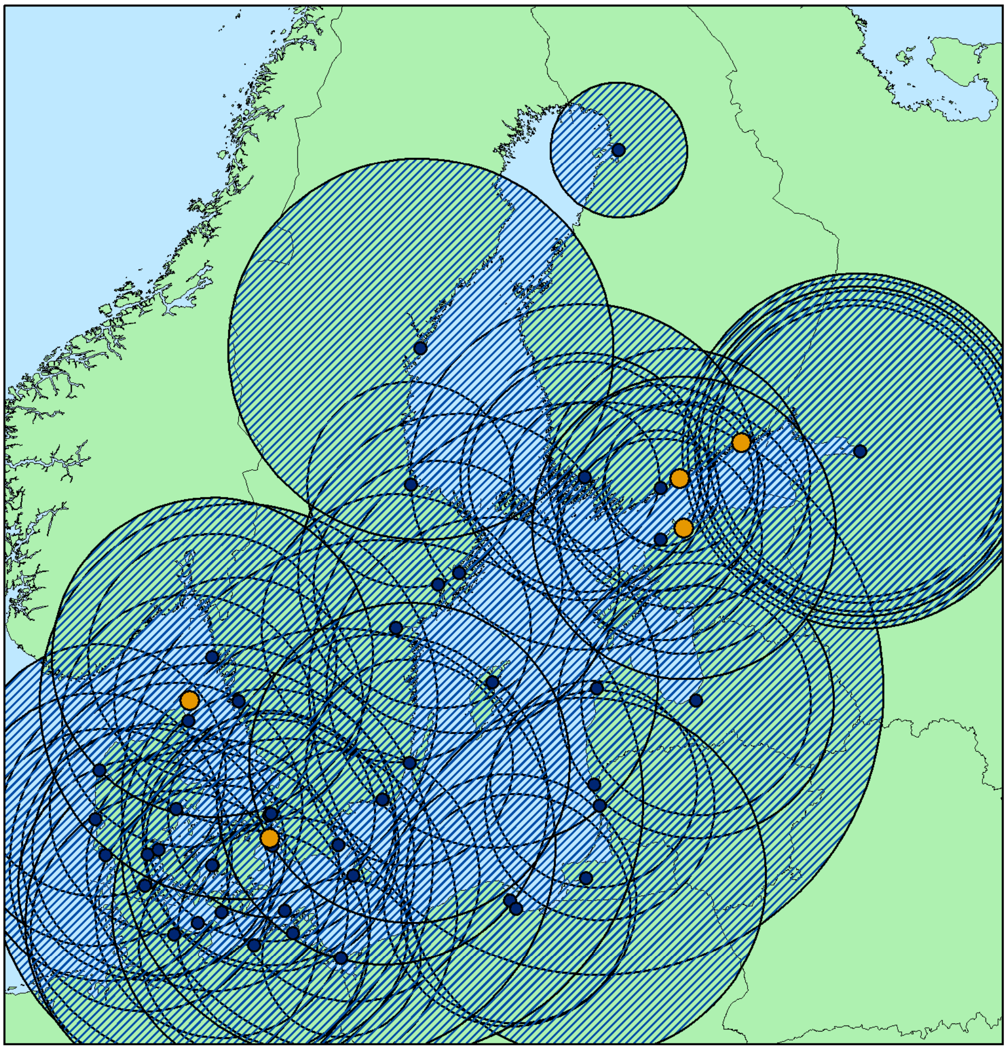
Response vessel coverage up to 8 h (reported MT)

Map 5. Reported 12 hrs response time

The 12 hrs response time corresponds to the recommendation 31/1. All sea areas, except for the Bothnian Bay are within the vessels range. Still a few ships are in home ports.

Draft 03.03.2011

Scenario of area coverage of response vessels
12 h from alert and according to reported mobilisation time



Response vessels with mobilisation time > 12 h

Response vessel starting point

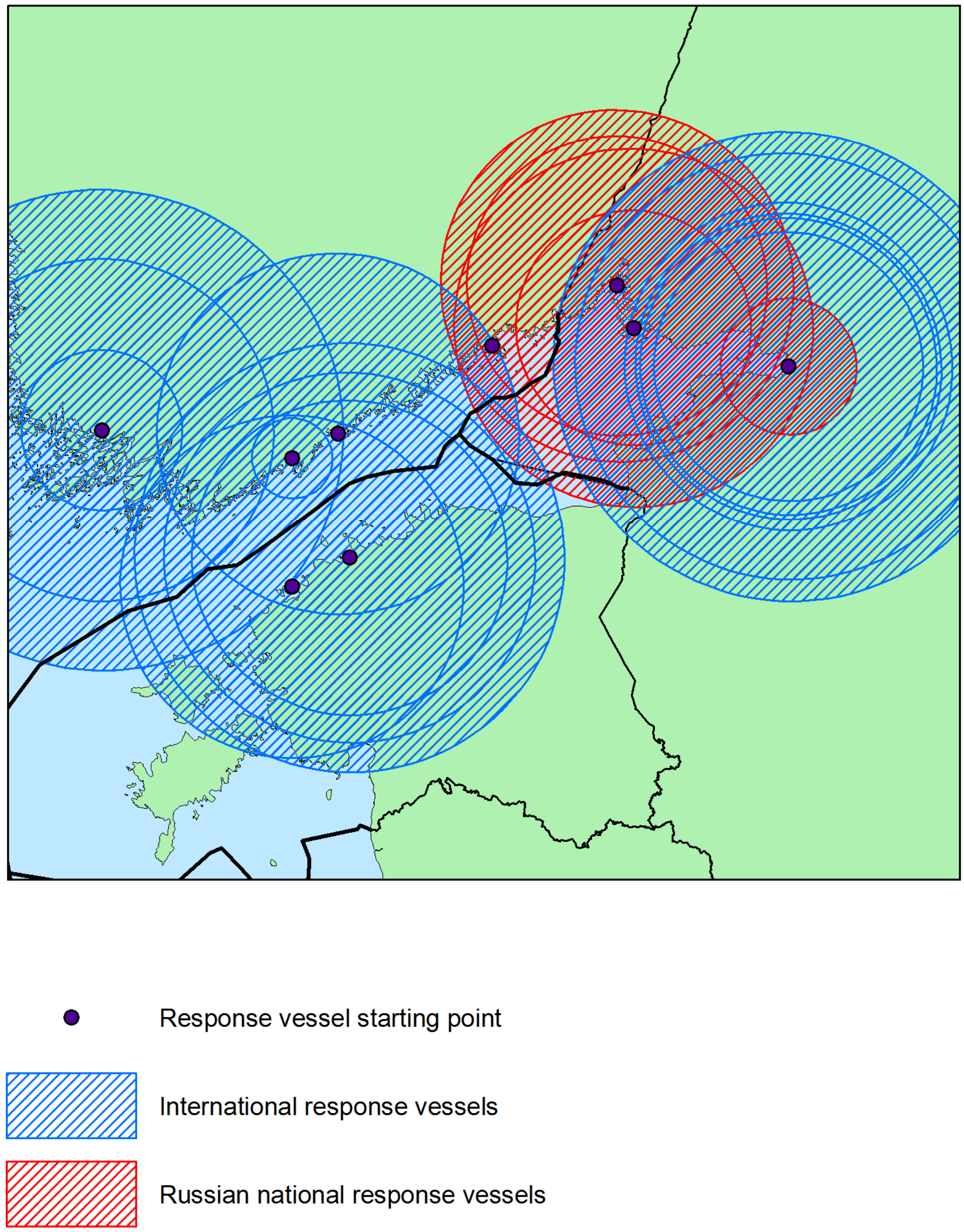
Response vessel coverage up to 12 h (reported MT)

Map 6. Dedicated and Russian national response capacity in the Gulf of Finland

This map illustrates Estonian, Finnish and Russian vessels which can be sent abroad (blue) as well as Russian vessels which are only for national purposes (red) after 3 hrs of detection of the spill.

Draft 03.03.2011

Scenario of area coverage of international response vessels and Russian national response vessels after 3 hours of alert

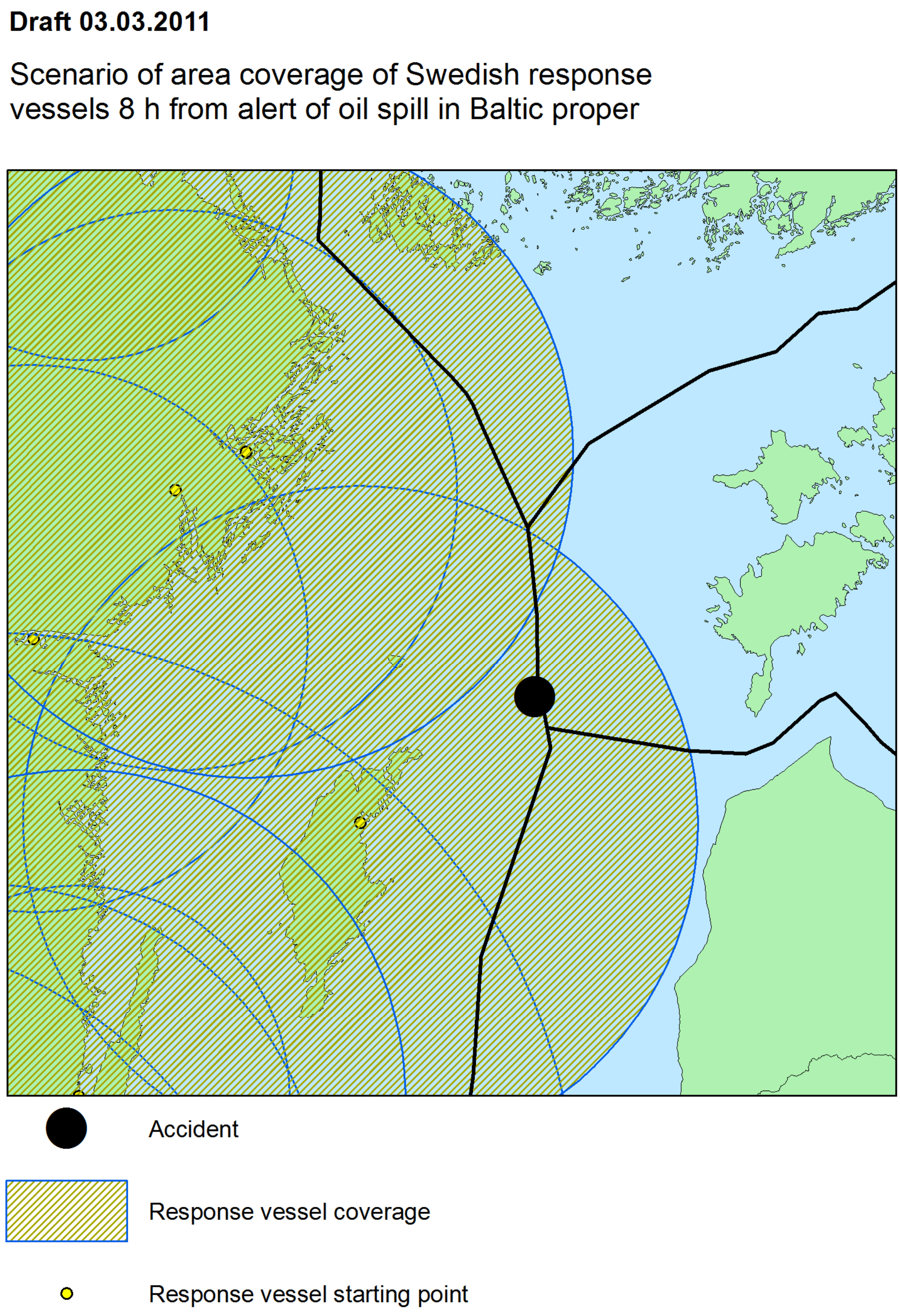


1. Alerting neighboring countries

Prompt alerting of neighboring countries is crucial for bringing the needed response capacities to the spill site. A case has been investigated where a) only vessels of a country in which waters a spill has occurred are alerted, b) all countries in vicinity of a spill are alerted, c) vessels of neighboring countries are altered within 8 hrs. A hypothetical site for an oil spill was selected in the Swedish EEZ between Gotland and Saaremaa, based on the map for risk of spill created by COWI. The site represents a high risk area for collisions on route. All scenarios are based on the cruising speed and the real MT as described previously.

