REPORT

Date:
2012-06-11

SSPA Report No.:
20105728-03

Project Manager:
Björn Forsman

Author:
Björn Forsman
bjorn.e.forsman@sspa.se
Phone: +46 31 772 9059

MSB Swedish Civil Contingencies Agency
651 81 Karlstad, Sweden
Attn:
Karl-Erik Kulander, karl-erik.kulander@msb.se, +46 10 240 50 72
Sonja Dobo, Sonja.dobo@msb.se, +46 10 240 545

Reference:
Order No: 15354010, 2010-11-30. CDIID: KARKU

ENSACO - Environmental Atlas

MSB, Swedish Civil Contingencies Agency is partner in the central Baltic Interreg IVA project EnSaCo, Environmental and safety management on shoreline oil spill response. SSPA Sweden has been commissioned by MSB to conduct the task addressing Environmental Atlas within Work Package No 2; Developing efficient tools for cross-border shoreline oil spill response management. SSPA's commitment for MSB is divided into five phases and this report summarises and presents the output of all five phases.

ENSACO
CENTRAL BALTIC INTERREG IV A PROGRAMME 2007–2013
EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

SSPA Sweden AB

Björn Forsman
Project Manager
Maritime Operations

SSPA Sweden AB

Jim Sandkvist
Vice President
Maritime Operations

Summary and recommendations

SSPA's commitment to MSB comprises and is divided into the following five phases:

1. Inventory and description of environmental atlas systems/tools
2. Analysis of used systems and tools
3. Harmonization of classification schemes
4. Coordination of resources for sensitive areas
5. Development of a harmonized spatial database and manual

This report is based on the report of the first two phases but has been supplemented to provide a summary report the entire project and its five phases.

MSB and the consultant have arranged and participated in several workshops and seminars and pilot platform for a harmonized cross-border environmental atlas has been developed by the consultant. A number of existing and developing national systems has been reviewed and used as for trial application of data exchange.

The following systems are specifically addressed in the study; the Swedish Digital Miljöatlas, the Finnish BORIS II and the Finnish/Estonian OILRISK/MIMIC and SmartResponse Web.

During the course of the project it was indicated that it would be difficult to ensure that a complete internationally harmonized system could be realized within the environmental atlas component of the EnSaCo project. The reviewed systems are primarily designed to serve the respective national needs and the number of events where cross-border oil spill scenarios would call for a common international harmonised system to facilitate cross-border prioritisation considerations, is generally expected to be low. The respective owner organisations of these systems are not EnSaCo partners and are not committed to reconsider their development plans to build a common Baltic system. They do, however, find the aim of this EnSaCo component interesting and support the BSAP recommendations aiming at improved cross-border exchange of information on sensitivity and resource allocation.

In the project, it has been shown and demonstrated that it is possible to exchange basic information on shoreline type, sensitivity and available response resources and it is recommended that further possibilities for this type of exchange and possible integration of common service application are further examined in the future.

In order to make the output of the EnSaCo Environmental Atlas component sustainable when the project is completed, introduction of the EnSaCo maps presented and integration of some of the functionality in the HELCOM map and data services, is considered to be a feasible solution that together with the output from the BRISK project, would gain a combined sensitivity mapping addressing both shoreline response and at sea response.

Well established routines for updating of data as well as possibilities for integration with spill trajectory tools like the Setrack Web are also identified as key features. A modernised version of the Setrack Web may also be used as common platform for presentation of different national sensitivity and resource map layers.

Table of contents

1 Introduction and progress report

1.1 The EnSaCo project

Oil transportation and other traffic in the Central Baltic Sea are growing steadily, increasing the risk of pollution from ships. Authorities responsible for shoreline (including archipelago) oil spill response recognize that their readiness to act is not high enough and have launched the EnSaCo Oil Spill project as an initiative to enhance the readiness to an adequate level. The EnSaCo-project aims to reduce negative environmental and socio-economic impacts of an oil spill accident through rapid and efficient shoreline oil spill response. The project is of importance as it can substantially contribute to improving the preparedness of Estonia, Finland, Sweden and Russia to respond to pollution from ships in the Central Baltic Sea.

The main objective of the EnSaCo Oil Spill project is to raise the level of expertise and to intensify cross-border shoreline response by jointly developing new practical management tools and efficient cooperation methods, including oiled wildlife response, among authorities, NGOs and educational institutions in Estonia, Finland (incl. Åland), Sweden and Russia. Such practical target-oriented cooperation aiming at intensified cross-border shoreline oil spill response from environmental and safety management perspective has not so far existed.

The basis for EnSaCo's harmonisation and cross-border coordination ambitions is; Recommendation 28E/12 of HELCOM's Baltic Sea Action Plan defining; "…development of an electronic Sensitivity Mapping and Logistical Resource Allocation Mapping for ecological prioritization and resource mobilization…." as a high priority target for the oil spill preparedness along Baltic coast lines. EnSaCo's Environmnetal Atlas component is aiming to present a pilot solution for a mapping system for cross-border application in real operations and exercises.

1.2 MSB's contribution and consultant input from SSPA Sweden AB

MSB has the lead in the task addressing Environmental Atlas which is one component of Work Package No 2; Developing efficient tools for cross-border shoreline oil spill response management. MSB has commissioned SSPA to conduct the Environmental Atlas component in close cooperation with the project officials at MSB.

SSPA's commitment to MSB divided into the following five tasks:

1. Inventory and description of environmental atlas systems/tools in the partner countries

2. Analysis of used systems and tools
3. Harmonization of classification schemes
4. Coordination of resources for sensitive areas
5. Development of an harmonized spatial database and manual

SSPA's commitments in the project period started in January 2011 and was completed in June 2012.

1.3 Scope and limitations of the study

In dialogue with MSB, SSPA has chosen to primarily focus on the following known national systems and tools:

Sweden:
- "Digital Miljöatlas" sometimes referred as the national environmental atlas

Finland:
- BORIS II - Situation awareness system for environmental emergency response
- OILRISK/MIMIC -Applications of ecological knowledge in managing oil spill risk

Estonia:
- OILRISK Web and SmartResponse Web decision support and web applications

These systems are defined and established GIS based environmental sensitivity mapping tools designed for oil spill contingency planning, prioritization and shoreline response. During the Inventory (Task 1) additional systems and tools shall be identified and described in the partner countries and Russia, St Petersburg and if possible also in Latvia.

The study has been focussed on the functionality and output services provided by the systems. Many of the systems are, however, based on sophisticated technical platforms and issues on possible harmonization between the different systems inevitable also involved discussions on technical matters and with technical expertise. International harmonization, possible modifications and adjustments of established systems also required some reconsideration of commission and mandate within the organisations responsible for the systems.

This means that even though functionality was the primary aspect of interest, technical and managerial issues also was addressed to a certain extent.

1.4 Conducted activities and progress

1.4.1 Progress and budget

The project has followed the planned time schedule and budget well and the four workshops have been arranged according to the plans. Some delay and extra time were, however, spent in the final phase of the project due to unforeseen difficulties with the computer application for the proposed pilot model of the atlas.

1.4.2 Meetings and activities conducted in the project

Conducted meetings and dated activities are tabulated below:

Date	*Activity*	*Description*	*Place*	*Consultant*	*MSB represent.*	*Notes*
14 Dec 2010	Start	Kick-off meeting, planning and contract issues.	Stockholm	B Forsman	K-E Kulander S Dobo	App 1
12 Jan 2011	Interview J Fejes	SSPA, MSB and IVL Swedish Environmental research institute. Issues on background, functionality and development of Miljöatlas	Telephone meeting	B Forsman	K-E Kulander S Dobo	
27 Jan 2011	Presentation	Presentation of the Environmental Atlas component for Swedish EnSaCo partners	Stockholm	E Molitor	S Dobo M Ericsson	
10 Feb 2011	Meeting	Discussion with the "miljöatlas"-management group – the group's first meeting	Göteborg County Ad.	B Forsman	S Dobo	
16 Feb 2011	Meeting	Information exchange with representatives from BORIS II and OILRISK	Helsinki Haaga-H	B Forsman	S Dobo	
8 Mar 2011	Meeting R Aps	Information on Estonian projects and discussions on phase 2 seminar planning	Malmö WMU conf	B Forsman	K-E Kulander S Dobo	
21 Mar 2011	Meeting	Discussion with the "miljöatlas"-management group – the group's 2nd meeting	Halmstad County Ad.	B Forsman	S Dobo	
28 Mar 2011	Meeting	Progress report presented at the EnSaCo steering committee meeting	Stockholm	B Forsman	K-E Kulander S Dobo	
3-4 May 2011	Workshop	International Environmental Atlas workshop in cooperation with Baltic Master II project		B Forsman J Pålsson WMU	K-E Kulander S Dobo M Ericsson	
30-31 Aug 2011	Workshop	Environmental Atlas workshop No 2 on Harmonization on sensitivity classification	Haaga-Helia Helsinki	B Forsman	S Dobo M Ericsson	
29-30 Nov 2011	Workshop	Environmental Atlas workshop No 3 on Coordination of resources & sensitive areas	Maritime Academy Tallinn	B Forsman J Hüffmeier	S Dobo M Ericsson	
21 Mar	Workshop	Environmental Atlas workshop No 4 on Development of an harmonized spatial database and manual	WTC Stockholm	B Forsman J Hüffmeier	K-E Kulander S Dobo M Ericsson	
22 Mar	Presentation	Presentation at the EnSaCo Cross-border oil spill response workshop	WTC Stockholm	B Forsman	K-E Kulander S Dobo M Ericsson	
19 Apr	Presentation	HELCOM Response meeting	Sopot Poland	B Forsman	S Dobo M Ericsson	
11 May	Presentation	EnSaCo Final Conference	Sveaborg Helsinki	B Forsman	S Dobo M Ericsson	

2 Inventory and analysis of existing systems

In order to define what systems that should be included in the study and how to define an Environmental Atlas in this context, some basic criteria were identified.

- Designed for oil spill contingency planning and for prioritization of environmentally sensitive areas and objects to be protected in case of an oil spill
- Include a Geographical Information System, GIS, where identified sensitive areas vulnerable to oil spills are marked and attributed with relevant information

All studied systems include these types of basic information but they also include a number of additional functions, services and features. In order to characterise, compare and identify possible synergies and harmonisation options, such additional characteristics must be compiled and structured in a systematic way. The sections below list a number of such characteristics under three headlines.

2.1 Functionality and output services

- **Geographical coverage**
  -Depending on the owner/user, the systems can cover areas of different size. Most of the systems discussed here are national systems with national geographical coverage. One objective of EnSaCo is, however, to develop systems that allow cross-border applications so issues on common background maps, interfacing and overlapping coverage are important.
  - Another aspect of geographical coverage is the aspect of “on land”, “coastal zone”, “shoreline”, “archipelago” and “at sea”. The focus of EnSaCo is on shoreline protection and hence such systems are of primary interest for this inventory.
- **User Categories, organisations, resources required**
  The structure of local, provincial and national organisational responsibilities for oil spill contingency planning and response differs a lot between the partner countries. These differences are also reflected in the systems used, in the categories of users and the skills and type of equipment required. Systems can be designed for expert decision support to be used by well-trained users or to be simple tools available to anybody.
- **Shoreline classification**
  - By experience it is well known that there are certain relations between the morphological type of shoreline and its vulnerability to oil spill and associated efforts required for clean-up operations.
  - Vulnerability, resilience and clean-up cost is also a function of the degree

of exposure to waves, tide and ice which also is an aspect that may be included in shoreline classification schemes.

