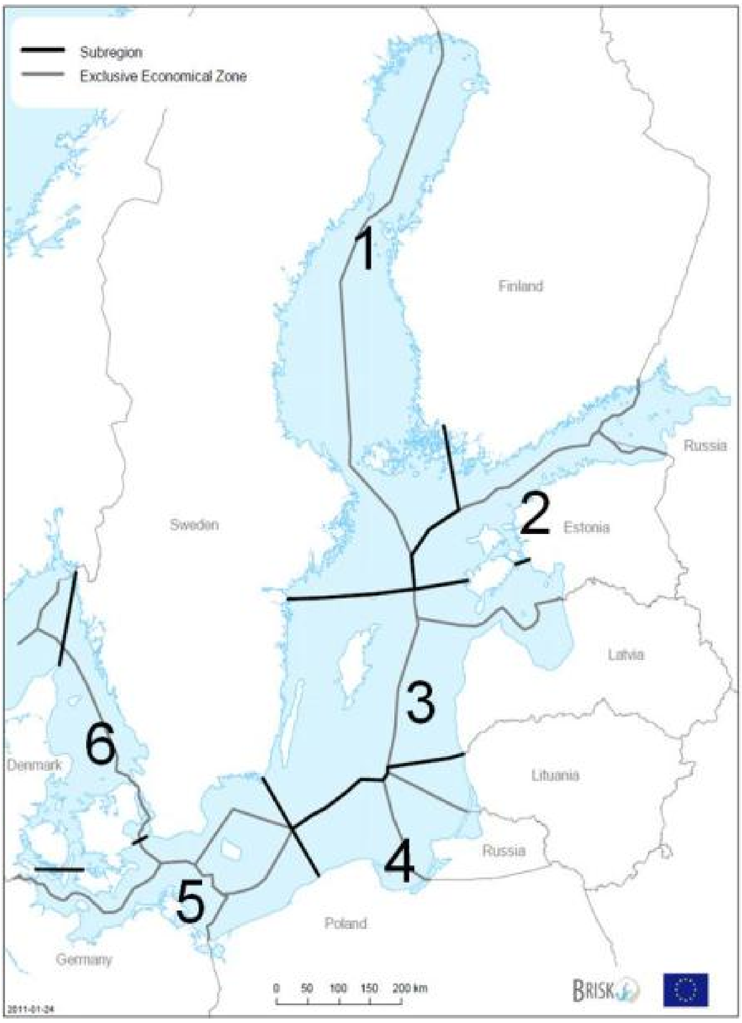
Baltic Sea Region
Programme 2007-2013

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

Investment Plans

February 2012



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Version:	Final 01
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Content

1. Introduction

This report presents the preliminary results of the sub-regional investment plans based on the risk analysis within the BRISK project.

The report shall serve as basis for the further work on identification of needed resources and corresponding investment plans.

In addition to optimizing oil spill response preparedness, the BRISK project has investigated a number of navigation aid scenarios. This additional analysis serves to open up a more general perspective on how the risk of spill could be reduced. It should be emphasized that the expected effect of the respective navigational aids is based on a number of assumptions in order to make direct comparison between the different optional scenarios possible. Any decision on specific measures should however be based on specific and more detailed analyses.

2. Summary

The basis for preparation of the investment Plans Report is the BRISK Application Form, which i.a. states that the idea behind building up the preparedness on the sub-regional level is that the investment costs will be “shared” among the neighbouring countries.

The Baltic Sea has been divided into 6 sub-regions as seen below. The Lead nation in each sub-region is marked with bold:

Sub-region 1: **Sweden**, Finland
Sub-region 2: Finland, **Estonia**, Russia
Sub-region 3: **Sweden**, Estonia, Latvia
Sub-region 4: **Lithuania**, Russia, Poland
Sub-region 5: Sweden, Denmark, **Germany**, Poland
Sub-region 6: Sweden, **Denmark**

Based on the risk analysis, relevant response scenarios have been agreed by the project partners. These response scenarios form the foundation for preparation sub-regional investment plans comprising identification of proposed response level, potential resources, costs of resources, cost benefit calculation, selection of preferred resources, and time table for procurement.

The risk picture varies from sub-region to sub-region. Therefore the conclusions and recommendations are specific for each sub-region and are not comparable. These conclusions and recommendations will be further discussed and considered by the competent authorities in all Baltic Sea countries within the HELCOM Response Group, to form basis for future work on investment plans for needed improvements in response capacities in the Baltic Sea region, according to the HELCOM Baltic Sea Action plan. As there are some plans for the BRISK extension stage, if realized, the extension stage will provide possibilities for implementation of selected investments.

In Sub-region 1, Gulf of Bothnia. Sweden, Finland a scenario analysis was carried out for the current situation, use of mandatory pilotage, use of VTS, ECDIS, Double hull cargo tanks, Double hull bunker tanks, escort towing, additional response capacities, additional booms and skimmers, night vision capability, and recovery from ice.

The following conclusions were made:

- The risk reducing measures scenarios would provide some reduction in the amount of oil spilt and oil on the coast
- The present location of the response capacities is sufficient to deal with spills up to 5,000 tons
- Major investments in additional response capacity would only have minor effect on the ability to recover oil on the coast
- Investment in shallow water response capacities would have some effect on ability to recover oil and oil on coast
- Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast.
- An increase in response capacity will have some effect on the ability to recover oil

- Investment in ice recovery equipment will have minor effect but should be considered for this sub-region

Sub-region 2, Gulf of Finland, Finland, Russia, Estonia the partners agreed that creating a joint investment plan is a time consuming process, which needs to be taken to the highest level of decision makers and also needs inter-governmental coordination, which all cannot be achieved in the given time frame.

It was decided, that an ad hoc list of ideas for investment (a wish list) could be presented instead of a joint investment plan. A list of already decided and planned investments of each subregional country has been presented instead of a joint investment plan.

In Sub-region 3, Central Baltic Proper, Sweden, Estonia, Latvia 3 a scenario analysis was carried out for the current situation, use of mandatory pilotage, use of VTS, ECDIS, Double hull cargo tanks, Double hull bunker tanks, escort towing, additional response capacities, additional booms and skimmers, night vision capability, and recovery from ice.

The following conclusions were made:

- The risk reducing measures VTS and TSS will provide the most significant reduction in the amount of oil spilt and on the coast
- The present location of response capacities is considered optimal
- The general conclusion is that major investment in additional response capacity will have only minor effect on the ability to recover oil and on oil on coast. Investment in additional response capacity is expensive and such an investment is considered not cost effective. This is only valid if the calculation by10 % recovery rate is used. This figure is not in accordance with the actual experiences from the Baltic Sea, where the estimated recovery rate is as high as up to 50 %.
- Investment in shallow water response capacities will have some effect on the ability to recover oil and on oil on the coast
- Major investment in additional response capacity will have some effect on the ability to recover oil and on oil on coast

- Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast
- An increase in response capacity will have some effect on the ability to recover oil

In Sub-region 4, South Eastern Baltic Proper, Lithuania, Poland, kaliningrad's Region of Russian Federation the partners agreed that a complete report to be fulfilled requires an extensive multidisciplinary examination, which - with the given time line – was not been possible. The outcome from the Risk Model Report is not clearly defined yet, and some final risk result parameters require further interpretation or even modification. Furthermore, decisions on future investments are to be made on the political level. Therefore, this report is limited to scenario analyses and contains only suggestions to be considered during further work on investment projects.

A scenario analysis was carried out, and the following conclusions were made:

- Compared to other sub-regions SR 4 is the lowest risk area of the Baltic Sea, and the environmental damage is lower than in other sub-regions
- The existing risk reducing measures have strong positive effect on the amount of oil spilt, environmental damage, and the amount of oil on the coast
- Risk reducing measures planned for 2020 have a less positive effect
- Non coordinated relocation of response vessels will bring a negative effect
- Depending on the size of the oil spill additional response capacity incl. booms and skimmers will bring a positive and very positive effect
- Methods to improve bad weather and night visibility will bring a positive and very positive effect
- Improved recovery from ice capability will not bring any effect

In Sub-region 5, Western Baltic Proper, Sweden, Denmark, Germany, Poland a scenario analysis was carried out for the current situation, use of mandatory pilotage, use of VTS, ECDIS, Double hull cargo tanks, Double hull bunker tanks, escort towing, additional response capacities, additional booms and skimmers, night vision capability, and recovery from ice.

The following conclusions were made:

- VTS will bring the most significant reduction in the amount of oil spilt and oil on the coast
- The present location of the response capacities is considered optimal
- Major investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast
- Investment in shallow water response capacities will have an effect on ability to recover oil and on oil on coast – especially in the Danish area.
- Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast

In Sub-region 6, Kattegat, Great Belt, The Sound, Denmark, Sweden a scenario analysis was carried out for the current situation, use of mandatory pilotage, use of VTS, ECDIS, Double hull cargo tanks, Double hull bunker tanks, escort towing, additional response capacities, additional booms and skimmers, night vision capability, and recovery from ice.

The following conclusions were made:

- In general the RRM scenarios VTS and TSS will provide the most significant reduction in the amount of oil spilt and oil on coast
- Present location of the general response capacities is considered optimum
- Major investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast
- Investment in shallow water response capacities will have an effect on ability to recover oil and on oil on coast – especially in the Danish area
- Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast

For each sub-region the effect of the existing efforts is determined. The existing efforts comprise Navigational Aids (NavA), such as pilotage, VTS, TSS, etc. as well as response capacities (response vessels with their respective booms, skimmer, storage, etc.).

Finally, it must be emphasised that there is no final and correct solution. The choice of design spill size and its return period is a political choice that indicates the balance between costs and response preparedness.

3. Aims and Objectives

There are limited financial resources that could be allocated to the response equipment/vessels and corresponding human resources.

This depends on many conditions, including the length of the coastline and intensity of traffic in national waters.

The idea behind building up the preparedness on the sub-regional level is that the investment costs will be “shared” among the neighboring countries.

Therefore, concrete programs, including the timetable, how to fulfill identified gaps in the resources has been prepared in each sub-region, see figure 1.

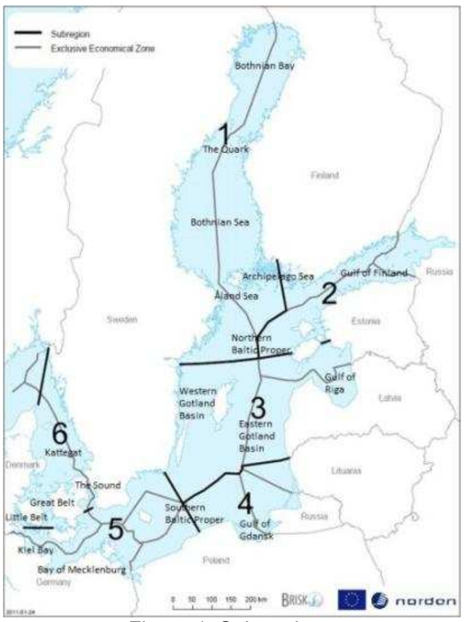


Figure 1. Sub-regions

The programs should include as far as possible technical description of the resources needed, indication which national and international financial sources could be/will be addressed to obtain necessary financing.

The programs will prepare the ground for investments in emergency and response resources in order to ensure timely and well organized emergency response and, if needed, response to pollution incident and in that way to minimize environmental damage caused by an accident.

Investments plans, for the additional response resources needed to obtain a balanced and satisfying level of response to oil and chemical pollution in the Baltic Sea, will be carried out in cooperation between national experts and an external consultant specialized within this field.

Taking the integral character of the BRISK project into account it seems obvious to let one major player lead the preparation of the investment plans for each sub-region. The project partners will prepare the content of the plans.

4. Scenarios

The sub-regions (SR) in figure 1 comprise the following countries:
SR1: **SWE**, FIN
SR2: FIN, **EST**, RUS
SR3: **SWE**, EST, LAT
SR4: **LIT,** RUS, POL
SR5: SWE, DEN, **GER**, POL
SR6: SWE, **DEN**

The countries in bold letters are the lead countries in their respective sub-region. Within each sub-region the experts of the sub-region carry out the specific interpretations of the modelled risk picture. Also the sub-regional experts based on the model results of the common risk model prepare the investment plans.

<u>Response scenarios for the entire Baltic Sea</u>

The project partners agree the following response scenarios:

4-1	2020 traffic prognosis	2020 NAVA	Re-allocation of existing capacities (vessels)
4-2	2020 traffic prognosis	2020 NAVA	Additional response equipment, as proposed by partners
4-3	2020 traffic prognosis	2020 NAVA	50% more response equipment
4-4	2020 traffic prognosis	2020 NAVA	Night visibility (0.85)

4-5	2020 traffic prognosis	2020 NAVA	Recovery of oil from ice (from 20% to 40%)

Figure 2. Overview of response scenarios

<u>Additional scenarios for the entire Baltic Sea</u>

The project partners agree the following additional scenarios:

3-1	2020 traffic prognosis	Mandatory Pilotage in the Danish Straits (add. to 2020 NAVA)	Exist. response
3-3	2020 traffic prognosis	Maximum Vessel traffic system (VTS), Kattegat, Femern, Bornholm and Gotland hotspots (add. to 2020 NAVA)	Exist. response
3-4	2020 traffic prognosis	Traffic separation schemes (TSS) in Kattegat (add. to 2020 NAVA)	Exist. response
3-5	2020 traffic prognosis	Electronic chart display and information system (ECDIS) for all large ships (add. to 2020 NAVA)	Exist. response
3-6	2020 traffic prognosis	Double hull at the cargo tank (<5000 BRT) (add. to 2020 NAVA)	Exist. response
3-7	2020 traffic prognosis	Double hull at bunker tank (add. to 2020 NAVA)	Exist. response
3-8	2020 traffic prognosis	Escort towing for all tankers in narrow shipping lanes where towing is done now (add. to 2020 NAVA)	Exist. response

Figure 3. Overview of navigational aids scenarios

5. Investment plans development

Lead Partner has prepared guidelines for preparation of needed resources and investment plans for the further work with the investment plans and comparison between the sub-regions.