The hypothetical spill used in the oil recovery scenarios can be representative for the whole Baltic Sea area. By comparing maps 7, 8 and 9 it can be concluded that prompt alarming of vessels from neighboring countries will improve the possibility to recover oil substantially at the early stage of accident. It should, though, be kept in mind that the recovery rate taken into account here is 100 %. In reality the recovery rate is reduced by weather conditions, quality of oil etc. up to 50 %.

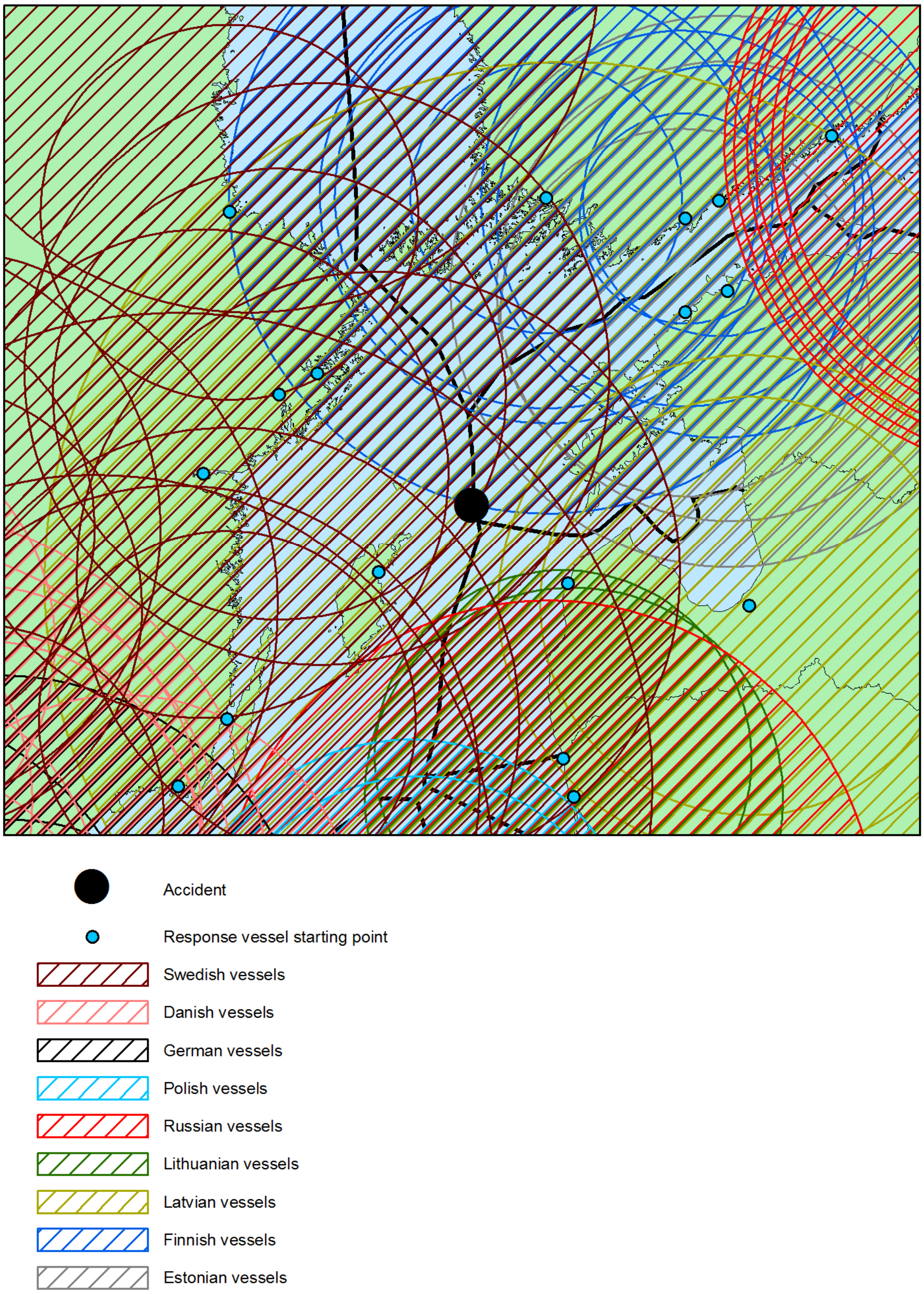
Map 7. Swedish vessels available at the spill site in 8 hrs
This map illustrates how many Swedish vessels are able to reach the spill site within Swedish EEZ in 8 hrs. Only one vessel has reached the site. The recovery capacity of the vessel is 400 m^3/h



Map 8. Vessels available at the spill site in 12 hrs after detection of the spill and immediate alert.
This map illustrates the vessels in the spill area after 12 hrs from the detection of the spill. At this point four Swedish vessels, one Finnish vessel and one Latvian vessel have reached the spill site. The total recovery capacity of the vessels is 712 m^3/h.

Draft 03.03.2011

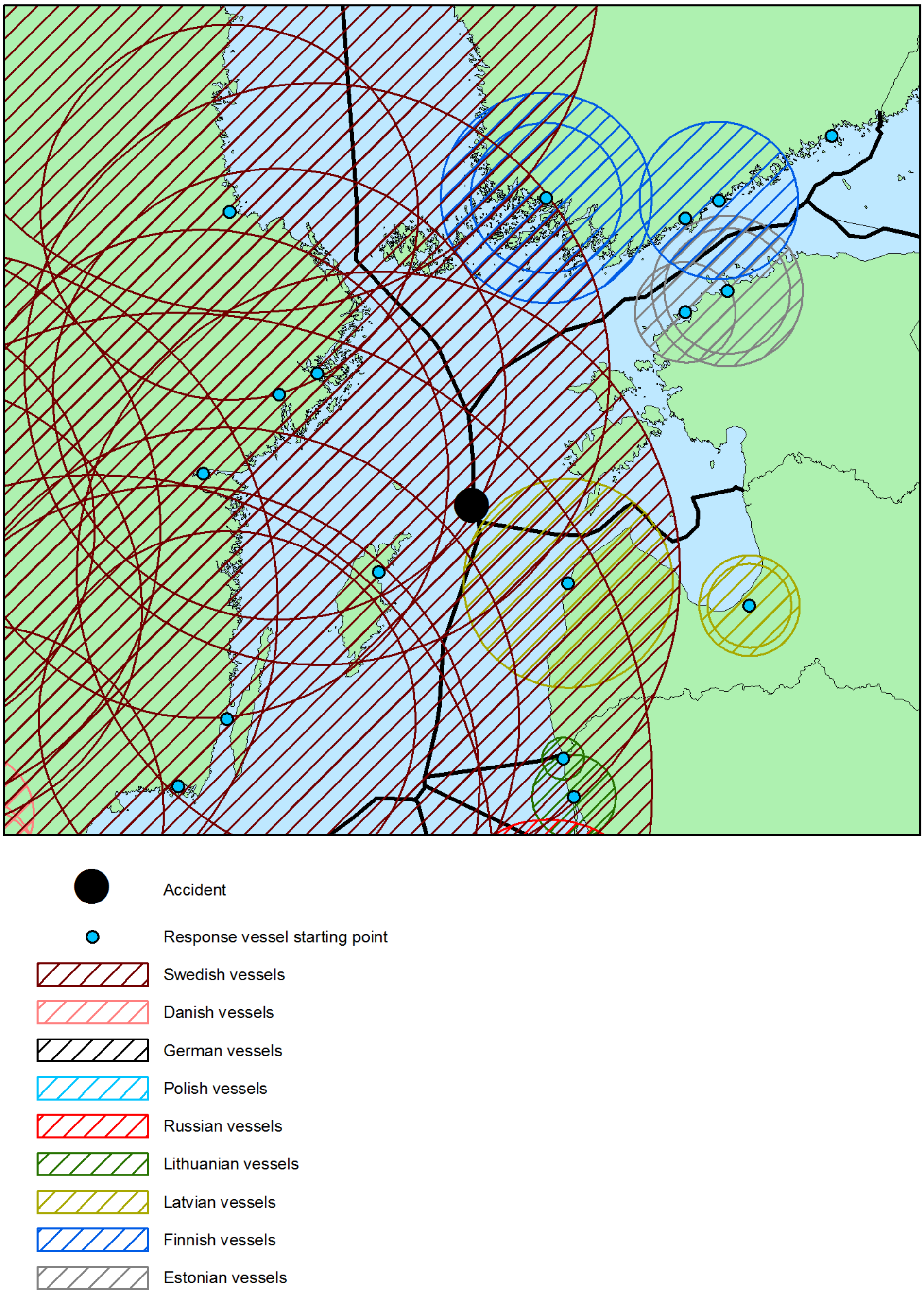
Scenario of area coverage of response vessels of oil spill in Baltic proper 12 h from alert



Map 9. Vessels available at the spill site after 12 hrs (8 hrs alarming time + 4 hrs response time).
This map illustrates the same situation as in the previous map but also taking into account that vessels in other countries are not alarmed immediately after detection of a spill. In this scenario Swedish vessels have been alarmed immediately, while vessels in other countries have been alarmed only after 8 hrs. Only 4 Swedish vessels have reached the site of the spill with a total recovery capacity of 580 m^3/h.

Draft 03.03.2011

Scenario of area coverage of response vessels of oil spill in Baltic proper with 8 h alarm time. (Swedish vessels coverage 12 h from alert, others 4 h)