- **Ecological sensitivity, oil spill vulnerability**
  -Different systems apply different classification principles and prioritization ranking for ecologically sensitive areas, locations, habitats with respect to its values of specific fauna, flora, biotopes etc.
  - Legally protected areas and habitats may be part of the same classification or considered separately and prioritized with respect to its level of legal protection.
  - The scales of classifications are normally based on resilience consideration where short term consequences expected to recover quickly get lower priority than long term or irreversible consequences and may be divided in to a few classes or a number of classes.
  - Overlapping protection claims may either be cumulated or governed by the one with highest priority.

- **Human-use classification**
  In addition to ecological values some systems also consider human-use of coastal resources and shoreline in order to be able to combine potential socio-economic spill damage cost in the total assessment and prioritization of resources to be protected.

- **Time – differentiation with respect to seasonal variations and time of year**
  In particular with respect to ecological sensitivity, the time aspect in terms of seasonal variations of fauna and flora are important for prioritization considerations.

- **Response resources**
  For the purpose of contingency planning as well as for operational decision support it is feasible to include basic information on available response resources, type and number of equipment and its locations.

- **Response logistics**
  In addition to the basic information on response resources it may also be useful to have associated logistical information for example on shoreline access roads and tracks, identified places for temporary waste storage, waste transportation capability per hour and time-radius relation on resources that can be allocated to a specific site in a specific time.

- **Simulation/prediction tools**
  Systems capable of using actual on-line weather information may include more sophisticated simulation or prediction functions where, for example, booms and simmers may be deployed and their efficiency calculated with respect to limitations imposed by wind and waves. This may particularly be useful for training of response operations but is likely to be difficult for comparative and optimization of real response operations.

- **Operational recommendations – decision support**
  In order to facilitate quick and correct decision making, direct operational recommendations are often included in links or as information attributed to the respective area or item subject to protection measures.

- **Additional information services**
  – Some systems are stand-alone systems while others may include a number of connections to other information systems or possibilities for personal expertise contacts. Import/export functions of layers to/from other systems as well as integrated data presentation for example from on-line AIS display services may improve flexibility for various applications and promote the attractiveness of a system.
  - Map links to geo referenced photos – aerial or shoreline - are included in many systems.

2.2 GIS and technical platforms

- **Available background maps**
  - From a technical point of view, the use of different background maps, different detail level at different zoom rates, transformation from different projections and coordinate systems are not a problem as computerized GIS software is used. In case paper based systems are used, modifications require more efforts.
  - From a licensing perspective, however, map handling may be somewhat more difficult. In web applications where the user is a client primarily viewing maps stored in a host server, licensing is normally not an issue.
  - Various land maps in different scales, sea charts and satellite/aerial photos usually facilitate the use of the system.

- **Client - server solutions**
  - In most systems the user is either accessing the system from Internet by a web interface while the program and database is running at a central server.
  - Some systems require that the user have the tool or system installed in the user's computer.

- **Web facilities and user interfaces**
  Most established GIS software offers web-client server applications designed for simple and versatile systems.

- **GIS platform and applications**
  The GIS technology is developing rapidly and some first generation of environmental sensitivity mapping systems were based on GIS platforms which now are out of date. Change of platform and updating of the system may require substantial technical effort and cost.

- **On-line, regular or manual updating of information**
  The data stored in various GIS files or geo databases may be updated at different frequencies. Some layers or linked data may include on-line information on ships' position (AIS) or wind measurements, some datasets are regularly automatically updated and others need manual input to be updated.
- **Reliability, redundancy and technical support**
  Systems designed to be used for decision support in real response operations must be operational 24-7 with very few and short down time periods. This may require redundant systems and technical support resources at the owner/host organisation.
- **Versions and log handling**
  For all decision support systems, and in particular when development work is going on in different organisations it is important to log all changes carefully and to track and disseminate information on the relevant version.

2.3 System status, ownership and management

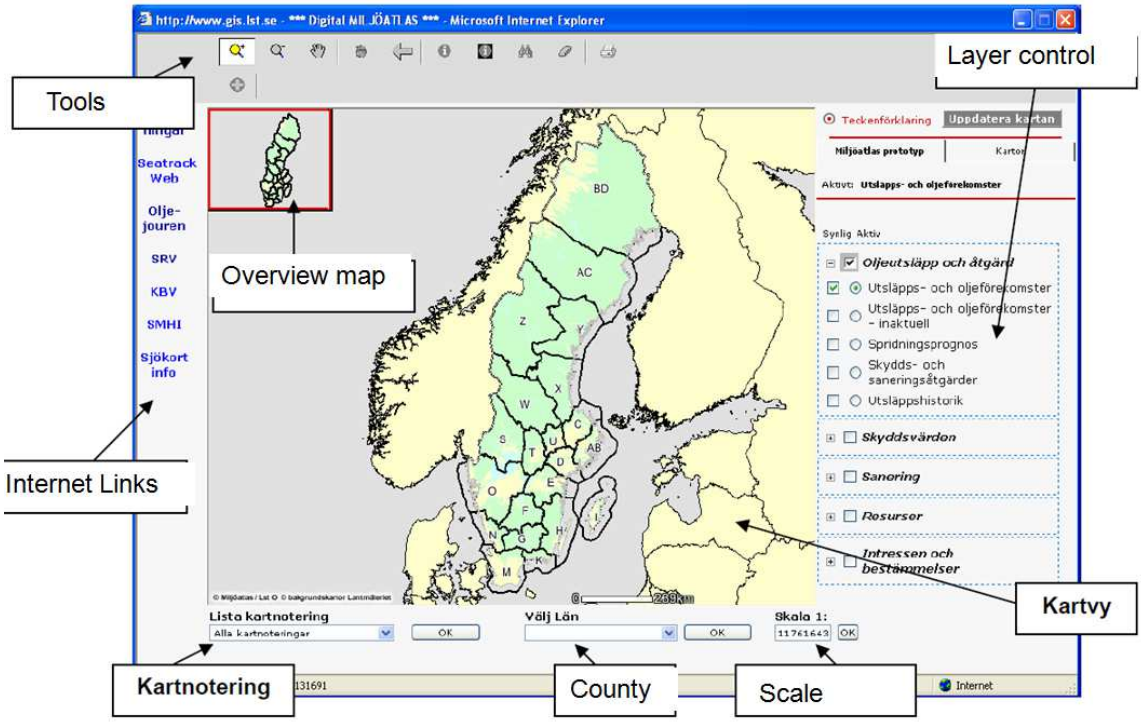
- **System status**
  For the comparative use of this inventory it is considered important to characterise the present status of the respective systems in terms of; "Established in service system", "Trial or pilot application – beta version", "development project" or "research and demonstration". The established systems in service today have often taken many years to develop.
- **Accessibility and authentication**
  The systems may have users of different categories and different authorities to change and introduce data in the system.
- **Owner organisation, operation, development and maintenance**
  Many of the established operational organisations or agencies who are owners of the systems have established IT-units and skilled staff to operate and maintain the system. During the development phase the systems may be more dependent on specific persons and sensitive to organisational changes.
- **Management, promotion of use and training**
  For operational systems in service it is important that there is an established management organisation or steering committee to ensure contact between the users, their needs and the system owner and that the management body regularly evaluate the benefits, the costs and the potential development needs for improvement. Training and promotion of the use may also be an important task for such a management body.

3 Sweden

3.1 Digital Miljöatlas

3.1.1 Background

In 1979 the Swedish Government commissioned the County Administrations to compile an Environmental Atlas to facilitate oil spill response operation. In 1982 Swedish Environmental Protection Agency, EPA, presented a template but the result turned out to be very diverging when the situation was evaluated in 1996. During the period 2003 – 2007, EPA commissioned IVL Swedish Environmental research institute in cooperation with the County Administration in Västra Götaland to develop a pilot application which was officially launched in 2008. Since then it is available on the Web for contingency planners and other interested parties. The use of it has not yet been widely spread among the coastal counties but in 2011 the ownership was transferred from the EPA to the County Administration in Västra Götaland who has now established a management group with representatives from other counties to promote and guide the use and future development. Today the responsibility shoreline oil spill preparedness and response issues at the governmental level has been transferred from the EPA to the new authority; Swedish Agency for Marine and Water Management (SwAM).



Start window of the Miljöatlas web user interface

Digital Miljöatlas is a GIS based system for oil spill contingency preparedness planning and it is also intended to serve as decision support to identify prioritized coastal ecological resources for protection in real response operations.

The system is designed for and intended for national use in Sweden and all documentation, so far, is in Swedish. The background maps cover Swedish territories and sea areas inside EEZ. Specific input data on sensitive resources and response resources are basically included for the mainland shorelines and coastal waters.

Some Swedish partners within the Interreg Project Baltic Master II have actively been involved in development and new regional application of the system.

3.1.2 Available information and functions/services

The system comprises the following five expandable main layer categories or themes:

1 Oil spill and measures
– A system operator can define and update spill slick data for real cases or for exercising by use of an SVG editor
– Any user can view the information and quick communication is ensured
- An additional import feature is developed in order to enable a map overlay of an oil spill drift and spreading calculation conducted in SeaTrack Web. The SeaTrack Web application is run separately and its output for a specific time is exported to the Miljöatlas by a command in the Miljöatlas interface as a static map layer.

2 Sensitive areas/objects
- Defined by provincial authorities. Not nationally harmonised.
Examples of available sensitivity aspect layers:
Aqua culture, Economic interests, Recreational interests,
Biology, Geology

3 Shoreline classification
Shoreline classification in ten morphological classes based on US ESI classification. Compiled from inventories of mainland shoreline (original inventory from 1969). Most island shorelines are not classified. Ecological sensitivity, resilience and difficulty of clean-up are considered in the classification. The following classes are defined:

0 ports, harbours, piers etc.

1 cliffs and stone walls

2 sandy beaches

3 gravel beaches

4 shingle beaches

5 block beaches

6 rocky shores

7 pebble (stone) beaches

8 sediment beaches

9 reed belts and beach meadows

For each shoreline class, attributed information includes operational recommendations on feasible clean-up techniques for different seasons.

4 National stockpiles of clean-up equipment

State owned shoreline response equipment from five stockpiles are marked but provincial, municipal and private resources are not yet included.

5 Legally protected areas
Map layers for "fixed" areas and habitats defined by EPA and County Administrations with various dedicated legal protection status like Natura 2000, National Parks, Bird sanctuaries etc.

All themes can be presented on optional background land maps or sea charts

3.1.3 Application for planning and response – Experience and examples

The county administrations in Halland and Skåne are actively using the system in their contingency planning process. There is, however, still very little experience of using the system for prioritization decisions during real response operations.

3.1.4 GIS platform and user interface

The host organisation, the County administrations' common IT-department are planning to upgrade Miljöatlas from today's ESRI Arc IMS system to a new ArcGIS Server with a Silverlight web application as a user interface. Other similar GIS services hosted by the IT-department have already been transferred to the new Silverlight application, cf. viss.lst.se. According to present plans the Digital Miljöatlas will be transferred to the Silverlight platform in 2013.

3.1.5 Management and operation of the system

Swedish EPA and MSB have in 2011 transferred ownership and operational responsibilities for Digital Miljöatlas as a tool for coordination of national shoreline oil spill contingency planning to the County Administrations. The County Administration in Västra Götaland is heading a management group responsible for the operation, development and maintenance of the system.

The main responsibility for making the system fully operational, however, lies with the respective coastal County Administrations who are supposed to enter county specific input on shoreline characteristics and areas to be protected. Responsible planners and system operators at the County level are free to

introduce new map layers and identify priority areas for protection within their jurisdiction.

The County Administrations will then present the plans to the respective municipalities who are responsible for the operational response. Municipalities are also free to propose/introduce specific municipal priority protection areas, response resources and logistics but are not supposed to actively do adjustments in the shape files and geo-databases themselves.

