Kartverket	**NHC 59th Meeting** **Reykjavik 14-15 April 2015**	**NHC59-5D** **National Report** **NORWAY**

NATIONAL REPORT
NORWAY

Executive Summery

This report gives the summary of the activities and events that has taken place within the Norwegian Hydrographic Service (NHS) since the last report given at the NHC57 Conference in Helsinki, August 2014. Some highlights:

- *OD project launched*
- *Moving to new premises*
- *New multibeam data processing software implemented*
- *The final report of the LiDAR pilot project (Topobaty) delivered*
- *Continued high activity in the Mareano project*

1. Hydrographic Office

From 1 January 2014 the Norwegian Mapping Authority (NMA), included NHS, was transferred from the Ministry of Environment to the Ministry of Local Goverment and Modernisation. This change is likely to increase the cooperation with the Land and Cadastre department of NMA and with coastal municipalities.

The yearly audit related to the ISO certification has been accomplished with a few minor deviations identified.

NHS will move to new premises outside Stavanger city center in June 2015. We will be co-located with the Electronic Chart Centre (operating the Primar infrastructure), the Petroleum Directorate and the Petroleum Safety Authority. A part of the University of Stavanger (UiS), and some research institutions affiliated to UiS, are located in the same area.

The NMA has over the last year discussed goals and strategy based on international trends, expectations from our "owner" and internal goals. A project called *Destination 2025* involved all divisions of NMA. Related to the outcome of the project NHS has initiated an Organizational Development (OD) activity, aiming at adjusting the organization to underpin the main strategic goals.

2. Hydrographic Surveys

Internal conducted surveying 2014
During 2014, R/V Hydrograf and its two survey launches have been working in the coastal waters of Norway and Svalbard. In addition, R/V Hydrograf surveyed at open sea for the MAREANO project.

The MAREANO project *(see also item 9.3)*
R/V Hydrograf worked about 1.5 months for the MAREANO project and 3433 km² was surveyed. These areas are along the continental margin in the area between Stadt and Lofoten.

Norwegian coast
Due to the takeover, equipment installation, testing and calibration of the new survey launches, very little surveying was done during the first four months of 2014. The surveying along the coast has since then been done with three survey launches equipped with EM2040D. The surveying have been organised as 7/12 operations.

The primary survey area has been between Sognefjorden and Stadt. Some areas between Stavanger and Haugesund are also surveyed.

The total area surveyed along the Norwegian coast in 2014 was 611 km². Figure 1 presents the coverage of surveying within the territorial waters.

