

**Executive Summary**

This report gives the summary of the activities that has taken place within the Norwegian Hydrographic Service since the autumn 2009.

**1. Hydrographic Office**

The director gave notice late 2009 and he left his position in February 2010. The new director, Commander (Ret.) Evert Flier, took up his position in August 2010  
The IHO Yearbook has been updated in September 2010.

**Administrative information:**

The Norwegian Hydrographic Service (NHS) is a department within the Norwegian Mapping Authority. Some changes to the organizational structure were made in 2009 and 2010 as result of an Organization Development (OD) process. The new structure is shown in figure 1 below.

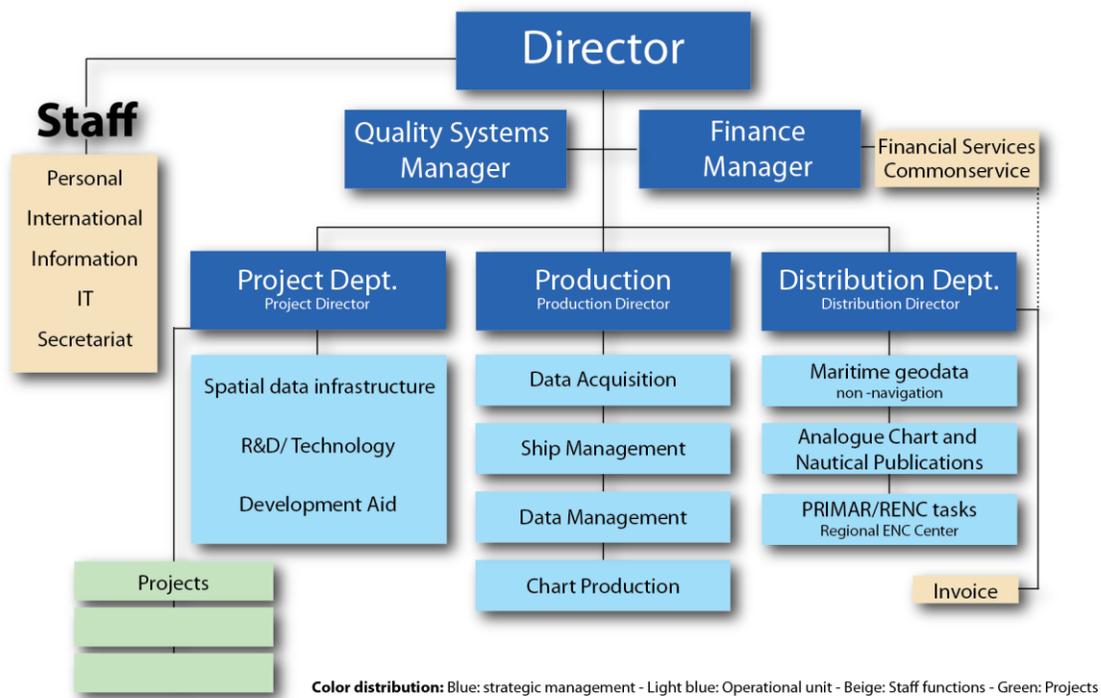


Figure 1. The organizational structure of the Norwegian Hydrographic Service.

The main change was the establishment of the Project Department. This department will have the responsibility for all major development projects, but work in close cooperation with the other departments. The Distribution Department is organized with the purpose of making a clear distinction between the PRIMAR tasks and the national responsibilities related to making other products available. A solution to outsource the management of crew and technical operation of

our survey vessel to the Institute of Marine Research is pending. A Ship Management section was established as a provisional arrangement from July 2010.

Total budget for 2010 is NOK 199.6 mill., included expected annual sales revenue of NOK 54 mill.

## 2. Hydrographic Surveys

### 2.1. Internal conducted surveying 2009/2010

R/V Hydrograf had its EM710 installation modified in the spring of 2009, and the echo sounder is now mounted in an elevator mechanism.

#### Svalbard

Two survey launches equipped with EM 3002D have been operating for 12 weeks in Svalbard in the period late June- 1 September 2010. R/V Hydrograf, with the EM 710, has also been used in the deeper parts. The efficiency has been very good as the operation partly been 24 hour per day. A total of 1248 km<sup>2</sup> has been surveyed along the coast of Svalbard. The green areas in Figure 2 are the coverage of multibeam surveys, blue areas are single beam.