From 1 July 2011 a new authority is established called; Swedish Agency for Marine and Water Management, SwAM. This new agency has taken over oil spill preparedness and response responsibilities from the EPA and may become engaged in the management structure, development and implementation of the Digital Miljöatlas.

3.1.6 Development plans and needs

The management group identifies primary development needs with regard to operational reliability of failing/missing links, import of SeaTrack Web forecasts and dissemination of the use and knowledge of the system to other Counties.

Within the Baltic Master II project the development efforts of the Digital Miljöatlas are primarily focussing on preparedness for large spills, larger than 10 000 tonnes. In order to realise and facilitate the implementation, Baltic Master II proposes simplification marking of sensitive areas (areas rather than objects) identified for priority protection – no ranked classification of priorities. Within these “red” priority areas there may be a number of smaller “blue” areas with common specific protection needs and attributed information. According to Baltic Master II representatives, practical experience shows that this type of general priority marking covers corresponding areas as identified when more sophisticated detailed prioritization schemes are applied.

3.1.7 Findings and minutes from demonstration meetings and discussions

Other possible developments areas have been identified during meetings and interviews for example the following:

- More developed layers and tool functions on response resources
- Full integration with Sea Track Web
- Integration with AIS display
- Integration with Google Earth or similar satellite or aerial images
- Multi lingual version – at least English
- More open water sensitive areas, banks, sanctuaries
- Alert mode ”red button” for urgent response instructions
- Other fields of applications, integrated tool, EIA, permit processes etc.

3.1.8 References

Home page and public web interface: http://gis.lst.se/miljoatlas/

A working document within the project MARSUNO has been prepared in English with a description of the Miljöatlas.

3.2 SeaTrack Web

Seatrack Web is a well-established oil spill drift and spreading prediction tool which are used in connection with environmental sensitivity mapping systems and tools in many HELCOM member states.

Seatrack Web is developed at SMHI in close cooperation with the Danish Maritime Safety Administration, Bundesamt fur Seeshifffart und Hafen and the Finnish Environment Institute. The first version of Seatrack Web was introduced in 1995 and since then Seatrack Web has been used successfully in several oil spill cases. It is also developed further to be a well-functioning tool for authorities responsible for oil spill response in the Baltic Sea region.

Seatrack Web's main purpose is to calculate the spreading of oil that has come out in the Gulf of Bothnia, the Gulf of Finland, the Baltic Sea, the Sounds, the Kattegat, the Skagerrak and part of the North Sea (out to E 3^{o}). The program can also be used for other substances than oil, such as chemicals, algae and objects. In addition to an oil drift forecast, it is possible to make a backward calculation. Then a calculation starts at the position where a substance was found. The programme calculates the drift backwards in time and traces the origin of the substance or an object.
[Extracted from http://seatrack.smhi.se/seatrack/]

3.3 SJÖBASIS and MARSUNO

The SJÖBASIS system was launched in March 2010 by the Swedish Coast Guard and made available to users. In addition to the Swedish Coast Guard these users consist of the Police, Swedish Customs, SMHI Swedish Meteorological and Hydrological Institute, MSB the Swedish Civil Contingencies Agency, SGU Geological Survey of Sweden, Swedish Maritime Administration, Swedish Transport Agency, National Board of Fisheries, Swedish Environmental Protection Agency and the Swedish Armed Forces.

The SJÖBASIS system provides its users with on-line data, presented in GIS charts, with information compiled from AIS-data, radars, port state control records, advance notification data and several other sensors, and can automatically detect if ships deviate from shipping lanes, TSS Traffic Separation Schemes), or enter into restricted areas. It will also be utilised for the

compilation of statistical information on specific traffic, ship emission exposure etc. and the number of services offered will gradually be expanded.

Its users have already found the services provided by the first version very useful and it is also noteworthy that the European Commission Directorate General for Maritime Affairs and Fisheries unity (DG MARE) also considers this type of information system most interesting and is financially supporting the Swedish Coast Guard in a research project aiming at a corresponding European system. This research project, coordinated by the Swedish Coast Guard, is called MARSUNO.

The MARSUNO (Maritime Surveillance North) pilot project supports the policy process of the European Commission to create a Common Information Sharing Environment for the EU maritime domain. The project will identify the expected gap between various user communities' demand for the exchange of cross-sectorial maritime surveillance data unmatched by current supply. It will further explore the possibility to achieve such data exchange. [http://www.marsuno.eu/]

4 Finland

The Finnish Environment Institute (SYKE) is the competent government oil pollution combating authority. The oil response vessels are manned and owned by the Navy, Border Guard of Finland and state's Meritaito Oy.

According to information available on the Community Information System web site CIS, the rescue service regions also hold a number of medium- and small-size vessels that can be used in recovery operations. These include 71 specialised oil combating boats in the 10 - 20 metre length range as well as hundreds of smaller, non-specialised boats. Among the municipal boats, 31 are permanently fitted with sweeping arm stiff-brush oil recovery systems.

4.1 BORIS II

The system that will be output of the BORIS II project is called a Situation awareness system for environmental emergency response. A previous version of the system, BORIS (Baltic Oil Response Information System) a GIS for oil spill response hosted by SYKE has been in operation since 2006, but needed to be updated and further developed. The purpose of the new BORIS 2 project is to produce an Internet-based GIS for the Finnish oil spill response authorities that support preparedness planning for oil spills, cost-effective and well-targeted spill response, information services during operations as well as archiving the data relevant for compensation negotiations.

The new system will enable the response commander of the oil spill operation to view the different datasets necessary for response planning in single map view: the locations of the resources, high priority protected targets, traffic networks, harbours etc. Satellite and aerial surveillance imagery can be loaded into the view to estimate the extent of the spill. The system is connected to real time weather datasets and predictions and it enables the user to calculate a forecast of the oil drifting. Shore reconnaissance units can report their observations in to the system. Based on all of these different datasets the leading authority can plan the operations in the map view and distribute the plans to through the system to all of the users or print them out on paper.

As the response operation progresses, new information and new plans are continuously fed into the system, providing the users with an up-to-date view of the current situation. This view can be utilized by the leaders of the operations as well as other involved parties.

In addition to actual response operations, the system will also support other duties related to oil spill response. It can be used in assessing and further enhancing the preparedness for spill response, in oil spill response training and in justifying the compensations. The system will function as an archive from which the information concerning a certain case can easily be retrieved at a later point in time. [www.ymparisto.fi/syke/boris2.]

4.1.1 Background

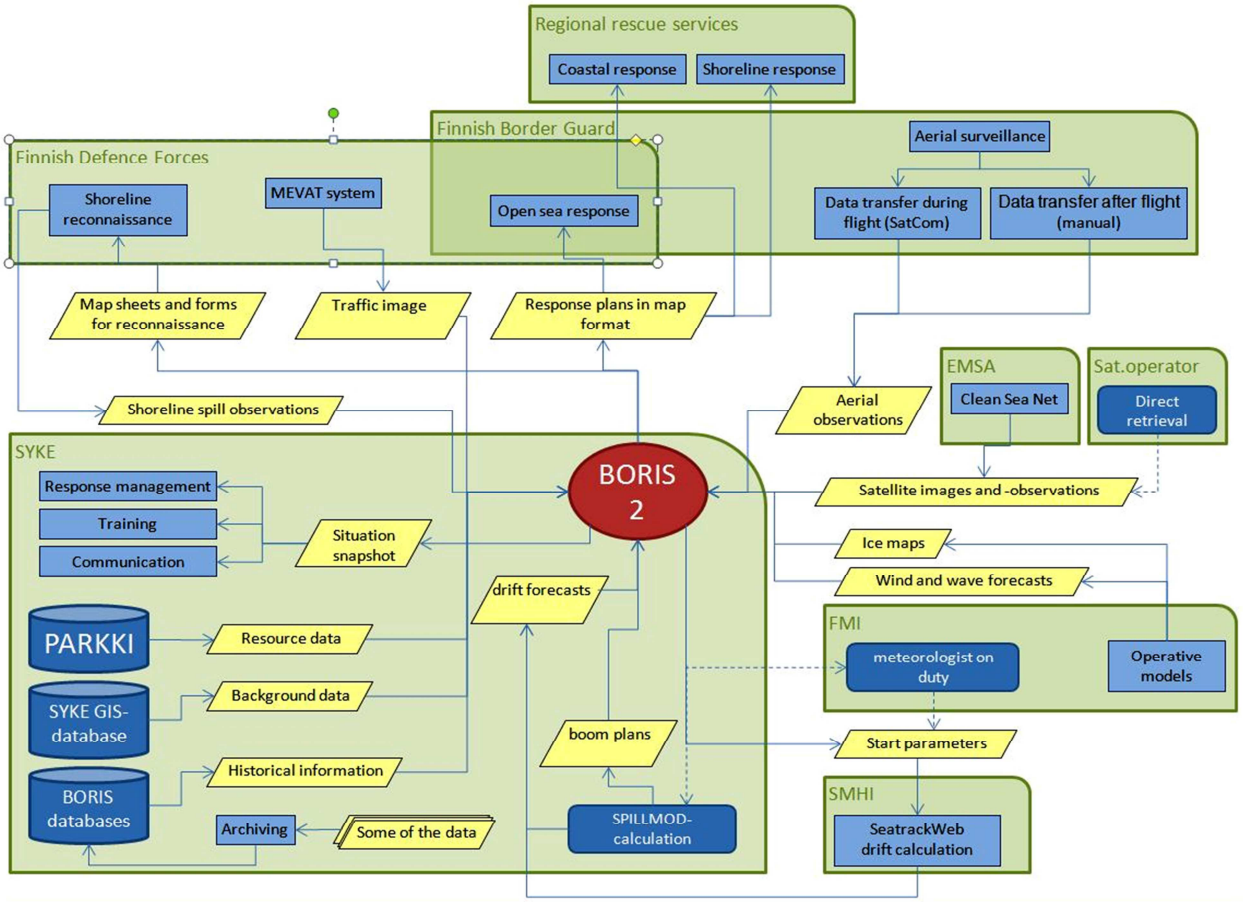
- Funded by Finnish Oil Pollution Fund and SYKE
- All oil spill authorities in Finland involved
- The objective is a versatile map system for oil spill combating containing:
  - ”static” datasets
  - satellite images and spills observed in them
  - aerial and shoreline surveillance data
  - possibility for calculating drift forecasts
  - weather and environmental conditions
  - tools for planning and managing response operations
- Priorities: clarity, reliability and accessibility

4.1.2 Overall structure

The host server is located at SYKE where the main databases spill response resources, background data and stored historical data are available.

The system receives aerial spill information sea areas and shorelines from the Finnish Border Guard and the Finnish Defence Forces and communicates with SMHI and FMI to receive weather information for predictions. Processed feedback information is delivered to the operational units at sea and to the regional rescue services.

The structure and flowchart of the system is illustrated in the figure below.



Boris II general flowchart

4.1.3 Available information and functions/services

All themes can be presented on optional background land maps or sea charts

4.1.4 Application for planning and response – Experience and examples

The system will be used by well trained and skilled operators in the respective partner organisations involved in oil spill response and contingency planning. All of the intended end users of the system have been involved in the project from the very beginning to allow early feedback on their needs and requirements. They have also been testing trial versions of the system for testing and familiarisation.

4.1.5 GIS platform and user interface

The GIS platform of BORIS II is built on an ArcGIS Server with a Silverlight web-application.

4.1.6 Management and operation of the system

The BORIS II project is managed by Finnish Environment Institute SYKE and it has funding from the Finnish Oil Pollution Fund.