2. Response to high-viscosity oil

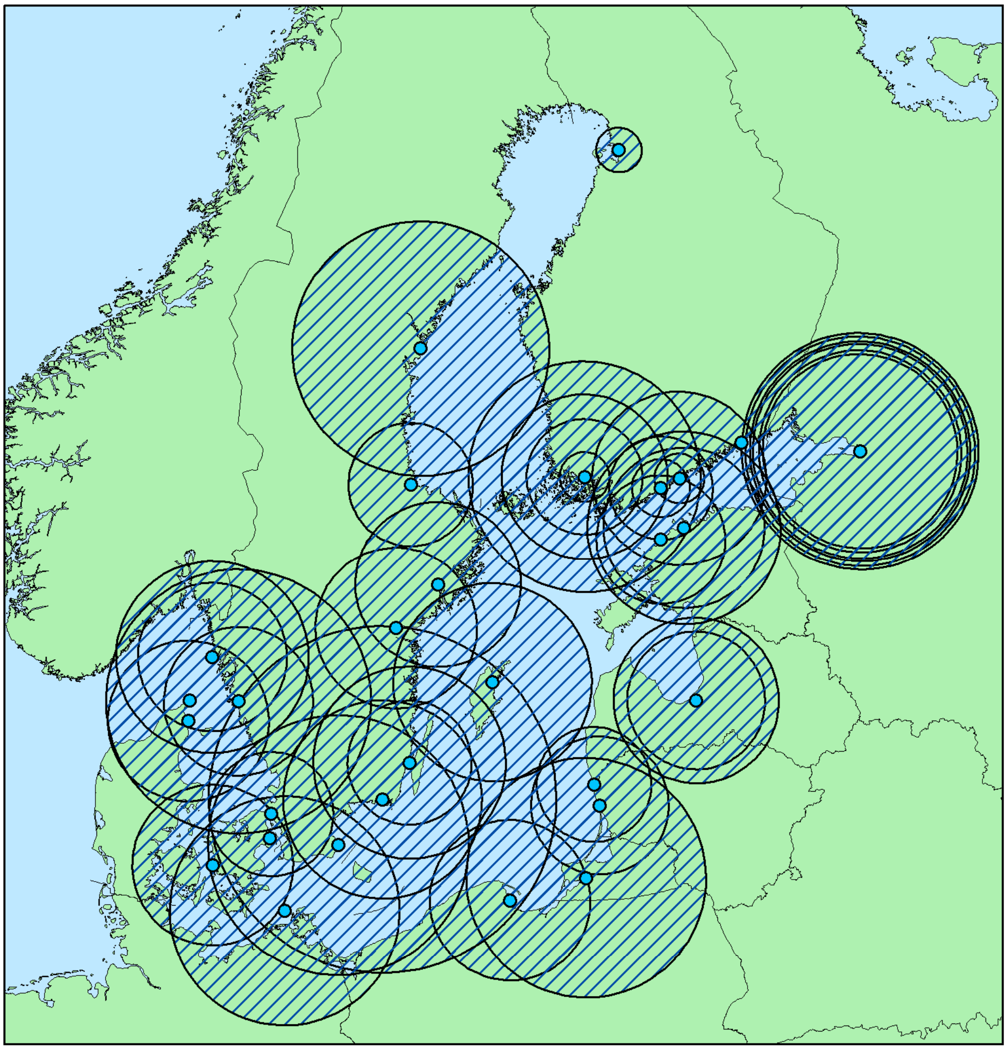
There are different factors affecting the efficiency of oil recovery: the viscosity of the oil to be recovered, the amount of oil on the sea surface, the temperature and weather conditions, and also the type of equipment (skimmer and brushes) being used. For oils with low viscosity (up to 100 000 cst) the recovery rate might be equivalent to the maximum capacity of the skimmer and the connected pump. For heavier oils (up to 1 000 000 cst) the recovery rate might go down with up to 25%- 50 %. The location of the spill also effects which vessels are able to reach the site and based on the type of equipment, how well they are able to recover the oil.

Map 10. Vessels able to handle HVO.

This map illustrates the vessels which are able to handle high viscosity oil and how far they can reach within 8 hrs. A total of. 52 vessels are able to handle HVO. All Russian vessels as well as three EMSA chartered vessels were assumed to be able to handle HVO. Bothnian Bay and some areas in the northern parts of the Baltic Proper are not covered after 8 hrs.

Draft 03.03.2011

Scenario of area coverage of response vessels capable of handling high viscosity oil 8 h from alert



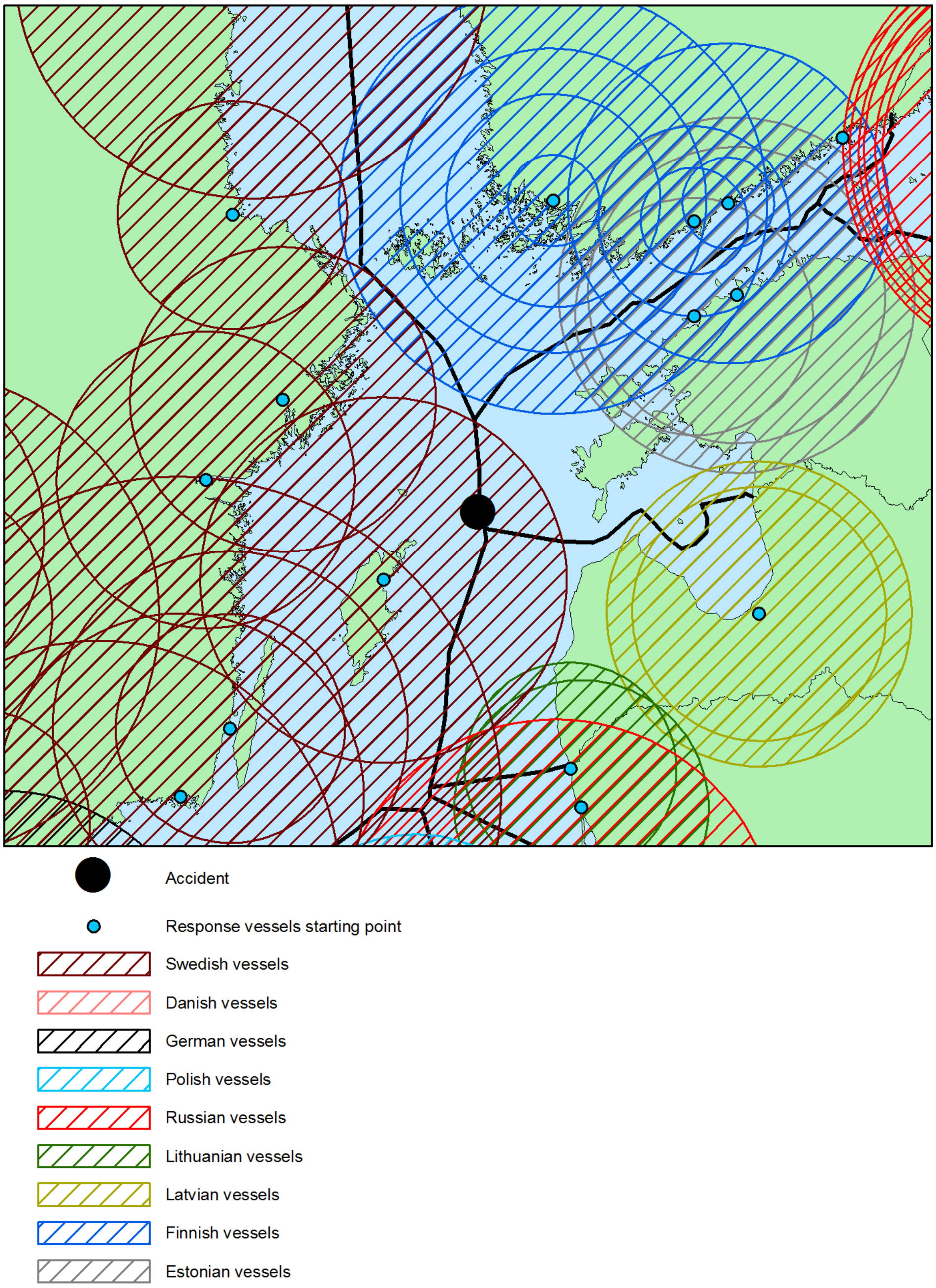
Response vessel starting point

Response vessel coverage

Map 11. HVO vessels in the oil spill area after 8 hrs
This map illustrates the response capacity able to handle HVO in the hypothetical spill site. Only one vessel has reached the site with a recovery rate of 400 m^3/h.

Draft 03.03.2011

Scenario of area coverage of response vessels capable of handling high viscosity oil 8 hours after alarm



Spills of hazardous and noxious substances (HNS) acting like oil can also have a detrimental impact on the marine environment. For response vessels to be able to handle HNS, special equipment and protective clothing is required. Sweden has one specially design vessel for this purpose (KBV 003 Amfitrite). All other Swedish response vessels are able to handle small amounts of HNS. Also the German response vessels ARKONA and SCHARHÖRN are able to handle HNS. The capacity to handle HNS is unknown for vessels in other Baltic Sea countries.

Annex 1. List of members

Table 1. The working group members

Project Part-ner Country	Name	Email, Telephone	Institution, Postal address
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PP3 SWE	Bernt Stedt	Bernt.Stedt@kustbevakningen.se +46 (709) 15 35 55	Swedish Coast Guard HQ Response Department P.O. Box 536 SE-371 23 Karlskrona
PP4 FIN	Kalervo Jolma	kalervo.jolma@environment.fi +358400444686	Finnish Environment Institute SYKE Marine Research Centre Marine Pollution Response Unit P.O. Box 140 FI-00251 Helsinki
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PP8 (MOG) POL	Juliusz Ga-jewski	jul-gaj@im.gda.pl +48 583018724	Maritime Institute in Gdansk Department of Operational Oceanography Dlugi Targ St. 41/42 PL-80 830 Gdansk
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PP10 (MIG) POL	Wojciech Wa-sowski	wwa-sowski@umgdy.gov.pl +48 (663) 88 55 04	Marine Environment Protection Inspector-ate Maritime Office in Gdynia
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BRISK-RU RF	Vladimir Polja-kov	polvg@buksir.ru +7 8127849762	Deputy head of Baltic Salvage & Towage Company Safety Navigation Department 1, Elvatornaya Square RU-19809 St. Petersburg
	Gennady Se-manov	sema-nov@cniimf.ru Dir.Phone: +7 8122711015	Central Marine Research and Design Insti-tute (CNIIMF) Ltd. Kavalergardskaya Str. 6 RU-191 015 St. Petersburg

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Annex 2. Answers by countries

1. There are some big response vessels being built in some countries (Finland, Sweden, any other?) to be delivered within a relatively short time which will have a considerable impact on response capacities in the region. Therefore, to be as realistic as possible, the best way is to take these vessels into account in scenarios as the "existing" resources. Consequently, you are requested to indicate if there are any additional resources to be available in your country within coming three years and provide their details as in the attached excel file (as far as possible).

Denmark: No coming resources in the next three years

Estonia: New oil response vessel will be in service by the end of 2012

Finland: Phone call Heli Haapasaari 25 January 2011: One multifunction ship to be delivered and in operation during 2011.

Germany: There will be no additional resources available in Germany within coming three years.

Latvia: There will be no additional resources available within coming three years.

Lithuania: No real plans for the additional response recourses so far. There are some considerations on purchase of new multipurpose vessel with more enhanced performance for the replacement of existing 'Sakiai'. More justification is needed for that.

Poland: No new vessels within next three years

Russia:

Sweden: Sweden will have 4 ships delivered, the first in early summer 2011 and then the three remaining in 2012. All information to be found in the attached file. Their home ports will be as follows:

031 Stockholm, 032 Kungshamn (West Coast, Skagerak) 033 Kalmar (south east sound inside Öland) 034 Härnösand (mid northern coast)

2. To be able to provide a scenario on reduced response times, you are requested to provide the Secretariat with an estimation of the current response time of the vessels in your country (in reality and in legislation, if defined) – please use the additional column “Response time” in the attached excel file.

Denmark: See table. Phone call to Peter Poulsen 27 January 2011: No national law on the mobilization time. HELCOM Recommendation 31/1 as guideline. GUNNAR SEIDENFADEN and GUNNAR THORSON MT 1h, MARIE MILJÖ and METTE MILJÖ MT 1h, MHV 900 vessel MT 1h, tree of DIANA; FREJA, HAVFRUEN, NAJADEN, NYMFEN and ROTA at sea 24/7, others MT 1h.

Estonia: No response time is set by legislation, inner regulations stipulate from 15 min to 1 hour mobilization time. Response time in Gulf of Finland for all ships 6h, otherwise 12 h.

Finland: See table

Germany: If response time means the time the vessel can stay outside to response the response time is dependent on several conditions such as distance to place of incident (fuel consumption, remaining bunker), adequate crewmembers (does not concern the two multipurpose-vessels SCHARHÖRN and ARKONA, because they are equipped for the 24/7 service) to ensure a 24-hrshrs operations (if necessary), maintenance of combating-vessels on scene (fuel, provisions, lighterage, crew-change), availability of storage capacities. All German response vessels have a mobilization time of 2 hrshrs, except the two multipurpose-vessels (SCHARHÖRN and ARKONA), which are at sea for 24/7.

Phone call to Michael Akkermann 27 January 2011: 2 hour mobilization time is defined by law and it is sufficient for the German vessels in reality.