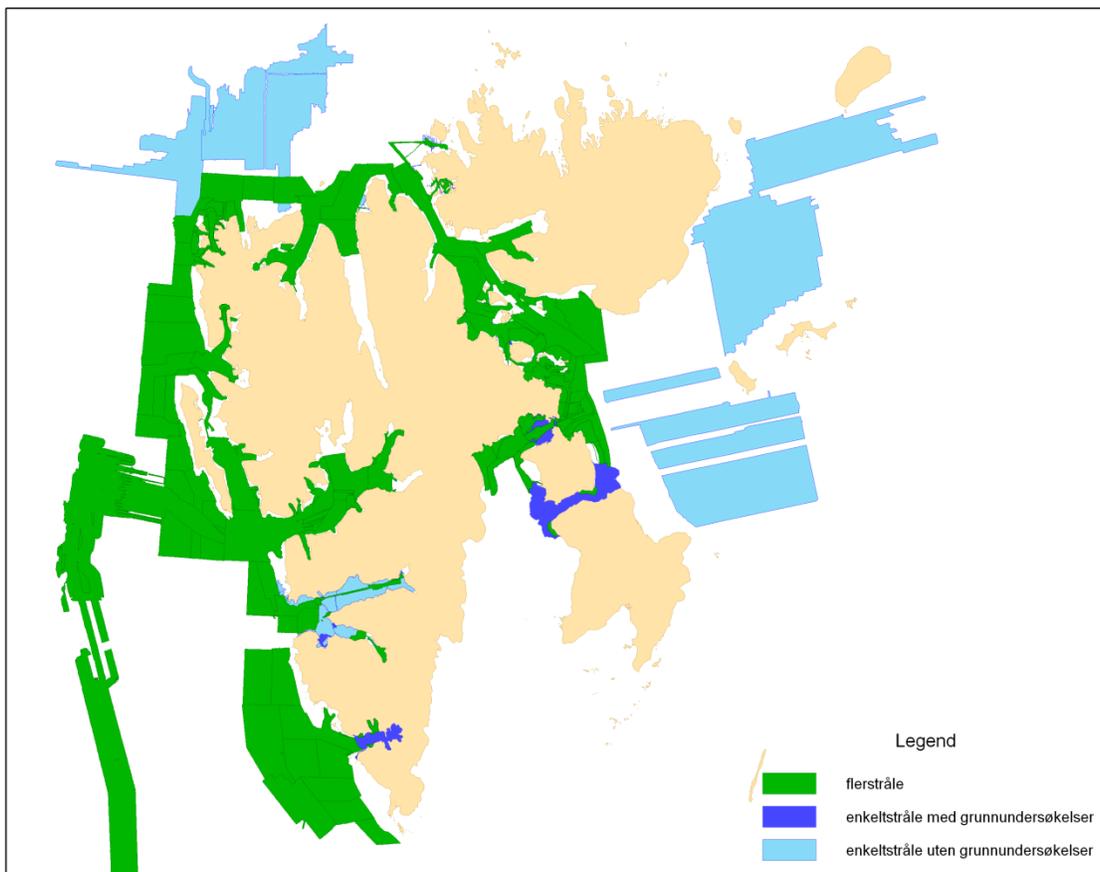


Figure 2: Status of modern surveying along Svalbard

### The MAREANO program

R/V Hydrograf has been engaged in a 4 weeks long surveying campaign for the Mareano program off northern Norway, using EM710 multibeam echo sounders. R/V Hydrograf collected a total of 2052 km<sup>2</sup>. One of the survey launches was doing an autonomous survey campaign along the Norwegian coast while R/V Hydrograf was surveying deep water for the Mareano program.

### Norwegian coast

Two survey launches, equipped with EM 3002D, have been operating on a 12-hour daily operation when not involved in the other activities mentioned above. R/V Hydrograf has contributed with the EM710. The main survey areas are in southern Norway and outside the Arctic area.

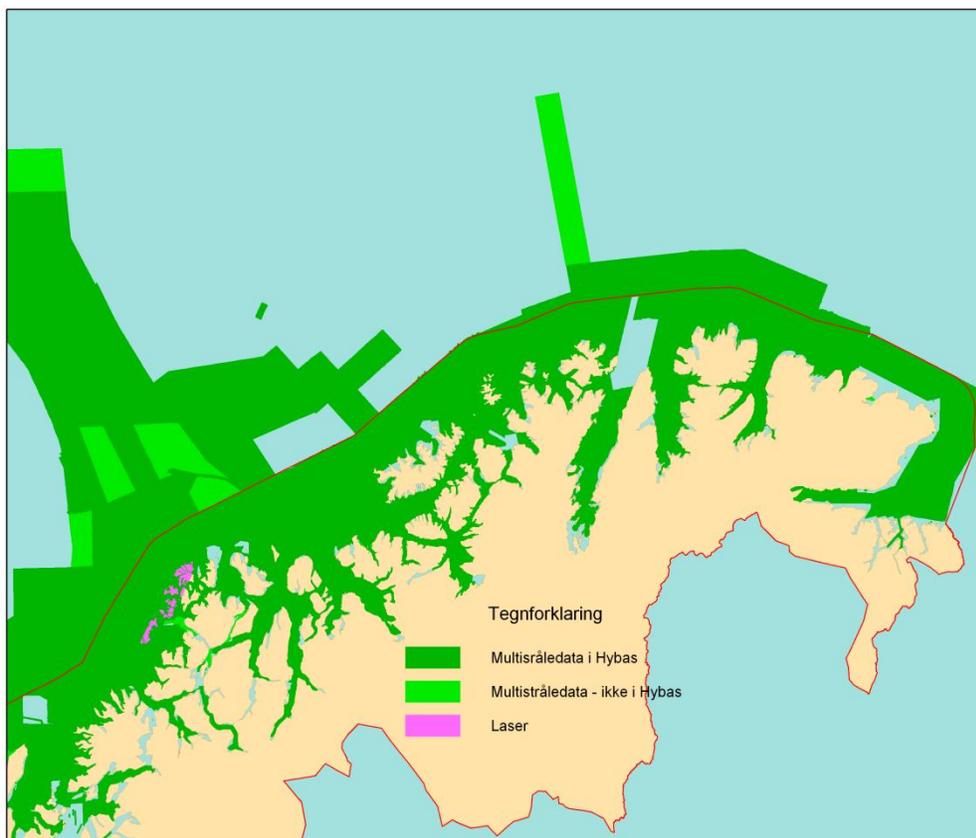


Figure 3: Status of modern surveying along the coast of northern Norway

### 2.2. External conducted sea surveying 2010

The external partners F-OSAE has surveyed a total of 5007 km<sup>2</sup> related to the Mareano program in 2010.

### 2.3 Survey capacity

As this report is the very first report related to the Arctic Regional Hydrographic Commission, a description of the survey fleet of the NHS is included. Compared to the long and complex coastline and enormous ocean area within our territory, the internal survey capacity is quite low. Our only survey vessel, R/V Hydrograf, was built in 1985 and has the following specifications: length (OA) 43.8 m, beam 10m, draft 3.8m. The number of cabins is 14 and the maximum speed is 11.5 knots. The vessel is equipped with an Em710 0.5x1 degree multibeam echosounder. The vessel has the capacity to carry our two survey launches (11.5m and 9.9m long). The launches were built in 2003 and 1998, respectively.