Partners and representatives of the project steering group are recruited from: Ministry of the Environment, Centres for Economic Development, Transport and the Environment (previously Regional Environment Centers), The Ministry of the Interior Department for Rescue Services, Regional rescue services, The Finnish Border Guard, The Finnish Navy, Finnish Metrological Institute, European Maritime Safety Agency EMSA, SMHI (Swedish Meteorological and Hydrological Institute) and Kymenlaakso University of Applied Sciences

4.1.7 Development plans and needs

Air surveillance data collected by the Finnish Border Guard will be made available within BORIS 2 as near real time as possible.

The operational manuals for oil spill response for the regional rescue service area of Kymenlaakso, developed in the SÖKÖ Pilot Project and extended to the entire Gulf of Finland in the SÖKÖ II, developed by Kymenlaakso University of Applied Sciences, are linked to the BORIS 2. For example, the shore line segments and reconnaissance forms used by the SÖKÖ model are incorporated into BORIS 2 and used as the basis for the shore reconnaissance database and for visualization. Integration with the functionalities of the OILRISK project may also be part of the future development plans.

4.1.8 Findings and minutes from demonstration meetings and discussions

The system is a very complex and sophisticated system with a wide range of functionalities and linked information chains. It is basically designed for national application in Finland only and its coverage has successively been expanded from the central areas of the Gulf of Finland to include more areas of Finnish coastlines and sea areas. Some of the data handled by BORIS II is confidential and therefore the system cannot be made public or directly made accessible for authorities outside Finland.

Due to its relative complex structure the user interface is also relative complex and needs trained staff that are regularly using the system to keep their knowledge up to date. The information and situation maps elaborated by the system operators may, however, be clear and simple to interpret for users working at the spill site and may provide them with good guidance on prioritization, spill development and operational instructions.

4.1.9 References

More information on the project is found on the website www.ymparisto.fi/syke/boris2.

4.2 OILRISK

The main objectives of the OILRISK - Applications of ecological knowledge in managing oil spill risk are to:

- To assess the risk of a possible oil spill to nature values and especially to endangered species in the Gulf of Finland and the Archipelago Sea
- To investigate the possibilities to minimize the harmful effects to the environment by the means of offshore and onshore oil combating

Based on the information the most vulnerable species of animals and plants habitat types (IUCN red list, breeding/resting areas important birds etc.), a web based map application will be created to combine the information on drifting oil slicks and sensitive nature values. The map will help oil combating personnel make concrete decisions on what kind of offshore oil combating measures to apply and how the onshore combating should be arranged taking the nature values into consideration.

Output recommendations from the tool to the oil spill response will include recommended response options, clean-up methods and functionalities to estimate the total cost of the recommended operation will also be included.

Gulf of Finland and Finnish archipelago are the main focus for the Finnish components of the project but the partner organisation in Estonia is actively developing the system for application in Estonian waters and coastal areas. The tool will provide valuable guidance and facilitate planning, response operations and shoreline clean-up for involved organisations, but the organisations are not obliged to use the system.

The data on rare and vulnerable species and habitats are sensitive and cannot be presented publicly. The tool also utilise detailed bathymetric data with confidential depth data in the archipelago region as well as in open sea.

4.2.1 Background

Before the OILRISK project was launched, another Finnish-Estonian cooperation project called OILECO was conducted in cooperation between SYKE, University of Helsinki, Kotka Maritime Research Centre and University of Tartu with financial support from EU.

The final scientific project report “Integrating ecological values in the decision making process on oil spill combating in the Gulf of Finland” was published in 2008 and outlines a set of analytical tools to support the oil spill contingency planning and operational decision making on oil combating. The tools include models based on Bayesian network approaches.

To OILRISK project was launched in 2009 partly in order to refine and develop the results of the OILECO project. The partners of OILRISK include: Kotka Maritime research Centre, University of Helsinki, ELY Centre for Southeast

Finland, SYKE, Aalto University and University of Tartu, Estonia. Funding is received from EU Interreg IVA.

4.2.2 Overall structure

OILRISK, Applications of ecological knowledge in managing oil spill risk, is developing strategic and operational tools for combating authorities in Estonia and Finland to be used in oil spill contingency planning. The aim is to strengthen the cooperation between authorities on oil spill risk management and minimise the negative impacts of future oil accidents on the nature values.

Another focus is to raise the awareness of stakeholders on the effects of oil spills and on the various actions that can be taken in order to minimise the effects. Among other things, the project is developing web-based tools for integrating biological and ecological knowledge into oil-combating risk assessments and management. Substantial efforts are being made to ensure interoperability with existing and developing information systems for environmental management.

The project comprises the following work packages:

WP 1 - Project management and coordination, Kotka Maritime Research Centre

WP2 - Estimation of oil spill risks on nature values, University of Helsinki. The aim of WP2 is to assess the risk of a possible oil spill on the nature values in the Gulf of Finland and to investigate the possibilities to reduce the harmful effects of an oil spill on the environment by using appropriate oil combating measures.

WP3 - Development of web based tool for oil pollution risk management, University of Tartu, Estonian Marine Institute. The aim of W3 is to develop web based map application is to be created to support the planning and practical implementation of oil combating measures. The map application combines the information on oil drifting and sensitive nature values.

WP4 - Developing operational tools to support onshore oil combating, Centre for Economic Development, Transport and the Environment for Southeast Finland. The objective of WP4 is to develop tools to support the operational oil combating decision making, in order to help the oil combating authorities and personnel choose the appropriate cleaning methods and plan the purchases for new cleaning equipment.

4.2.3 Available information and functions/services

All themes can be presented on optional background land maps or sea charts. Sensitivity maps designed with high resolution with a basic grid of 200x200 m. The classification scales include class 0-1. Overlapping species, identified sensitive resources are added together, and the square gets higher index.

4.2.4 Application for planning and response – Experience and examples

The geographical coverage of the Finnish OILRISK project is the Gulf of Finland and Finnish archipelago waters.

4.2.5 GIS platform and user interface

It is assumed that the OILRISK tools will be designed on a platform that allow for easy communication with system based on ArcGIS Server with a Silverlight web application.

4.2.6 Management and operation of the system

The tools are still under development but some components are intended to be integrated with the BORIS II system and managed correspondingly when the project is completed.

4.2.7 Development plans and needs

The project is a development project and a number of separate development tasks are undertaken at the respective partner organisations.

4.2.8 Findings and minutes from demonstration meetings and discussions

Some of the sensitivity data and bathymetric sea chart data include information that cannot be presented publicly. The resolution of the spatial classification structure is high and overlapping sensitivity indices of different environmental aspects are accumulated to a total index figure. The theoretical structure of the decision support model is sophisticated and differs from the other systems.

4.2.9 References

More information on the OILRISK project in Finland can be found on the home page and public web interface: http://www.merikotka.fi/uk/OILRISK.php

4.3 SÖKÖ Management of onshore oil spill combating

The SÖKÖ I and its on-going continuation project SÖKÖ II is a joint development program for shoreline response to worst case oil spill.

The SÖKÖ project is led by a university of applied sciences research team that develops re-gionally tailored on-shore oil recovery operations. The results of the project are presented in regional guidebooks achieved as a joint effort between oil combating authorities, educational institutes, civic organisations and businesses. The SÖKÖ action plan is a complementary study to the regional

and national statutory contingency plans for the worst case oil spill scenario (30 000 tons in the Gulf of Finland). The main result, comprehensive guidebooks, are a collection of studies undertaken mainly by further education students and specialists under the supervision of the project steering group composed of oil com-bating authorities. The guidebooks are used as action plans and manuals for the response commander as well as for training both authorities and volunteers. The first guidebook was accomplished in 2007 for the eastern Regional Rescue Service of Finland (Kymenlaakso). Three new guidebooks are to be produced by the year 2011 including regional updates and new topics.

[Information extracted from http://www.kyamk.fi/Projektit]

The guidebooks and most information documents on the SÖKÖ projects are in Finnish but include very detailed information and instructions for responders and preparedness planners.

4.4 MIMIC

Minimizing risks of maritime oil trans-port by holistic safety strategies is a cooperation project between the following partners:

Kotka Maritime Research Centre,
Centre for Maritime Studies at the University of Turku,
Kymenlaakso University of Applied Sciences,
Aalto University, University of Helsinki,
Tallinn University of Technology,
University of Tartu,
Swedish Meteorological and Hydrological Institute and
Finnish Environment Institute

The MIMIC project integrates the knowledge from earlier projects and new information on the less studied aspects of accidents. The objective is to study and compare the effect of different management actions to avoid accidents, giving insight to the cost-effectiveness of these measures. Based on the modelling work, the most effective measures will be identified, and possible recommendations will be presented. One of the new and specific aims of the project is to view the problem both form the point of private companies and society and to try to find ways how society can influence the private activities in most effective way to decrease the risks. A totally new element is to link the safety and security issues, where the same actions can support both interests, and same methodology can be used to assess the risks. The main deliverables are an Integrative Probabilistic Model for comparing the management actions and SmartResponse Web application for decision analysis and support.

The project includes the following five work packages.

WP 1 Management

WP2 Traffic flows

WP3 Security related risks

WP4 Environmental and economic risks

WP5 Effective risk reduction measures

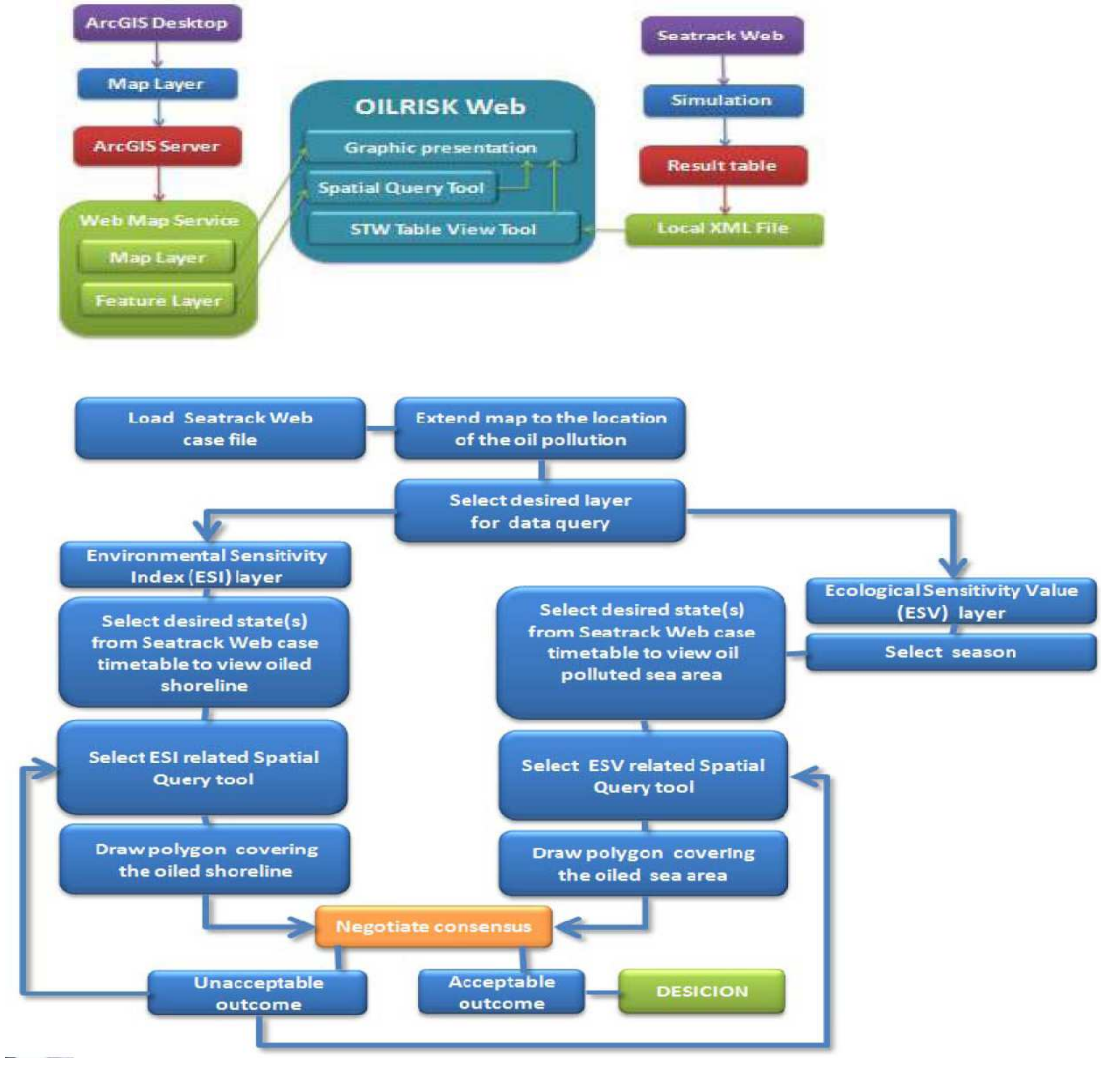
Within WP4 of this project the “Development of operational interactive decision analysis/support application (SmartResponse Web)” is included. This task has several components in common with the environmental sensitivity and resource allocation mapping system described for the other systems. In particular there are a number of common interfaces with the Estonian SmartResponse Web project and together they may represent one step towards a harmonised environmental system for the Gulf of Finland area.