E-mail 1 February 2011: A correction to the previous, 2 hour mobilization time is not defined by law. The mobilization time for the vessels from the Coastal states is defined by contracts.

E-mail 2 February 2011: For the start points of our multipurpose vessels we suggest for SCHARHÖRN the position westerly of island FEHMARN and for ARKONA the position between KADETRINNE and island RÜGEN.

Latvia: Additional column “Response time” in the attached excel file is completed accordingly.

Response time is defined by Order of Cabinet of Ministers of Latvia No283 “National contingency plan for pollution incidents by oil, hazardous and noxious substances”, i.e.

Mobilization time: within 2 hrs

Response time: 6 hrs to reach any point of marine area of Latvia after the alert is received, but not exceeding 12 hrs

Lithuania: According to Lithuanian legislation (marine oil spill contingency plans) response time for ‘Sakiai’ is:

- mobilization time – 2h;
- in 6 hrshrs after departure any place within Lithuanian marine area (response area) should be reached;
- on receipt of notification not later that in 12 hrshrs well organized response operations should be executed.

No possibility to reduce response time for ‘Sakiai’ due to speed limit.

In the Butinge oil terminal two support boats are provided. The priority role of a multi role vessel ‘Soll Tengiz’ equipped with oil spill recovery equipment, fifi, maintenance and towing capability, and a port tug are to assist during the tanker approach and mooring to the buoy. ‘Soll Tengiz’ assists also in hose connection and acts as pullback tug during loading period. In case we have 100 tankers calls per year and on the average it takes 36 hrs to assist one tanker, in total about 40 percent of yearly time ‘Soll Tengiz’ is engaged in direct tanker assistance duties and has limited possibility for other purposes. Besides, tug boat is also used for terminal maintenance and other services.

No possibility to reduce response time.

Additional clarification:

Mobilization time for ’Sakiai’ is 2 hrs, both in reality and as defined by legislation.

Mobilization time for Soll Tengiz is not applicable. If tug boat is assisting tanker during mooring, loading operations, it will not be allowed to leave tanker for response operations somewhere in the Baltic Sea. If spill occur from tanker or terminal installations - depending on situation it would take for ‘Soll Tengiz’ 2-3 hrs to be ready to respond (2-3 hrs is needed for safe tanker unmooring, etc.), e.g. booms deployment will start in 2-3 hrs. If there is not tanker at the Butinge oil terminal, e.g. ‘Soll Tengiz’ is not engaged in services, in that case mobilization time equals zero – time is not needed for mobilization because tug crew permanently are on the board of the tug despite the location of the ‘Soll Tengiz’ – in Klaipeda port or on guard duty at terminal off-shore buoy. It is in reality and the same defined by legislation.

Poland:

T+2 – readiness time

T+8 – first response unit on scene (any place on EEZ)

T+12 – full scale response action conducted by SAR Service

T+24- full scale response with the use of all required or adequate national resources

T+48 – full scale response with the use of HELCOM fleet

All response times are set-up by our national contingency plan. Concerning the SAR Service vessels; CZESLAW II and KAPITAN POINC we have also internal rules of readiness tasking oil pollution response vessels to leave the port within two hrs. In reality we are able to do so even faster; CZESLAW II needs less then half an hour and KAPITAN POINC, depending on how much equipment she has to take onboard, needs about one hour. The use of ZODIAK is different. Depending from the place of accident we need from 2 hrs (for internal waters) to 24 hrs (for external waters), to mobilize the vessel. To make scenarios much more realistic we have to use the speed of vessels other then maximal. Apart from the economical factor, normally we sail with the speed reduced with 20 – 25%, the weather conditions can lower the speed significantly.

Russia:

Sweden: The figure for all Swedish vessels to be put in that column should be 8 hrs - which is the response time that is a demand from our government, "the first response/recovery action should be started within 8 hrs in Swedish response zone".

Phone call to Bernt Stedt 27 January 2011: The mobilization time for the Swedish vessels is not defined in law. Instead it is defined that the first vessel should reach the location of the spill within 4 hrs and the first response/recovery action should be started within 8 hrs in Swedish response zone. In each Swedish region (totally four regions), there is always at least one vessel at sea 24/7, meaning that there is a minimum of four vessels without response time.

EMSA: Phone call to Lech Auriga 28 January 2011: The formal maximum mobilization time for OW Alborgh and OW Copenhagen is 8 h if equipment is on board, if not then 15h. The formal mobilization time for Kontio is 24h. In reality it might be faster depending on the current location.

3. HELCOM RESPONSE 13/2010 commented that the skimming capacity, which is smaller than the pumping capacity, would better reflect the actual situation. Do you have any suggestions how to "convert" the figures on pumping capacity into the skimming capacity? Can we apply any common "conversion factor" to all figures on recovery rate?

Denmark: No reply

Estonia: No suggestions

Finland: E-mail 2 February 2011: We use value of $6m^3$/hour/brush when we calculate the maximum lifting capacity of the brushes. The manufacture's figure is $25m^3$/h/brush but as in reality the oil layer gets very thin very quickly we have decided to use value that is only about 25% of the manufacture's figure. This $6m^3$/h/brush also corresponds to our experiences.

We actually calculate two different values that show the theoretical recovery efficiency: the $6m^3$/h/brush which gives the theoretical "maximum value that the brushes of a vessel can lift" from the sea surface AND in addition we calculate "recovery rate" in which we take into account the width of the sweeping arm system, the speed of the ship and the average thickness of the oil layer. So when we calculate the "recovery rate" we do not use the lifting capacity of the brushes at all. If the oil layer is very thick (average 1 mm) then the "recovery rate" is higher than the "lifting capacity", in 'normal' layer thickness situation the "lifting capacity" is higher that the "recovery rate".

Germany: Why not using the "conversion factor" 1 to all figures on recovery rate and try to get so similar results before starting with fictive values? We should consider the fact, that not all vessels can handle oil with high viscosity.

Latvia: In our opinion pump initially is designed with capacity to take maximum amount of skimmed oil. While skimming capacity depends on type of media being skimmed (Heavy oil or Diesel oil) and amount of it on sea surface – thickness. Therefore it is rather difficult to apply a conversion factor.

Lithuania: No reply

Poland: Please find attached files and follow the link: http://www.oilspillsolutions.org/skimmers.htm

Russia:

Sweden: There is not an easy and simple way to deal with this question. It all depends on the viscosity of the oil to be recovered. If we deal with oils up to 10 000 cst I would say that the recovery rate is equivalent to the maximum capacity of the skimmer and the pump connected. When dealing with heavier oils up to 1000 000 cst we can expect the capacity to go down with up to 50 % in some cases. But it is also a question on what type of skimmer being used.

I suggest that two scenarios are presented, one with low viscosity oil = full capacity and one with heavy oil with a reduced capacity of 25-50 %.

4. HELCOM RESPONSE 13/2010 also commented that in real life situation storage capacity is a limiting factor when dealing with large spills. Do you have any preliminary suggestions how this could be taken into account?

Denmark: To be discussed by partners

Estonia: Contract with able companies

Finland: Phone call Heli Haapasaari 25 January 2011: Ship specific and depending on the situation (distance, speed). The first filling of the tank is 100% after which a correction factor of 0.6 or 0.5 is taken into account.

Germany: Contracts with Tanker-Shipping Companies to ensure sufficient tank capacities.

Latvia: In case of a large spill we have EMSA's Stand-by Oil Spill Response Vessel which can be used as storage platform of collected oil in addition to already existing storage capacities of national Response Vessels (indicated in attached excel file).

Lithuania: Consideration should be given to increasing the amount of temporary storage available for recovered oil, either through barges, storage on vessels or integrated oil collection, separation and containment booms. Priority also should be given to skimmers capable to recover a small percentage of water than compared with recovery systems collecting a larger percentage of water.

This would decrease amount of temporary storage being required and enhance response capability.

Poland: To describe a scenario, where insufficient storage stops the recovery operation. That's easy calculation. By comparing recovery rate with temporary storage capacity we can calculate the time of recovery. While additional storage capacity won't be delivered the recovery must be stopped.

Russia:

Sweden: In Sweden we calculate with a full turn over per vessel of approximately 24 hrs. This means 5-7 hrs to fill the tanks onboard from recovery start + 4 hrs to reach a harbour + 5 hrs to unload + 4 hrs to get back to the recovery area and start all over again. This does not include the first 8 hrs (maximum) to reach the area initially! This is valid for about 48 hrs and then it will take longer time to recover oil to fill a ship because of the spreading. These figures are of course just estimates since factors like the distance from the accident area to port could differ and sufficient reception facilities need to be in place. It could be a much better situation if there is a temporary storage on a tanker close to the recovery area. The main idea is anyway to assume that a medium and large recovery vessel only will be able to actually recover oil 25% of a full 24 hour day.

We are aware of that there is a lack of reception facilities in most of the ports to deal with large amount of oil and water/oilmixture. Chartering a tanker or using one or more of EMSA:s contracted vessels for that purpose and have them anchored in a sheltered area or port would be one way to solve the problem.

5. What would be the most relevant response times to be investigated, on top of the mobilization time (MT): MT+2 hrs, MT+6 hrs, or MT+12, any other?

Denmark: No others than the three mentioned. Normally the Danish vessels (GUTH and GUNS) are able to mobilize within 12 hrs.

Estonia: MT + 6 is our proposal

Finland: Phone call Heli Haapasaari 25 January 2011: According to HELCOM recommendation, 6 hrs and 12 hrs.

Germany: MT+2 hrs will be the most relevant response times for Germany because of the shown coverage in the maps after 2 hrs.

Latvia: MT+6hrs is relevant or

The slowest response vessel + the outermost boundary of the respective EEZ of the state. These criteria actually describe the worst scenario of national response time to be used for modelling.

Lithuania: Time needed to reach potential pollution sources (f.ex. fixed objects) and to start response operations.

Poland: MT+24 because of **HELCOM Recommendation 31/1 end influence of storage capacity limitations**

Russia:

Sweden: MT + 6 is our proposal.

6. Attached is the map indicating a home base of each of the response vessels. While we realize that it is challenging/not always meaningful to indicate any alternative home port for them, I would like to ask you to give a go and provide us with a list of possible new home ports for all/some of the vessels in your country (for that purpose use “Alternative home ports” column in the attached excel file). The list will be used as a preliminary one for our internal investigation first, and the final list will be proposed by the working group.

Denmark: Denmark do not use any alternative home bases, but in case of emergencies or ice-condition we will be able to choose any capable harbors as alternative home ports.

Estonia: We agree with Germany, though one response vessel is presumably located in Tallinn

Finland: Phone call Heli Haapasaari 25 January 2011: Providing alternative home ports is a very theoretical task and therefore not meaningful. The vessels are multifunctional an therefore not easy to relocate.

Germany: Home ports of the our vessels are also important due to the other duties of this vessels (buoy yards, location of responsible waterways- and shipping boards or companies) and have also political and strategically reasons.

Latvia: Additional column “Alternative home ports” in the attached excel file is completed accordingly.

Lithuania: Considering close location of potential oil spill sources – oil terminals in Klaipeda port, Butinge oil terminal and oil extraction platform D-6 (oil rig is situated in the Russian - Kaliningrad region marine area close to LT maritime border) together with increasing shipping in Klaipeda port and multi role of two LT vessels, their relocation currently is not practicable.

Poland: See Poland XI0000000.xls

Russia:

Sweden: We will not be able to present any changes for our vessels since they are used for normal Coast Guard duties when not engaged in response operations. The decision to use the existing home ports are based on national risk assessments both regarding oil spills and surveillance reasons. In case of a large accident the recovery vessels will be temporary relocated though.