Figure 4: R/V Hydrograf



Figure 5: The survey launches "Sjøtroll" (1998) and "Sjøfalk" (2003)

## **2.4. Planned surveying along Svalbard**

Based on inputs from the main stakeholders a long term survey plan for the territorial waters of Svalbard has been developed.

The guidance for the plan is that the whole Svalbard area shall be covered by adequate ENC/navigational charts, except for a few areas that are seldom visited

The surveying takes place at the western side in the beginning of the season as the eastern part is normally covered with ice until July/August. The routes for the cruise traffic will be prioritized in the west and north. On the east side safe navigation is some main passages will govern the priority of surveying.

## **3. New charts and updates**

A new chart production system, based on the dKart Office technology from Jeppesen, has gradually been implemented over the last few years and is now fully operational.

### **3.2. Chart production**

Since autumn 2008, when the NHS completed the major task of covering the Norwegian coast with ENCs and modernized paper charts, the production is currently concentrating on replacing areas with old survey data (approx 11000 km<sup>2</sup>) with new data. The NHS also has the objective to convert the remaining analogue charts (approx 70) of the paper chart portfolio to digital charts. The NHS will outsource some of the production tasks.

A chart plan comprising both surveying and ENC/chart production for the Norwegian coast and the Svalbard area for the period 2011 – 2015 was published September 2010. The plan has been developed in concert with our main cooperating partner, the Coastal Administration. The new plan will be circulated among the main users of our products.

### 3.3. ENC production

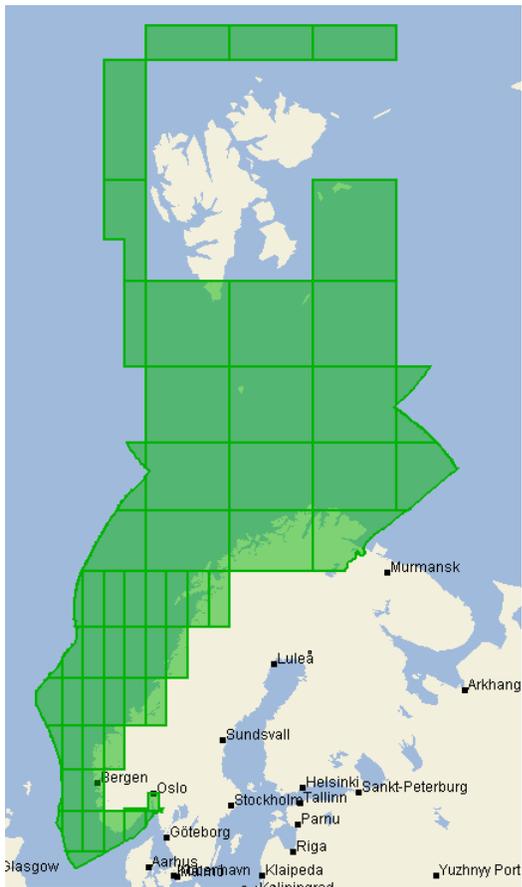


Figure 4

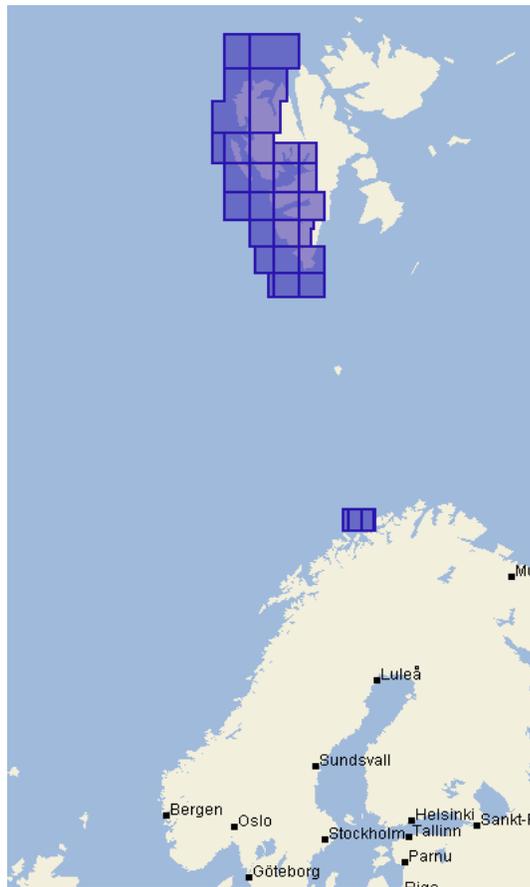


Figure 5

Figure 4: ENC coverage for the Norwegian coastal waters (ENCs in User Band 2-6).

Figure 5: ENC coverage in the Svalbard area (User Band 3-5).

In 2009 ENCs equal to 6 D-cells (30' x 30') in the Approach and Harbour User Band were produced. In addition 8 ENCs covering the west coast of Svalbard were published. The total number of ENCs is currently 996. One overview ENC covering the Norwegian Sea (INT 10, INT 100, INT 101, INT 113 and INT 140) was completed and published in January 2010, see Figure 6. The coverage of this ENC is planned to be extended during the autumn 2010.