5 Estonia

5.1 OILRISK

The OILRISK is an advanced tool for enhancing spill response decision making and can be used for:

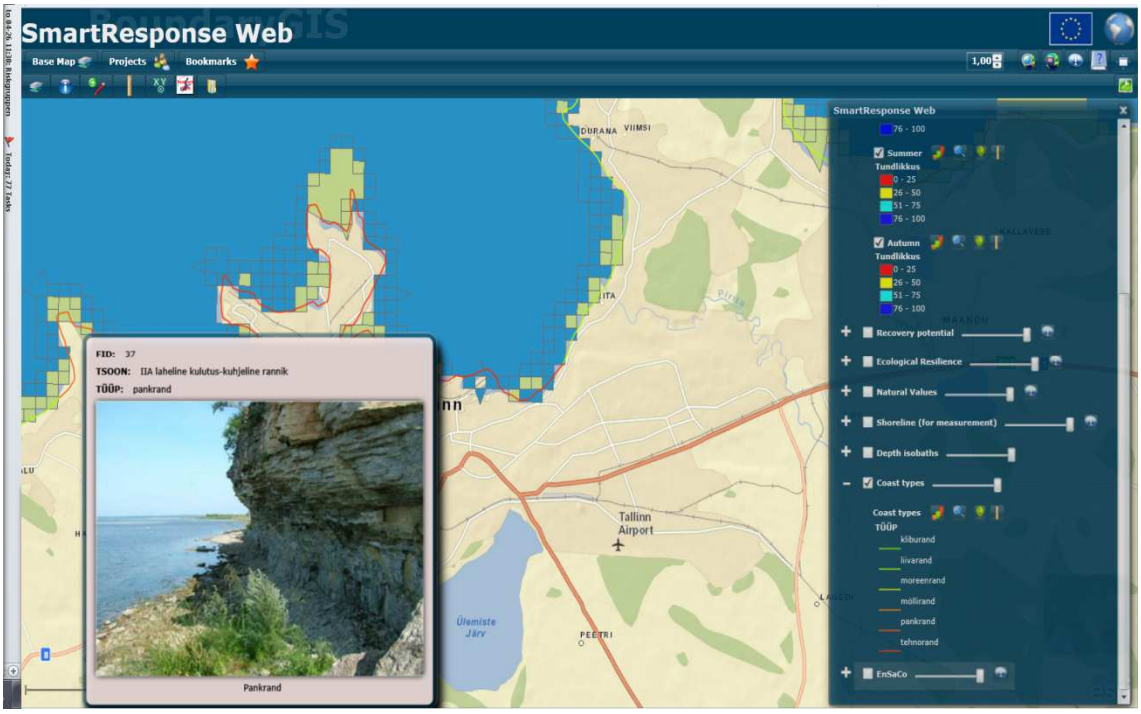
- Contingency planning
- Training of personnel
- Information for decision makers and other stakeholders concerned
- Communication of risk assessment results and associated uncertainty



Schematic description of the OILRISK Web structure

5.2 SmartResponse Web

The Finnish-Estonian cooperation within the SmartResponse Web has generated interesting results during the course of the EnSaCo project. Based on the portal BoundaryGIS (boundarygis.eu) and with input from the Oilrisk project, the University Tartu in cooperation with the Estonian Maritime Academy has developed the web application called SmartResponse Web into an operational pilot tool for testing and demonstration. References and reports from the development have been exchanged and discussed in a fruitful way between the project and the EnSaCo environmental atlas component.



Example of sensitivity map layer presentation in the SmartResponse Web

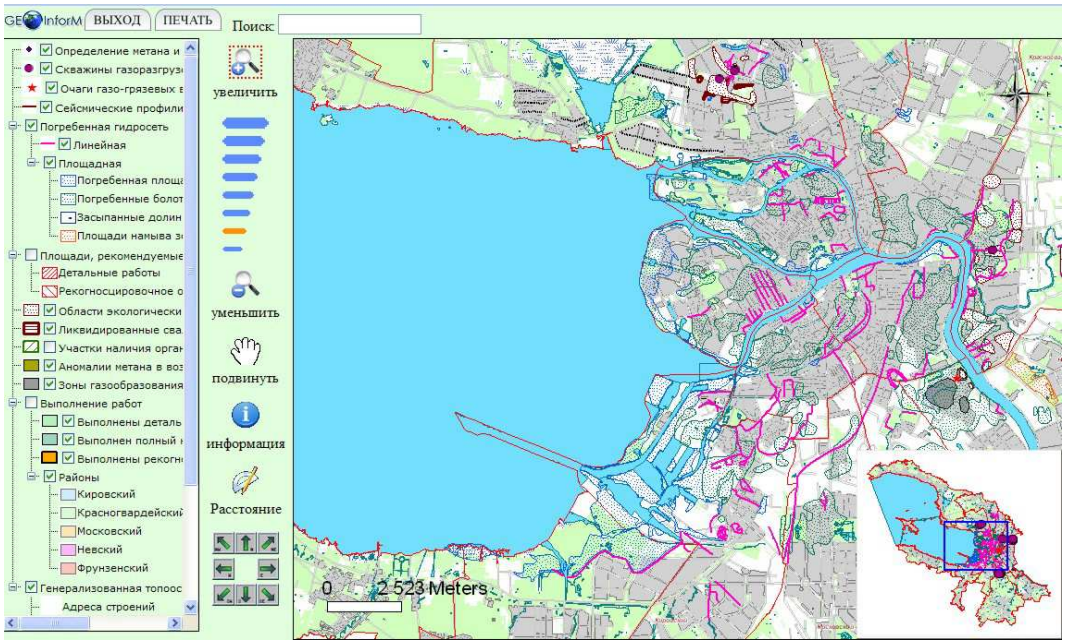
The figure above illustrate some basic functions and services provided by the SmartResponse Web with shoreline type indicated by a line in six different colours, sensitivity layers for four different seasons by colour codes with a resolution of 200 x 200 m squares and linked photos for identification of shoreline character.

The SmartResponse Web application also allows downloading of oil spill prediction and trajectory scenarios from Seatrack Web. Scenarios prepared by Seatrack Web can display a sequence of oil spill time-history in the map window and analyses may be conducted at different points of time. The SmartResponse Web also includes identification, selection and search tools as well as spatial query tools. It is based on a Silverlight application and ArcGis.

6 Russia – St Petersburg

In 2011 a WEB-service with unrestricted access to the cartographic data of the St. Petersburg geological database was established. The software tools of the database system can be used for searching and displaying borehole columns, geological profiles and modelling results using WEB interface. According to information provided from the Environmental Protection and Ecological Safety, City of St-Petersburg St. Petersburg, an environmental atlas including sensitivity maps will also be available. It is not known if this database yet contains any specific shoreline spill sensitivity mapping data. More information on system and specifically on spill sensitivity will be presented in a paper titled "Vulnerability to oil spill contamination in Saint-Petersburg water area".

The system platform is ESRI ArcIMS and the services are available on the infoeco.ru server http://www.infoeco.ru/gisgeo.



Example of map interface from the Russian GEOInforM geological database available from www.infoeco.ru.

7 Latvia

Among the tasks of the Marine and Inland Waters Administration (MIWA) which is a unit of State Environmental Service of the Ministry of Environment of the Republic of Latvia, is approval of spill contingency plans for ports and terminals and they also collect, compile and provide information on marine environment quality and use of natural resources. According to MIWA the only existing oil spill environmental sensitivity mapping in Latvia is the one done is by Carlo Bro Ltd. in 1999. The mapping was done MapInfo 4.5 form, map scale 1:50 000 and covered the coastal zone of Latvian marine waters up to 20m depth in average, and 1 km inland. It is not known if it is regularly used for contingency planning, training or if it has been used in real spill response operations.

Within the BRISK project, COVI has conducted spill sensitivity mapping for Latvian waters, and the results may be displayed from Helcom map and data services web page. MIWA was the Latvian partner body of BRISK.

The response to oil spills in Latvia is organized by the National Oil Spill Contingency Plan (NOSCP) from 2004 which defines MIWA as responsible for the coordination of the implementation of the NOSCP and the fulfilment of international obligations regarding oil spill response. Oil spill contingency operations at sea on a national and international level are carried out by Latvian Coastguard (Ministry of Defence).Maritime Rescue Co-ordination Centre (MRCC Riga) serves as a national and international contact point for emergency situations. On the shoreline the state Fire fighting and Rescue Service (SFRS) is responsible for response operations on the coast. SFRS maintains main office in Riga and regional offices located in municipalities along the coastline and they operate its own technical equipment. Local municipalities take part in response operations to oil pollution on the coast. [Community Information System (CIS), http://www.lva.gov.lv/spills/Engl/index_engl.htm].

Under the headline Computer Systems, the CIS web site lists the SeaTrack Web as the only available system.

The location of the main stockpiles for oil recovery equipment in Latvia [CIS]

8 International initiatives and cooperation projects

8.1 Baltic Master II

The overall aim of Baltic Master II is to improve the on-land response capacity to oil spills in the Baltic Sea as well as to enhance the prevention of pollution from maritime transport. As part of this aim Baltic Master II puts a significant effort in developing practical solutions to environmental safety problems in the Baltic Sea including oil contingency plans in coastal regions

The project is divided into four different work packages

- Project Management and Administration
- Communication and Information
- Improved on-land response capacity to oil spills at sea
- Enhanced prevention of pollution

Lead Partner Region Blekinge, Sweden and there are 48 partners from 9 different countries around the Baltic Sea. The duration 25 January 2009 – 25 January 2012 and the total budget Approximately 4 million Euro. [http://www.balticmaster.org]

Four Swedish County administrations are among the Baltic Master II partners. They agreed to build and develop their environmental atlases in the existing web-based Digital Miljöatlas. The shoreline type will be classified by rank depending on how easy it would be to clean up the oil, how long the oil would persist, and how sensitive the habitat is. The county administrative board of Skåne, in cooperation with the municipalities, has produced an updated Miljöatlas including a guideline to facilitate corresponding upgrading in other coastal counties.

A similar tool for mapping the coastal zone is also being created in Poland by the Baltic master II partner Maritime Institute in Gdansk. Swedish and Polish partners are developing their tools separately although in close contact with each other to gain experience from their respective work. [Baltic master progress Report May 2010].