The guideline states that the sub regional work shall comprise the following subjects:

- Identification of proposed response level
- List of potential resources (scenarios)
- Cost of resources
- Cost/Benefit calculation based on the outputs of the model results
- Selection of preferred resources (including technical specifications)

• Time table for procurements

5.1. Sub-region 1, Gulf of Bothnia, Sweden, Finland

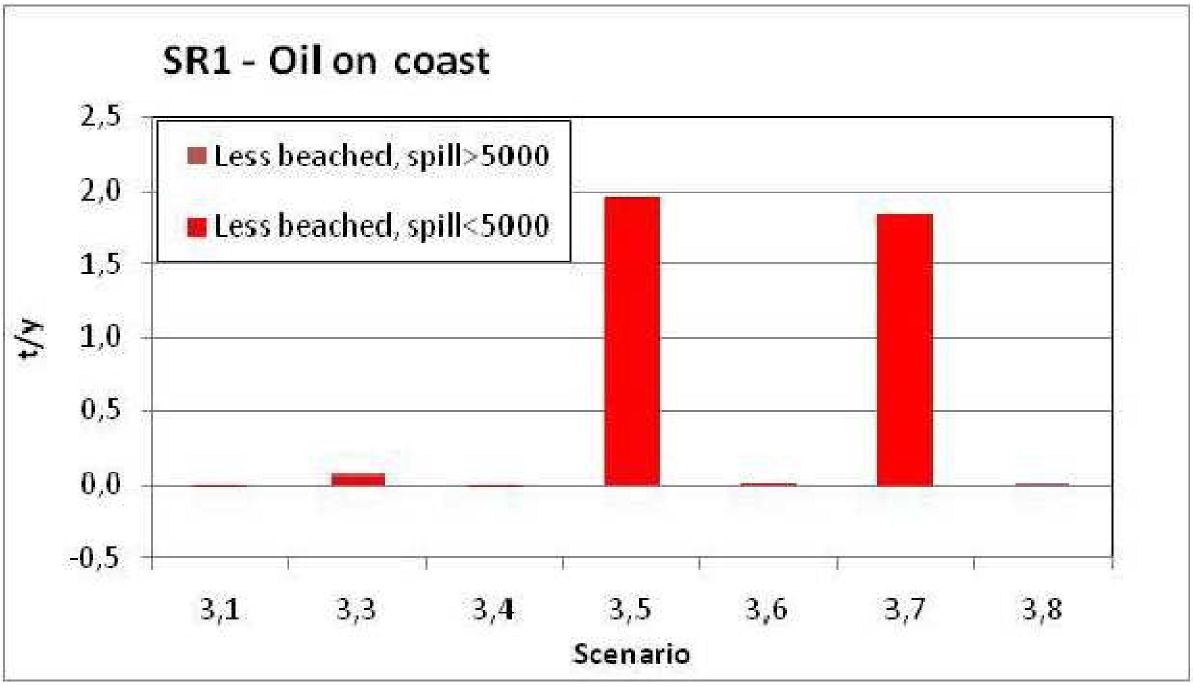
Introduction
This report consists of an analysis of the various scenarios in the DRAFT Risk Model Report august 2011, followed by conclusions on the various scenarios and finally a list of recommendations to be used for the decision makers.

The various scenarios will be compared to scenario 2,1 (2020 traffic, Risk Reducing Measurements (RRM) already decided upon until 2020 and the existing response capacity).

Scenario analysis:

Scenario 1,3 (current situation) vs. scenario 2,1:
Amount of oil spilt on long-term average annual basis is expected to decrease from 237 t/y to 220 t/y. Oil on coast is likewise expected to decrease from 18 t/y to 16 t/y.

Despite the increased traffic and risk, the expected amount of oil spilt will decrease due to RRM already decided upon until 2020.



Scenario 3,1 (mandatory pilotage) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to be unchanged. Oil on coast is expected to be unchanged as well.
Mandatory pilotage will have no effect on amount of oil spilt, or on oil on coast.

Scenario 3,3 (VTS) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to be unchanged. Oil on coast is expected to be unchanged as well.

Scenario 3,4 (TSS) vs. scenario 2,1:

Amount of oil spilt on long term average annual basis is expected to be unchanged. Oil on coast is expected to be unchanged as well.
Implementation of TSS will have no effect on amount of oil spilt and on oil on coast.

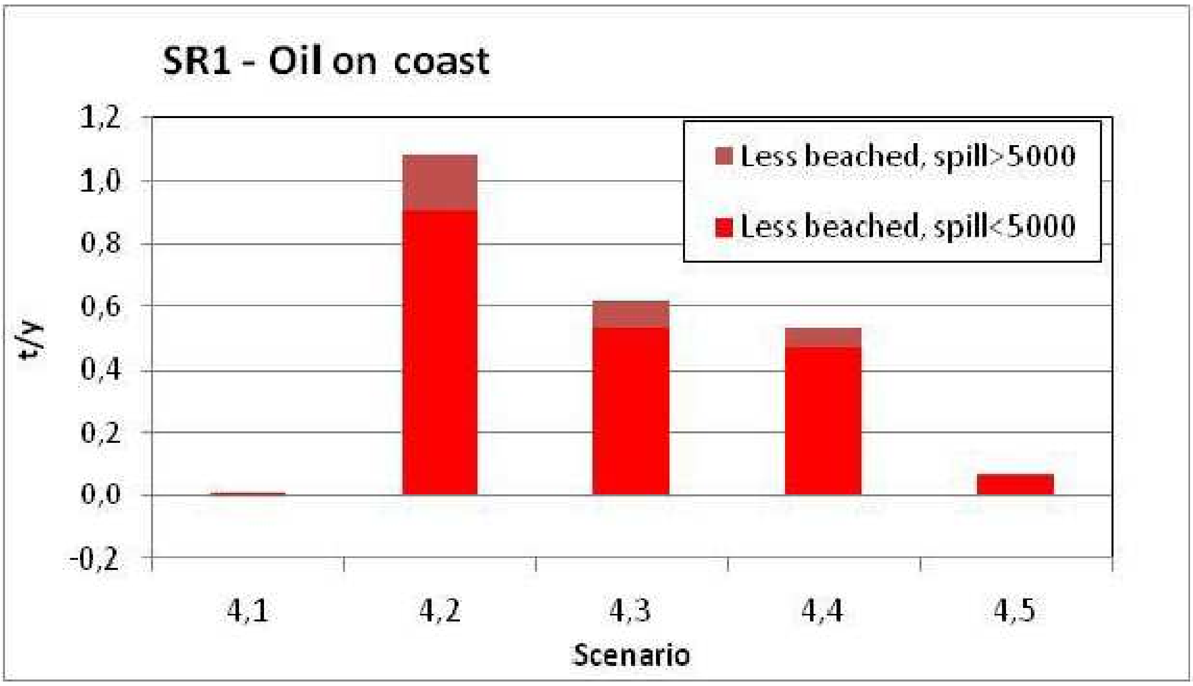
Scenario 3,5 (ECDIS) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from, 237 t/y to 220 t/y. Oil on coast is expected to decrease from 18 t/y to 16 t/y.
Implementation of mandatory ECDIS for all large ships will have only minor effect on amount of oil spilt and oil on coast.

Scenario 3,6 (DB hull at cargo tanks in ships < 5000 BRT) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to be unchanged. Oil on coast is expected to be unchanged as well.

DB hull in smaller tankers will have no effect.

Scenario 3,7 (DB hull at bunker tanks) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from 237 t/y to 221 t/y. Oil on coast will decrease from 18 t/y to 16 t/y..
DB hull at bunker tanks will only have minor effect.

Scenario 3,8 (escort towing for tankers) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to be unchanged. Oil on coast is expected to be unchanged as well.
Escort towing for all tankers will have no effect.



Scenario 4, 1 (reallocation of response capacities) vs. scenario 2, 1:
Reallocation of response capacities will have no effect on the ability recover oil. Oil on coast will remain unchanged.

Scenario 4, 2 (additional response capacities) vs. scenario 2, 1:
Additional investments in response capacity (ships, personnel, booms, skimmers etc.) will increase the ability to recover oil with from 21 t/y to 22 t/y. Oil on coast is expected to remain unchanged, 18 t/y.

Significant investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast. (if recovery rate is 10%)
The joint Swedish/Finnish recovery capacity in SR 1 has not been decided due to the fact that we use different approach. Sweden has a target volume of 10.000 t around our coast. We know that this is a very high goal to achieve and even harder in this part of our waters. Finland has defined an oil response target level for each of the sea areas. The target level is based on the risk level, which FI considers to depend on the size of the biggest tankers sailing at each of the sea areas.
In Gulf of Bothnia the target level defined by Finland is 5 000 tn. Finland is aiming to be able to reach the target jointly with Sweden.

However an analysis of the “Sensitivity, impact and damage maps” indicates that investment in additional shallow water response capacities might have an effect on ability to recover oil at sea and on oil on coast. This subject should be investigated further.

Scenario 4, 3 50 % more booms and skimmers
An increase in response capacity will result in a slight increase in recovery of oil oil from 21 t/y to 22 t/y.
Oil on coast is expected to remain unchanged, 18 t/y. Nations should investigate this matter further.
Scenario 4, 4 (night vision capability) vs. scenario 2,1:
Investment in night vision capability will increase the ability to recover oil from 21 t/y to 22 t/y.
Oil on coast is expected to remain unchanged, 18 t/y.

Investment in night vision capacity will have a minor effect on the ability to recover oil and on oil on coast.

There is a variety of systems with different performance available on the market. The cost for one system is - depending on system - between 70.000 and 120.000 Euros. Nations should investigate this matter further.

Scenario 4, 5 (recovery from ice) vs. scenario 2,1:
Investment in recovery in ice capability will have no effect on the ability to recover oil and on oil on coast.
However this should be further investigated.

Conclusion
In general the RRM scenarios will provide some reduction in the amount of oil spilt and oil on coast.
Present location of the general response capacities is considered sufficient to deal with spills up to 5000 t.
The general conclusion is that major investment in additional response capacity will have only minor effect on the ability to recover oil and on oil on coast. This is only valid if the calculation by 10% recovery rate is used. This figure is not in accordance

with the actual experiences from the Baltic Sea, where the estimated recovery rate is as high as up to 50%!
Investment in shallow water response capacities will have some effect on ability to recover oil and on oil on coast and should be considered due to the shallow areas in the sub-region. One response unit to be used in shallow waters is estimated to cost about 250 000 Euro.

Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast. Cost for one system is estimated to vary from 100 000 Euro to 150 000.

An increase in response capacity will have some effect on the ability to recover oil. An increase in response capacity should be investigated further.

Investment in ice recovery equipment will have minor effect but should be considered for this sub-region. Cost for skimmers to be used in icy conditions are estimated to 50 000 Euro/skimmer

Recommendation
It is recommended that the final report should contain recommendations on investigations on improved RRM
Investment in shallow water response capacities should be further investigated.
Nations should investigate further on night vision capacities.
Even if the scenarios show a low effect on having investments in ice recovery equipment and response vessels with ice going capacity this should be considered for sub-region 1 due to the fact that the area is covered by ice every winter.

5.2. Sub-region 2, Gulf of Finland, Finland, Russia, Estonia

The Gulf of Finland subregion has discussed the possibility to create joint investment plan accordingly to the results of BRISK project. As the result of discussion, held in Helsinki at subregional meeting 15-16.11.2011, a common understanding was reached, that creating a joint investment plan is a time consuming process, it needs to be taken to the highest level of decision makers and needs also inter-governmental coordination, which all cannot be achieved in the given time frame. It was also understood that BRISK project's results for proposed investments for Gulf of Finland subregion include prevalently skimmers and booms.

It was decided, that a *ad hoc* created list of ideas for investment (a wish list) could be presented instead of joint investment plan, also it was considered suitable, that a list of already decided and yet planned investment of each subregional country should be presented instead of a joint investment plan as follows.

Ideas for investment
- Common stockpile of response equipment to be established at one of the islands (for example Vaindloo)
- Upgrading 2 ice class tankers (1500 tn) to ORV (total 2 M€),Russian waters, whisch is similar concept to some EMSA chartered vessels concept.
- A HELCOM level E-Tool which integrates existing (inc. National) systems, it could integrate the systems and provide the international fleet a common situational picture

- Floating storage tanks which could be quickly deployed with e.g. helicopters
- One ship and open sea booms (Estonian proposal)
- Container for the first response
- Trucks to transport the equipment to ports close to accident area
- Remote sensing equipment to aircraft
- emergency pumps (to keep the casualty from sinking and/or fuel/cargo transfers), can be delivered with helicopters
- Common Skimmer for oil in ice
- Shoreline protection booms (inc. accessories) (Note: the storage is also needed)

Planned and decided investments by each country
Finland
Decided:
One multipurpose vessel for border patrolling, search and rescue and oil and chemical response:
- to be delivered 2014
- to be located in Gulf of Finland
- to be operated by Finnish Border Guard
- (About the same size as oil response vessel Louhi)

Planned:
Two smaller multipurpose vessels for functional ferry service and oil and chemical response
- to be possibly delivered 2014-2015
- one to be located in Archipelago Sea (Hiittinen area) and one in Gulf of Finland (Kotka area)
- to be operated by one of the companies offering functional ferry services
- (the tender decision related to the functional ferry services is still in court, so the planned marine pollution response investments have been delayed)

One additional multipurpose vessel
- (About the same size as oil response vessel Louhi)

Russia
- Multifunctional search-and-rescue ship, 7 Mwt, delivered 2015
- Multifunctional search-and-rescue ship, 2.5-3.0 Mwt, delivered 2014
- Marine diving boat, delivered 2012
- 1 boom deployer, delivered 2012

Estonia
No investments are planned, nor decided.