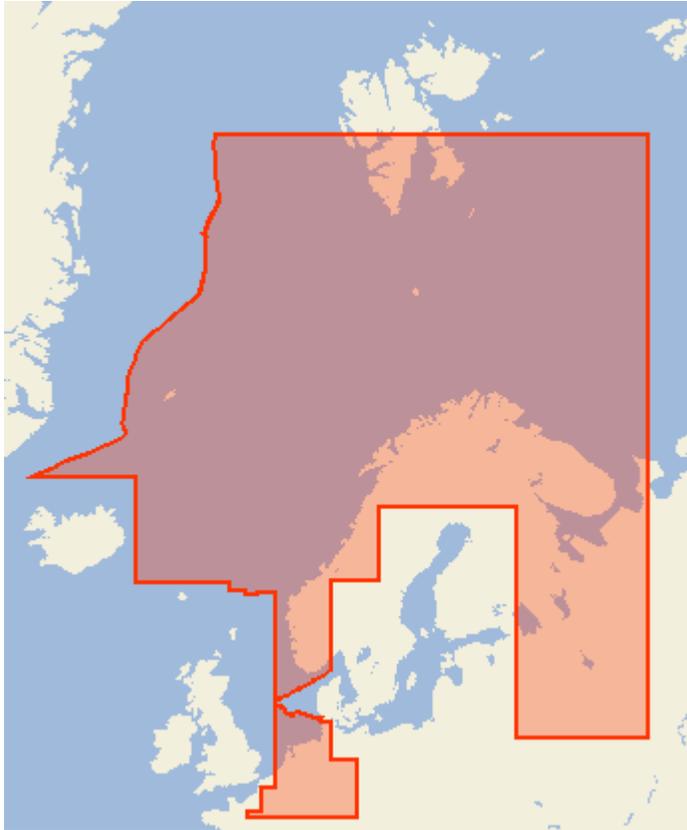


Figure 6. NO1A3000 Norskehavet

Updating via ER profiles has been issued in accordance with the Notices to Mariners and distributed through PRIMAR. A total of 1039 ER files and 71 NE were issued as part of the continuous maintenance of the ENC's.

In connection with the transfer of ENC's to the new chart production system, a review of all ENC's are currently being undertaken in order to improve the quality of the data. New Editions of 231 ENC's were published in 2009 as a result of this task. In 2010 we expect about 200 new editions to be published.

#### Planned activities in 2011:

The NHS will replace the Coastal chart in scale 1:200.000 in northern Norway with new compilation to scale 1:350.000. The corresponding ENC in user band Coastal (NO3) will be in compilation scale 1:180.000. In the Main charts series (1:50.000)/NO4 a new chart in northern Norway (Lopphavet) will be published and complete full coverage of our coast at this scale. The Main chart series at Svalbard is in scale 1:100.000, see Figure 7. In 2011 new edition and reconstruction of totally 9 charts is planned. Up to now 14 charts out of the planned 26 are published.

The production of new harbour ENC's and new editions of existing harbour and approach ENC's will continue.

For more details on the Norwegian charts production please refer to the National Report prepared for the 54<sup>th</sup> Nordic Hydrographic Commission meeting in April 2010.

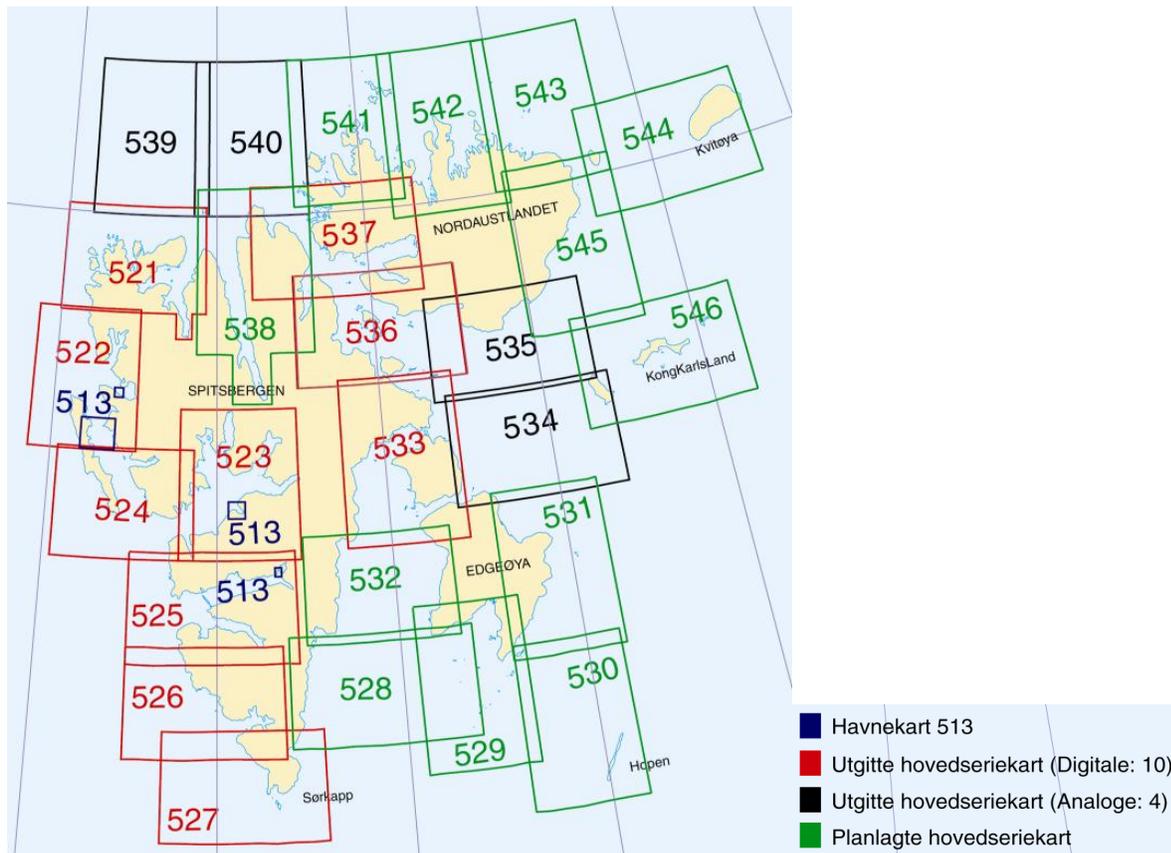


Figure 7. Overview of the main charts (issued – red/black, planned-green) at Svalbard.