Within the Baltic Master II project the Swedish County Administrative Boards of Halland, Skåne, Blekinge and Kalmar developed and updated their geographical information as a contribution to the common national Environmental Atlas. These four Baltic Master II case regions are today leading the way forward for other coastal regions of Sweden when it comes to the Environmental Atlas.

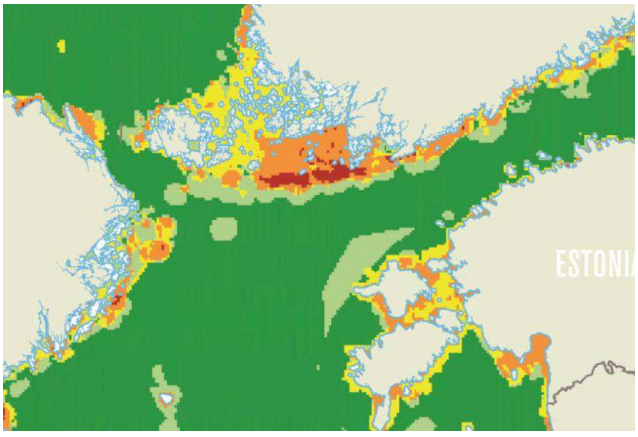
The Baltic Master II was completed in October 2011. More information on Baltic Master II is found on www.balticmaster.org/

8.2 BRISK

The overall aim of the project Sub-regional risk of spill of oil and hazardous substances in the Baltic Sea (BRISK) was to increase the preparedness of all Baltic Sea countries to respond to major spills of oil and hazardous substances from shipping.

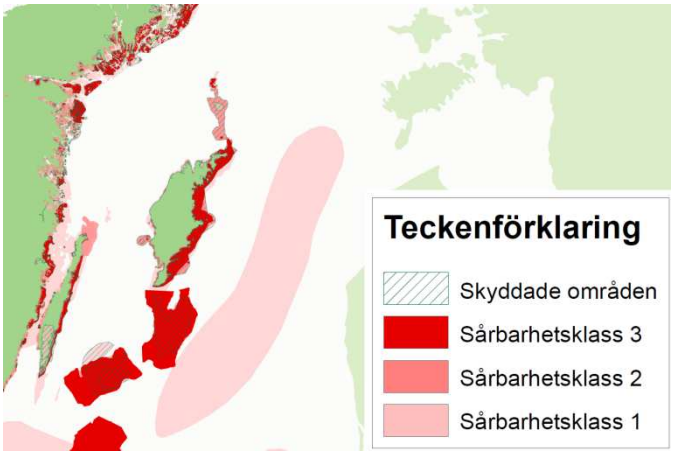
The BRISK project started in 2009 and was completed in January 2012 and it was co-financed by the European Union within the Baltic Sea Region (BSR) Programme 2007-2013. BRISK has been selected as a strategic project of the BSR Programme due to its importance for the sustainable development of the region. Its total budget was around 3.3 million, with approximately EUR 2.5 million to be allocated from the European Regional Development Fund. [Extracted from http://www.brisk.helcom.fi/].

Within the BRISK a comprehensive sensitivity mapping has been conducted based on the "COWI-classification" scheme originally developed and applied for characterization of Danish coastal and shoreline conditions. Mapping of environmentally sensitive areas are more focussed on offshore resources and areas than the mapping issues addressed in the EnSaCo Environmental Atlas component. The BRISK output with regard to spill vulnerability is presented in a separate deliverable published in January 2012 and as it covers the entire Baltic area the resolution is somewhat restricted with regard to local shoreline protection prioritisation issues. Vulnerability is categorised into five classes (from red to green) and presented in separate maps for four seasons.



Detail of BRISK environmental vulnerability map (spring season)

The Swedish Coast Guard was partner in BRISK and has been assisted by the EPA to develop a complementary oil spill vulnerability analysis for Swedish waters. Metria was commissioned by EPA to develop a set of monthly vulnerability maps.



Vulnerability map for oil spill in May prepared by Swedish EPA

8.3 HELCOM Map and Data Services

The main objective of the HELCOM Map and Data Services is to make environmental information accessible for interested users and the general public. The Map and Data Service aims to be easy to use, intuitive and attractive, with a similar look and feel as Google Maps, Bing Maps, etc.

The new Map and Data Service is based on ESRI's ArcGIS Server and Flex development platform. Through the HELCOM map and data service, users are able to:

- Visualize, analyse and search Baltic Sea environmental data.
- Draw and save or print your own maps.
- Download ESRI shape files
- Access layers in OGC WMS standard protocol

The new HELCOM Map and Data Services combines a number of services previously found in different map and GIS applications like the MARIS.

There is no a specific map layer or functions dedicated for shoreline oil spill vulnerability mapping and protection priorities but there are for example layers describing ecological features like seabed sediments, zostera meadows, important bird areas, wintering grounds of sea birds etc. which may provide very valuable input for and identification of resources at risk and protection priorities.

The most important feature of the HELCOM Map and Data Services in this context is, however, that it is a common platform for all the concerned partner countries and that it therefore may provide an interesting option of platform

for the harmonised central Baltic environmental atlas outlined within the objectives of the EnSaCo project.

The output map layer results from the BRISK project are available as layers in HELCOM Map and Data Services.

http://www.helcom.fi/GIS/Mapservice/en_GB

8.4 HELCOM Baltic Sea Action Plan

The HELCOM Baltic Sea Action Plan is an ambitious programme to restore the good ecological status of the Baltic marine environment by 2021. Oil spill prevention, response and shoreline clean-up is one are addressed by this multi-sector environmental plan. Of particular interest with regard to the EnSaCo project is the Recommendation 28E/12 on development of an electronic *"Logistical Resource Allocation Mapping" about mobilization of technical and human oil spill resources and an electronic "Sensitivity Mapping"* about ecological prioritizing in oil spill response to be developed and integrated as part of shoreline authorities´ management systems in all coastal areas of the Central Baltic Region of Estonia, Finland and Sweden plus Russia and Latvia.

[http://www.helcom.fi/BSAP]

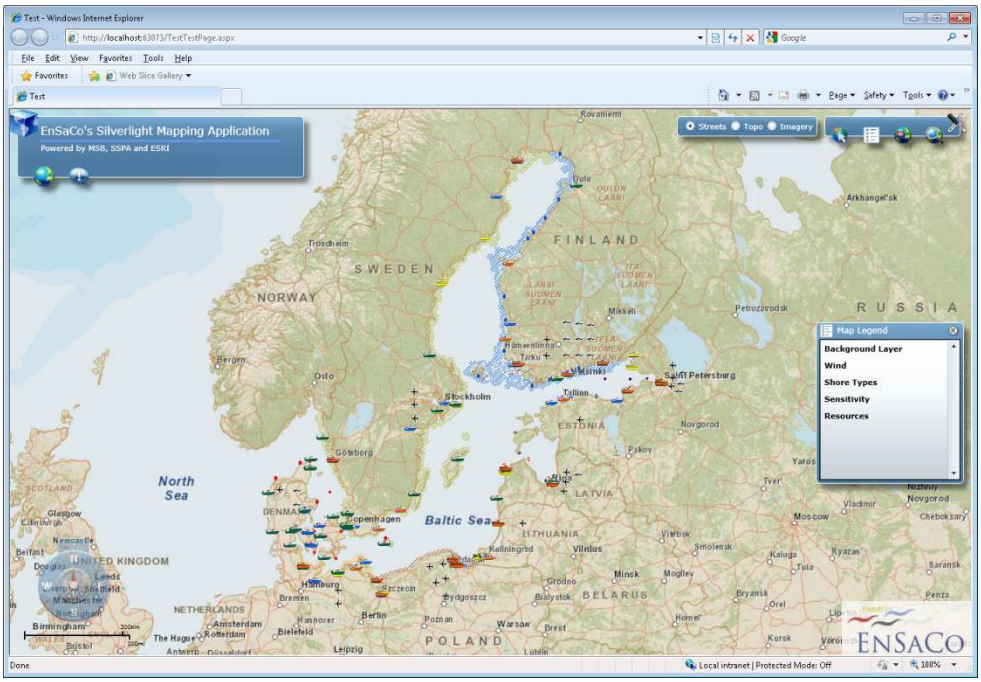
8.5 The EU Inspire directive

The implementation of the Inspire Directive requires many GIS host organisations to upgrade the metadata of their systems and databases according to the directive. This process will enhance the knowledge on how to interchange map layers internationally and make it a routine business for official GIS host authorities and agencies. With regard to the geo-databases and map layer files that are specifically used for environmental atlas applications, these are, however, not considered to be the ones primarily addressed by the directive. Map layers and metadata on i.e. legally protected areas, Ramsar, Natura 2000 etc. may be subject to harmonisation according to the directive. In the long run the implementation of the directive is expected to gain international cooperation and facilitate development of common trans-boundary GIS-systems.

Cf. Inspire web page: inspire.jrc.ec.europa.eu/

9 Development of a harmonized spill sensitivity and resource allocation system

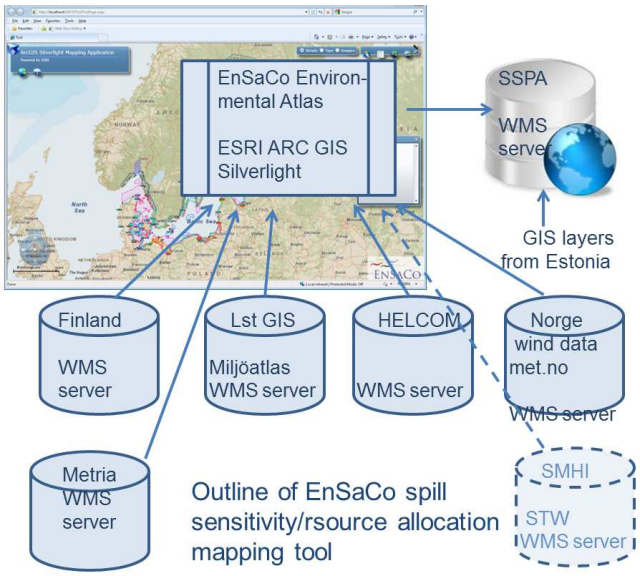
Following the inventory and analysis phases, available GIS data-sets on shoreline characteristics, spill sensitivity and resources for shore line response from the partner countries were collected and compiled. A test platform with a web application based on Silverlight software was set up for demonstration and display of the various available map sheets from the respective countries.



A screenshot from the EnSaCo Environmental Atlas test platform

The intention was to make the final EnSaCo Environmental Atlas platform accessible by everyone through the Internet. During the project, this web based platform was hosted by SSPA and communicated via WMS (Web Map Services) to collect national data on shoreline type, shoreline oil spill sensitivity and response resources from various data owners.

The figure below schematically illustrates the communication via WMS with various organisations supplying GIS data to the EnSaCo environmental atlas.



Schematic outline of the WMS structure of the EnSaCo environmental atlas

The test version developed in a Silverlight application should accommodate the following standard GIS functionalities:

- Zooming
- Drawing
- Legend
- Measuring
- Pop-up
- Query of layers
- Progress bar
- Different background maps
- Measure tool
- Range rings for vessels and other resources
- Polygon tool, delivering shore type length, percentage

9.1 Harmonization of classification schemes

The second workshop, arranged in Helsinki, focussed on the issue of harmonization of classification and categorisation of sensitivity, and it was clear that the coverage, level of details and formats differs significantly between the countries. A translation table for harmonisation of various shoreline type classes was proposed and relevant map layers from other HELCOM member

states were presented and compared in the GIS environment including some on-line demonstration of various web-applications.