5.3. Sub-region 3, Central Baltic Proper, Sweden, Estonia, Latvia

Introduction
This report consists of an analysis of the various scenarios in the DRAFT Risk Model Report august 2011, followed by conclusions on the various scenarios and finally a list of recommendations to be used for the decision makers.

The various scenarios will be compared to scenario 2,1 (2020 traffic, RRM already decided upon until 2020 and existing response capacity).

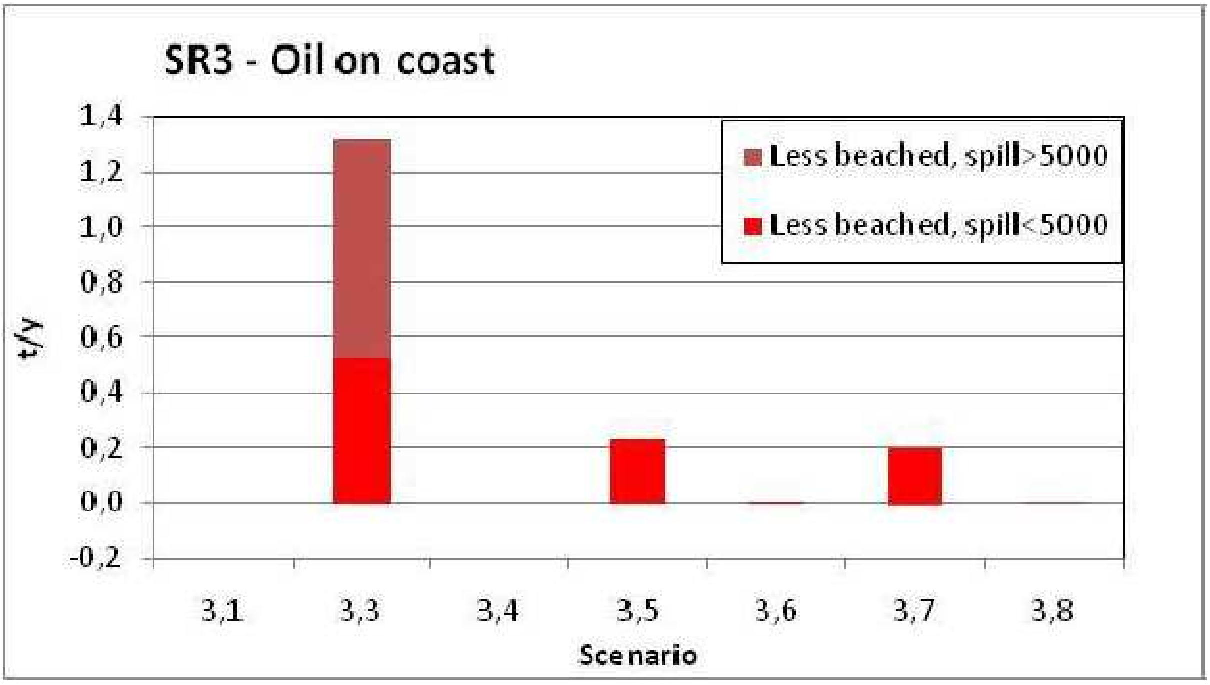
The BRISK Project requested the below listed chapters in the report:

- Identification of proposed response level
- List of potential resources (scenarios)
- Cost of resources
- Cost/Benefit calculation based on the outputs of the model results
- Selection of preferred resources (including technical specifications)
- Time table for procurements

A report of the requested volume would require an extensive cross-ministerial examination which - with the given time line – has not been possible. Furthermore decisions on future investments are to be made on the political level.

Scenario analysis:

Scenario 1,3 (current situation) vs. scenario 2,1:
Amount of oil spilt on long-term average annual basis expected to decrease from, 1.192 t/y to 1.030 t/y. Oil on coast is likewise expected to decrease from 17 t/y to 15 t/y.
Despite the increased traffic and risk, the expected amount of oil spilt will decrease due to RRM already decided upon until 2020.



Scenario 3,1 (mandatory pilotage) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected not to differ compared to scenario 2.1 1.030 t/y. Oil on coast is expected to be equal, 15 t/y.
Mandatory pilotage will have some effect on amount of oil spilt, but only minor effect on oil on coast.

Scenario 3,3 (VTS) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from, 1.030 t/y to 844 t/y. Oil on coast is expected to decrease from 15 t/y to 14 t/y. Implementation of VTS will have a significant effect on amount of oil spilt but almost no effect on oil on coast.

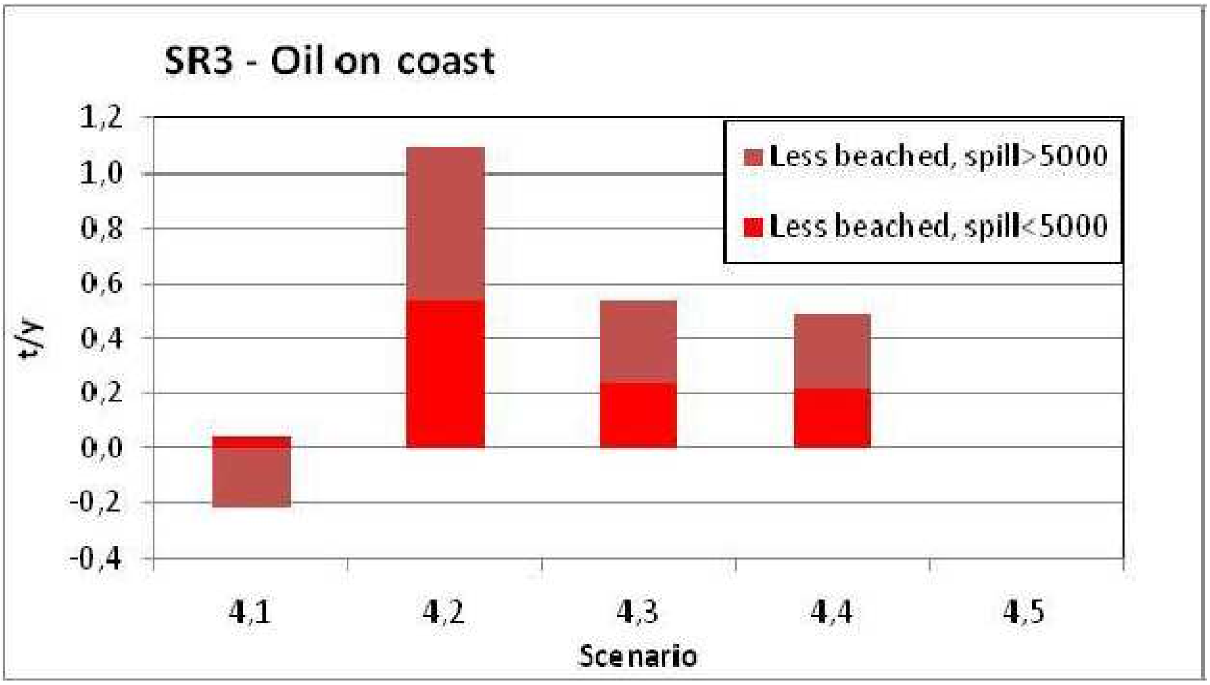
Scenario 3,4 (TSS) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected not to differ compared to scenario 2.1 1.030 t/y. Oil on coast is expected to be equal, 15 t/y. Implementation of TSS will have no effect on amount of oil spilt and on oil on coast.

Scenario 3,5 (ECDIS) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from, 1.030 t/y to 1.027 t/y. Oil on coast is expected to be equal 15 t/y.
Implementation of mandatory ECDIS for all large ships will have no effect on amount of oil spilt and oil on coast.

Scenario 3,6 (DB hull at cargo tanks in ships < 5000 BRT) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected not to differ compared to scenario 2.1 1.030 t/y. Oil on coast is expected to be equal, 15 t/y.
DB hull in smaller tankers will have no effect.

Scenario 3,7 (DB hull at bunker tanks) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from 1.030 t/y to 1.027 t/y. Oil on coast will remain unchanged.
DB hull at bunker tanks will have no effect.

Scenario 3,8 (escort towing for tankers) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected not to differ compared to scenario 2.1 1.030 t/y. Oil on coast is expected to be equal 15 t/y.
Escort towing for all tankers will have almost no effect.



Scenario 4,1 (reallocation of response capacities) vs. scenario 2,1:
According to the figures in the document "Model results numerical values (1).xlsx" reallocation of response capacity will not have any effect on recovery of spilt oil.
The considered existing response capacity within the BRISK Model Scenarios Report in the central and eastern part of SR3 has no equal distribution pattern and therefore is not space adequate. Reallocation of recovery capacities from the gulf of Riga to the Baltic coastline should have significant effect on response capacity. According to the inventory of the existing response capacities we can see that distribution of response capacities is very unequal in the SR3 in general due to the large area of the sub-region, as well as due to slight differences in response capacities of the respective countries. We have to reconsider spatial distribution and possible reallocation of response capacities in the central and southern part of SR3

Scenario 4,2 (additional response capacities) vs. scenario 2,1:
Additional investments in more response capacity (ships, personnel, booms, skimmers etc.) will not change the ability to recover oil. Oil on coast is expected to be almost equal 14 t/y. Significant investment in additional response capacity will have no effect on the ability to recover oil and on oil on coast.
Significant investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast. (if recovery rate is 10%!!!
Therefore investment in general additional response capacity should have significant effect on the ability to recover oil in the south-eastern part of the sub-region. If resources for the sub-region could be distributed more evenly for example more capacities based on the island of Gotland, it would change the ability to recover oil in the whole sub-region

The joint Estonian/Latvian/Swedish recovery capacity in SR 3 is roughly estimated to be 6000 tons if the three countries co-operate during an operation, and this capacity is considered sufficient.
The existing estimated Latvian response capacity at sea is 800 tons and is considered as not sufficient. No specialized oil response vessel is designated within the south-eastern part of the sub-region, as Latvia does not operate any purpose-built or multifunctional oil response vessel.
Estonian relevant capacity is 500 tons (summary tank volumes of 3 vessels), and it must be considered, that response vessels are positioned in Gulf of Finland. Such capacity is also considered not sufficient for Estonian AOR.
Investment in shallow water response capacity is significant issue for the south-eastern part of the SR3, as all the coastline consists of shallow waters and all the recent accidents have been groundings in shallow waters. Investment in shallow water response capacities will have significant effect on ability to recover oil and on oil on coast. This subject should be investigated further.

Scenario 4,3 50 % more booms and skimmers
An increase in response capacity will result in a slight increase in recovery of oil oil from, 63 t/y to 71 t/y.
Oil on coast is expected to decrease by one ton to 14 t/y. Nations should investigate this matter further.

Scenario 4,4 (night vision capability) vs. scenario 2,1:
Investment in night vision capability will not change the ability to recover oil. Oil on coast is expected to be almost equal 14 t/y.
Investment in night vision capacity will have no effect on the ability to recover oil and on oil on coast.
This is only valid if the calculation by 10% recovery rate is used. This figure is not in accordance with the actual experiences from the Baltic Sea, where the estimated recovery rate is as high as up to 50%!
No recent spills which can confirm a higher recovery rate in SR3. However spills

- on the Swedish west coast 2011,
- Norwegian south coast 2011
- close to Copenhagen 2008
- Bornholm 2003

are all examples of spills at sea where the recovery rate was much higher than 10 %. The waters in SR3 will not be more difficult to handle and within the co-operation of Helcom a higher recovery rate is very reasonable

There is a variety of systems with different performance available on the market. The cost for one system is - depending on system - between 70.000 and 120.000 Euros. Nations should investigate this matter further.
Scenario 4,5 (recovery from ice) vs. scenario 2,1:
Investment in recovery in ice capability will have no effect on the ability to recover oil and on oil on coast.

Conclusion
In general the RRM scenarios (especially 3,3 and 3,4) will provide the most significant reduction in the amount of oil spilt and oil on coast.
Present location of response capacities is considered optimum.
The general conclusion is that major investment in additional response capacity will have only minor effect on the ability to recover oil and on oil on coast. Investment in additional response capacity is expensive and such an investment is considered not cost effective. This is only valid if the calculation by10 % recovery rate is used. This figure is not in accordance with the actual experiences from the Baltic Sea, where the estimated recovery rate is as high as up to 50 %.
Investment in shallow water response capacities will have an effect on ability to recover oil and on oil on coast One response unit to be used in shallow waters is estimated to cost about 250 000 Euro.

Major investment in additional response capacity will have some effect on the ability to recover oil and on oil on coast. Investment in additional response capacity is expensive and the effect is considered not cost effective. This is only valid if the calculation by 10% recovery rate is used. This figure is not in accordance with the actual experiences from the Baltic Sea, where the estimated recovery rate is as high as up to 50%.

An increase in response capacity will have some effect on the ability to recover oil. An increase in response capacity should be investigated further.

Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast. Cost for one system is estimated to vary from 100 000 Euro to 150 000.

Recommendation
It is recommended that the final report should contain recommendations on improved RRM.
Nations should monitor the technical development on response equipment and replace outdated equipment with state of the art.
Nations should invest in night vision capacities Cost for one system is estimated to vary from, 100 000 Euro to 150 000.

Nations should develop /aim to develop sea surveillance systems which can be used for anomaly detection functions.

5.4. Sub-region 4, South-eastern Baltic Proper, Lithuania, Poland, Kaliningrad's Region of Russian Federation

Introduction
This report presents the analysis of the various scenarios as the result of the DRAFT Risk Model Report from August 2011 submitted by COWI A/S, followed by conclusions on the various scenarios and finally, a list of recommendations to be used for the decision makers.

The various scenarios are compared to scenario 2,1 (2020 traffic, RRM already decided upon until 2020 and existing response capacity).