### 3.4. Technology

#### Print On Demand (POD)

The NHS initiated in 2007 a project with the objective of establishing a Print on Demand (POD) service, with technical solution based on the dKart Office technology offered by Jeppesen. The company has produced a product generator for POD files and the delivery was finally accepted 5 August 2010. We will offer updated charts every 14 days, based on a continuous day to day update routine of the production data base. The available files in pdf format can be downloaded by the actual distributor and printed locally. The total amount of distributors will be small, typically 5-10. In addition the Norwegian Hydrographic Service will have its own printing facility and also the company printing our traditional paper charts

Before the ordinary delivery starts, scheduled for 1 January 2011, a test period will be completed. During the test period only 28 charts will be available. From January 2011 all the main coastal navigational charts (> 100) will be included in the service.

### **Tracings service integrated with NtM**

In 2009 Norconsult was contracted to develop tools for tracings production. The solution is based on Intergraph GeoMedia tools. The flowline was tested and accepted by the NHS late 2009. A tracing service was set up from January 2010, but only for the subscriber receiving at fully digital version the Notice to Mariners (NtM). The tracings are not yet supplied together with the paper version of the NtM. In the near future the main dealers will be able to print the tracings locally and serve the customers. Tracings will not be available from the smallest dealers. The service for distribution of tracings is charged with a fee.

### **The Norwegian Bathymetric Database - NMDB**

The Norwegian Hydrographic Service awarded in 2008 a contract to the Dutch company Atlis B.V. for the delivery of a new management and distribution system for high resolution depth data, called the Norwegian Bathymetric Database (NMDB). The work is a part of the NHS' commitment to the MAREANO program, and the database will be the management system for the official and authoritative depth data in Norwegian waters.

The solution is based on Atlis' QARTO product suite, and adapted to The Norwegian Hydrographic Service's specifications. The work is now in its final phase, and the system is to be implemented by the end of 2010.

The NMDB will have three main functional parts: Data assembly, data management and data distribution.

The data assembly consists of constructing digital terrain models based on quality assured survey data. The system includes adapted functionality for the construction and visualisation of terrain models with user controlled parameters. Emphasis is put on the registration of standardized metadata.

The data management includes collocating the various terrain models to a seamless, continuous digital model of the seabed. The database will at first include data for the Norwegian coastal and sea areas, and the Svalbard region. In the long term the database will also include data from the areas of interest to Norway in Antarctica. The data shall be kept updated and replaced as and when data of increased quality is available.

The data distribution is web based and user controlled. Internal and external users shall have an overview of coverage, available product types and metadata, the opportunity to view the data through standardized interfaces, and to download data. The data will be made available as a part of the Norwegian spatial data infrastructure

Emphasis is put on use of ISO and industry standards so as to open up for later expansions and integration with other systems internally and externally.

## **4. Nautical Publications**

No new editions of the "Norwegian Pilot", has been published in 2009, but volume 1, general information and volume 7, Svalbard, are planned for late 2010.

### **Notices to Mariners**

Totally 24 editions were published in 2009. The publication is available both as printed version

and in PDF-format for distribution by e-mail. Notice to Mariners is also published on <http://www.statkart.no/efs/>.

## 5. MSI

The Norwegian Coastal Administration is the national authority responsible for MSI in Norway. Out of the 5 new NAVAREA defined in the Arctic recently, Norway is responsible for NAVAREA XIX. Test operation was initiated in July 2010. The very first message was sent from the VTS in Vardø (north eastern Norway) on 1 July.

The AISSat-1 was launched in July 2010. The satellite will be in a polar orbit at 600km altitude. The satellite will pass the ocean area of northern Norway every 90 minute and collect all AIS information available. The AIS information will be made available as a part of the service from the VTS in Vardø, operated by the Norwegian Coastal Administration. At present the AISSat-1 is only for test purposes.

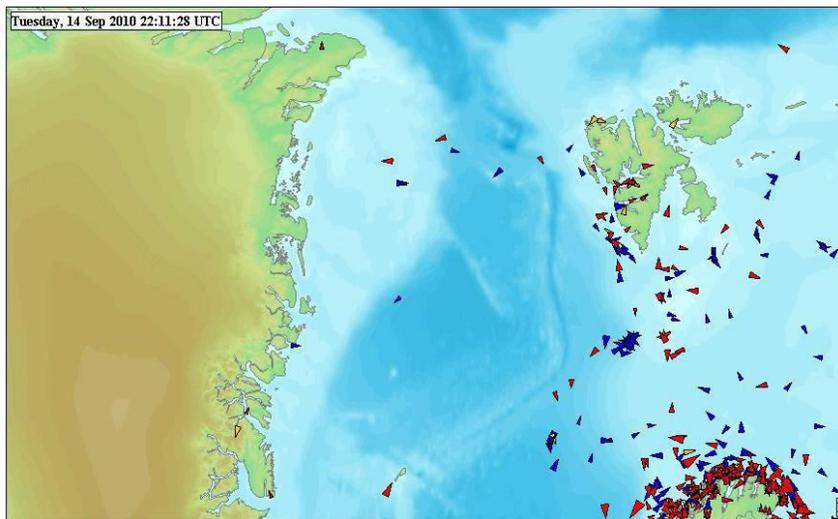


Figure 8. All ships identified by AISSat-1 on Tuesday 14 September 2010 (Source: Coastal Administration)

Several studies are ongoing in Norway with the purpose of finding ways of improving the SAR operations and the information distribution to mariners in the Arctic region.