Appendix B: WG4: Additional response equipment

Two scenarios have been developed in this working group:

WG5 scenario 1: Increase in boom length and skimmer capacity as proposed by the partners See table 1 below

WG5 scenario 2: A 50 % extension of recovery rate, boom length and storage capacity. A table with 50% larger numbers is not presented.

Table 1 describes the increase in boom length and skimmer capacity as proposed by the partners

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage capacity	Additional storage	Boom length	Additional boom length
Denmark	6	GUNNAR SEIDENFADEN	Korsör	60	125	312		600	
Denmark	6	MARIE MILJÖ	Korsör	50	100	64		200	
Denmark	6	GUNNAR THORSON	Frederikshavn	60	125	312		600	
Denmark	6	METTE MILJÖ	Copenhagen	50	100	64		200	
Denmark	6	DIANA	Korsör	0		0		360	
Denmark	6	FREJA	Korsör	0		0		360	
Denmark	6	HAVFRUEN	Korsör	0		0		360	
Denmark	6	NAJADEN	Korsör	0		0		360	
Denmark	6	NYMFEN	Korsör	0		0		360	
Denmark	6	ROTA	Korsör	0		0		360	
Denmark	6	MHV 851 KOLDING	Kolding	0		0		360	
Denmark	5	MHV 901 ENØ	Rødbyhavn	0		0		360	
Denmark		MHV 902 MANØ	Thyborøn						
Denmark	5	MHV 903 HJORTØ	Rønne	0		0		360	
Denmark		MHV 904 LYØ	Esbjerg						
Denmark	6	MHV 905 ASKØ	Hundested	0		0		360	

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage ca-pacity	Additional storage	Boom length	Additional boom length
Denmark	6	MHV 906 FÆNØ	Helsingør	0		0		360	
Denmark	6	MHV 907 HVIDSTEN	Holmen	0		0		360	
Denmark	6	MHV 908 BRIGADEN	Århus	0		0		360	
Denmark	6	MHV 909 SPEDITØREN	Frederica	0		0		360	
Denmark	6	MHV 910 RINGEN	Åbenrå	0		0		360	
Denmark	6	MHV 911 BOPA	Dragør	0		0		360	
Denmark	6	M103	Korsör		20		0		
Denmark	6	MS201	korsör		0		360		
Denmark	6	MS202	Copenhagen		0		360		
Denmark	6	MS203	Frederik-shavn		0		360		
Denmark		TOTAL		220	470	752	1080	7360	0
Germany	5	KIEL	Kiel	160		325		600	
Germany	5	SCHARHÖRN	Kiel	640		430		400	
Germany	5		Kiel						600
Germany	5		Kiel						200
Germany	5	BOTTSAND	Rostock	320		790		0	
Germany	5	VILM	Rostock	320		500		0	
Germany	5		Rostock						400
Germany	5	STRALSUND	Stralsund	160		200		0	
Germany	5	ARKONA	Stralsund	640		400		800	
Germany	5		Stralsund						600
Germany	5		Stralsund						400

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage ca-pacity	Additional storage	Boom length	Additional boom length
Germany	5		Stralsund						600
Germany	5	GERMANY ADD1	Flensburg						400
Germany	5	GERMANY ADD2	Heiligen-damm						200
Germany	5	GERMANY ADD3	Lübeck						400
Germany	5	GERMANY ADD4	Lübeck						200
Germany		TOTAL		2240	0	2645	0	1800	4000
Poland	5	CZESLAW	Swinoujscie	40		20	50	340	
Poland	5		Swinoujscie		250				600
Poland	5		Swinoujscie						900
Poland	4/5	KAPITAN POINC	Gdynia	280	100	516		600	600
Poland	4	ZODIAK	Gdansk	160		72		0	
Poland	4		Gdynia		150		50		900
Poland	4		Leba						450
Poland	4		Ustka						450
Poland		TOTAL		480	500	608	100	940	3900
Lithuania	4	SAKIAI	Klaipeda	200		220		500	
Lithuania	4	Soll Tengiz	Klaipeda/Butinge	100		150		250	
Lithuania	4	A new deepowater port	New location		200		500		500
Lithuania	4	New gas terminal	Klaipeda		200		500		500
Lithuania		TOTAL		300	400	370	1000	750	1000
Latvia	3	KA-14 ASTRA	Ventspils	60		300		0	
Latvia	3	A-90 VARONIS	Riga	160		30	100	800	

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage capacity	Additional storage	Boom length	Additional boom length
Latvia	3	JL - 1	Liepaja	none		100		400	
Latvia	3	RK-12 "VALPAS"	Riga	60		14		600	
Latvia	3	LATVIA ADD1	Riga		160		1,5		1000
Latvia	3	LATVIA ADD2	Venstpils		160				500
Latvia	3	LATVIA ADD3	Venstpils						225
Latvia	3	LATVIA ADD4	Liepaja		100		16		
Latvia		TOTAL		280	420	444	117,5	1800	1725
Estonia	2	EVA-316	Tallinn	120		200		0	
Estonia	2	VALVAS PVL-109	Talinn	-		-		800	
Estonia	2	KATI - PVL202	Tallinn/Paldiski	220		113		200	
Estonia	2	ESTONIA ADD1	New location/Tallin						10000
Estonia	2	ESTONIA ADD2	New location		1000				
Estonia		TOTAL		340	1000	313	0	1000	10000
Russia	2	YASNYY	St.Petersburg	250		300		400	
Russia	2	Vyborg	Gulf of Finland	30		15			
Russia	2	Tonas	Gulf of Finland	190					
Russia	2	Portovyi-1	Gulf of Finland	30		25			
Russia	2	Vodolaz-15	Gulf of Finland	20					
Russia	2	Arneb	Gulf of Finland						

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage ca-pacity	Additional storage	Boom length	Additional boom length
Russia	2	Aliot	Gulf of Finland						
Russia	2	Alfred	Gulf of Finland						
Russia	2	Altair	Gulf of Finland						
Russia	2	SPRUT-2	Gulf of Finland	30					
Russia	2	MT-77	Gulf of Finland	30					
Russia	2	SPRUT-1	Vysotsk	130		400			
Russia	2	OB-6	Vysotsk	10		100			
Russia	2	Bryansk	Primorsk	100		475			
Russia	2	Kazan	Primorsk	10		20			
Russia	2	Tumen	Primorsk	10		20			
Russia	2	Orlan	Primorsk			2,4			
Russia	2	Urok	Primorsk						
Russia	2	Striz	Primorsk						
Russia	2	KIT	Kaliningrad	110		80		850	
Russia	2	Pribrezhnyy	Kaliningrad	110		20			
Russia	2	RUSSIA ADD1	New location						
Russia	2	RUSSIA ADD2	New location						
Russia	2	RUSSIA ADD3	New location						
Russia	2	RUSSIA ADD4	New location						
Russia		TOTAL		1060	0	1455	0	1250	0
Finland	2	LETTO	Helsinki	73		43		600	

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage capacity	Additional storage	Boom length	Additional boom length
Finland	2	SEILI	Helsinki	72		196		0	
Finland	2	Oili I	Helsinki	60		80		0	
Finland	2	MERIKARHU	Helsinki	91		40		600	
Finland	2	HYLJE	Kirkkonummi	96		800		1200	
Finland	2	Oili III	Kotka	60		80		0	
Finland	1	Oili II	Turku	60		80		0	
Finland	1	HALLI	Turku	108		1400		1600	
Finland	1	Tursas	Turku	72		100		0	
Finland	1	Uisko	Turku	72		100		0	
Finland	1	LINJA	Oulu	67		77		0	
Finland	2	SEKTORI	Talinn, Estonia	60		108		0	
Finland	2	FINLAND ADD1	Helsinki		78		1200		800
Finland	1	FINLAND ADD2	Turku		78		1200		800
Finland	1	FINLAND ADD3	Turku		60		80		0
Finland	2	FINLAND ADD4	Kotka		60		80		0
Finland	2	Stockpile shore based	Hanko		8			1600	2000
Finland	2	Stockpile shore based	Helsinki		26				4000
Finland	1	Stockpile shore based	Kalajoki		18			1600	2000
Finland	2	Stockpile shore based	Kotka		8			2800	1200
Finland	2	Stockpile shore based	Porvoo		18				800

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage ca-pacity	Additional storage	Boom length	Additional boom length
Finland	1	Stockpile shore based	Turku		8		100		2000
Finland		TOTAL		891	362	3104	2660	10000	13600
Sweden	1	KBV 045	Gävle	50		150		300	
Sweden		KBV 010	Djurö						
Sweden	1	KBV 046	Södertälje	50		150		300	
Sweden	3	KBV 047	Kalmar	50		150		300	
Sweden	5	KBV 201	Karlskrona	50		104		300	
Sweden	5	KBV 202	Simrishamn	50		104		300	
Sweden	6	KBV 048	Helsingborg	50		150		300	
Sweden	6	KBV 051	Gothenburg	30		190		300	
Sweden	1	KBV 050	Kungshamn	30		190		300	
Sweden	6	KBV 001 Poseidon	Göteborg	500		1150		600	
Sweden	3	KBV 002 Triton	Slite	500		1150		600	
Sweden	5	KBV 003 Amfitrite	Karlskrona	500		1150		600	
Sweden	1	KBV 501 Aircraft	Skavsta						
Sweden	1	KBV 502 Aircraft	Skavsta						
Sweden	1	KBV 503 Aircraft	Skavsta						
Sweden	1	Stockpile shore based	Härnösand		0		360		400
Sweden	1	Stockpile shore based	Härnösand						1500
Sweden		Stockpile shore based	Djurö		65		360		400
Sweden		Stockpile shore based	Djurö						2000

Country	Sub-region	Name of vessel	Location	Recov. rate	Additional recov. rate	Storage ca-pacity	Additional storage	Boom length	Additional boom length
Sweden	3	Stockpile shore based	Slite		65		50		800
Sweden	3	Stockpile shore based	Slite						1000
Sweden	5	Stockpile shore based	Karlskrona		165		300		800
Sweden	5	Stockpile shore based	Karlskrona						2000
Sweden	6	Stockpile shore based	Göteborg		65		300		800
Sweden	6	Stockpile shore based	Göteborg						1500
Sweden		TOTAL		1860	360	4638	1370	4200	11200
EMSA	6	OW Aalborg	Skagen	1500		4360		400	
EMSA	6	OW Copenhagen	Copenhagen	1500		4360		500	
EMSA	2	Kontio	Helsinki	740		2033		500	
EMSA		TOTAL		3740	0	10753	0	1400	0
BALTIC		TOTAL		11411	3512	25082	6327,5	30500	45425

Appendix C: WG5: Night visibility

2011-04-01
Bernt Stedt
Swedish Coast Guard

Final report WG 5 Night visibility

1. General objective

In order to be able to increase the possibility to recover oil under dark hours and other conditions with low visibility it is necessary to have sensors installed on the response vessels.
There is very little experience from what such systems in fact can contribute with since only a few real spills of significance have occurred in the last years in our waters. Some experience from the recent accident in Norway with the grounding of GODAFOSS shows that the systems used on Swedish recovery vessels indicated oil on the surface but no deeper evaluation has been made.

2. Terms of reference

In the TOR it is stated that the WG should prepare and agree upon 1 new parameter set where technical devices for night and bad visibility are introduced on key response vessels.

3. Description of systems

For the time being we have different systems on our (Swedish) response vessels.

- Sea Darq, which is an oil detection radar system
- Rutter system, which is a soft ware for a normal navigational radar
- IR cameras
- UV spotlights

The radar systems, Sea Darq and Rutter have so far proved to be able to detect anomalies on the sea surface. However, these anomalies could be oil or something else, like ice. They could be useful when we have a given position for an oil slick, detected in daylight or by other means to keep track of the slick and help to keep the response vessel within the area under recovery operations. The range for detection with acceptable quality is 1-2 nautical miles.

