



Master Plan Studies for Development of the Motorways of the Baltic Sea

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Explanatory Note
FINLAND

Safe Routes On Motorways of the Baltic Sea Gulf of Finland Hydrographic Survey

WP3
2005-SE-91406-S

Study Report

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Merenkululaitos



Veeteede Amet



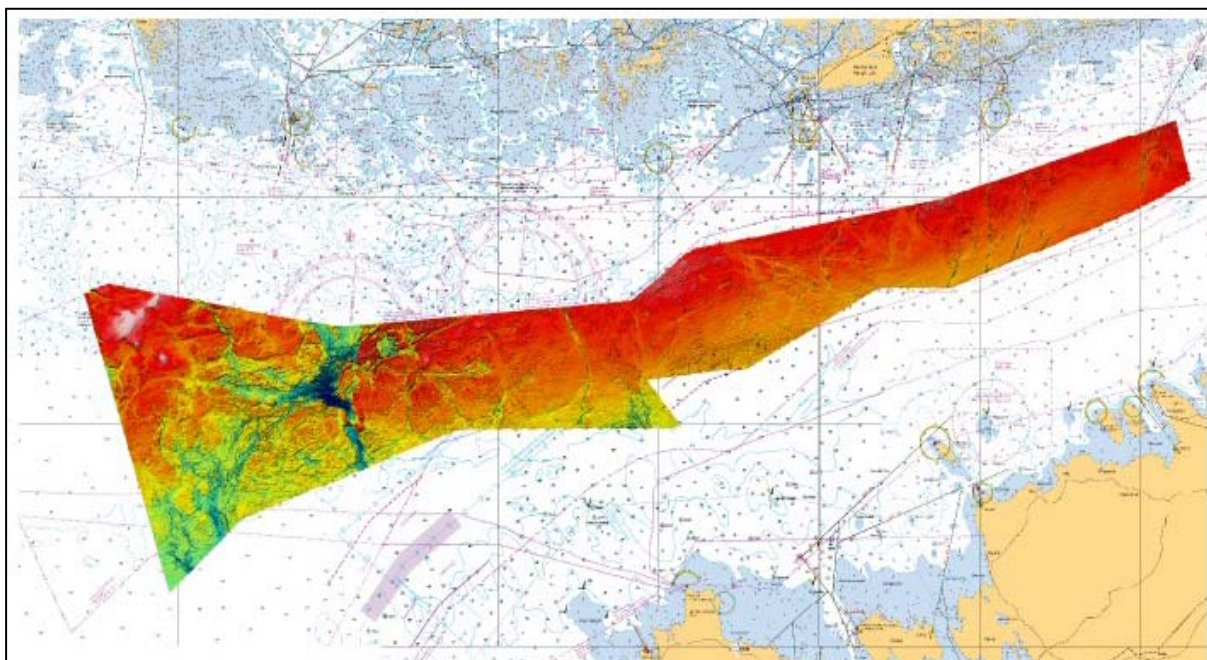
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Motorway of the Baltic Sea: safe routes in the Gulf of Finland

1. Introduction and summary

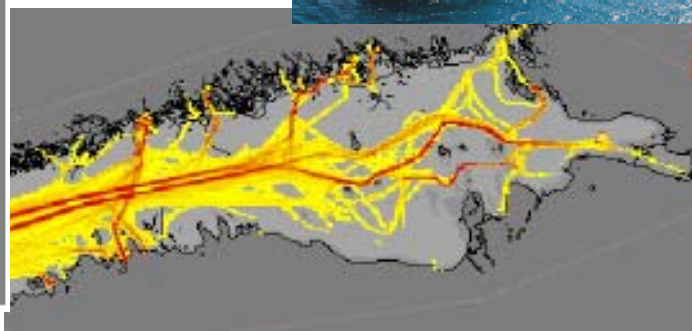
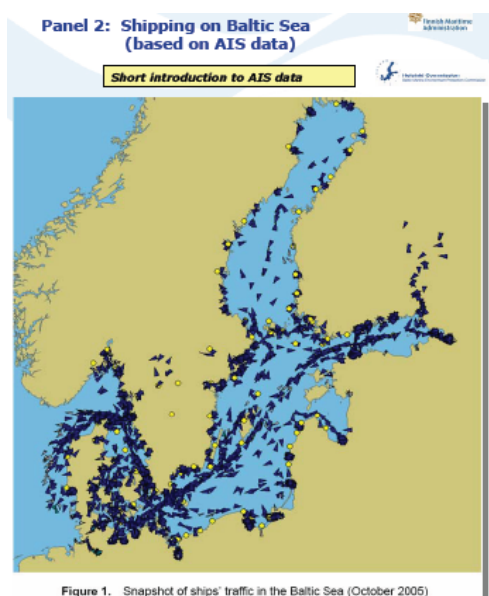
Introduction