## 6. C-55

Updates of C-55 was sent to IHB in October 2009 and a next update will October this year.

## 7. Capacity building

Norway has participated in the annual meeting in the IHO Capacity Building Sub-Committee.

The Norwegian Agency for Development Cooperation (Norad) has launched a programme called

*Oil for development.* NHS is represented in the programme, as subordinate of the Ministry of Environment. In December 2009 we participated in a Need Assessment Workshop in Ghana. No conclusion is yet available related to assistance within hydrography.

## **8. Oceanographic activities**

One oceanographer at NHS is taking a PhD in numerical tidal/tidal current models. Her thesis is related to the strong maelstrom at the Lofoten islands, northern Norway. We have several narrow straits with strong tidal currents in northern part of the country and also a few in eastern Svalbard.

The Norwegian Meteorological Institute is working on a tidal model for the North Sea, the Norwegian Sea and the Barents Sea. We will use the results to calculate harmonic tidal constants in a 4 km grid and find the LAT surface relative to the MSL surface (from the Danish National Space Center).

We have started a project to establish a model of the MSL for coastal/inshore waters. For this purpose we bought 20 pressure gauges and plan to collect one-month observation series at a lot of closely spaced locations. With the help of GPS measurements at each site we aim at finding the difference between the MSL and ellipsoid. In addition we utilize the information from the permanent gauges. At open sea we already do the surveying with the ellipsoid as vertical reference surface.

NHS operates totally 23 tide gauges of which 8 are located in northern Norway and 1 at Svalbard (Ny-Ålesund). Data from the tide gauges are transferred to the office typically once per hour. We collect one-minute data, and after an automatic quality control we publish ten-minute values on the Internet (<http://vannstand.no/index.php/nb/english>). The GPRS system is used for the data transfer from the different locations. For 2009 we obtained a data acquisition rate of approximately 99%.

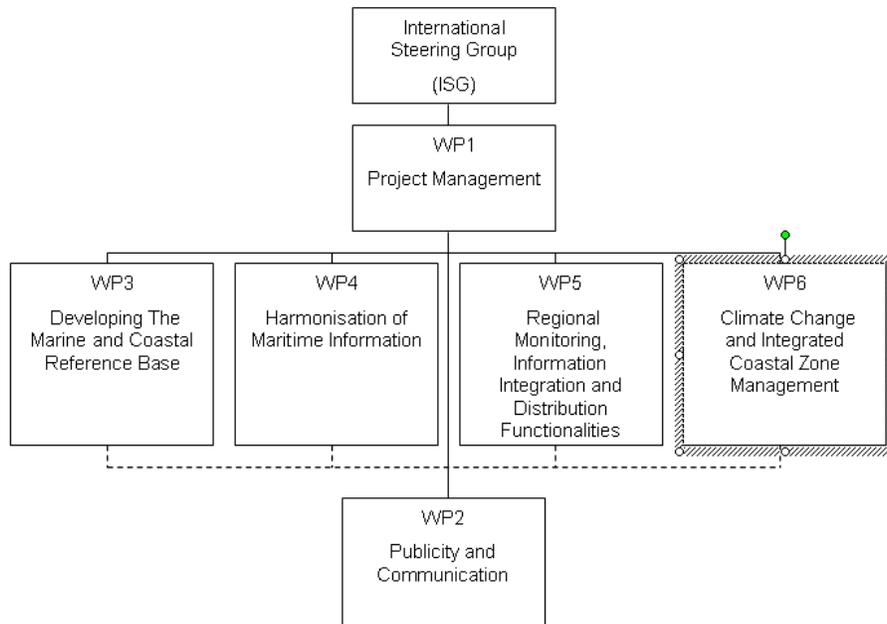
## **9. Other activities**

### **9.1. The BLAST project – Bringing Land and Sea Together**

BLAST was proposed in the Explanatory Note Item D5.3, Denmark at the NHSC 28<sup>th</sup> conference in April 2008. The proposal was followed up by several preparatory efforts ending up in a well-written application posted for the 4<sup>th</sup> Interreg IVB program call.

BLAST was approved by the Interreg IVB Steering Committee in April 2009 as a 3 year project to be finished by Dec.2012 with a budget of approx. 5.9 mill. euro. At this stage 16 partners from 6 countries formed the consortium, with the Norwegian Hydrographic Service as Lead Partner. In April 2010 an extended application was compiled to the Interreg IVB program 5<sup>th</sup> call. The extended application was approved by the Interreg IVB Steering Committee in June 2010. The project now comprise 17 partners from the seven North Sea Region countries and the budget was extended to approx 6.3 mill euro.

The work is organized as follows:



The International Steering Group acts as the general assembly meeting once a year. The professional work is performed in the four workpackages titled WP3 – WP6.

BLAST has a strong focus on networking and cooperation. Relations have already been established with other projects such as SUSCOD, C-Scope and STIRES. The work will also be performed in close connection with INSPIRE, IHO and EMSA.