IR cameras and UV spotlights are helpful tools to keep in contact with a spill and would probably be valuable to optimize where to use the recovery equipment.
Scientific studies of high performance IR detection shows on results for calculations of thickness/concentration of oil on water. Such systems would of course enhance the recovery rate in bad visibility but are on the other hand quite expensive.

4. Conclusions and proposals

Existing systems have not been tested under real conditions
Detections are not always oil – could be algae's, ice or just bleach water
Use of IR and UV light is a way to keep in touch with an oil slick and so are the radar systems. This indicates the importance of aircrafts with remote sensors to lead the ships to high concentrations of spilled oil.
The use of sensors would probably increase the recovery rate, but only to a limited extent.
A qualified estimate from WG 5 is that recovery vessels with remote sensors installed will be able to work up to 85% of the time (24 hours) under certain conditions.
We do have to keep in mind that storage capacity and turn over time for vessels from starting recovery to offloading and back for new recovery still is a limitation factor.

In addition there are some other beneficial effects from having sensors of this type. They could be used in fire fighting (IR) to find the hot spot, SAR missions (IR and UV) looking for people in water or on shore, aids to navigation (IR and radar) looking for small targets and ice.

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The Thermal-Eye 4000M is weatherized for marine use and is specifically designed to withstand the rigors of marine applications such as search and rescue, pollutant detection and more. Unaffected by salt water, light rain, snow or darkness, the 4000M provides a true infrared image without the use of intrusive or expensive lighting. Designed to hold up to the typical shock and vibration of marine use, the Thermal-Eye 4000M includes a pan and tilt-positioning platform, which is operated by a joystick controller. The user can observe or search for boats or stray objects in the water by maneuvering and pointing the camera in the necessary direction. The image is projected on a monitor located inside the cabin or instrument panel area.

Featuring Raytheon BST detector technology, the 4000M offer users a clear, crisp image. People, boats and other objects easily stand out from their surrounding environment, making it easy to spot potential activity or hazards in seconds. The camera can detect activity up to 1500 feet and is NTSC compatible. The joystick and monitor easily configure into marine systems.

Benefits

- Provide the powerful advantage of sight in the dark
- Depart and enter the marina or boat slip safely at night or early morning
- Detect channel markers and shorelines
- Identify lost boaters or stray objects on the water
- Navigate the waters more safely, quickly and efficiently
- Pinpoint lost cargo, equipment or passengers in the water
- Spot intruders or suspicious activity
- Identify and track pollutants such as oil and chemicals on the water

Thermal Images of Nighttime Rescue Scenarios. The same scene viewed with the naked eye would appear completely blacked out or dark.

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	Pixel Count	160 x 120
	Spectral Response	7-14 µm
Thermal Imaging Performance	Start-up Time	~45 sec
	Contrast / Brightness	Automatic
	Detection Range for Human Activity	Up to 1500ft (457m)
Optics	Minimum Focus Distance	~ 25 ft (8m)
	Focus Method	Automatic
	Field of View	(12°x9°)
Video	Output Format	NTSC or PAL Compatible
	IR Polarity	White Hot – Black Cold
Power	Input Voltage	9.5 to 16 VDC
Physical Characteristics	Size with 18mm lens	11.1" L x 11"W x 11.4"H (282 x 280 x 290mm)
	Weight with 18mm lens	10 lbs. (4.5 kg)
	Mounting Provisions	Mobile Mount or Stationary Mount
Environmental	Operating Temp	-40C to 55C
	Water Resistance	IEC level IPX6 (Not submersible)
	Pan and Tilt Function	Pan / Joystick Controlled, 360 degrees continuous Tilt / Joystick Controlled –20 to +180 degrees
	EMC Compliance	FCC Part 15 & CE Mark
Ordering Information	With Camera, Electronics Module, Mounting Ring, Hand Controller and Cable set	NTSC 4973500-1 PAL 4973500- 2
Optional Accessories	Marine Dual Remote Kit	4973527-1
	Monitor Kit (5.6" Flat Panel w/ shroud, swivel mount, BNC/RCA adapters)	3197573-4
	Vehicle Roof Mounting Bar	3264568-2 (Black)
		3264568-1 (White)

All specifications are subject to change without notice 4000M RevA May 04

Raytheon

SEARCHLIGHT DEVELOPMENT

UV searchlight enhances navigation, rescue, and oil spill detection

The sea is filled with perils for both floating and fixed equipment. Add heavy weather to the mix and all operations become harder. Navigation must be done by instrument because visibility becomes minimal. If a crewman is washed overboard, locating and retrieving him is difficult at best. Heavy weather can also initiate or increase small oil leaks that can affect the environment and endanger the vessel.

Until now these have been intractable problems, but ColorLight has developed a technology to address these issues – a searchlight that uses a special frequency ultraviolet (UV) light, also known as blacklight, to penetrate snow, rain, mist, or fog, and also to detect oil spills.

Special properties

UV light has the ability to cause certain materials to fluoresce. When fluorescent materials are attached to navigation aids, platform supports, rescue boats and capsules, crew clothing, or other floatable objects, the fluorescent materials can be easily seen and located in the water with the use of the UV searchlight.

Most synthetic materials are fluorescent and washed garments are also visible due to the whitening agents in normal detergents.

The searchlight is dual-headed with both halogen and UV searchlamps in one unit. In clear weather, the halogen lamp has a reach of up to 3 km, while the UV searchlamp can project up to 1 km. This provides a wide envelope of protected space around the vessel, when used to avoid hazards. When the UV searchlamp is used alone, the night vision of sailors is preserved.

In heavy weather, the effectiveness of the halogen lamp especially is reduced. The halogen searchlamp's reach is extremely poor in such conditions and is limited to the area immediately around the vessel. The UV searchlamp in contrast can still reach out 0.8-1.0 km, depending on conditions. This enhances safety considerably.

The searchlight is focusable and each searchlamp can be focused independent of the other. Unlike other searchlights, the focusing is done by moving the lighting element rather than using an independent lens system, which would complicate the apparatus. Each searchlamp has a patented special parabolic reflector with myriad angled steps, similar to a Fresnel lens, that guides the light into a wide or narrow beam.

One of the searchlight's key properties is its freedom of movement to direct the light. The searchlight is fitted with dual slipring assemblies that allow the light to be fully rotated 360° in the vertical plane and 360° in the horizontal plane.

There is no need to "unwind" the light, a necessity on some searchlights with internal cable connections. It can be operated by remote control with a simple joystick control that allows rotation in any direction to place the light where it is needed. The searchlight is made of a heavy stainless steel housing for durability and is IP66 approved for heavy seas.

Aside from locating navigational aids, the searchlight is an excellent choice for locating accident victims or floating overboard equipment in the water. The penetration ability of the UV lamp is an order of magnitude improvement over standard searchlights. Its fluorescent properties in heavy weather make it excellent at locating objects hidden by mist or fog.

Oil spill detection

The fluorescent properties also come into play when locating oil leaks from a vessel. Oil has a natural fluorescence under UV light, so it is easy to see the sheen on the water, regardless of the oil's thickness or the type of oil product floating on the water. Thus, the light is excellent for ships and facilities to self-police their vessels and to take action on any leak or spill that occurs before it becomes large or hazardous to people or the environment. Also, it allows the crew to see the varied thickness of a spill and thereby direct a response action more efficiently.

The searchlight is about to be incorporated into the Norwegian navigation system. A new navigational marker system is planned that will place fluorescent paint on buoys and imbed fluorescent materials in markers. Life vests will be required to have fluorescent materials on their exterior as an additional safety measure.

For more information, contact Astrid Hellring-Hansson, ColorLight. Tel: +46 35 382 80, Fax: +46 35 382 79, E-mail: fixonomen@swipnet.se.

The ColorLight searchlight has both halogen and ultraviolet lamps to illumine objects over 2 km from the vessel or oil installation.

126 Offshore July 2001 • www.offshore-mag.com

SeaDarQ:

PRELIMINARY

System features and specifications at a glance

Function / Parameter	Specifications
• Image Presentation • Image sampling grid • Detection Range Resolution • Operational wind speed • Vessel Movement Compensation • Static Objects Enhancement	• Logarithmic display of amplitude Zooming, panning, scrolling Overlay of geocode information Software STC correction • Cartesian • 0.1-3.5 km distance *) better than 3.75 m (short pulse mode) • >2 m/s • real-time • Up to detection resolution in real-time *) Antenna height at 15 – 17 m
Operator Controls	
• Keyboard and Mouse	• Function buttons / docking windows / pop-up menus / left- or right handed operator adaptable
Wave Mode	
• 1st and 2d Peak Direction Period	 Range: 0 - 360°; Accuracy: ± 1° Range: 1.0 - 100 s; Accuracy: ± 0.3 s; Resolution: 0.1 s
• Wavenumber Spectrum	Up to 0.003 1/m
• Frequency Spectrum	Range: 0.004 - 0.25 Hz; Resolution: 0.01 Hz
• Directional Spectrum	Range: 0 - 360°; Resolution 10°
• 2 – Dimensional Frequency Direction Spectrum	Range: 0.03 (1/M) ;Resolution: 0.003 (**1**/M) Range: 0 - 360° ; Resolution: 1°
• 1-Dimensional Spectrum	Range: 0.03 (1/M); Resolution: 0.003 (**1**/M)
• Significant wave height 0 - 2 meter	Resolution: 0.1 m; Accuracy: better than 0.2 m
• Significant wave height > 2 meter	Resolution: 0.1 m; Accuracy: better than 20% (guaranteed), better than 10% (typical)
• Total Energy Directional Spread	
Current Mode	
• Current Speed • Current Direction	• Range: ± 2 m/s; Accuracy: ± 0.1 m/s; Resolution: 0.1 m/s • Accuracy: 5°-10° Measurements apply to upper 3 m water layer
• Water Depth	Dept range: up to 25 m; Accuracy: ± 0.5 m

Interface	
• Video Input	0-1 Volt* Analog, 75 Ohm
• Trigger Input	TTL*
• Azimuth Input	TTL/RS422* pulses, up to 4096 pulses/revolution
• North Reset Input	TTL/RS422*
• Data Communications	RS232/RS422*
	* Note: Signal levels can be adapted to actual needs

Mechanical	
• Size (HxWxD)	• 180 x 430 x 515 mm (4U 19"-chassis)

Recommended navigation radar system specifications	
• Frequency	• X-Band
• Antenna length	• 8 feet or longer
• Minimum antenna height above watersurface	• 5 meters (range = 300 x antenna height) (Processing doesn't limit range only weather and antenna height above the watersurface)
• Polarization	• horizontal / vertical
• Field of View: Range	• > 2500m
Azimuth	• 360°
• Pulse Width	• 50 ns / 250 ns / 1 μs
• Peak Power	• 25 kW
• PRF	• 1800 Hz / 1300 Hz / 650 Hz
• Rotation speed	• 48 RPM
• Receiver	• No clutter suppression
• GPS/DGPS	• NMEA RS232/RS422 OUTPUT
• Heading. (Optional: Speed/Waterdepth)	• NMEA RS232/RS422 OUTPUT

For information please contact our office:

Telephone +31184615551
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Email: info@seadarq.com

These specifications may be changed without prior notice.

SYSTEM DESPRIPTION

Functional description

The hardware of the Seadarq products basically exists of commercially available navigation radar components and computer components. The application of commercial available and massive produced components of multiple suppliers insures affordable investments and cost of ownership. Also world-wide service, maintenance and installation can be guaranteed. The functionality is achieved by the different software packages. The system is capable of handling radar data and mix that with other information and store that real time on disc or ram. This gives the possibility to measure and process radar images in time. With different algorithms and or combinations of them, it is possible to detect disturbances of the water surface. These disturbances can be retrieved from the radar signals in the clutter (Clutter is radar signal wave reflection). These disturbances have different patterns or structures. Some are caused by bottom variances some by current seams others by current etc. etc.