A complete report to be fulfilled requires an extensive multidisciplinary examination which - with the given time line – was not been possible. The outcome from the Risk Model Report is not clearly defined yet, and some final risk result parameters require further interpretation or even modification. Furthermore, decisions on future investments are to be made on the political level. Therefore, this report is limited to scenario analyses and contains only suggestions to be considered during further work on investment projects.

Overall risk within the Baltic Sea Area

Reference spill (tonnes) for different return periods[1]

Sub-area	Area name	50 years	100 years	200 years	500 years
1	Gulf of Bothnia	2 200	3 700	5 500	11 100
2	Gulf of Finland	3 500	7 000	15 700	54 800
3	Central Baltic Proper	5 000	10 700	28 600	74 100
4	S-E Baltic Proper	800	1 800	3 300	7 400
5	Western Baltic Proper	8 900	23 400	44 900	100 000
6	Kattegat	11 100	25 900	49 600	110 500
ALL	Baltic Sea	31 500	72 500	147 600	357 900

[1] A **return period** also known as a **recurrence interval** is an estimate of the interval of time between events of a certain intensity or size (Wikipedia).

Conclusion: Sub-region 4 comparing to other sub-regions is the lowest risk area. For the return period of 200 years the estimate spill of 3300 tons makes only 2,3% of the total spill estimated for the whole Baltic.

Environmental damage from all spills

The environmental damages from all spill size classes are shown in table below. The Figure describes the long-term average damage and is given in gram oil per km2 weighted with the environmental vulnerability.

Scenario ID	Sub-region	Oil Spilt	Oil Re-covered	Oil Re-covered	Env. Damage	Oil on Coast
2,1	1	237	21	9%	272 116	18
2,1	2	910	49	5%	113 560	58
2,1	3	1 030	63	6%	98 759	15
2,1	4	123	11	9%	68 662	4
2,1	5	1 626	114	7%	174 648	68
2,1	6	2 005	116	6%	174 577	203
2,1	All	5 932	375	6%	902 321	366

Scenario 2.1: 2020 traffic prognosis, 2020 RRM (already decided upon), existing response.

Conclusion: The environmental damage in Sub-region 4 is lower then in other sub-regions however, the proportion is not so small like in the risk figures. The environmental damage of 68 662 grams/km2 weighted makes 7,6% of the total environmental spill.

Comments: The term of environmental damage requires further explanation. Environmental sensitivity data was delivered by each country, and the index (ESI) is rather subjective term, perhaps because of different sensitivity understanding.

A ratio of oil recovered is rather non-estimated. ITOPF calculations are based on worldwide statistics. There is no similar region in the world having such confined area and so much developed mechanical recovery capacity. There is no any country in the world having declared response capacity of 30.000 tons!

The impact of risk reducing measures (RRM)

Scenario Name		RRM	Spill Class	Oil Spilt	Oil Recovered		Env. Damage	Oil on Coast	RRM or CRM Effect	Effects			
Name	ID	Protective Measures	tons	tons/year	tons/year	(%)	g/km2 weighted	tons/year		Oil split	Oil rec.	Env. damage	Oil on Coast
2008/9 traffic	1,1	No RRM	<5000	67,8	8,92	13,2%	65 770	2,9					
2008/9 traffic	1,1	No RRM	>5000	95,2	3,76	4,0%	30 850	2,7					
2008/9 traffic	1,1	No RRM	All	163,0	12,68	7,8%	96 621	5,6					

2008/9 traffic	1,3	Exist. RRM	<5000	60,1	7,95	13,2%	39 621	2,4	Strong positive effect	11,30%	-10,90%	39,76%	18,27%
2008/9 traffic	1,3	Exist. RRM	>5000	87,3	3,46	4,0%	21 757	2,3	Strong positive effect	8,29%	-8,14%	29,47%	29,47%
2008/9 traffic	1,3	Exist. RRM	All	147,4	11,41	7,7%	61 378	4,7	Strong positive effect	9,54%	-10,08%	36,48%	16,54%
2020 traffic prognosis	2,1	2020 RRM	<5000	63,7	8,61	13,5%	50 791	2,4	Strong positive effect	6,00%	-3,49%	22,77%	15,78%
2020 traffic prognosis	2,1	2020 RRM	>5000	59,7	2,40	4,0%	17 870	1,3	Strong positive effect	37,31%	-36,3%	42,07%	50,32%
2020 traffic prognosis	2,1	2020 RRM	All	123,4	11,01	8,9%	68 662	3,8	Strong positive effect	24,28%	-13,2%	28,94%	32,35%

Reduction of oil recovered !

Conclusion: Existing risk reducing measures have strong positive effect on the amount of oil split, environmental damage and the amount of oil at the coast. RRM planned for 2020 have a less positive effect. Calculations for RRM are not corresponding because of different traffic densities in 2008/9 and 2020. The same time period reference is important for the further net environment benefit analyses NEBA and NEEBA (including economics). Furthermore, blank option (no RRM, no response) would be useful for that purpose.

Comments: Reduction of the amount of oil recovered is causing the significant reduction of the amount of oil recovered. It seems that the response capacity and response efficiency is not so dependent from the amount of spilled oil. Certainly, this is non-linear relationship.

The impact of additional risk reducing measures

Scenario	RRM	CRM	Spill Class	Oil Spilt	Oil Recovered		Env. Damage	Oil on Coast	RRM or CRM Effect	Effects			
ID	Protective Measures	Response Measures	tons	tons/year	tons/year	(%)	g/km2 weighted	tons/year		Oil split	Oil rec.	Env. damage	Oil on coast
3,5	ECDIS	Exist. reponse	<5000	62,6	8,50	13,6%	48 423	2,3	Small positive effect for small spills	1,72%	-1,22%	4,66%	4,53%
3,5	ECDIS	Exist. reponse	>5000	59,7	2,40	4,0%	17 870	1,3	Any effect in Sub-region 4				
3,5	ECDIS	Exist. reponse	All	122,3	10,90	8,9%	66 293	3,7	Small positive effect for small spills	0,89%	-0,95%	3,45%	2,94%
3,7	Double hull at bunker	Exist. reponse	<5000	62,8	8,51	13,6%	48 683	2,3	Small positive effect for small spills	1,52%	-1,10%	4,15%	4,01%
3,7	Double hull at bunker	Exist. reponse	>5000	59,7	2,40	4,0%	17 870	1,3	Any effect in Sub-region 4				
3,7	Double hull at bunker	Exist. reponse	All	122,4	10,91	8,9%	66 553	3,7	Small positive effect for all spills	0,81%	-0,86%	3,07%	0,00%

General conclusion related to the risk reduction measures:

RRM do not bring any effect or bring small positive effect. Perhaps this is connected to the fact that all RRM and additional RRM are dealing with arrangements on other sub-regions. Never mind the outcome of the BRISK there is realised a huge investment project called: The National Maritime Safety System with the aim to improve safety of navigation on Polish maritime areas. The cost of the project is about 110 million PLN (~25 million EUR) and the first stage of the investment should be finalised by the end of 2015.

The impact of additional response measures

Scenario Name	CRM	Spill Class	Oil Spilt	Oil Recovered		Env. Damage	Oil on Coast	RRM or CRM Effect	Effects		
ID	Response Measures	tons	tons/year	tons/year	(%)	g/km2 weighted	tons/year		Oil recovered	Env. Damage	Oil on Coast
4,1	Relocation of vessels	<5000	63,7	8,55	13,4%	52 049	2,5	Negative effect	-0,66%	-2,48%	-0,90%
4,1	Relocation of vessels	>5000	59,7	2,40	4,0%	17 913	1,3	Negative effect	0,00%	-0,24%	0,00%
4,1	Relocation of vessels	All	123,4	10,95	8,9%	69 963	3,8	Negative effect	0,00%	-1,90%	0,00%
4,2	Add. booms and skimmers	<5000	63,7	9,00	14,1%	44 298	2,4	Positive effect for small spills	5,28%	12,78%	0,00%
4,2	Add. booms and skimmers	>5000	59,7	3,39	5,7%	16 759	1,3	Strong positive effect for large spills	41,32%	6,22%	0,00%
4,2	Add. booms and skimmers	All	123,4	12,39	10,0%	61 056	3,6	Positive effect for all spills	13,17%	12,73%	3,91%
4,3	50% more booms and skimmers	<5000	63,7	8,86	13,9%	46 890	2,4	Positive effect for small spills	2,92%	7,68%	0,00%
4,3	50% more booms and skimmers	>5000	59,7	2,96	5,0%	17 244	1,3	Strong positive effect for large spills	23,43%	3,50%	0,00%
4,3	50% more booms and skimmers	All	123,4	11,82	9,6%	64 135	3,7	Positive effect for all spills	7,39%	4,16%	2,08%
4,4	Night visibility (0.85)	<5000	63,7	8,82	13,8%	48 334	2,4	Positive effect for small spills	2,41%	4,84%	0,00%
4,4	Night visibility (0.85)	>5000	59,7	2,85	4,8%	17 470	1,3	Strong positive effect for large spills	18,82%	2,24%	0,00%
4,4	Night visibility (0.85)	All	123,4	11,67	9,5%	65 804	3,7	Positive effect for all spills	5,98%	4,16%	2,08%

Relocation of vessels

ID			Add. response effect	Effects		
				Oil recovered	Environmental damage	Oil on shore
4.1	Relocation of vessels	<5000	Negative effect	-0,66%	-2,48%	-0,90%
4.1	Relocation of vessels	>5000	Negative effect	0,00%	-0,24%	0,00%
4.1	Relocation of vessels	All	Negative effect	0,00%	-1,90%	0,00%

Conclusion: Non-coordinated (within the sub-region) relocation of vessels brings the negative effect.

Comment: For further investigations additional locations should be considered.

Additional booms and skimmers

Add. response effect			Effects		
ID			Oil recovered	Environmental damage	Oil on shore
4,2	Add. booms and skimmers <5000	Positive effect for small spills	5,28%	12,78%	0,00%
4,2	Add. booms and >5000	Strong positive effect for large spills	41,32%	6,22%	0,00%

	skimmers					
4,2	Add. booms and skimmers	All	Positive effect for all spills	13,17%	12,73%	3,91%

Conclusion: Additional response capacity, including booms and skimmers brings depending of the size of the spill positive and very positive effect.

Comment: It should be further investigated what kind of platform would be used for additional booms and skimmers because investments without vessels able to use additional equipment do not make any sense.

Additional response + 50 % more booms and skimmers

Add. response effect				Effects		
				Oil recovered	Environmental damage	Oil on shore
4,3	50% more booms and skimmers	<5000	Positive effect for small spills	2,92%	7,68%	0,00%
4,3	50% more booms and skimmers	>5000	Strong positive effect for large spills	23,43%	3,50%	0,00%
4,3	50% more booms and skimmers	All	Positive effect for all spills	7,39%	4,16%	2,08%

Conclusion: Additional response capacity, including 50% more booms and skimmers brings depending of the size of the spill positive and very positive effect.

Comment: It should be further investigated what kind of platform would be used for additional booms and skimmers because investments without vessels able to use additional equipment do not make any sense.

Response during the night and bed visibility

Add. response effect				Effects		
				Oil recovered	Environmental damage	Oil on shore
4,4	Night visibility (0.85)	<5000	Positive effect for small spills	2,41%	4,84%	0,00%
4,4	Night visibility (0.85)	>5000	Strong positive effect for large spills	18,82%	2,24%	0,00%
4,4	Night visibility (0.85)	All	Positive effect for all spills	5,98%	4,16%	2,08%

Conclusion: The development of methods allowing the response at night and bad visibility brings depending on the size of the spill positive and strong positive effects.

Comment: In our opinion, the effect is estimated to low, and we would recommend further investigation.

Recovery from ice

(Scenario 4.5)

Recovery of oil from ice	<5000	63,7	8,61	13,5%	50 791	2,4	Any effect in Sub-region 4
Recovery of oil from ice	>5000	59,7	2,40	4,0%	17 870	1,3	Any effect in Sub-region 4
Recovery of oil from ice	All	123,4	11,01	8,9%	68 662	3,8	Any effect in Sub-region 4

Conclusion: Improvement of recovery from ice capacity does not bring any effect, probably because of lack of the ice. However, some these special response possibilities have to be considered in relation to costal and sheltered waters.

Final conclusion:

These analyses led us to the general conclusion that for the Sub-region 4, the most benefit should be investments related to the new response equipment.

Information about existing response capacity

Sub-region 4.
South-Eastern Baltic Proper (Lithuania, Poland, Kalingrad's Region of the Russian Federation)

No	Country	Existing response capacity [tonnes]	Planned response capacity [tonnes]	Comments
1	Lithuania	2.500	2.500	
2	Poland[2]	4.500	8.000	
3	Russian Federation	1.000	1.500	by 2020
4	Total Sub-region 4	8.000	12.000	

Investment plans

No	Country	Item	Basic functions	Cost ml EUR	Delivery time
1	Lithuania[3]	Response vessel	ETOW, OIL & HNS fast response vessel	tbd.	2020
2	Poland	Response vessel	ETOW, OIL & HNS fast response vessel, shoreline response support	~50,0	2016 - 2018
3	Poland	Costal response boat (2 pcs.)	oil containment and recovery	0.50	2015
4	Poland	Modernization of the existing response vessel	ETOW, OIL fast response vessel, shoreline response support	3,0	2020
5	Russian Federa-	Response vessel	Boom deploy		2010

[2] Polish response capacity is shared between sub-regions 4 and 5

[3] Lithuania has one of the oldest response vessel SAKIAI. Fishing trawler SAKIAI was built in Jaroslavlis shipyard (Russia) in 1986. This vessel has only one main engine (power 970 kW) with one screw. It is necessary to replace the existing vessel SAKIAI to more modern response vessel (Lithuanian comment to the investment plans).

	tion				
6	Russian Federa-tion	Response vessel	Inshore diving boat		2013

Sub-regional proposals for the BRISK extension stage

No	Sub-region	Item	Basic func-tions	BRISK out-come	Additional reasons	Cost EUR
1	4	Response boat for sheltered waters of the Curonian Lagoon	oil contain-ment and re-covery	Additional booms and skimmers	High sensitive area, lack of resources	220,000
2	4	Response boat for sheltered waters of the Vistula (Kalinin-grad) Lagoon	oil contain-ment and re-covery	Additional booms and skimmers	High sensitive area, lack of resources	220,000
3	4	NOFI Current Buster	oil contain-ment and re-covery	Additional booms and skimmers	Fast contain-ment and re-covery. The use of vessels of opportunity	150,000
		Total				590,000

5.5. Sub-region 5, Western Baltic Proper, Sweden, Denmark, Germany, Poland

Introduction

This report consists of an analysis of the various scenarios in the DRAFT Risk Model Report august 2011, followed by conclusions on the various scenarios and finally a list of recommendations to be used for the decision makers.