At the first reporting to EU in March 2010 the following major deliverables were reported:

- An ENC checker (shortly available as download from the BLAST website)
- State of the Art – Maritime Information Management. Report. (shortly available as download from the BLAST website)
- Maritime Data Collection System (MDCS) requirements Specification. High level.
- The BLAST website

More information about the BLAST project can be found at the project website

[www.blast-project.eu](http://www.blast-project.eu)

## 9.2. The MAREANO Program

*Background:* Mareano is a multidisciplinary marine mapping and documentation programme aiming at providing the foundation for ecosystem based sustainable management of the Norwegian coastal and sea areas. The primary focus is The Management plan for the Barents Sea (see figure 9 below). The aim is to bridge the knowledge gap in poorly mapped but very sensitive areas. High quality multibeam bathymetry is regarded as a premise for further geological and

biological investigations. The Norwegian Mapping Authority Hydrographic Service (NHS) is responsible for bathymetry data acquisition, and effective data management and distribution of survey data, derived products and services. An important facet of the program is the web-based geodata distribution, and distributed data management as part of a National Spatial Geodata Infrastructure (NSDI)

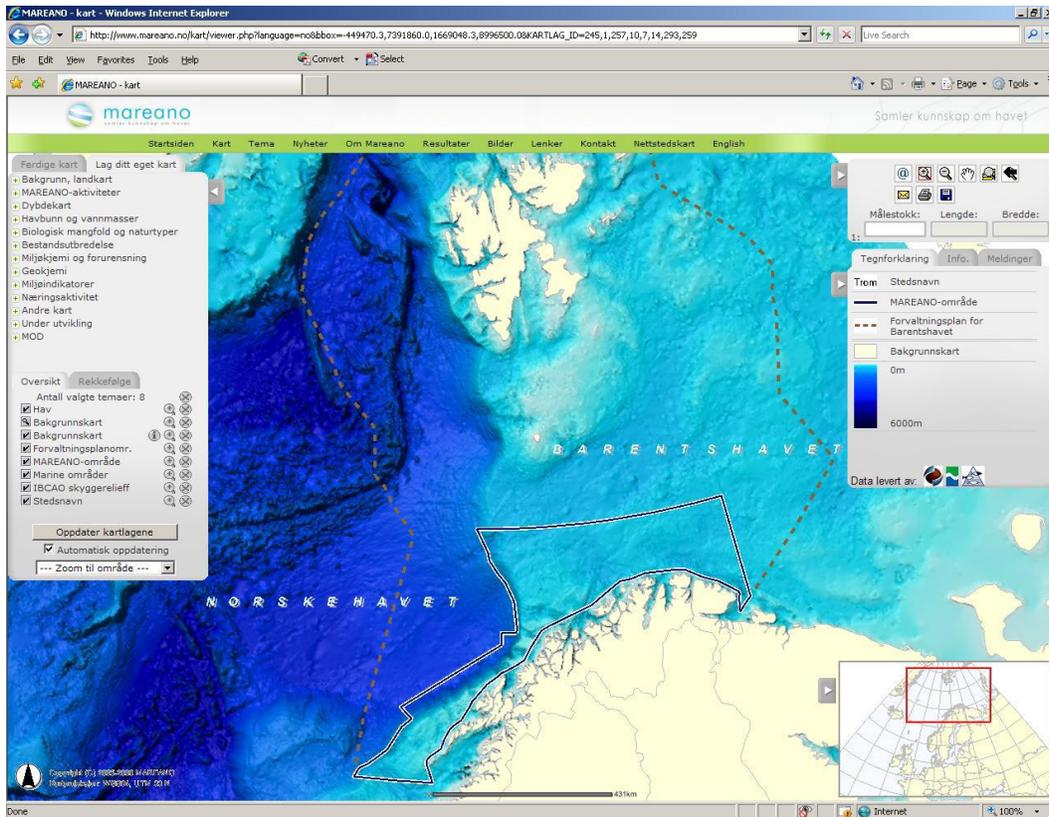


Figure 9. The solid lines indicate the *Mareano* program area. The stippled lines encircle the area for *The Management plan for the Barents Sea*

**Organization:** The NHS is a program partner with the Institute of Marine Research (IMR, program management) and the Geological Survey of Norway (NGU).

**Results 2010:** In 2010 the program received NOK 51.5 mill in total through earmarked funding to Mareano through the National budget with a focus in the southern Barents Sea. NHS received NOK 20.6 mill and 7156 km<sup>2</sup> was surveyed (see figure 10 below).