Through 18 years of experiments, TNO-FEL has successfully demonstrated the possibilities to extract information about Currents, Waterdepth, Bottom, Shiptracks, Waves, Land/Water borders, Floating slicks, Small floating objects, Icebergs etc. out of the radarsignals. This information is very valuable to oceanographs hydrographs, ship owners and –operators, Police, Marines and Coastguard.

The SeaDarQ products increase efficiency and safety at sea and on board. Illegal Oil Spills can be detected through existing VTS infra structures. In case of incidents the right material can be directed to location more efficient so reducing the environmental damage. The conditions of an incident, like currents, bottom, waterdepth can be reconstructed because raw radar data can be stored and made available. In man over board situations a search and rescue operation can be more efficient because current vectors can be measured, providing an accurate prediction of water movement in time and so the possible location of the person.

Because the platform is based on a Microsoft environment all kinds of connection to the system are possible. Network support offers functionality control on a distance and interchange of data with other platforms. A histogram function is available to change the systems response to the sea state conditions. Also in an area the radar response can be measured and the dynamic range of the system can be adapted optimally.

The images are displaed in layers. Layers can be switched on and off. The layers are free accessable. One layer can be a map the next layer can be the radar image or current or Oil spill etc. Etc. The colors and relations between the layers can bemodified. A toolbox to show the possibilities so the system can be tuned to customers wishes without a high investment.

Oil Spill

Anything disturbing the roughness of the watersurface and influencing the clutter can be detected. Tests with floating slicks have been done under different weather conditions. All have been successfully detected. The last slick, caused by the "Prestige" incident could also be detected. Even very small spots 4 * 5 meters are clearly visible under Atlantic conditions.

Example Oil Spill:

> If storage is performed "looking" 180 degrees forward (normal operational conditions for the Arca) storing a processed image every 5 seconds gives almost 2 hours of data. That could be sufficient to have an impression of an operation.
> If The stored data is used to prove that cleaning operating was successful, only taking images of the area in reach of the radar is sufficient and then afterwards images have to be taken from the same spot with the same reach for comparison. Those images can be stored then as well to prove that the cleaning operation was successful.

For some functionality waves are necessary (Wave information and Current). The system has not been tested under conditions with a windspeed less then 2 meters per second.

Sensorhardware:

The sensor is build out of commercial available navigation radar components. For most of the maritime applications the primary or secondary navigation radar can be used. Ofcourse the specification of the radar will influence the performance of the system. For instance if an antenna is used with a relative wide opening angle the system can not improove that. The same is thrue for the output power and sensitivity. In general the more accurate the radar is the better results can be achieved. A longer antenna will give abetter resolution on a longer distance. A higher output power and a more sensitive input will improove the detection range. If the antenna can be placed high above the water surface this will increase the detection range dramatically. The system will under every circomstances improove all capabilities of any radar.

For some applications a special sensor is necessary. This special sensor fits in most of the radom of all the leading navigation radar manufacturers. The electrical antenna specification is different as far as the slotted wave guide. The specification of this special sensor are:

The opening angle is	1 degree azimuth,
The elevation is	24 degrees,
Side lobs	the best possible.

All specifications are specified by the manufacturer of the navigation radar components.

Computer hardware:

A server computer with a high processing capability and a fast bus
A commercial available LCD touch screen with backlight suppression in 256 steps
To be mounted standard not longer then 2 meters from the 19" rack PC
Windows XP/2000 operating system
The housing of the computer can be chosen out of commercial available housings:
Industrial, 19" rack / Shoe box mount or office like.
Display: Customers choice the software is suitable for a touchscreen.
File back up's can be made on CD, DVD as an option.
Back up's cannot be made during operation.

The specification of the used measuring boards are specified by the manufacturer of the boards. Sometimes the a minor signal conditioning is necessary to connect to the radar signals like: impedance or level etc.. The interface box is providing that for all the leading navigation radar components manufacturers.

Data Acquisition Software

The system is capable of displaying the radar images real time on the screen. Raw radar images can be stored on ram or disc. Processed images can be stored in ram and disc. The storage capacity is limited to the amount of discs and the discs capacity. Each radar line is approximately 16Kbyte. Storage time is depending on the amount of discs and the size of the discs. Storage of processed data is depending on the amount of images a user likes to have and is adjustable in the user interface.

Installation

Installation can be done locally. The computer must be connected to the radar video output, Angle and North reset to the PC as indicated in the manual. A power connection on the bridge must be provided. The Computer and can be provided with a touchscreen. The PC must be mounted under conditions that enough cooling is guaranteed for normal operating temperatures. The vibration levels may not exceed the specification of the disc drives. The radar must be installed by certified people from the radar supplier.

HERNIS Scan Systems AS
Datasheet No: DS095490A.doc
Page 1 of 1

Camera station PT36W Dual Thermal & Compact

GENERAL DESCRIPTION

The PT-36WDual is a weatherproof camera station designed for nighttime surveillance in marine environment. The key purpose is to detect oil spills on water surface, as well as personnel and vessel detection in total darkness.
The Camera station has to sensor, one is a long-wave infrared thermal imaging device (7-14 micron), able to detect a person up to approx 500m,(Detect a object:2,5x2,5 square meter up to 1000)

The other is a ¼" 4-42mm Zoom.
No cooling unit of the sensor is required, and thus the lifetime is estimated to 20 000 hours.

The camera station is delivered complete and fully tested with camera, lens and telemetry control for HERNIS 400, 250, 200 control system.

An export restriction applies to this product, and we reserves the right to refuse any sales.

Specifications

Item Group	1.2
Video Output	Composite video signal: 1.0V(p-p), 75 Ohms, unbalanced, PAL,
Lens f/1	Thermal: Fixed 18, 25 or 50mm f/1, adjustable focus, iris. Compact: Zoom 4-42mm
Picture control	Digital zoom, adjustable contrast
Resolution (Horizontal x Vertical)	Thermal: 320 x 240 pixels NETD>,008°C Compact: ¼" 752 x 582 pixels (NTSC:768 x 494)
Data signals	RS-422, HE400 protocol
Power Supply	30VAC 50/60Hz
Power Consumption (Max)	3A
Operating temperature range	-30°C ~ +50°C (Heating element inside housing)
Operation humidity	Less than 90% Rh (non-condensing)
Weight	15,5 kg
Rotating angle (Pan & tilt)	0-350° & 0-180°
Max Pan speed	40°/sec
Max Tilt speed	20°/sec
Protection	IP 66
Material	Stainless steel, AISI 316, electropolished
Sunshield	Included
Wind rating	100 knots
Free rotating radius	360 mm
Free height	560 mm
Liquid Tank Capacity	2 Litre
Mounting	Upright or hanging
HERNIS Part Number	095490-xxx/xxx

Note: All data in the data sheet are subject to change without any notice.

C C T V improves safety and efficiency

HERNIS Scan Systems AS, PO Box 619, 4809 Arendal Norway, Phone: +47 37 06 37 00, Fax: +47 37 06 37 06 E-mail: cctv@hernis.no www.hernis.com


SIGMA S6 OIL SPILL DETECTION SYSTEM
TECHNICAL SPECIFICATIONS
Oil Detection System
• IEC 60945 certified for marine use rack/shelf mount computer
• IEC 60945 certified for marine use 19" panel/desktop mount TFT display (monitor)
• RSI4000RT Sigma S6 radar interface card
• Console/Desktop keyboard and trackball
• Sigma S6 server software
• Sigma S6 radar display client software
• Sigma S6 advanced processing module software
• Radar antenna and transceiver
Inputs
• Position and Date/Time
- GPS (NMEA-0183) – position output should be 1Hz or better
• Ship's Heading
- Gyrocompass (NMEA-0183) – heading output should be 10Hz or better
RUTTER X BAND (3CM) SCANNER (COMPRISING OF ANTENNA AND TURNING UNIT)
RUTTER
• 2535mm (8ft) Scanner - Weight 55kg max.
SYSTEM CONFIGURATIONS
X Band (3cm)
ANTENNA SIZE 2.4m
TRANSCEIVER CONFIGURATION bulkhead or masthead
POWER 25kW
Rutter offers its RADAR-10056 system as a floor console, desktop console and as a component system for integration into existing bridges.
Rutter Technologies offers horizontally and vertically polarized antennas depending on the specific spill detection application. Both have a recommended turning rate of 48 RPM. Combined with Rutter's 3 KHz short pulse antenna/transceiver, this provides optimal performance in oil spill detection.
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RUTTER
Superior oil spill detection
SIGMA S6
OIL SPILL DETECTION SYSTEM
Experience clarity and effectiveness across the widest range of sea and weather conditions.
RUTTER


SIGMA S6 OIL SPILL DETECTION SYSTEM
THIRD SPILL
With Clutter Removed
third spill visible
SIGMA S6
OIL SPILL DETECTION SYSTEM
Sigma S6 Radar Technology: Proven Reliability for Cost-efficiency and Environmental Protection
Oil spills are costly to both marine industries and the environment. Even with the best preventive measures, spills happen. The key to minimizing spill damage is early detection. With remarkable clarity and effectiveness, Sigma S6 detects even small quantities of oil at further distances across a broad range of sea states and weather conditions. Superior radar processing combined with motion compensation allows even vessel-based systems to detect oil at speeds over 10 knots. The result: cost savings and minimized damage to the environment.
• Experience reliable detection from both moving vessels and stationary platforms.
• Automatic archiving of ESRI shapefile data and netCDF data (optional module).
• AIS target and chart overlay capability available (optional module).
• Horizontal and vertically polarized antennas available.
• Detection of the oil early for improved response and containment.
SIGMA S6 OIL SPILL DETECTION SYSTEM
SUPERIOR PROCESSING FOR SUPERIOR IMAGING
• Scan Average Processing – enhances definition of small, slow-moving objects; enables operator to accurately monitor activity and positions of spill response vessels and equipment.
• The Rutter Oil Spill Detection System's remarkable clarity and effectiveness across a wide range of sea and weather conditions is supported with superior radar processing and imaging technology
• STC Control – adjustable gain control enhances detection of close-range targets in high clutter situations
FAMILIAR, USER FRIENDLY INTERFACE
The Sigma S6 display conforms closely to industry standard layout for navigational radar displays, making it easy to learn and operate. The four corners of the display provide quick access to the most common operations.
• System configuration defaults and user-saved settings
• Processing filters and threshold/gain settings
• Radar range settings
• Allows selection between two radars
• Plot and track display (user enabled/disabled)
• Overlays (user enabled/disabled)
KEY SYSTEM FEATURES
• Provides accurate geographic position and dimension of oil spill (optional module).
• Oil spill delineation and screen capture (optional module).
• Screens shots saved to Raster format, jpg or png (automatic/user enabled).
• Can save up to 10 days of key data (optional module).
• Outline and area calculations (optional module).
• Surface current direction and intensity (optional module).
• Wave direction (optional module).
RUTTER RADAR-10056 SOLUTION
RADAR ANTENNA
RUTTER
GPS
GYRO
SIGMA S6 SYSTEM
Keyboard & Track Ball
Display
CUSTOMIZED SOLUTIONS AVAILABLE ON REQUEST
CUSTOMER'S EXISTING RADAR ANTENNA
GPS
GYRO
EXISTING RADAR CONSOLE
SIGMA S6 SYSTEM
Keyboard & Track Ball
Display
RUTTER

Appendix D: WG6: Oil recovery in ice

Draft final report of the results of the BRISK WG6 on recovery of oil in ice

General objective of the report

The present report is a working document within the #014 BRISK project of EU's Baltic Sea Regional Programme. The specific objective of this report is to describe the final results of the BRISK Working Group 6: Recovery of oil in ice (later referred as WG6)**.**

The WG6 was one of the working groups which were established at the project meeting in Århus, 5-6 October 2010 to develop different kind of input to be used for modelling within the BRISK integral model.