The various scenarios will be compared to scenario 2,1 (2020 traffic, RRM already decided upon until 2020 and existing response capacity).

As implementation of most scenarios will require further analysis and as decisions are to be made on the political level it is not possible to describe a time table for possible implementations.

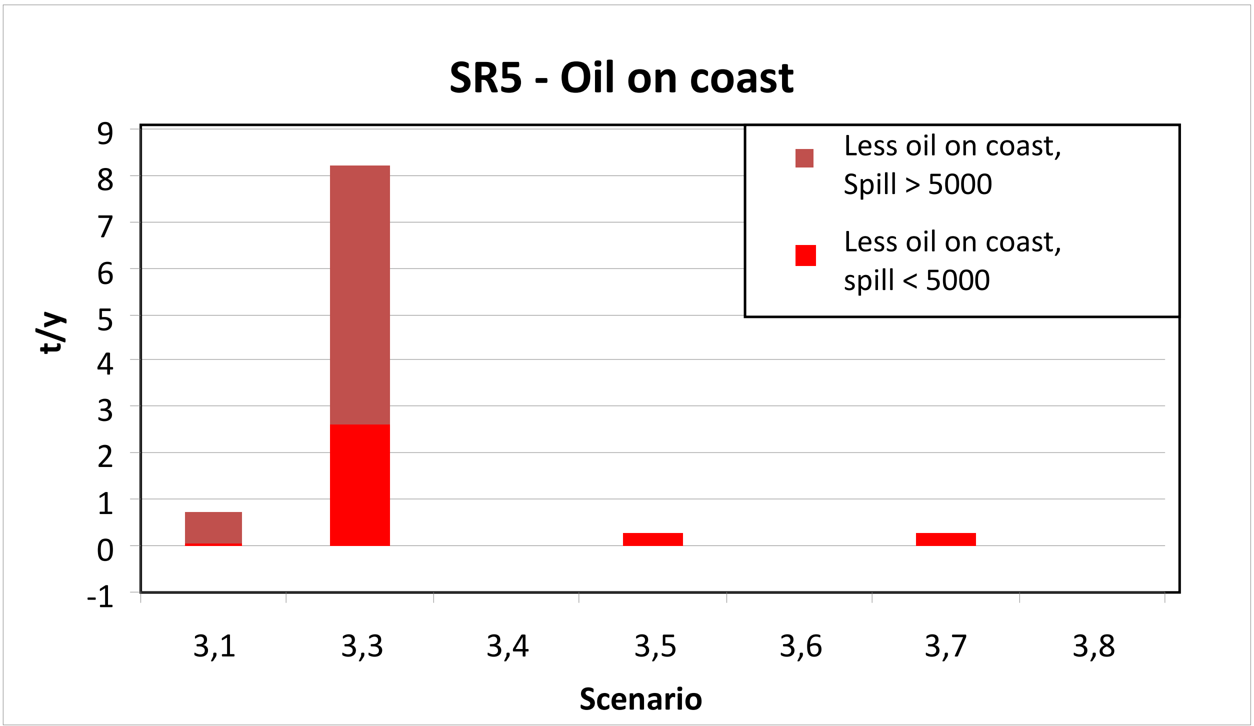
Scenario analysis (general):

Scenario 1,3 (current situation) vs. scenario 2,1:

Amount of oil spilt on long term average annual basis expected to decrease from 1.832 t/y to 1.626 t/y. Oil on coast is likewise expected to decrease from 76 t/y to 68 t/y.

Despite the increased traffic and risk, the expected amount of oil spilt will decrease due to RRM already decided upon until 2020.

Scenario analysis (Risk Reducing Measures):



Scenario 3,1 (mandatory pilotage) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from 1.626 t/y to 1.619 t/y. Oil on coast is expected to decrease from 68 t/y to 67 t/y. Mandatory pilotage will have some effect on amount of oil spilt, but only minor effect on oil on coast.

Scenario 3,3 (VTS) vs. scenario 2,1:
VTS are already established in the southwestern Baltic Proper. Fehmarnbelt: VTS is already implemented by VTS Centre Travemünde but as part of the construction of the Fehmarnbelt fixed link a VTS Centre for that area is requested. It should be investigated if this should be a permanent solution and if VTS should also be available for the Bornholm area.
Amount of oil spilt on long term average annual basis is expected to decrease from 1.626 t/y to 1.304 t/y. Oil on coast is expected to decrease from 68 t/y to 60 t/y. Implementation of VTS will have a significant effect on amount of oil spilt and on oil on coast.

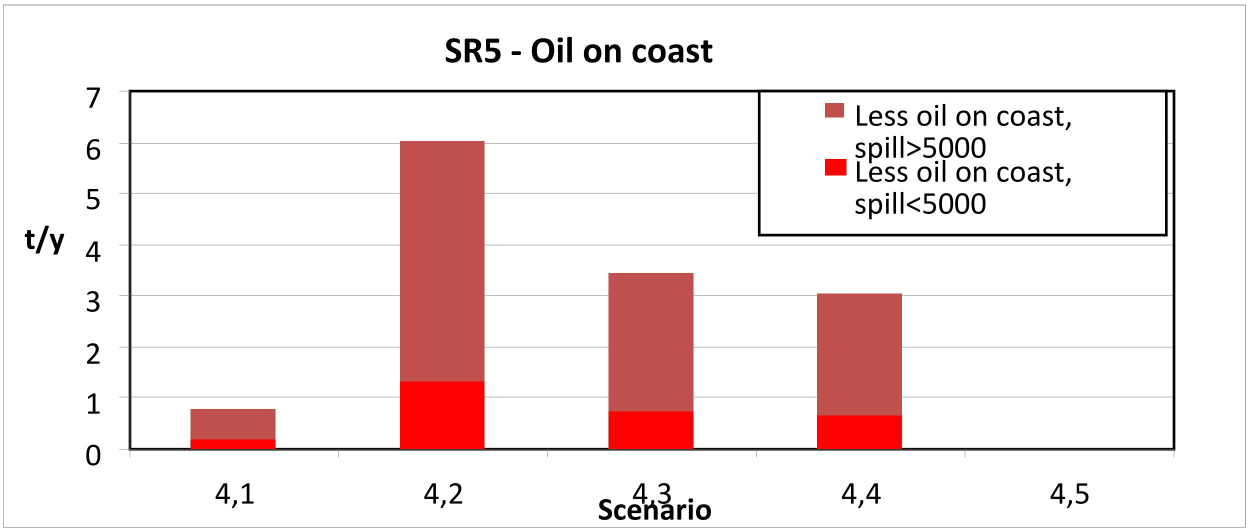
Scenario 3,4 (TSS) vs. scenario 2,1:
Implementation of more TSS will have no effect on amount of oil spilt and on oil on coast.

Scenario 3,5 (ECDIS) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from 1.626 t/y to 1.621 t/y. Oil on coast is expected to decrease from 68 t/y to 67 t/y. Implementation of mandatory ECDIS for all large ships will have only minor effect on amount of oil spilt and oil on coast.
Implementation of this scenario would be financed by ship owners and thus free of cost for nations.
Scenario 3,6 (DB hull at cargo tanks in ships < 5000 BRT) vs. scenario 2,1:

DB hull in cargo tanks in ships < 5000 BRT will have no effect on amount of oil spilt and on oil on coast.
Implementation of this scenario would be financed by ship owners and thus free of cost for nations.

Scenario 3,7 (DB hull at bunker tanks) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from 1.626 t/y to 1.622 t/y. Oil on coast is expected to decrease from 68 t/y to 67 t/y.
DB hull at bunker tanks will have almost no effect.
Implementation of this scenario would be financed by ship owners and thus free of cost for nations.

Scenario 3,8 (escort towing for tankers) vs. scenario 2,1:
Escort towing for tankers will have no effect on amount of oil spilt and on oil on coast.



Scenario 4,1 (reallocation of response capacities) vs. scenario 2,1:
Reallocation of response capacities will have no effect on amount of oil spilt and on oil on coast.

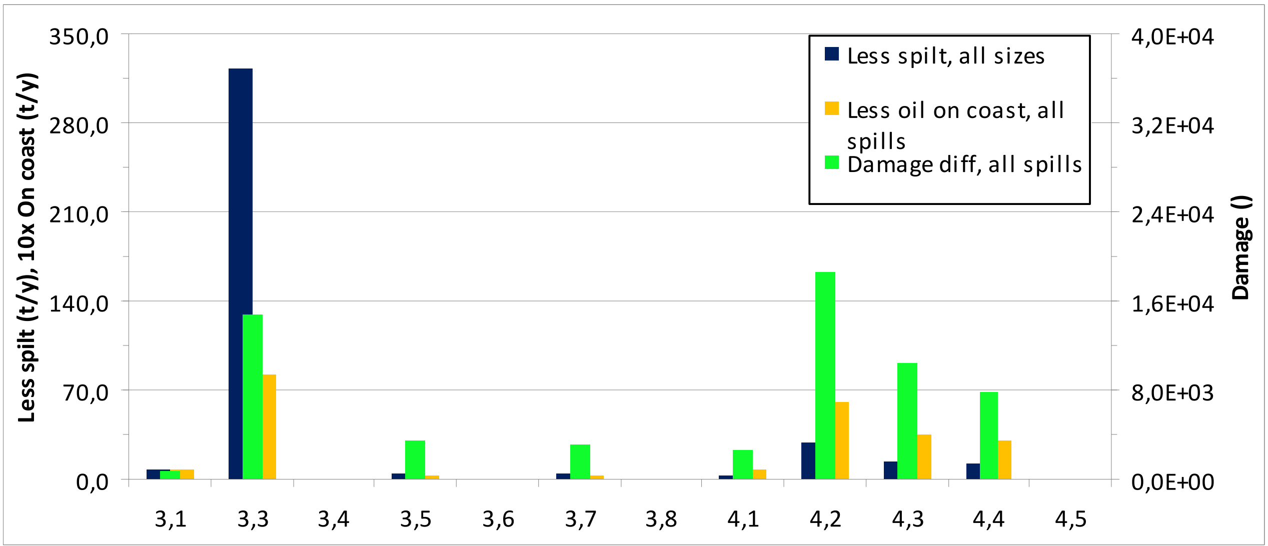
Scenario 4,2 (additional response capacities as proposed by partners) vs. scenario 2,1:
Investment in optimum amount of response capacity (ships, personnel, booms, skimmers etc.) will increase the ability to recover oil with 2 % (from 114 t/y to 142 t/y).
Oil on coast is expected to decrease from 68 t/y to 62 t/y.
Extreme investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast.
The joint Swedish/Danish/German/Polish recovery capacity in SR 5 is estimated to be 34000 t, and this capacity is considered sufficient.
(It is assessed that implementation of this scenario will cost more than 100 million Euros in procurement and approximately 20 million Euros in annual costs.
Implementation of this scenario is considered not cost effective.
However an analysis of the “Sensitivity, impact and damage maps” indicates that investment in additional shallow water response capacities probably will have an effect on ability to recover oil at sea and on oil on coast – especially in the Danish area.

There are a number of various shallow water response capacities on the market. It is roughly estimated that one unit could be purchased for approximately 250.000 Euros. It is assessed that 5 units will be adequate (Lifetime is estimated to be 20 years).)

Scenario 4,3 (additional response capacities) vs. scenario 2,1:
50 % more response capacity (ships, personnel, booms, skimmers etc.) will increase the ability to recover oil with 1 % (from 114 t/y to 128 t/y). Oil on coast is expected to decrease from 68 t/y to 64 t/y.
Significant investment in additional response capacity will have some effect on the ability to recover oil and on oil on coast.
The joint Swedish/Danish/German/Polish recovery capacity in SR 5 is estimated to be 34000 t, and this capacity is considered sufficient.
Implementation of this scenario is considered not cost effective.
Regarding shallow water capacity, see scenario 4,2.

Scenario 4,4 (night vision capability) vs. scenario 2,1:
Investment in night vision capability will increase the ability to recover oil from 114 t/y to 126 t/y.
Oil on coast is expected to decrease from 68 t/y to 65 t/y.
Investment in night vision capacity will have some effect on the ability to recover oil and on oil on coast.
There is a variety of systems with different performance available on the market. The cost for one system is - depending on system - between 70.000 and 250.000 Euros.

Scenario 4,5 (recovery from ice) vs. scenario 2,1:
Investment in recovery in ice capability will have no effect on the ability to recover oil and on oil on coast.



Conclusion
In general the RRM scenario 3,3 (VTS) will provide the most significant reduction in the amount of oil spilt and oil on coast.
Present location of response capacities is considered optimum (scenario 4,1) also in view of the fact that some of the response vessels are multipurpose-vessels with different duties.
Major investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast (scenarios 4,2 and 4,3).

Investment in additional response capacity is expensive and the effect is considered not cost effective.
Investment in shallow water response capacities (scenarios 4,2 and 4,3) will have an effect on ability to recover oil and on oil on coast – especially in the Danish area..
Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast. This solution could probably be implemented at relatively low cost.