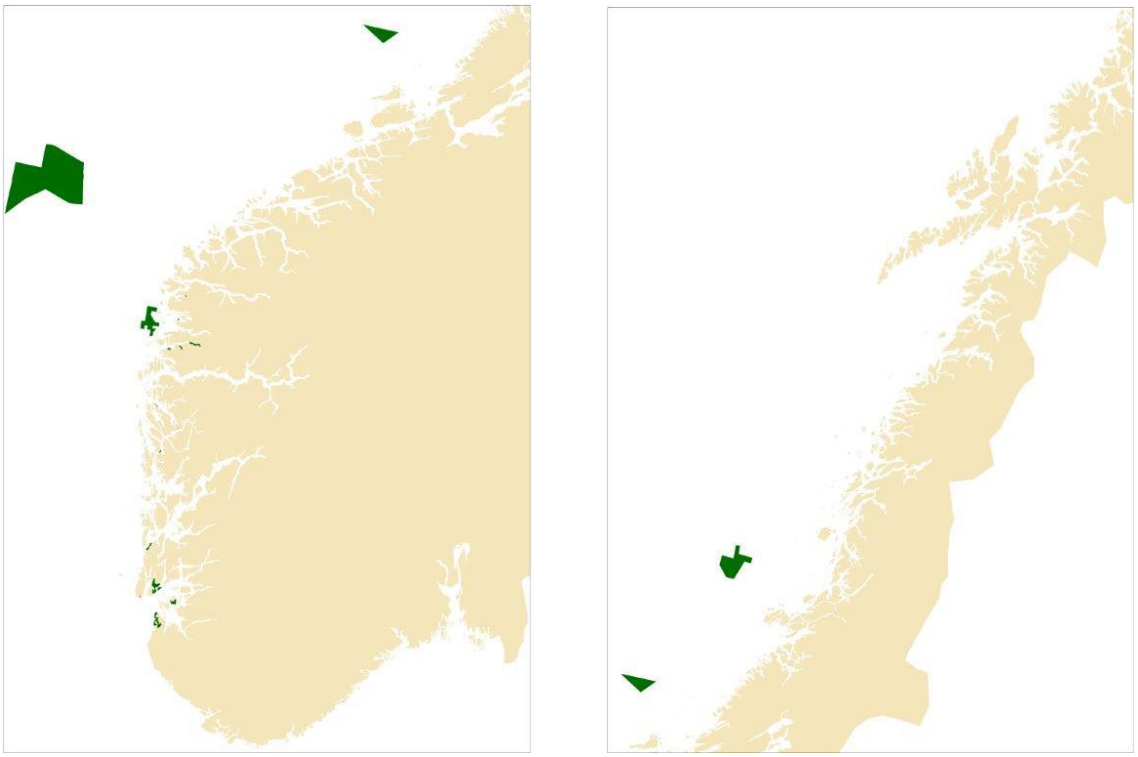

Fig. 1. Area survey in territorial waters during 2014

Svalbard
R/V Hydrograf and two survey launches operated at Svalbard for 10 weeks in 2014. Totally 651 km^2 was surveyed, see figure 2.

Fig. 2. Surveying at Svalbard during 2014 season
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External conducted surveying 2014
For 2014 the German company Fugro OSAE has been awarded the contract for surveying for the MAREANO project.

The new survey launches
Three similar survey launches were delivered by Swede Ship Marine, Sweden, during the period December 2013 - May 2014. Two of the launches have been in full time operation as part of ordinary survey capacity. The third one has served the needs for the Coastal Administration (contracted surveying). The launches have proved to be of good quality and have had only minor operational interruptions. A small modification to the hulls was implemented to reduce air bubbles (disturbing the data quality) at low speed. Under favourable conditions, surveying has been done at a maximum of 12 knots.

Fig. 3. The launches delivered in March and May 2014

3. Nautical Charts

3.1. Maritime Primary Database

The Maritime Primary Database consists of selected bathymetry, coastline, shoreline constructions, pontoons, lights and navaids, submarine cables and pipelines, overheads cables, anchor berthing, marine farms, wrecks and obstructions, restrictions, precautionary area, traffic separation zones etc. In 2014 the production comprised replacing areas with older survey data with new survey data mainly at Chart 536 Svalbard and the harbor of Egersund. Besides the new surveyed areas updates were received continuously from many different governmental partners, contractors and customers. These updates enter into the Maritime Primary Database immediately. The production of Notices to Mariners ("Etterretninger for sjøfarende") and the production of all charts/ENCs are based on the information extracted from the Maritime Primary Database.

3.2. Chart production

Since autumn 2008, when the NHS completed the major task of covering the Norwegian coast with ENCs and modernised paper charts, the production has been concentrating on replacing areas with old survey data (approx 11 000 km^2) with new data. The NHS also has the objective to convert the remaining analogue paper charts (18 charts per Dec 31st 2014) to digital format. The NHS outsources some of the production tasks.

3.3. ENC production

In 2014, 13 ENCs in the Approach and Harbour user bands were produced along the Norwegian coast corresponding with the charts 24, 464, 465 and 488.
In addition, 8 new ENCs in Coastal user band were published. In addition, 8 existing ENCs in the General user band covering chart 308 were upgraded at the same time. See Figure 4.

In the Antarctica, a new ENC in Overview user band corresponding with INT 909 was produced, see Figure 5.

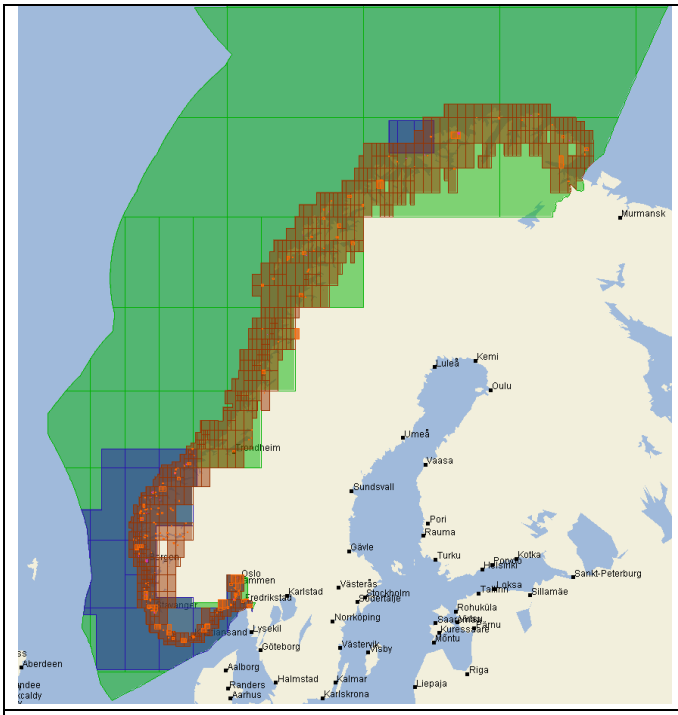


Figure 4.
ENC coverage for the Norwegian coastal waters (ENCs in User Bands 2-6).