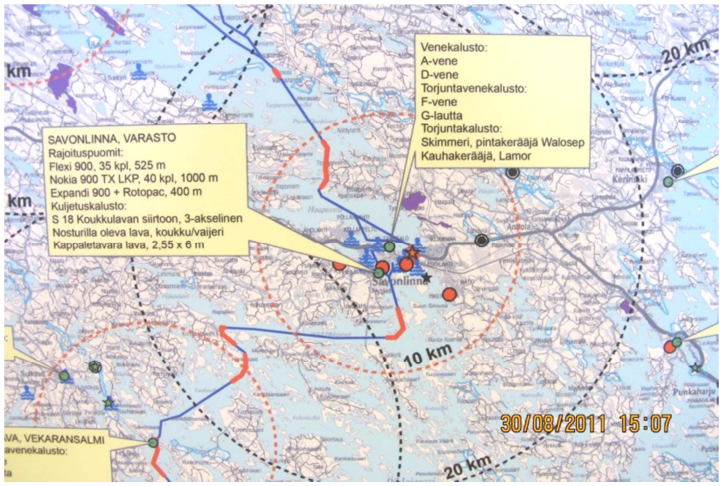
Some specific issues regarding the harmonisation and scaling raised during the process are listed below:

- Some “master” scheme or reference required for harmonisation, type ESI
- Present 0-9 (EU) and 1-10 (US) and Yes/No-sensitivity scales may be normalised and simplified by a colour ramp of yellow to red
- Different local, regional or national valuators use more or less red paint, no problem within the region, but may give biased Interreg prioritization
- Harmonisation by “translation” algorithms ok for yellow-red scaling, but tricky if multi aspect scaling should be reflected
- “Political” sensitivity assessment/valuation often overrides ecological ones
- Is a cumulative multi aspect scaling better than a max based approach?
- How to classify un-valuated shorelines? “white” or precautionary approach
- A multilingual glossary would be useful for a harmonised system
- Occupational risks and security should be a high priority scaling aspect

For Estonia, multi aspect sensitivity data and ESI based shoreline classification data are available at high resolution (down to 50x50 or 200x200 m) and high national coverage. The Estonian sensitivity and resource mapping is tired for different levels of spill severity and the maps are part of the NOSCP (National Oil Spill Contingency Plan). Regarding the Estonian beach type and sensitivity information, The University of Tartu has useful scientific data but the accessibility need to be discussed further to find feasible solutions to use it for the EnSaCO project

In Sweden rough multi aspect sensitivity data are available in selected areas and ESI based shoreline classification data are available for mainland coasts. For Finland detailed multi aspect sensitivity data are available in selected areas but no ESI based shoreline classification is presented. Some of the Finnish sensitivity data are confidential and cannot be presented in an open web based application.

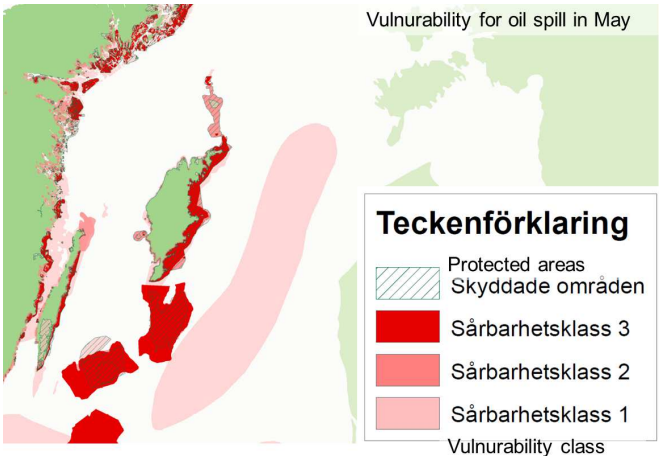
Among the various options and approaches applied for national sensitivity classification, the examples illustrated by the figures below provide a view of the various structures of classification in existing national systems.



Example of the Ensaco Saima basic sensitivity/resource map

The EnSaCo Saima map (not a GIS application – only paper maps) above is a two classes sensitivity classification (red or blue) with the resources are indicated by spots with attributed text lists and the logistic aspects simply illustrated by distance radii from the respective resource locations.

The approach applied within the Baltic Master II project for the development and implementation of the Swedish Digital Miljöatlas also introduced a simplified sensitivity classification where only the most prioritised area for protection where marked in the maps and where detailed protection reasons and seasonal variations are described in attributed text files. The Swedish Environment Protection Agency (EPA) also prepared a spill sensitivity classification based on a three grade classification scaling with seasonal variations specified by a set of different maps for each month of the year. The EPA map GIS files are today available via the Swedish Agency for Marine and Water Management, (SwAM).



Examples of three grade vulnerability classification presented by Swedish EPA.

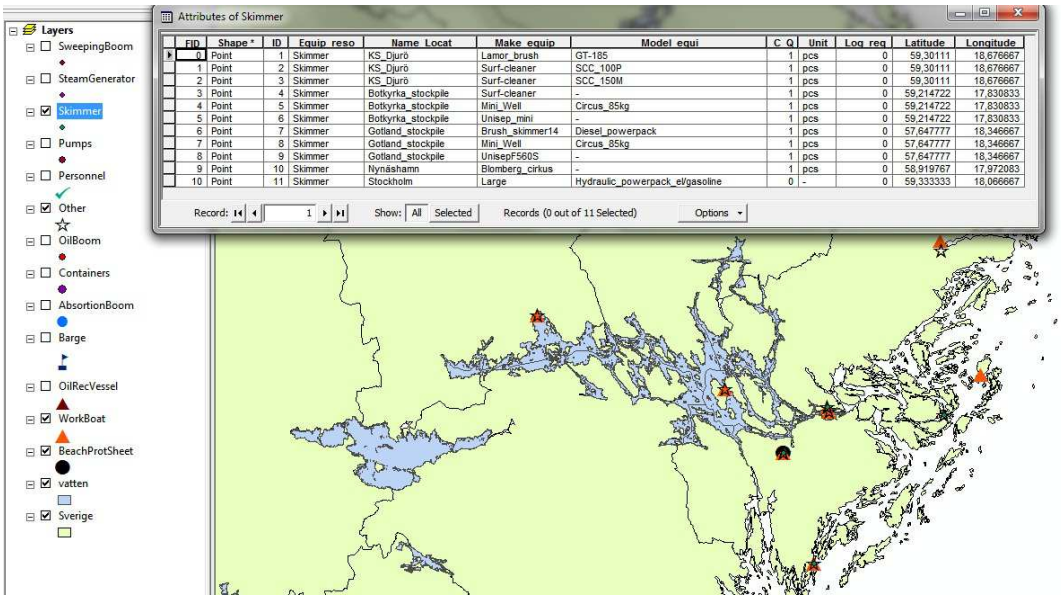
The classification scale applied within the BRISK project is based on a five grade classification structure with wide coverage but relatively rough resolution.

9.2 Allocation and coordination of resources for sensitive areas

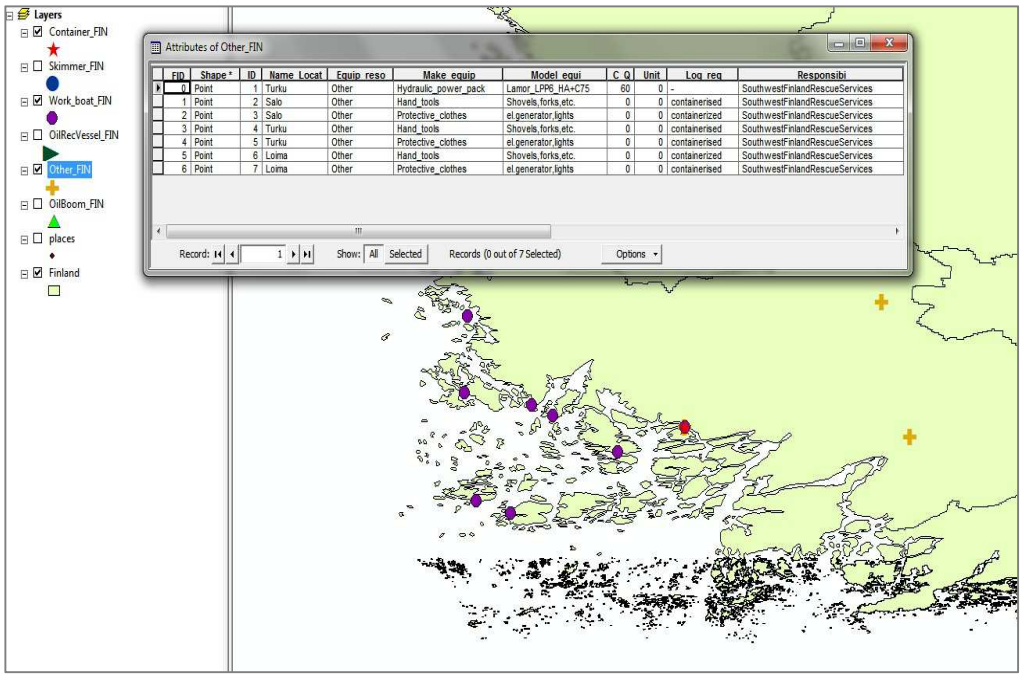
The series of workshops and development of a harmonized spatial database also specifically addressed the possibilities of cross-border exchange of special shoreline spill response resources. It was concluded that GIS data on resources in Sweden has been tabulated by an MSB inventory within the Swedish EnSaCo regions. For Finland, data from the south western part of the country were provided in table format from the Rescue Services and for Estonia, information on the resources was provided from The Maritime Academy in Excel format as well as GIS format.

The collected info on shoreline spill response resources include the following main data:

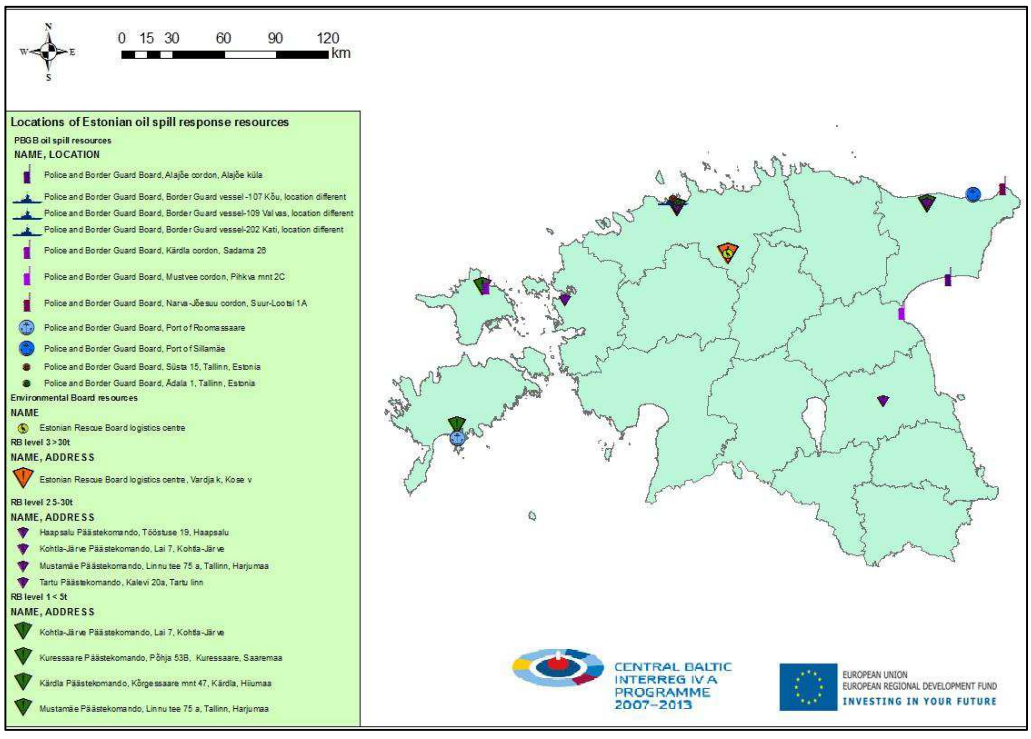
- Lat; Long, Name/location, Address, Contact
- Types: Oil boom, Absorption boom, Skimmer,
  Pump, Work boat, Oil recovery vessel,
  Container, Personnel, Other (hand tools…)
- Quantity of equipment, no of units, oil recovery capacity, storage volume…
- All organisations included: Official, private, volunteer organisations
- Availability, Metadata on last updated info



Example of GIS view of available Swedish resources in the Stockholm area including attributed info on skimmers based on the MSB inventory from 2011.