Sea transport and especially oil transport is increasing in the Gulf of Finland.

Existing hydrographic survey data is not sufficient. Re-surveys of the main routes on the Motorway of the Baltic Sea have already been deemed necessary¹ and a scheme already developed and approved by the Baltic Sea Hydrographic Commission². New shallows or shallower than previously assumed have been found during re-surveys done.

A study project lasting from 2005 to 2007 by Estonia, Finland and Sweden will complete the re-surveys of the most important routes in the Gulf of Finland one year earlier than otherwise possible. Requisitions for further outsourcing of re-surveys, invitations to tender from the open market and methods for enhanced processing of hydrographic survey data were developed in the study.

The study project was part of the EU TEN-T (Transport and Energy Commission) Motorways of the Baltic Sea Master Plan led by the Swedish Maritime Administration. Work Package 3 consisted of Safe Routes in the Gulf of Finland, led by the Finnish Maritime Administration (Merenkulkulaitos), as Estonian Maritime Administration (Veeteede Amet) and Swedish Maritime Administration (Sjöfartsverket) participated. The estimated combined total costs were 2,9 M€.



¹ HELCOM Copenhagen Declaration by Extraordinary Ministerial meeting in September 2001.

² The Baltic Sea Hydrographic Commission is a regional Commission of the International Hydrographic Organisation (IHO). All hydrographic offices of the Baltic Sea countries are contributing to the work of the IHO.

Summary

The study lasted from November 2004 to September 2007, including all planning and reporting tasks. The TEN-T Motorways of the Baltic Sea Master Plan lasted from June 2005 to June 2007.

Some 24 experts from Hydrographic Offices of Estonia, Finland and Sweden participated in the project or a part of it. It is estimated, that 48 man months was used for the project. The total cost of the project was € 1,65 million.

An invitation to tender on a restricted procedure S-208 – 205204 was published on 27 Oct 2005 to cover the field surveys and respective data processing. An invitation to tender document was written, also to be utilized later, with national specification to be taken into account.

The tendering process revealed that there are operators able and willing to perform open sea hydrographic surveys in the Baltic Sea. The received tender level showed, that these operators price their work varying. It is obvious, that the vessel available for the field work has the major role in how economic the work is priced.

A hydrographic survey contract was drawn and signed with OSAE GmbH from Bremen, Germany (now FUGRO OSAE GmbH), consisting of € 1.350.000 contract lump sum and 3,897 km² field surveys to be performed to IHO S-44 (4th ed) Order 1 and respective data to be processed. Contract document was written, which may be used later as a sample.

Field surveys were performed from 16 June to 28 September 2006. Data processing was completed and delivered at the end of November 2006.

All three participating Hydrographic Offices validated some common data cells and similar observations were made on the automated processing techniques of the delivered data. The quality requirements are common and on a high level in each HO.

In general the project participants were satisfied with the received data and field work completed.

A group of Technical experts in the Baltic Sea countries' Hydrographic Offices had a meeting at Estonian Maritime Administration discussing the vertical reference level of the hydrographic surveys. Recommendations were concluded towards a common geodetic model based vertical reference level for bathymetry tied to land vertical level. This work will continue within the Baltic Sea Hydrographic Commission.