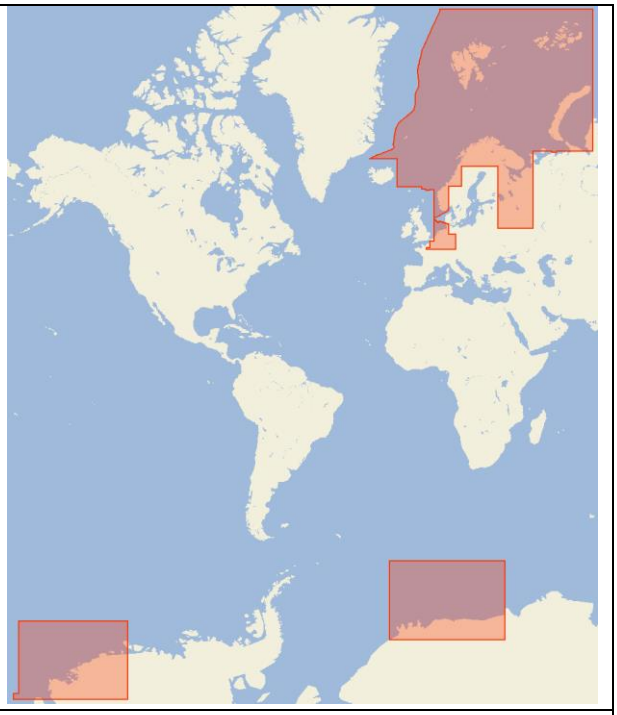
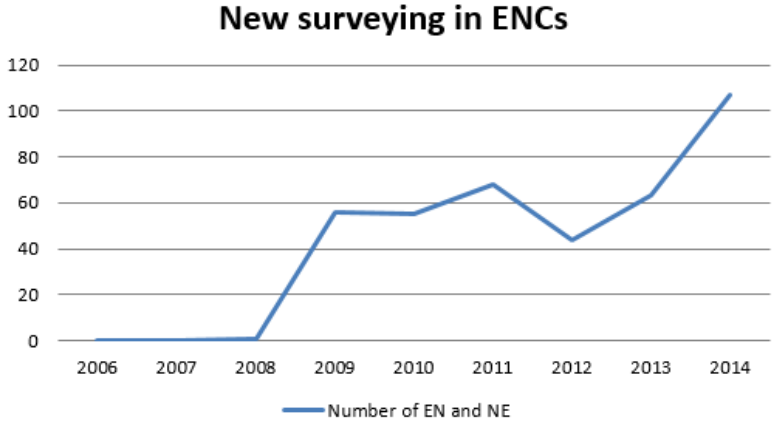


Figure 5.
NO1A3000 Norwegian Sea,
NO1A5500 Dronning Maud Land and
NO1A5490 Martin Peninsula, Cape Colbeck

Totally 107 ENCs in the user bands 2-6 have been upgraded with new multibeam survey data in limited areas, and published as New Editions (NE) or new ENCs (EN). Six of these are new ENCs produced in accordance with pilot sketches. The graph below shows an increasing trend of this task in recent years.



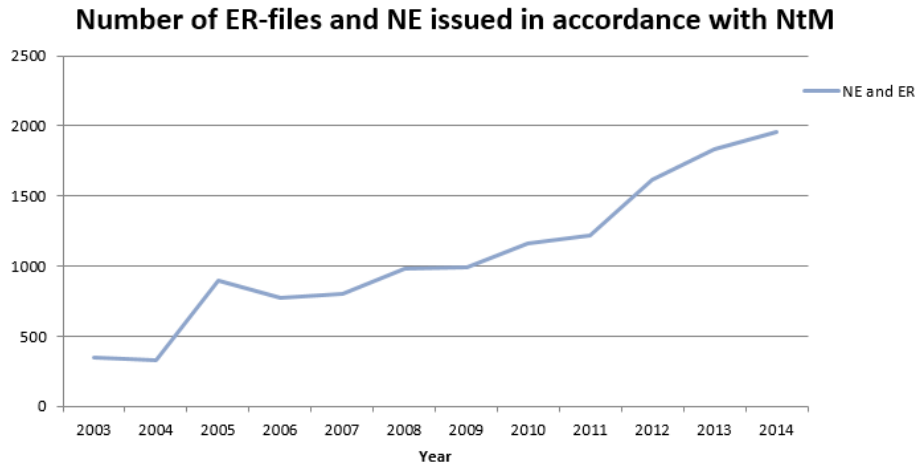
The total number of ENCs was 1107 at the end of 2014.