The background material for the WG6

COWI prepared the Terms of Reference (ToR) for the WG6 and the ToR was sent to WG6 by email on 3rd Jan 2011.

The updated list of the response capacity for each of the HELCOM Contracting Party was send to all BRISK and BRISK-RU Partners by HELCOM Secretariat on 28th Jan 2011.

The members and the working methods of the WG6

The members of the WG6 were: Lead Finland (SYKE); Group members: Estonia, Sweden and Russia (via Brisk-RU)

The WG6 had email correspondence between the February and March 2011.. The main parties of the email correspondence were:

EE	Mart Käbin
FI	Hietala Meri
NCM	Christina Parkhomenko
RU	Gennady Semanov
SWE	Bernt Stedt

In addition to the email correspondence the WG6 issues were discussed during three BRISK meetings. These three meetings were held in Århus (5-6 Oct 2010), in Helsinki (8-9- Feb 2011) and in Copenhagen (11-12 April 2011). The WG6 issues were also presented at the Baltic Sea Day roundtable on Risks of maritime transportation and the need for response capacities in St Petersburg (22 March 2011).

The task of the WG6

According to the ToR the WG6 was tasked to estimate for each of the response vessels the reduction of the oil recovery efficiency due to presence of ice. The reduction of the recovery rate for each of the vessels was to be a coefficient between 0-1. The BRISK integral model was then to calculate how much oil each vessel can collect at the presence of ice. The model was to do that by multiplying the vessel's recovery rate at open water with the coefficient estimated by WG6.

After estimating the current coefficients for each of the vessels the WG6 was to estimate how much the HELCOM Contracting Parties could in theory improve the recovery efficiency of these same vessels.

Description on how the WG6 task was carried out

Estimating the recovery rate in ice

The updated list of the response capacity for each of the HELCOM Contracting Parties was used as a basis of the WG6 estimations on the recovery efficiency at the presence of the ice. For the purposes of the WG6 some new columns were added to the list:

Is vessel sea-going IN ICE? [yes/No]	Current recovery rate in ICE [% from the recovery rate in open water]			Other useful facilities for oil response operation IN ICE (emergency towing, storage capacity, etc)
	Ice cover 0 -30%	Ice cover 30-70%	Ice cover 70-100%	

Explanations for the columns:

1) is the vessel seagoing also in ice?
   ONLY IF the vessel is seagoing also in ice the parameters for another columns were estimated:

2) coefficients between 0-1 (or 0-100%) to indicate the current recovery rate in ICE [% from the recovery rate in open water]
   (According to the guidance of the BRISK Project Meeting (8-9 Feb 2011 in Helsinki) the WG6 estimated these coefficients for three kinds of ice conditions. The classes indicating the ice conditions were (ice concentration <30%, 30%<x<70%, >70%).)

3) other useful facilities for the oil response operation in ice (ice breaking, emergency towing, storage capacity, etc)

EE, FI, RU and SWE estimated the above mentioned parameters and coefficients for each of their oil response vessels. FI also estimated the coefficients for the EMSA vessel Kontio. The tables including the results of these estimations are attached to this report. (Attachement 1)

The tables were presented to BRISK project meeting in Copenhagen (11-12 Apr 2011). The meeting noted that the coefficients estimated by different countries indicated that the countries have based their estimations on different kind of assumptions and principles. So the coefficients between the vessels of different countries are not comparable with each other.

Anyway, the meeting and the WG6 agreed that (when taking into account the variation between the possible ice conditions and the differences between the recovery rates of the different vessels) as a general rule 20% of recovery rate in open waters would be a good estimate to reflect recovery in ice.

Also the meeting noted that the length and the severity of the ice season vary a lot between the different parts of the both Gulf of Finland and Gulf of Bothnia as well as between the different years. After these notifications the meeting agreed that in BRISK scenarios one third of the total length of the ice season can be reflected by each ice class (ice concentration <30%, 30%<x<70%, >70%).)
.

Finally the project meeting (Copenhagen (11-12 Apr 2011) agreed that the BRISK model should estimate how much could be gained if efficiency of
oil recovery in ice is doubled.

The main outcomes of the WG6

The main outcomes of the WG6 are:

- Attachment 1, which includes the tables where each country has estimated how much less is the recovery rate in ice than in open water.

- Notifications and decisions of the project meeting (Copenhagen (11-12 Apr 2011):

    - At the attachment 1 the tables between the different countries are not comparable because the countries have based their estimations on different kind of assumptions and principles.

    - "The Meeting … agreed that 20% of recovery rate in open waters, during a three-months period and in areas covered by ice during an average winter, would be a good estimate to reflect recovery in ice." (The minutes of the meeting, paragraph 4.11)

- "The Meeting agreed that the model should estimate how much could be gained if efficiency of oil recovery in ice is doubled." (The minutes of the meeting, paragraph 4.12)

Attachment 1

Draft final report of the results of the BRISK WG6 on Recovery of oil in ice

EMSA		**Is vessel sea-going <u>IN ICE</u>? [yes/No]**	**Current recovery rate in ICE [% from the recovery rate in open water]**			**Other useful facilities for oil response operation IN ICE (emergency towing, strorage capacity, etc)**
Name of vessel	**Location**		**Ice cover 0 -30%**	**Ice cover 30-70%**	**Ice cover 70-100%**	
EMSA	**Kontio**	**Helsinki**	**yes**	**10 %**	**0 %**	

Estonia		**Is vessel sea-going <u>IN ICE</u>? [yes/No]**	**Current recovery rate in ICE [% from the recovery rate in open water]**			**Other useful facilities for oil response operation IN ICE (emergency towing, strorage capacity, etc)**
Name of vessel	**Location**		**Ice cover 0 -30%**	**Ice cover 30-70%**	**Ice cover 70-100%**	
EVA-316	**Tallinn**	**yes**	**38 %**	**25 %**	**15 %**	**emergency towing**
VALVAS PVL-109	**Talinn**	**0**	**0 %**			
KATI - PVL202	**Tallinn/ Paldiski**	**yes**	**38 %**	**25 %**	**15 %**	
new vessel (from 2012)	**Tallinn**	**Yes**	**30 %**	**20 %**	**10 %**	**emergency towing**

-

Finland		**Is vessel sea-going <u>IN ICE</u>? [yes/No]**	**Current recovery rate in ICE [% from the recovery rate in open water]**			**Other useful facilities for oil response operation IN ICE (emergency towing, strorage capacity, etc)**
Name of vessel	**Location**		**Ice cover 0 -30%**	**Ice cover 30-70%**	**Ice cover 70-100%**	
LETTO	**Helsinki**	**Yes**	**30 %**	**20 %**	**10 %**	
SEILI	**Helsinki**	**Yes**	**30 %**	**20 %**	**10 %**	**Emergency towing**
Oili I	**Helsinki**	**No**	**0 %**			
MERIKARHU	**Helsinki**	**Yes**	**30 %**	**20 %**	**10 %**	
HYLJE	**Kirkkonummi**	**Yes**	**30 %**	**20 %**	**10 %**	
Oili III	**Kotka**	**No**	**0 %**			
Oili II	**Turku**	**No**	**0 %**			
HALLI	**Turku**	**Yes**	**30 %**	**20 %**	**10 %**	
Tursas	**Turku**	**Yes**	**30 %**	**20 %**	**10 %**	**Emergency towing**
Uisko	**Turku**	**Yes**	**30 %**	**20 %**	**10 %**	**Emergency towing**
LINJA	**Oulu**	**Yes**	**30 %**	**20 %**	**10 %**	
SEKTORI	**Talinn, Estonia**	**Yes**	**30 %**	**20 %**	**10 %**	
LOUHI	**Kirkkonummi**	**Yes**	**60 %**	**40 %**	**20 %**	**ice breaking, emergency towing**

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Russia		**Is vessel sea-going IN ICE? [yes/No]**	**Current recovery rate in ICE [% from the recovery rate in open water]**			**Other useful facilities for oil response operation IN ICE**
Name of vessel	**Location**		**Ice cover 0 -30%**	**Ice cover 30-70%**	**Ice cover 70-100%**	
YASNYY	**St.Petersburg**	**yes, ice class**	**100-80%**	**80-20%**	**5 %**	
Vyborg	**Gulf of Finland**	**yes, with support**	**100-80%**	**80-20%**	**5 %**	
Tonas	**Gulf of Finland**	**yes, ice class**	**100-80%**	**80-20%**	**5 %**	
Portovyi-1	**Gulf of Finland**	**yes, with support**	**100-80%**	**80-20%**	**5 %**	
Vodolaz-15	**Gulf of Finland**	**yes, with support**	**100-80%**	**80-20%**	**5 %**	
Arneb	**Gulf of Finland**					
Aliot	**Gulf of Finland**					
Alfred	**Gulf of Finland**					
Altair	**Gulf of Finland**					
SPRUT-2	**Gulf of Finland**	**yes, with support**	**100-80%**	**80-20%**	**5 %**	
MT-77	**Gulf of Finland**		**100-80%**	**80-20%**	**5 %**	
SPRUT-1	**Vysotsk**		**100-80%**	**80-20%**	**5 %**	
OB-6	**Vysotsk**	**storage facil**				
Bryansk	**Primorsk**					
Kazan	**Primorsk**					
Tumen	**Primorsk**					
Orlan	**Primorsk**					
Urok	**Primorsk**					
Striz	**Primorsk**					
KIT	**Kaliningrad**					
Pribrezhnyy	**Kaliningrad**					

Sweden		**Is vessel sea-going IN ICE? [yes/No]**	**Current recovery rate in ICE [% from the recovery rate in open water]**			**Other useful facilities for oil response operation IN ICE (emergency towing, strorage capacity, etc)**
Name of vessel	**Location**		**Ice cover 0 -30%**	**Ice cover 30-70%**	**Ice cover 70-100%**	
KBV 045	**Gävle**	**yes**	**25 %**	**15 %**	**10 %**	
KBV 010	**Djurö**	**yes**	**30 %**	**20 %**	**10 %**	
KBV 046	**Södertälje**	**yes**	**25 %**	**15 %**	**10 %**	
KBV 047	**Kalmar**	**yes**	**25 %**	**15 %**	**10 %**	
KBV 201	**Karlskrona**	**yes**	**25 %**	**15 %**	**10 %**	
KBV 202	**Simrishamn**	**yes**	**25 %**	**15 %**	**10 %**	
KBV 048	**Helsingborg**	**yes**	**25 %**	**15 %**	**10 %**	
KBV 051	**Gothenburg**	**yes**	**30 %**	**20 %**	**10 %**	
KBV 050	**Kungshamn**	**yes**	**30 %**	**20 %**	**10 %**	
KBV 001 Poseidon	**Göteborg**	**yes, Ice class 1A+**	**50 %**	**30 %**	**20 %**	**ice breaking, emergency towing**
KBV 002 Triton	**Slite**	**yes, Ice class 1A+**	**50 %**	**30 %**	**20 %**	**ice breaking, emergency towing**
KBV 003 Amfitrite	**Karlskrona**	**yes, Ice class 1A+**	**50 %**	**30 %**	**20 %**	**ice breaking, emergency towing**
031	**Stockholm**	**yes**	**30 %**	**20 %**	**15 %**	
032	**Kungshamn**	**yes**	**30 %**	**20 %**	**15 %**	
033	**Kalmar**	**yes**	**30 %**	**20 %**	**15 %**	
034	**Härnösand**	**yes**	**30 %**	**20 %**	**15 %**	

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