Swedish Maritime Administration concentrated on a more effective handling of the hydrographic data from hydrographic surveying up to and including the final stage of nautical charts, irrespective they are printed or digital ones. A more effective hydrographic survey data collection format is proposed, which will meet higher demands on the quality of the acquired data. An other item that has to be studied further is how to reduce the high amount of data prior storing it into a digital depth data base managing hydrographic data. This work will also continue within NHC and BSHC, as initial steps are taken in this report.

Difficulties encountered

Funding this type of study should be more carefully confirmed beforehand. On Finnish and Estonian experience a written confirmation on dedicated funding for this magnitude EU studies is required from the respective ministry.

Due to the lack of official decision on grant from the TEN commission and further from the respective ministry, the start of the project was slow and careful, to avoid excessive costs. Therefore also the area to be surveyed with given low lump sum was smaller than could have been. However the area of 3.798 km² proved to be challenging for the contractor to accomplish in due time.

On Swedish experience the markets are lacking specialized data processing consultant services and therefore some of the objectives have not been fulfilled. It is understood, since the safety of navigation and respective hydrographic surveys are a legal responsibility of a national Hydrographic Office (government administration).

It is also experienced, that a common vertical reference level is needed badly to be able to handle the ENC cells seamlessly within the Baltic Sea.

It is challenging to combine data produced by two different MBES systems on the same survey, even as the data falls well within the specified S-44 (rev 4) Order 1 standard.

Attention has to be put into the sound velocity profiles used by the MBES system, due to the Baltic Sea environment. At this survey this difficulty was tackled with an automated SVP profiler dip and undulating in the aft of the vessel frequently.

Automated processing techniques require a lot of interactive guidance on the varying bottom topography in the Gulf of Finland.

2. Safe Routes in the Gulf of Finland

Planning

The planning of the project started already in fall 2004, within meetings of Baltic Sea Hydrographic Commission task group, handling HELCOM surveys within the Baltic Sea, among other things.

It was clear, that not all Baltic Sea countries could accomplish the agreed re-surveys of the main shipping routes in set time. E.g. Finland had still a vast area of the traffic separation zone to be surveyed up to today's standards in the Gulf of Finland. At the same time EU Transport and Energy Commission (Baltic Sea Task Force) was promoting TEN-T funding for suitable studies and had the Motorways of the Sea in Regions concept in high priority.

The safety of navigation is an important and legal task for national Hydrographic Offices. Within the HELCOM scheme re-surveys to IHO S-44 Order 1 (4th ed) in shipping routes, traffic separation zones and transit areas are required and they must not be endangered by inadequate source information.

Reliable surveyed routes and extended areas allow safe ice breaking operations also in heavy ice conditions. Ice breakers in Finland will also operate widely outside normal shipping routes.

Therefore a group of experts started to plan suitable timetable and area to be accomplished within the proposed study. The participation was suggested to several Baltic Sea countries, but finally Estonia, Finland and Sweden decided to participate. In a government organisation funding planning and proposal is needed well in advance to have it allocated within the state budget.

Project management

The project, Work Package 3, was part of the TEN-T Motorways of the Baltic Sea Master Plan, lead by Swedish Maritime Administration [SMA]. Hydrographic Offices from Estonia, Finland and Sweden participated to the Safe Routes WP3 work, lead by Finnish Maritime Administration Mr. Seppo Mäkinen as a project leader.

Responsible personnel from each participating HO were:

Dr. Vaido Kraav at Estonian Maritime Administration
Mr. Seppo Mäkinen at Finnish Maritime Administration
Mr. Göran Nordström at Swedish Maritime Administration

Finnish Maritime Administration was handling the WP3 coordination and financing.

Preparation

Prior to tendering for the field work studies were made on the existing specifications on charting surveys (U.S. Army Corps of Engineers, LINZ, IHO S-44 ed 4) and on current market situation. A valuable consultation was obtained from UKHO / Admiralty Consultancy Services as well as from Norwegian Hydrographic Office.