Recommendation
It is proposed that nations should:

- Improve RRM, especially VTS (Scenario 3,3.
- Invest in shallow water response capacities (especially Denmark) and night vision capabilities (Scenario 4,4).
- It is proposed that the investments for the measures proposed above are carried out prior to 2020.

5.6. Sub-region 6, Kattegat, Great Belt, The Sound, Denmark, Sweden

Introduction:
This report consists of an analysis of the various scenarios in the Risk Model Report august 2011, followed by a cost benefit comparison of scenarios, conclusions and finally a list of recommendations to be used for the decision makers.

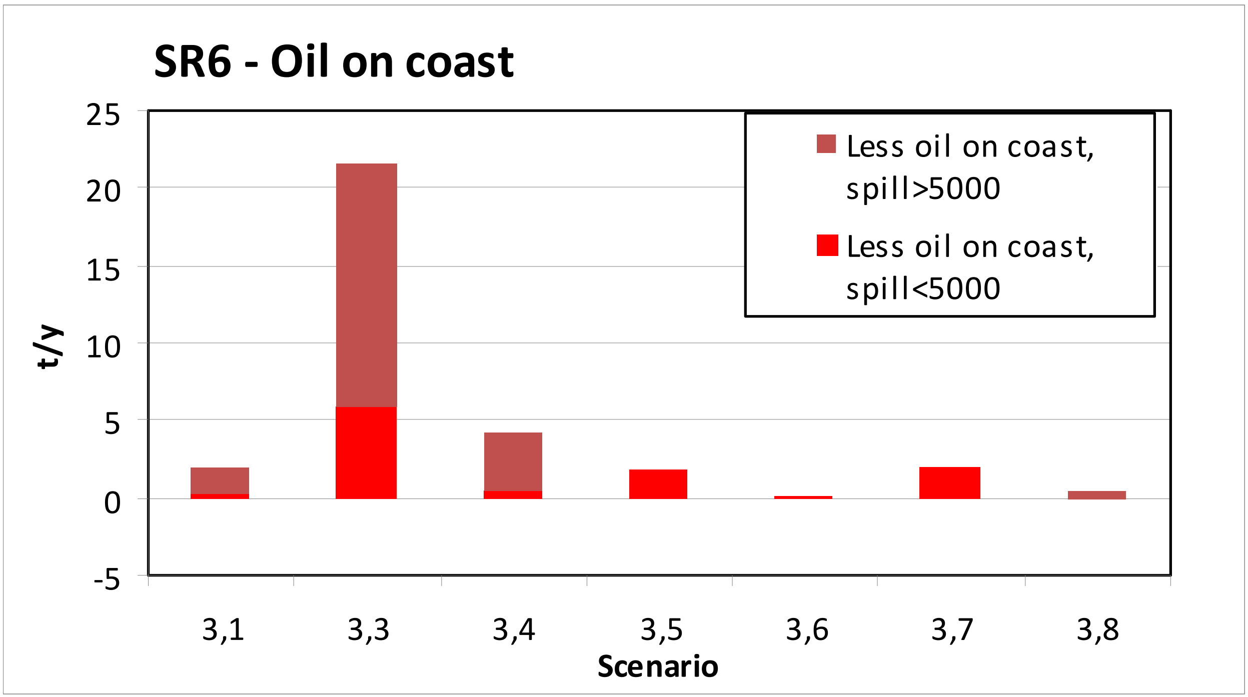
The various scenarios will all be compared to scenario 2,1 (2020 traffic, Risk Reducing Measurements (RRM) already decided upon until 2020 and the existing response capacity).

As implementation of most scenarios will require further analysis and as decisions are to be made on the political level it is not possible to describe a time table for possible implementations.

Scenario analysis (general):

Scenario 1,3 (current situation) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from, 2.336 t/y to 2.005 t/y. Oil on coast is likewise expected to decrease from 236 t/y to 203 t/y.
Despite the increased traffic and risk, the expected amount of oil spilt will decrease due to RRM already decided upon until 2020.

Scenario analysis (Risk Reducing Measures):



Scenario 3,1 (mandatory pilotage) vs. scenario 2,1:
More than 95 % of all vessels with a draught more than 11 meters (IMO recommendation) are already using pilot through Great Belt.
More than 99 % of tankers with a draught more than 11 meters (IMO recommendation) are already using pilot through Great Belt.
Amount of oil spilt on long term average annual basis is expected to decrease from, 2.005 t/y to 1.987 t/y. Oil on coast is expected to decrease from 203 t/y to 201 t/y.
Mandatory pilotage will have only minor effect on amount of oil spilt and oil on coast.
Implementation of this scenario would be financed by ship owners and thus free of cost for nations.

Scenario 3,3 (Vessel Traffic Service) vs. scenario 2,1:
VTS are already established in Great Belt, The Sound and major parts of the Swedish West Coast.
Description of establishment of VTS in SR 6 as a hole is very complex and could be a matter for further investigation.
The Skaw area is a very "Hot Spot" area, and establishment of VTS here, should be investigated further. The costs for establishment of VTS will depend on the level and extension of possible VTS-Centres.
Annual costs for VTS Great Belt are approximately 3 mio. Euros.
Amount of oil spilt on long term average annual basis is expected to decrease from 2.005 t/y to 1.771 t/y. Oil on coast is expected to decrease from 203 t/y to 181 t/y.
Implementation of VTS will have the most significant effect on amount of oil spilt and on oil on coast.

Scenario 3,4 (Traffic Separation Schemes) vs. scenario 2,1:
Implementation of additional TSS or adjustment of existing TSS in the Skagerrak/Kattegat area is already under investigation (Denmark, Sweden and Norway).
Amount of oil spilt on long term average annual basis is expected to decrease from 2.005 t/y to 1.902 t/y. Oil on coast is expected to decrease from 203 t/y to 199 t/y.

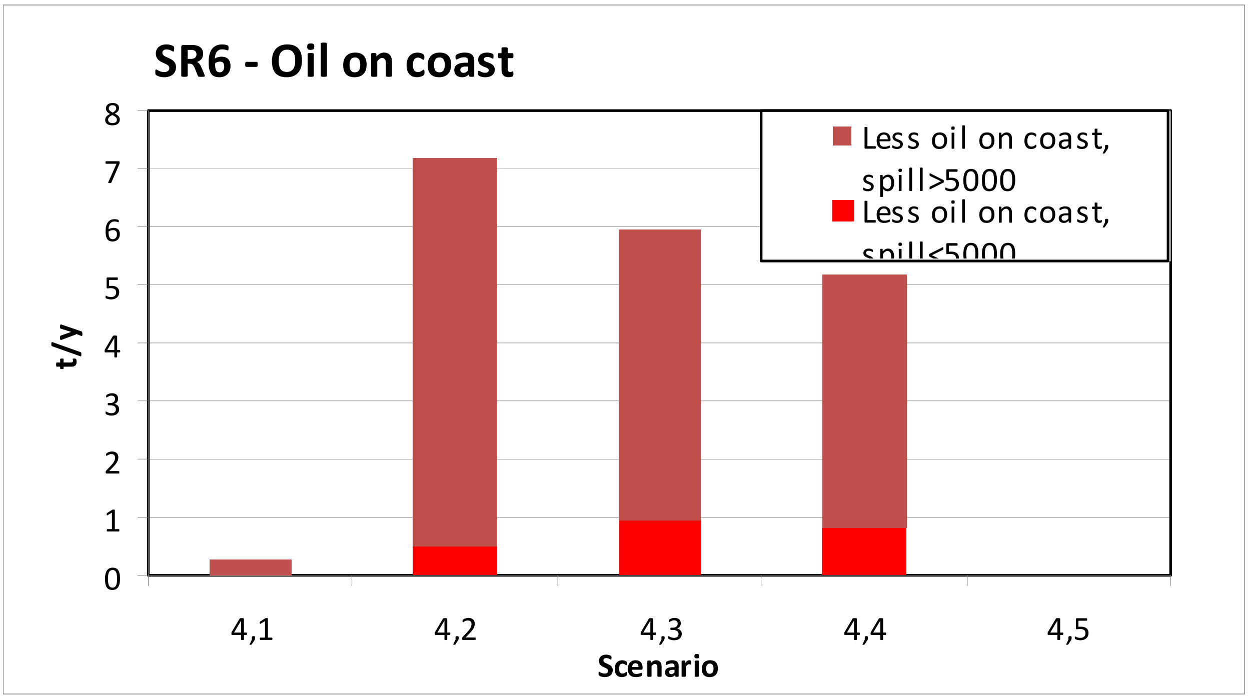
Implementation of TSS will have some effect on amount of oil spilt and on oil on coast.
Adjustment/additional TSS is assessed nearly free of cost for nations.

Scenario 3,5 (ECDIS) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from 2.005 t/y to 1.990 t/y. Oil on coast is expected to decrease from 203 t/y to 201 t/y.
Implementation of mandatory ECDIS for all large ships will have only minor effect on amount of oil spilt and oil on coast.
Implementation of this scenario would be financed by ship owners and thus free of cost for nations.

Scenario 3,6 (DB hull at cargo tanks in ships < 5000 BRT) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from 2.005 t/y to 2.004 t/y. Oil on coast will remain unchanged.
DB hull in smaller tankers will have almost no effect.
Implementation of this scenario would be financed by ship owners and thus free of cost for nations.

Scenario 3,7 (DB hull at bunker tanks) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from 2.005 t/y to 2.004 t/y. Oil on coast will remain unchanged.
DB hull at bunker tanks will have almost no effect.
Implementation of this scenario would be financed by ship owners and thus free of cost for nations.

Scenario 3,8 (escort towing for tankers) vs. scenario 2,1:
Amount of oil spilt on long term average annual basis is expected to decrease from 2.005 t/y to 2.001 t/y. Oil on coast is expected to decrease from 203 t/y to 202 t/y.
Escort towing for all tankers will have almost no effect.
Implementation of this scenario would be financed by ship owners and thus free of cost for nations.



Scenario 4,1 (reallocation of response capacities) vs. scenario 2,1:
The Danish response capacities were as a result of a national risk assessment relocated in 2009.
Further reallocation of response capacities will have no effect on the ability recover oil. Oil on coast will remain unchanged.

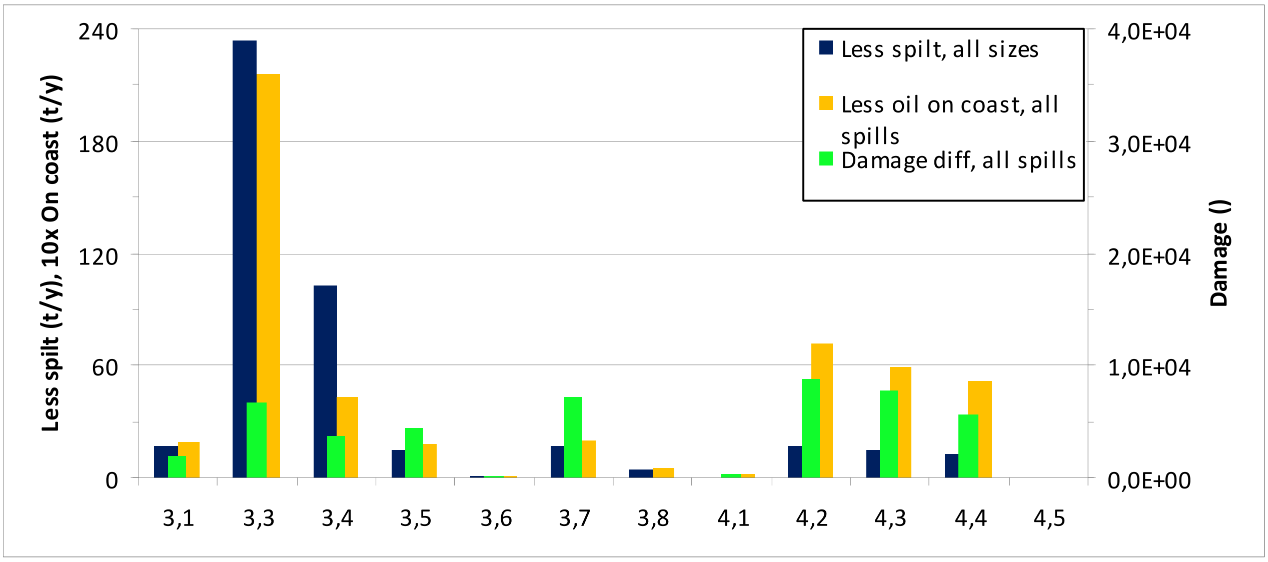
Scenario 4,2 (additional response capacities as proposed by partners) vs. scenario 2,1:
Investment in optimum amount of response capacity (ships, personnel, booms, skimmers etc.) will increase the ability to recover oil with 1 % (from 116 t/y to 133 t/y). Oil on coast is expected to decrease from 203 t/y to 196 t/y.
Extreme investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast.
The joint Swedish/Danish recovery capacity in SR 6 is estimated to be 20.000 t, and this capacity is considered sufficient.
It is assessed that implementation of this scenario will cost more than 100 million Euros in procurement and approximately 20 million Euros in annual costs.
Implementation of this scenario is considered not cost effective.
However an analysis of the "Sensitivity, impact and damage maps" indicates that investment in additional shallow water response capacities probably will have an effect on ability to recover oil at sea and on oil on coast – especially in the Danish area.
There are a number of various shallow water response capacities on the market. It is roughly estimated that one unit could be purchased for approximately 250.000 Euros.
It is assessed that 5 units will be adequate (Lifetime is estimated to be 20 years).

Scenario 4,3 (50 % additional response capacities) vs. scenario 2,1:
50 % more response capacity (ships, personnel, booms, skimmers etc.) will increase the ability to recover oil with 1 % (from 116 t/y to 131 t/y). Oil on coast is expected to decrease from 203 t/y to 197 t/y.