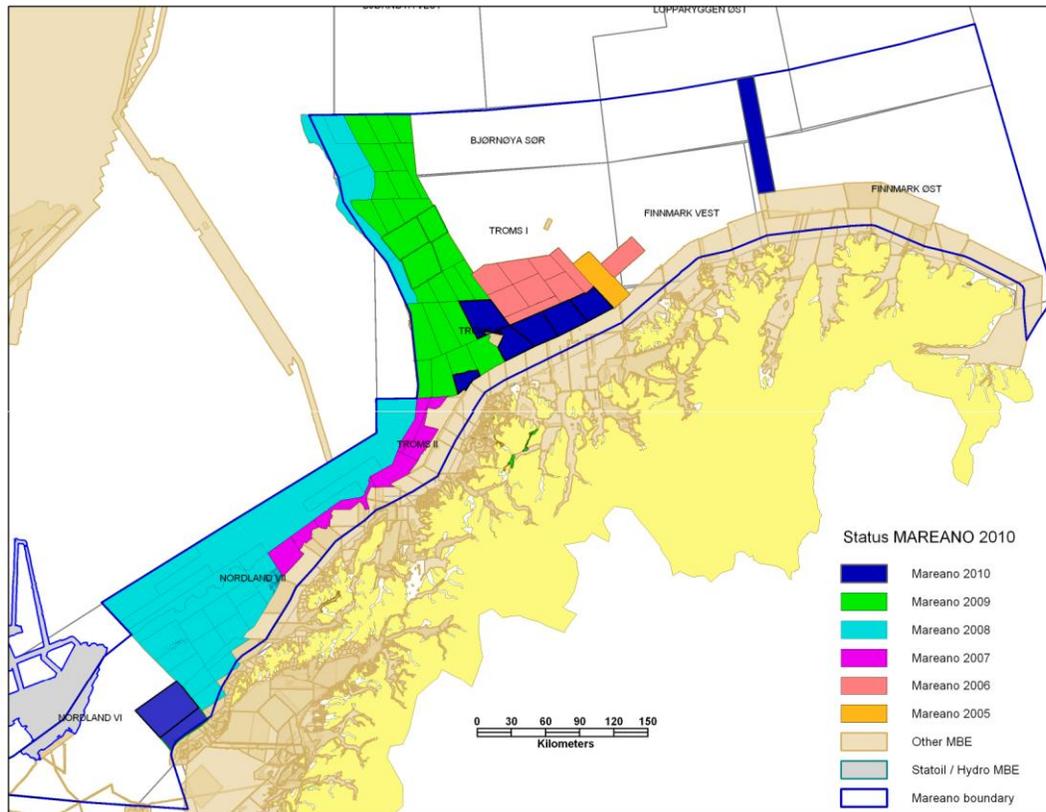


Figure 10. Overview of the surveyed area each year for the period 2005 - 2009

*Data distribution:* All the multibeam data in the NHS north of Lofoten has been modelled in grids of various resolutions, and visualized through shaded relief maps as a Web Map Service included in the map services on the Mareano webpage. Further overview bathymetry map services have been produced, also showing the coverage of all surveys in the NHS' data management system. Further information and results will be available on [www.mareano.no](http://www.mareano.no). This website will be a portal for knowledge dissemination mainly through effective map services and documentation aimed at both government decision-makers and the general public. This will be a joint effort among the programme partners, but the project management is led by the Institute of Marine Research.

*NSDI:* According to the Mareano data policy all geodata from the Mareano program will be published in the Norwegian spatial data infrastructure; *Norge Digitalt*.

Mareano will be a major undertaking for the NHS in the years to come, and is mainly aimed at non-navigational purposes, and it is planned to use the the Mareano concept also for the Management Plan for the Norwegian Sea.

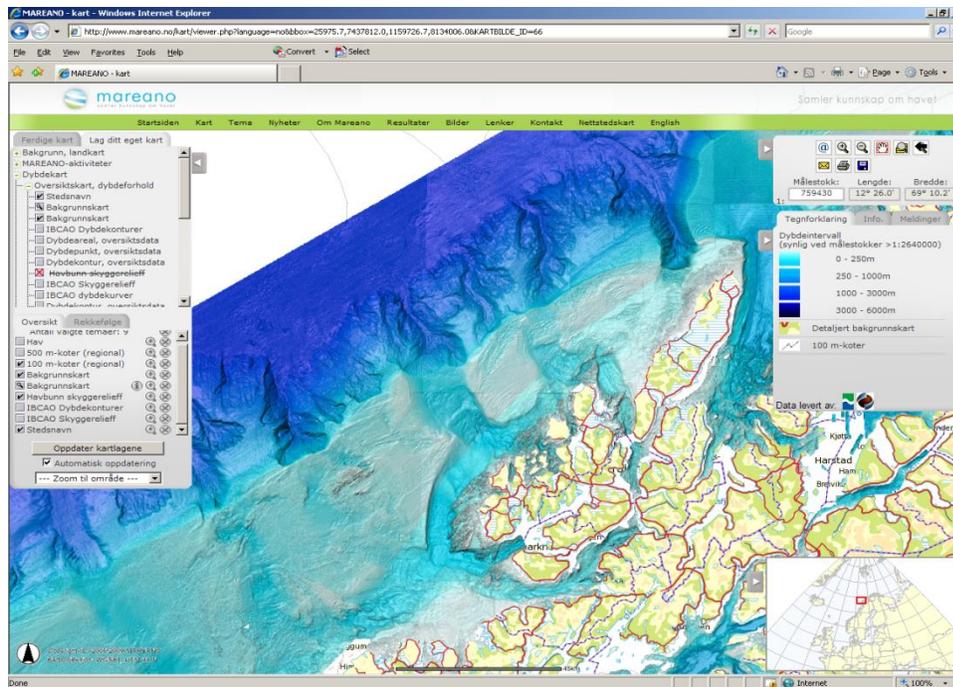


Figure 11. An example from the WMS shadow relief map service showing spectacular submarine canyons and slide scars on the edge of the most narrow part of the Norwegian shelf north of Lofoten and west of Andøya (screen dump from map service on [www.Mareano.no](http://www.Mareano.no))

### 9.3. Norway digital

Norway digital ([www.norgedigitalt.no](http://www.norgedigitalt.no)) is a nation-wide program for co-operation on establishment, maintenance and distribution of digital geospatial data. The aim is to enhance the availability and use of quality geographic information among a broad range of users, primarily in the public sector. After 5 years in operation, the co-operation counts over 600 collaborating partners, representing Norwegian public sector at national, regional and local level. Norway digital has developed a national geospatial infrastructure that offers more than 150 operational web map services, covering basic reference data and thematic data. Metadata is available together with the geospatial datasets. A national portal ([www.geonorge.no](http://www.geonorge.no)) is giving information about the present status of the available data and web map services. Downloadable data are available on standard formats. The technologies used are based on international standards (ISO<sup>1</sup> and OGC<sup>2</sup>). Norway digital will further develop according to the INSPIRE<sup>3</sup> development. Maritime geographic information is an integrated part of the content that is being offered through Norway digital.

<sup>1</sup> International Organization for Standardization. Ref. ISO/TC 211 Geographic information / Geomatics

<sup>2</sup> Open Geospatial Consortium

<sup>3</sup> Infrastructure for Spatial Information in the European Community