Also a group of technical experts from Baltic Sea countries had a workshop on 24.-25.1.2006 at EMA in Tallinn to discuss and study the vertical reference levels on charts within the Baltic Sea.



Based on the experiences from the organisations mentioned above and the specific conditions in the Baltic Sea region, a survey specification was prepared as a basis for the outsource of hydrographic survey.

Results of preparation:

- Recommendations on survey specifications on the Baltic Sea;
- Recommendations on vertical chart reference level. The unification work will continue within the BSHC.

Tender and field operation

Based on the specifications prepared an invitation to tender on the specified hydrographic survey area on the Gulf of Finland was issued (Official Journal of the European Union 28.10.2005: 2005 / S208 – 205204).

A restricted procedure within EU / ETA / GPA has been followed; in which 15 EU / ETA based companies asked for the documentation and 8 filed interests in due date December 2, 2005. The final invitation to tender documents were sent to 6 EU / ETA companies on December 21, 2005 as submission day was set to be January 31, 2006. A contract clarification day was held on January 19, 2006.

Five quotations were received in due time and a decision on the contract party was made on March 1, 2006.

A contract with OSAE GmbH (later Fugro-OSAE GmbH, Bremen, Germany) was signed on April 3, 2006, on the lump sum of M€ 1,35, covering 3.798 km² processed survey data

The Hydrographic survey field work started in June 2006 and field work was completed in September. Last parts of the processed data were delivered on 29.11.2006 Validation period continued to February and the data was accepted on February 2007. All parties were satisfied with the received data set. Feedback was given to the contractor on the data quality issues encountered.

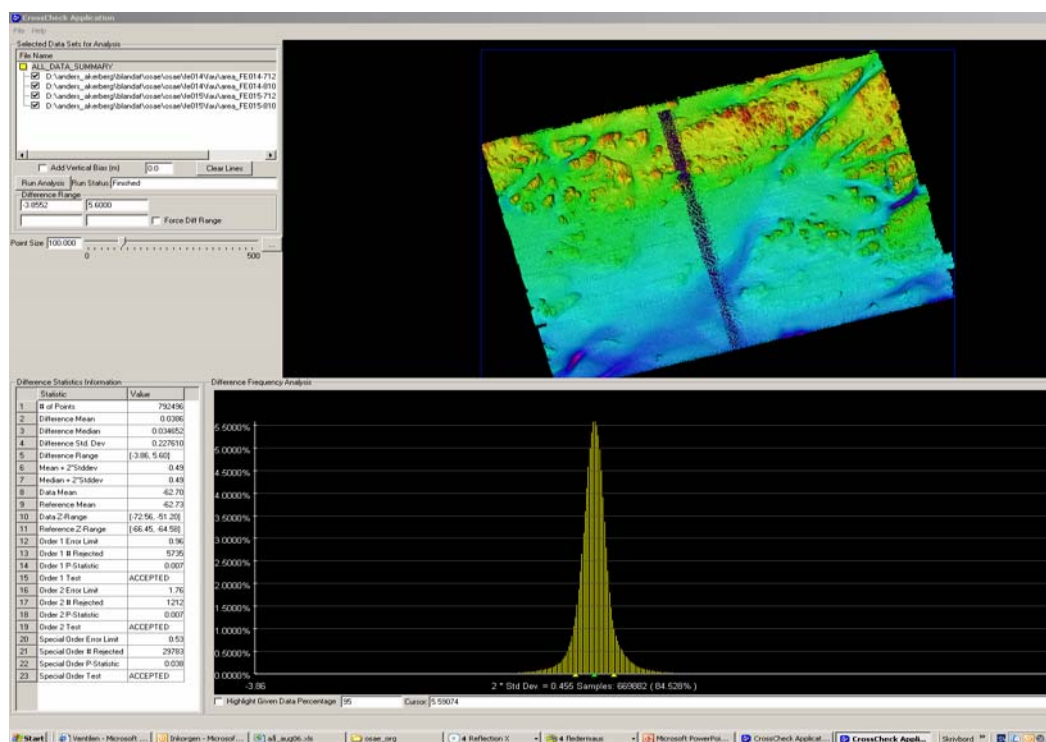


Results:

- A valid contract and successful delivery;
- difficulties on overseeing the field work as the vessel is performing surveys out 24/7 bases;

Data processing

Studies on automated data processing techniques and data transfers between Hydrographic Offices were carried out. Work flows, databases, software tools, QMS/ISO9000 certification, S-44 implementation, ZOC implementation have been evaluated and tested. Procedures in and experiences from the Hydrographic Offices in Sweden, Finland and Estonia have been exchanged.



Sample data cells were processed by all participants and similar observations were made. National Hydrographic Offices participating to the WP3 work have all similar requirements on data quality issues.

A common data format for hydrographic surveys within the Baltic Sea was introduced and further development will continue at Swedish Maritime Administration and this will be discussed further at the Baltic Sea Hydrographic Commission (BSHC) meetings. This proposed data format will tackle some of the data quality appraisal problems encountered within this WP3 work.

Results on data processing:

- Technical information on data processing of large hydrographic data sets;
- difficulties in combining data from different Multibeam survey systems on same survey
- A proposed new hydrographic survey format for Baltic Sea. This work will continue within BSHC and NHC;

3. Results and analysis

Results

As a result, FMA and EMA received a set of bathymetric data (IHO S-44 ed 4 order 1) to add to the respective national depth data base. This data set is significant addition to the HELCOM route coverage in the Gulf of Finland.

Besides bathymetric data (reduced depths) and respective data processing process valuable experience was gained in outsourcing procedure and existing private sector service providers.

As part of the tendering process useful documents were produced, such as the invitation to tender itself with hydrographic survey specifications.

Analysis

Analysis and reporting of the survey markets, survey work and data processing has been made as basis for commercial and political decision fostering further hydrographic survey outsourcing procedures.

Analysis on processing a same sample/test high volume bathymetric data was gained on all three participating hydrographic offices. The data quality control contained commonly following procedures:

- It was checked whether the survey was a full bottom search. This was controlled during the manual editing part when all data points are viewed.
- Cross-check analyses were performed to see if data held required quality.
- The bathymetric surfaces were analysed to see if any existence of systematic effects/errors.

Analyse results of test data

- In general, the survey result is of good quality. It has full bottom coverage and small systematic artefacts.
- It was found that the post-processing employed quite hard automatic filters for flagging data as rejected, also data in the bathymetric surface. For some cells, 40% of the data has been rejected. The disturbance in the 7125-data made it difficult to perform a careful post-processing. Some objects were rejected in the automatic process.
- The comparison of surfaces between OSAE and SMA test data shows a good consistency.

Also the suitability of this data to chart production procedure was studied. The data processing results, software and procedures were compared on a benchmarking meeting on 30-31 Jan 2007 in Helsinki.

Results:

- A set of procurement documentation to be utilized in further outsourcing procedures;
- Descriptions on data processing procedures at participating HOs;
- Analysis reports are attached to this report;

4. Recommendations

That technical experts in HOs and Regional hydrographic commissions discuss in meetings on experiences in field work, outsourcing and data processing and develop common procedures for QC of navigation safety data in the Baltic Sea.

That the BSHC member countries' technical experts shall study and harmonize the vertical reference level on the Baltic Sea.

That Sweden proposed data acquisition format shall be developed further among the BSHC member countries technical experts. It is equally necessary and important to test this data acquisition format in field use and to evaluate it commonly.

That a common water level information system (such as provided by Baltic Operational Oceanographic System, BOOS) shall be developed further to provide up to date information to mariners and navigators sailing in the Baltic Sea.

Additional information as well as copies of the project related documentation are available from Mr. Seppo Mäkinen at the Finnish Maritime Administration, tel: +358 20 448 4411, e-mail: seppo.makinen@fma.fi