Significant investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast and is considered not coast effective.
The joint Swedish/Danish recovery capacity in SR 6 is estimated to be 20.000 t, and this capacity is considered sufficient.
It is assessed that implementation of this scenario will cost close to 100 million Euros in procurement and approximately 20 million Euros in annual costs.
Implementation of this scenario is considered not cost effective.
Regarding shallow water capacity, see scenario 4,2.

Scenario 4,4 (night vision capability) vs. scenario 2,1:
Investment in night vision capability will increase the ability to recover oil from 116 t/y to 128 t/y.
Oil on coast is expected to decrease from 203 t/y to 198 t/y.
Investment in night vision capacity will have some effect on the ability to recover oil and on oil on coast.
There is a variety of systems with different performance available on the market. The cost for one system is - depending on system - between 70.000 and 120.000 Euros. It is assessed that four systems would be adequate (lifetime is estimated to 10 years).

Scenario 4,5 (recovery from ice) vs. scenario 2,1:
Investment in recovery in ice capability will have no effect on the ability to recover oil and on oil on coast. Occasionally ice conditions occur in the sub region and therefore future response vessels should have the capacity to operate in ice.



Conclusion
In general the RRM scenarios (especially 3,3 and 3,4 (VTS and TSS)) will provide the most significant reduction in the amount of oil spilt and oil on coast.
Present location of the general response capacities is considered optimum (scenario 4,1).
Major investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast (scenarios 4,2 and 4,3). Investment in

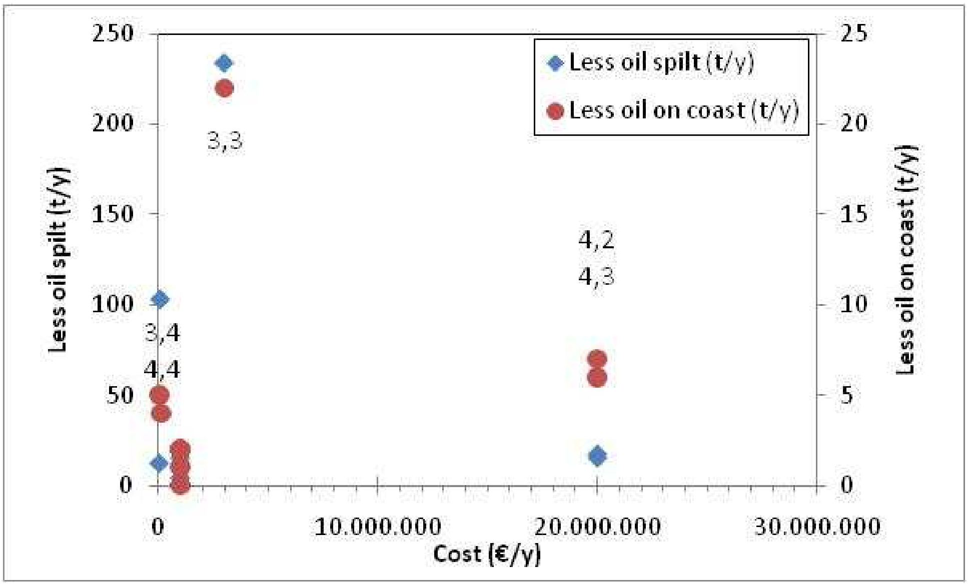
additional response capacity is expensive and such an investment is considered not cost effective.
Investment in shallow water response capacities (scenarios 4,2 and 4,3) will have an effect on ability to recover oil and on oil on coast – especially in the Danish area..
Investment in night vision capability (scenario 4,4) will have some effect on the ability to recover oil and on oil on coast.

Cost benefit comparison of scenarios

Scenario	Less oil on coast t/y	Invest-ment/lifetime + annual costs	Price/tons less oil on coast/year
3,1 Mandatory pilotage	2	0	0
3,3 VTS	22	3 mio. Annual cost only.	140 K
3,4 TSS	3	0	0
3,5 ECDIS	2	0	0
3,6 DB hull small tankers	0	0	0
3,7 DB hull fuel tanks	2	0	0
3,8 Escort towing	1	0	0
4,1 Relocation of response units	0	Not relevant	Not relevant
4,2 Capacity proposed by nations -- 4,2 Shallow water capacity	7 ------------- Est. 6	>25 mio. --------------------- 60 K	4 mio. -------------------- 10 K
4,3 50 % additional capacity	6	Approx. 25 mio.	Approx. 7 mio.
4,4 Night vision	5	40 K	8 K
4,5 Ice	0		

The general cost-benefit pattern of the different scenarios is illustrated in the figure below. Here the annual costs (rough estimates!) are given on the x-axis. On the left y-axis the amounts of less spilt oil are given. They are indicated as blue diamonds. On the right y-axis the amounts of less oil reaching the coasts are given. They are indicated as red dots.

- The points on the left and lower part of the diagram indicate scenarios that have relative little costs and relative little effect.
- The points on the left and upper part of the diagram indicate scenarios that have relative little costs and relative high effect (scenarios 4,4; 3,4; 3,3).
- The points on the right and lower part of the diagram indicate scenarios that have relative high costs and relative little effect (scenarios 4,2; 4,3). Not recommend-ed.
- The points on the right and upper part of the diagram indicate scenarios that have relative high costs and relative high effect (no scenarios in this group).
- The higher values on the y-axes, the higher the effect (scenario 3,3).
- The steeper a line is through origo and a specific dot, the more cost efficient is the scenario (scenarios 3,4; 4,4).



Recommendation
It is proposed that nations should:

- Improve RRM, especially VTS (Scenario 3,3) and TSS (Scenario 3,4).
- Invest in shallow water response capacities (especially Denmark) and night vision capabilities (Scenario 4,4).
- It is proposed that the investments for the measures proposed above are carried out prior to 2020.

6. Effect of present effort and potential of scenarios

For each sub-region the effect of the existing efforts is determined. The existing efforts comprise Navigational Aids (NavA), such as pilotage, VTS, TSS, etc. as well as response capacities (response vessels with their respective booms, skimmer, storage, etc.).

For each sub-region the risk is given with three contributions:

The worst case: How the risk would be without any human effort to avoid spills or to response to spills (yellow). Traffic as expected in 2020.

Status quo: How the risk is in 2020 (traffic as expected in 2020, existing NavAs and NavAs that already are decided upon, response level as it is at present plus as it has been decided upon.

The best situation: Traffic as expected for 2020, existing NavAs and capacities (as above) plus effect of all investigated scenarios of this study.

The risk distributions are given for the three risk parameters spilt oil, oil on coast and environmental damage.

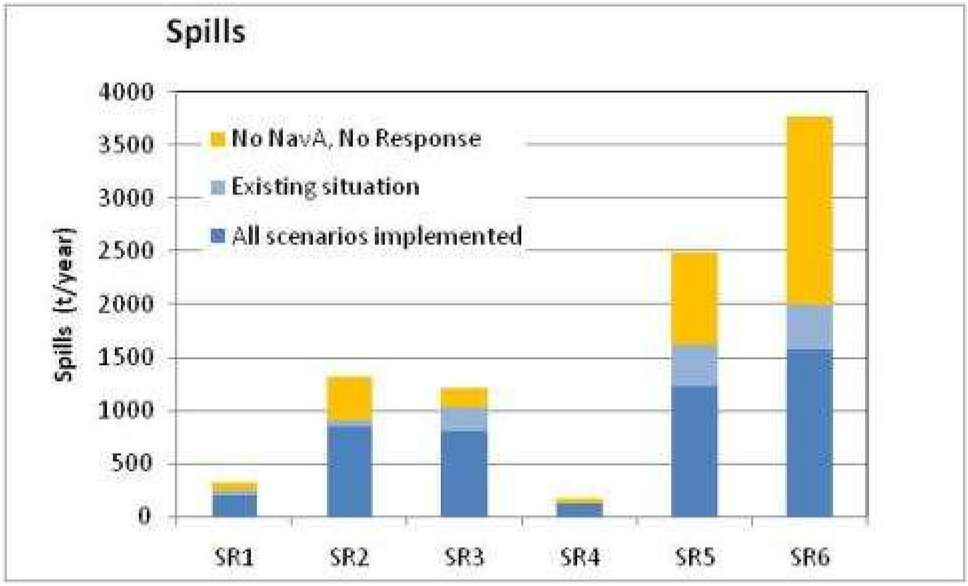


Figure 4 Risk for spills for each sub-region.

Top of the total bars indicates the risk in case of no NavA and no response capacities. The yellow parts represent the effect of existing efforts.
Top of the light blue bars indicates the risk as it is today. The light blue part of the bars represent the risk reductions by all scenarios
The dark blue bars indicates the remaining risk if all scenarios are implemented.

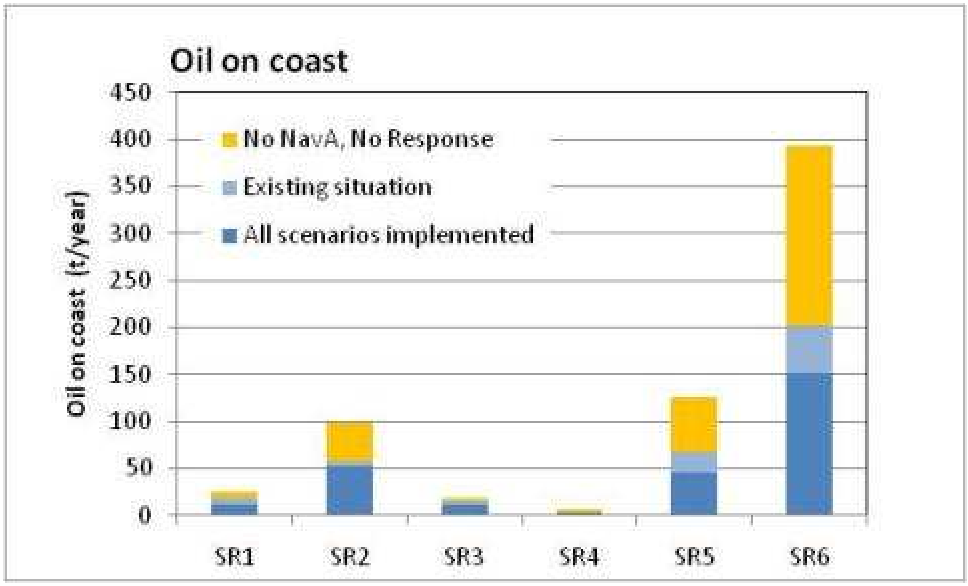


Figure 5 Risk for oil on coast for each sub-region.

Top of the total bars indicates the risk in case of no NavA and no response capacities. The yellow parts represent the effect of existing efforts.
Top of the light blue bars indicates the risk as it is today. The light blue part of the bars represent the risk reductions by all scenarios
The dark blue bars indicates the remaining risk if all scenarios are implemented.

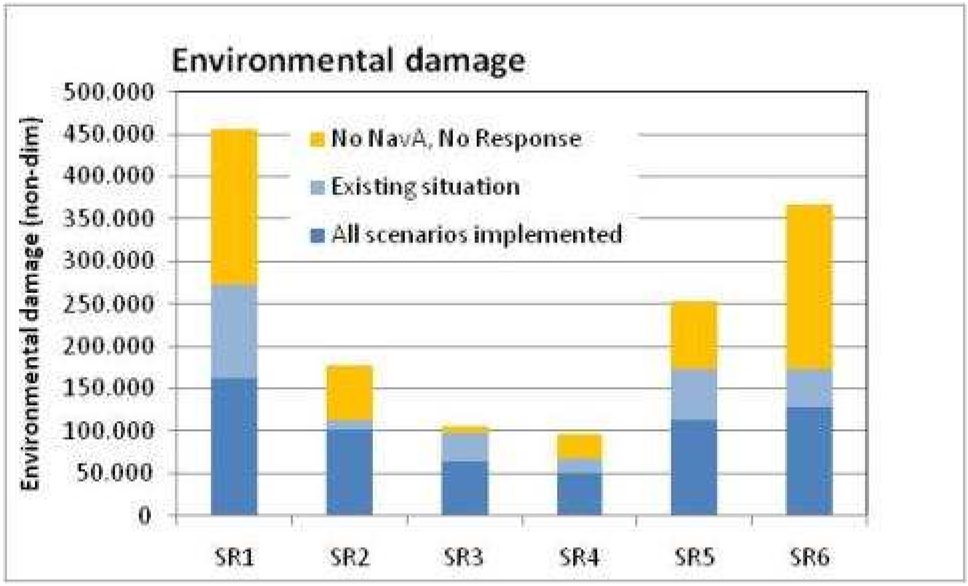


Figure 6 Risk for environmental damage for each sub-region.

Top of the total bars indicates the risk in case of no NavA and no response capacities. The yellow parts represent the effect of existing efforts.
Top of the light blue bars indicates the risk as it is today. The light blue part of the bars represent the risk reductions by all scenarios
The dark blue bars indicates the remaining risk if all scenarios are implemented.

7. Indications for future response levels

Sub-region	Countries in sub-region	Design spill capacity (tonnes)	Return period (years)
1	SE; FI	5.000	270
2*	FI, RU, EE	45.000	850
3	SE, EE, LV	5.000	105
4	LT, RU, PL	12.000	1400
5	SE, DK, GE	34.000	250
6	DK, SE	20.000	120

Figure 7 existing sub-regional design capacity. The respective return period for a design spill is added.

*) The design spill capacity was not provided explicitly in the report "5 Investment" but is based on information provided during the discussions at the Project Partner Meeting in Copenhagen, November 2011.
The above capacities include the effects of EMSA vessels.

It is seen that the sum of the design spills is larger than for the HELCOM recommendation. Furthermore, the range between the maximum and the minimum return period is significantly decreased. It is also seen that the lowest return periods are higher in the existing response system than the lowest return period according to the recommendation. Also the highest return period in the existing system is lower than in the recommended.