Example of GIS view of resources available in the south west area of Finland including attributed info on category "Other" based on list provided by the Finnish Rescue Services.



Example of GIS view of resources available Estonia. Data on available resources are compiled from Harbours, Environmental Board Resources, Estonian Rescue Board ERB resources and Police and boarder (PBGB).

10 Findings and recommendations

10.1 The need and interest for one common harmonised system

A number of key systems filling the criteria of environmental atlas systems specifically designed for oil spill contingency planning and shoreline response have been identified within the EnSaCo partner countries and are described in the report. The systems of primary relevance are the Swedish Digital Miljöatlas, the Finnish BORIS II, OILRISK and MIMIC and in Estonia the OILRISK and the SmartResponse Web.

Except for the SmartResponse Web where the Estonian Maritime Academy is active in the development and trial application, none of the owner or developing organisations for these systems are partners of the EnSaCo project. All parties involved in the development of these systems have, however, been very interested in the EnSaCo project as it may introduce new ideas, solutions and possible refinement of services. They are also eager to exchange experience on functionality, technical issues as well as managerial issues but none of them have made any commitments on adapting their systems or reconsider their development plans in order to build a common system that would be applicable in all the partners countries or other Baltic countries.

The new management group of the Swedish Digital Miljöatlas consider its mandate as primarily directed towards the users within the Swedish coastal County Administrations and to provide a relevant and reliable platform for national use. A common international system capable of handling trans-boundary shoreline spill operations is considered important but the original task to implement and disseminate the use of the Digital Miljöatlas is first priority for the group.

The other shoreline spill environmental atlas projects find it interesting to consider adjustments of their system and possibilities to include tools in order to facilitate comparison and exchange of sensitivity map layers and geo-databases on allocation of available response resources etc.

It is well known that different principles and classification scales for prioritization of protection needs may cause difficulties when cross-border scenarios are analysed and different sensitivity mapping systems are compared. It was therefore considered interesting to evaluate the possibilities to formulate “translation codes” to facilitate comparison of various systems and validate the consistency of different sensitivity maps and prioritized areas for protection. During the workshop process it was, however, later found that a more feasible way than the “translation codes”, could be to focus only on the areas and sensitivity classes representing the highest priority or the respective national systems.

Regarding the fifth phase with the objective of development of a harmonized spatial database and manual, the results and findings from the study already at an early stage indicated that it would be difficult to plant commitment and enough engagement within the owner and developer's organisations of the existing primary systems to ensure that a complete internationally harmonized system could be realized within the environmental atlas component of the EnSaCo project. The reviewed systems are primarily designed to serve the respective national needs and the number of events where cross-border spill scenarios would call for a common international harmonised system to facilitate cross-border prioritisation considerations, is generally expected to be low.

In this context it may also be noted that the international meeting on environmental atlases arranged by Baltic Master II on June 9, 2010 concluded that *"The consensus was that there was no real need (for harmonization) between countries and projects, but would perhaps needed within countries."* In the HELCOM Response meeting in April 2012, the opinion that the national competent authorities in the event of cross-border shoreline contamination primarily will focus on the respective national needs and instructions for protection priorities, was also expressed by some member states.

10.2 Recommendations on future activities and focus

The BRISK project is a comprehensive oil spill sensitivity modelling and it has been indicated that the international application of common classification schemes sometimes may, due to various level of detailed resource surveys and different resolution in the data layers, lead to "unfair" international comparisons on priority protection needs. BRISK is basically addressing open sea resources, risks and response resources and its level of detailed information on the shoreline resources at risk is limited. It may therefore be important to provide complementary comprehensive international information on shoreline recourses and its sensitivity. The EnSaCo environmental atlas project may provide this complementary information and also explain and clarify the understanding of the reasons for different sensitivity prioritization in different countries and promote international exchange of different map layers of special interest. Such a focus for the future EnSaCo environmental atlas project is believed to gain the objective to ensure efficient an unbiased trans-boundary response prioritization.

During the discussions and meetings it has been demonstrated that the functional structures differs a lot between the Digital Miljöatlas, the BORIS II and the OILRISK/MIMIC concepts. It has, however, also been stressed that the fact that the systems will be using the same type of GIS server client application system, the possibilities for exchange, not only of shape files and geo-databases but maybe also for various tools and services, will be significantly improved. In the project, it has been shown and demonstrated that it is

possible to exchange basic information on shoreline type, sensitivity and available response resources and it is recommended that further possibilities for this type of exchange and possible integration of common service application are further examined in the future.

It is further noted that the HELCOM map and data services, though built on a somewhat different GIS web application, possibly may form a natural platform for compiling international data on shoreline sensitivity mapping and to successively by adding specific services and tools also may include necessary basic functionality to serve as a common harmonized environmental atlas. The BRISK is closely related to HELCOM, the action plan and to the map and data services. In order to make its output sustainable when the project is over and all consultant reports delivered, introduction of the EnSaCo maps presented and integration of some of the functionality in the HELCOM map and data services, may be a feasible solution that would gain a combined sensitivity mapping addressing both shoreline response and at sea response.

It is recommended to further investigate if the HELCOM map and data services may provide a feasible platform for a successive development of a harmonised shoreline oil spill environmental atlas. The HELCOM map and data services are to provide data for all the member states and the work conducted and findings presented within this EnSaCo environmental atlas component may serve as a pilot template for continued efforts and project initiatives to enable cross-border exchange and establishment of a common platform for spill sensitivity and resource allocation mapping for the entire HELCOM area.

In order to make the sensitivity and resource allocation data useful for cross-border exchange of information also after the completion of the EnSaCo project, it is considered important to ensure that the selected data sets and maps are regularly updated and available from well-defined sources and WMS servers including detailed metadata on revision/updating, responsible person and owner organisation.

For operational use and training purposes it is also considered important that the tools used for presentation of cross-border sensitivity and resource mapping data also include functionalities for overlay maps of oil spill trajectory modelling, either as import of sequential time stamped static maps or by integration of dynamic on-line prediction features.

An alternative development option may be to use the HELCOM wide established spill trajectory prediction tool SeaTrack Web, STW as a common platform for introduction and presentation of GIS data on spill sensitivity and resources from the various member states. The STW platform is about to be modernised and integration of sensitivity and resource map layers would provide attractive additional functionality and facilitate the prioritization considerations in real spill operations. Relevant map layers may be compiled from different competent authorities and data owners by WMS.

11 References, contact persons and web references

11.1 Contact persons and contact details

11.1.1 Finland

Heikki Niemi	SouthWest Finland Emergency Services
Tanja Hallenberg	SouthWest Finland Emergency Services
Leif Lindström	SouthWest Finland Emergency Services
Eva Ehrnsten	Kotka Maritime Research Centre OILRISK/NANNUT
Meri Hietala,	SYKE, BORIS 2 project
Samuli Neuvonen,	SYKE, BORIS 2 project
Riikka Venesjärvi	University of Helsinki, OILRISK project
Miina Karjalainen,	Kotka Maritime Research Centre (KMRC), OILRISK project

11.1.2 Estonia

Madli Kopti	Estonian Maritime Academy, national project coordinator
Roomet Leiger	Estonian Maritime Academy

Robert Aps, Marine Institute, University of Tartu, Estonia OIL RISK project

Agni Kaldma	Estonian Fund for Nature

11.1.3 Latvia:

Evija Šmite, Director. Marine and Inland Waters Administration (MIWA).
Phone 67408169, 28310013. evija.smite@jiup.vvd.gov.lv.

Laura Mazmača, Senior inspector, Marine control division MIWA.
Phone 67408164. laura.mazmaca@jiup.vvd.gov.lv

11.1.4 Russia

Igor Berezin
Head of the Department of Environmental Activities
Committee of Nature Management, Environmental Protection and Ecological Safety of the Government of St. Petersburg

Nicolay Federov, PILARN

11.1.5 Poland:

Antoni Staskiewicz, Maritime Institute i Gdansk. BM II Env Atlas coordinator

11.2 Web sites

www.marsuno.eu/]

www.ymparisto.fi/syke/boris2

www.kyamk.fi

www.merikotka.fi/uk/OILRISK.php

http://www.merikotka.fi/mimic/i

www.infoeco.ru/gisgeo

www.lva.gov.lv/spills/Engl

www.balticmaster.org

http://smartresponse-web.eu/

www.brisk.helcom.fi

www.helcom.fi/GIS/Mapservice/en_GB

www.helcom.fi/BSAP

inspire.jrc.ec.europa.eu

APPENDICES

Report No 20105728-3

ENSACO - Environmental Atlas

1) Inventory of existing environmental sensitivity mapping systems and tools

2) Minutes from meetings, 14 Dec 2010. Kick-off meeting, planning, contract issues, Stockholm.

3) Minutes from meetings, 12 Jan 2011. Interview J Fejes. IVL Swedish Environmental research institute. Issues on background, functionality and development of Miljöatlas

3) Minutes from meetings, 27 Jan 2011. Presentation of the Environmental Atlas component for Swedish EnSaCo partners

4) Minutes from meetings 10 Feb 2011. Discussion with the "miljöatlas"-management group – the group's first meeting

5) Minutes from meetings 16 Feb 2011. Information exchange with representatives from BORIS II and OILRISK, Helsinki

6) Minutes from meetings 8 Mar 2011. Meeting with Prof R Aps Information on Estonian projects and discussions on phase 2 seminar planning with WMU, Malmö

7) Minutes from meetings 21 Mar 2011. Meeting, discussion with the "miljöatlas"-management group – the group's 2nd meeting, Halmstad

8) Minutes from meetings 28 Mar 2011. Meeting, Progress report presented at the EnSaCo steering committee meeting, Stockholm

9) 3-4 May 2011. International Environmental Atlas seminar in cooperation with Baltic Master II project, Stockholm

10) 30-31 Aug 2011. Workshop Environmental Atlas workshop No 2 on Harmonization on sensitivity classification. Haaga-Helia, Helsinki

11) 29-30 Nov 2011. Workshop Environmental Atlas workshop No 3 on Coordination of resources & sensitive areas. Maritime Academy Tallinn

12) 21 Mar 2012. Workshop Environmental Atlas workshop No 4 on Development of an harmonized spatial database and manual WTC Stockholm

13) 22 Mar 2012. Presentation at the EnSaCo Cross-border oil spill response workshop. WTC Stockholm

14) 19 Apr 2012. Presentation HELCOM Response meeting. Sopot Poland

15) 11 May 2012. Presentation EnSaCo Final Conference. Sveaborg, Helsinki

HEAD OFFICE: P.O. Box 24001 · SE-400 22 Göteborg · Sweden · Tel: +46 (0)31-772 90 00 · Fax: +46 (0)31-772 91 24
VISITING ADDRESS: Chalmers Tvärgata 10 · SE-412 58 Göteborg · Sweden

BRANCH OFFICE: Fiskargatan 8 · SE-116 20 Stockholm · Sweden · Tel: +46 (0)31-772 90 00 · Fax: +46 (0)8-31 15 43
INTERNET: www.sspa.se · E-MAIL: postmaster@sspa.se · VAT NO: SE556224191801