The values are shown in figure 8.

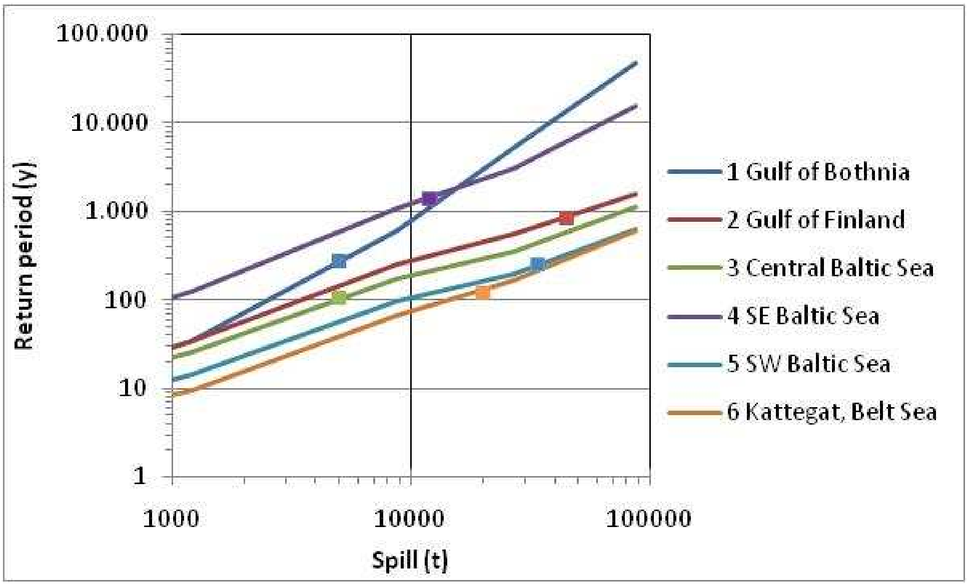


Figure 8. Return period for different spill sizes in each sub-region. The dots indicate the spill response capacities incl. until 2020 investments.

It is seen that the range of the return periods is narrower, whereas the range of the design spills is much wider. This indicates that the response is more evenly distributed.

Compared to the response level recommended by the HELCOM recommendation the investment plan situation appears to be more adapted to the present risk profile.

It is anticipated that development of the response capacities with due consideration to the risk pattern will provide a Baltic sea wide cost efficient response system. The Baltic Sea countries hereby now have a guideline of how to develop there respective response systems in a way that is consistent in comparison with the situation in countries in the other Baltic sub-regions.

Dots that are localised relatively low characterise sub-regions where the response system is designed to spill sizes that occur relatively often. This is valid in particular for sub-region 6 and 3. On the other hand is seen that the dots localised relatively high indicate sub-regions where the preparedness id designed for a spill that is likely to occur relative seldom.

It also should be taken into consideration that neighbouring areas will be able to use each others resources. Good examples are sub-region 2 (Gulf of Finland) and sub-region 3 (Central Baltic Sea). Many of the resources in sub-region 2 (particularly from Finland) will be able to intervene relatively quickly in sub-region 3 and somehow increase the response capacity in sub-region 3. Similar conditions are valid for sub-region 4 supporting sub-region 3 and sub-region 5 supporting sub-region 6.

In order to achieve a higher level of preparedness, the dot of a specific sub-region should obtain a higher position. The countries of the specific sub-region have two possibilities:

- They can either change the risk profile by means for enhanced Navigational Aids (The curve will then be steeper and the dot of the sub-region move upward with the curve, the value of the x-axis being constant as the design spill remains un-changed), or
- They can increase the response capacity to a higher design spill (The curve will remain unchanged but the dot will move along the curve to the new design spill size.

Finally, it must be emphasised that there is no final and correct solution. The choice of design spill size and its return period is a political choice that indicates the balance between costs and response preparedness.

8. Conclusion

The risk picture varies from sub-region to sub-region. Therefore the conclusions and recommendations are specific for each sub-region and are not comparable. These conclusions and recommendations will form basis for the future work with investment plans within the HELCOM Response Working Group and during the BRISK extension stage.

The risk picture varies from sub-region to sub-region. Therefore the conclusions and recommendations are specific for each sub-region and are not comparable. These conclusions and recommendations will be further discussed and considered by the competent authorities in all Baltic Sea countries within the HELCOM Response Group, to form basis for future work on investment plans for needed improvements in response capacities in the Baltic Sea region, according to the HELCOM Baltic Sea Action plan. As there are some plans for the BRISK extension stage, if realized, the extension stage will provide possibilities for implementation of selected investments.

Based on the investment plans from each of the 6 sub-regions the following can be concluded:

8.1. Sub-region 1, Gulf of Bothnia, Sweden, Finland

In Sub-region 1 the following conclusions were made:

In general the RRM scenarios will provide some reduction in the amount of oil spilt and oil on coast.

Present location of the general response capacities is considered sufficient to deal with spills up to 5000 t.

The general conclusion is that major investment in additional response capacity will have only minor effect on the ability to recover oil and on oil on coast. This is only valid if the calculation by 10% recovery rate is used. This figure is not in accordance with the actual experiences from the Baltic Sea, where the estimated recovery rate is as high as up to 50%!

Investment in shallow water response capacities will have some effect on ability to recover oil and on oil on coast and should be considered due to the shallow areas in the sub-region. One response unit to be used in shallow waters is estimated to cost about 250 000 Euro.

Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast. Cost for one system is estimated to vary from 100 000 Euro to 150 000.

An increase in response capacity will have some effect on the ability to recover oil. An increase in response capacity should be investigated further.

Investment in ice recovery equipment will have minor effect but should be considered for this sub region. Cost for skimmers to be used in icy conditions are estimated to 50 000 Euro/skimmer.

Recommendation
It is recommended that the final report should contain recommendations on investigations on improved RRM

Investment in shallow water response capacities should be further investigated. Nations should investigate further on night vision capacities.

Even if the scenarios show a low effect on having investments in ice recovery equipment and response vessels with ice going capacity this should be considered for sub-region 1 due to the fact that the area is covered by ice every winter.

8.2. Sub-region 2, Gulf of Finland, Finland, Russia, Estonia

In Sub-region 2 the following conclusions were made:

Finland
Decided:
One multipurpose vessel for border patrolling, search and rescue and oil and chemical response:

- to be delivered 2014
- to be located in Gulf of Finland
- to be operated by Finnish Border Guard
- (About the same size as oil response vessel Louhi)

Planned:
Two smaller multipurpose vessels for functional ferry service and oil and chemical response

- to be possibly delivered 2014-2015
- one to be located in Archipelago Sea (Hiittinen area) and one in Gulf of Finland (Kotka area)
- to be operated by one of the companies offering functional ferry services
- (the tender decision related to the functional ferry services is still in court, so the planned marine pollution response investments have been delayed)

One additional multipurpose vessel

- (About the same size as oil response vessel Louhi)

Russia

- Multifunctional search-and-rescue ship, 7 Mwt, delivered 2015
- Multifunctional search-and-rescue ship, 2.5-3.0 Mwt, delivered 2014
- Marine diving boat, delivered 2012
- 1 boom deployer, delivered 2012

Estonia

No investments are planned, nor decided.

8.3. Sub-region 3, Central Baltic Proper, Sweden, Estonia, Latvia

In Sub-region 3 the following conclusions were made:

In general the RRM scenarios (especially 3,3 and 3,4) will provide the most significant reduction in the amount of oil spilt and oil on coast.

Present location of response capacities is considered optimum.

The general conclusion is that major investment in additional response capacity will have only minor effect on the ability to recover oil and on oil on coast. Investment in additional response capacity is expensive and such an investment is considered not cost effective.

This is only valid if the calculation by10 % recovery rate is used. This figure is not in accordance with the actual experiences from the Baltic Sea, where the estimated recovery rate is as high as up to 50 %.

Investment in shallow water response capacities will have an effect on ability to recover oil and on oil on coast One response unit to be used in shallow waters is estimated to cost about 250 000 Euro.

Major investment in additional response capacity will have some effect on the ability to recover oil and on oil on coast. Investment in additional response capacity is expensive and the effect is considered not cost effective. This is only valid if the calculation by 10% recovery rate is used. This figure is not in accordance with the actual experiences from the Baltic Sea, where the estimated recovery rate is as high as up to 50%.

An increase in response capacity will have some effect on the ability to recover oil. An increase in response capacity should investigated further.

Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast. Cost for one system is estimated to vary from 100 000 Euro to 150 000.

<u>Recommendation</u>

It is recommended that the final report should contain recommendations on improved RRM.

Nations should monitor the technical development on response equipment and replace outdated equipment with state of the art.
Nations should invest in night vision capacities Cost for one system is estimated to vary from 100 000 Euro to 150 000.

Nations should develop /aim to develop sea surveillance systems which can be used for anomaly detection functions.

8.4. Sub-region 4, South-eastern Baltic Proper, Lithuania, Poland, Kaliningrad Region of Russian Federation

In Sub-region 4 the following conclusions have been made:

Sub-region 4 comparing to other sub-regions is the lowest risk area. For the return period of 200 years the estimate spill of 3300 tons makes only 2,3% of the total spill estimated for the whole Baltic.

The environmental damage in Sub-region 4 is lower then in other sub-regions however, the proportion is not so small like in the risk figures. The environmental damage of 68 662 grams/km2 weighted makes 7,6% of the total environmental spill.

Comment
The term of environmental damage requires further explanation. Environmental sensitivity data was delivered by each country, and the index (ESI) is rather subjective term, perhaps because of different sensitivity understanding.

A ratio of oil recovered is rather non-estimated. ITOPF calculations are based on worldwide statistics. There is no similar region in the world having such confined area and so much developed mechanical recovery capacity. There is no any country in the world having declared response capacity of 30.000 tons!

Existing risk reducing measures have strong positive effect on the amount of oil split, environmental damage and the amount of oil at the coast. RRM planned for 2020 have a less positive effect. Calculations for RRM are not corresponding because of different traffic densities in 2008/9 and 2020. The same time period reference is important for the further net environment benefit analyses NEBA and NEEBA (including economics). Furthermore, blank option (no RRM, no response) would be useful for that purpose.

Comment
Reduction of the amount of oil recovered is causing the significant reduction of the amount of oil recovered. It seems that the response capacity and response efficiency is not so dependent from the amount of spilled oil. Certainly, this is non linear relationship.

General conclusion related to the risk reduction measures:
RRM do not bring any effect or bring small positive effect. Perhaps this is connected to the fact that all RRM and additional RRM are dealing with arrangements on other sub-regions. Never mind the outcome of the BRISK there is realised a huge investment project called: The National Maritime Safety System with the aim to improve safety of navigation on Polish maritime areas. The cost of the project is about 110

million PLN (~25 million EUR) and the first stage of the investment should be finalised by the end of 2015.

Non-coordinated (within the sub-region) relocation of vessels brings the negative effect.

Comment
For further investigations additional locations should be considered.
Additional response capacity, including booms and skimmers brings depending of the size of the spill positive and very positive effect.

Comment
It should be further investigated what kind of platform would be used for additional booms and skimmers because investments without vessels able to use additional equipment do not make any sense.

Additional response capacity, including booms and skimmers brings depending of the size of the spill positive and very positive effect.

Comment
It should be further investigated what kind of platform would be used for additional booms and skimmers because investments without vessels able to use additional equipment do not make any sense.

The development of methods allowing the response at night and bad visibility brings depending on the size of the spill positive and strong positive effects.

Comment
In our opinion, the effect is estimated to low, and we would recommend further investigation.

Improvement of recovery from ice capacity does not bring any effect, probably because of lack of the ice. However, some these special response possibilities have to be considered in relation to costal and sheltered waters.

Final conclusion:
These analyses led us to the general conclusion that for the Sub-region 4, the most benefit should be investments related to the new response equipment.

8.5. Sub-region 5, Western Baltic Proper, Sweden, Denmark, Germany, Poland

Conclusion
In general the RRM scenario 3,3 (VTS) will provide the most significant reduction in the amount of oil spilt and oil on coast.
Present location of response capacities is considered optimum (scenario 4,1) also in view of the fact that some of the response vessels are multipurpose-vessels with different duties.
Major investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast (scenarios 4,2 and 4,3).

Investment in additional response capacity is expensive and the effect is considered not cost effective.
Investment in shallow water response capacities (scenarios 4,2 and 4,3) will have an effect on ability to recover oil and on oil on coast – especially in the Danish area..
Investment in night vision capability will have some effect on the ability to recover oil and on oil on coast. This solution could probably be implemented at relatively low cost.

Recommendation
It is proposed that nations should:
- Improve RRM, especially VTS (Scenario 3,3.
- Invest in shallow water response capacities (especially Denmark) and night vision capabilities (Scenario 4,4).

It is proposed that the investments for the measures proposed above are carried out prior to 2020.

8.6. Sub-region 6, Kattegat, Great Belt, The Sound, Denmark, Sweden

In general the RRM scenarios (especially 3,3 and 3,4 (VTS and TSS)) will provide the most significant reduction in the amount of oil spilt and oil on coast.

Present location of the general response capacities is considered optimum (scenario 4,1).

Major investment in general additional response capacity will have only minor effect on the ability to recover oil and on oil on coast (scenarios 4,2 and 4,3). Investment in additional response capacity is expensive and such an investment is considered not cost effective.

Investment in shallow water response capacities (scenarios 4,2 and 4,3) will have an effect on ability to recover oil and on oil on coast – especially in the Danish area..

Investment in night vision capability (scenario 4,4) will have some effect on the ability to recover oil and on oil on coast.

Recommendation
It is proposed that nations should:
- Improve RRM, especially VTS (Scenario 3,3) and TSS (Scenario 3,4).
- Invest in shallow water response capacities (especially Denmark) and night vision capabilities (Scenario 4,4).
- It is proposed that the investments for the measures proposed above are carried out prior to 2020.