	Usage Band	Compilation scale	No of ENCs
1	Overview	< 1:1 499 999	3
2	General	1:350 000 – 1:1 499 999	69
3	Coastal	1:90 000 – 1:349 999	61
4	Approach	1:22 000 – 1:89 999	742
5	Harbour	1:4 000 – 1:21 999	198
6	Berthing	> 1: 4 000	34

Table above: Number of ENCs in each usage band per 31 Dec. 2014

Updating via ER profiles were issued in accordance with the Notices to Mariners (NtM) and distributed through Primar. A total of 1960 ER files and NE were issued as part of the continuous maintenance of the ENCs. Temporary (T) and Preliminary (P) notices were published as ER files. They are included in the numbers.

The graph below shows the trend in recent years. The number has increased gradually, especially after NHS started to publish T/P notices in 2011.



In connection with the transfer of ENCs to the present chart production system, a review of all ENCs are currently being undertaken in order to improve the quality of the data. New Editions of 23 ENCs were published in 2014 as a result of this effort.

Planned activities in 2015:

In 2015, the NHS will continue the production of new editions of existing ENCs with focus on the Harbour and Approach ENCs corresponding with the charts 467 and 24. The

production of new Coastal ENCs and upgrading of General ENCs covering chart 309 to be completed in 2015/2016.

The publishing of new editions and new ENCs based on updated survey data will proceed.

Updating via ER profiles in accordance with the NtM will continue.

The review of ENCs in connection with the transfer of ENCs to the present chart production system will also proceed in 2015.

3.4. Paper chart production

Totally 27 charts were published as new charts or new editions in 2014 for areas with updated survey data available: 4 harbour charts, 14 main charts, 1 coastal chart, 7 charts for Svalbard and 1 chart in the Antarctica.

New charts/ new editions with new survey data published 2014:

Chart No.	Title	Scale
1	Oslofjorden. Færder – Hvaler – Halden	1:50 000
6	Jomfruland – Risør	1:50 000
12	Lista – Svåholmane	1:50 000
26	Håsteinen – Batalden	1:50 000
27	Sunnfjord	1:50 000
28	Bremanger	1:50 000
31	Breidsundet – Fjørtoft	1:50 000
36	Kristiansund – Tyrhaug	1:50 000
48	Gjæslingan – Dolmsundet	1:50 000
53	Lyngvær – Straumøyan	1:50 000
61	Træna – Nesøya – Myken	1:50 000
87	Rystraumen – Tromsø – Grøtsundet	1:50 000
124	Aurlands- og Nærøyfjorden	1:50 000
126	Storfjorden. Ytre del med Hjørundfjorden	1:50 000
308	Florø – Smøla	1:350 000
456	Ålesund havn	1:20 000
462	Svolvær – Kabelvåg	1:10 000
466	Tromsøysundet – Sandnessundet med Tromsø havn	1:20 000
488	Brønnøysund med innseilinger	1:10 000
513	Svalbard havner	1:25 000
523	Isfjorden	1:100 000
524	Prins Karls Forland – Barentsburg	1:100 000
534	Olgastretet. Freemansundet – Svenskøya	1:100 000
535	Erik Eriksenstretet. Sørporten – Svenskøya	1:100 000
539	Norskebanken	1:100 000

Chart No.	Title	Scale
540	Hinlopenrenna, Moffen - Lågøya	1:100 000
549	Mount Siple – Cape Colbeck	1:2 000 000

Revised Reprints published in 2014:
31 charts were revised and reprinted (out of these 29 were updated through our Digital Production Line based on changes in the Primary Database).

Planned activities in 2015:
The chart production for 2015 will be focused on production of 1 Harbour chart (467), 4 main charts (13, 24, 25, 121) and 2 coastal chart (305, 309).

We plan to do reconstructions of one Harbour chart (469).

Print On Demand (POD)

At the end of 2014, 204 charts were offered as POD out of a total portfolio of 236 Charts.

All 143 charts in the main chart series, 43 Harbour charts and 18 charts from the main chart series of Svalbard are available for the POD service.

The POD service will include all Paper charts by the end of 2015. No printing of charts will take place after March 2015. New editions are available only as POD-charts.

4. Nautical Publications

The Norwegian Pilots Guide «Den norske los» is to be revised and more customized for the professional users. Until the revised editions are available, the current updated pdf versions of the Pilots can be download from The Norwegian Hydrographic Service's homepage: www.kartverket.no. The Pilots are updated twice per year (May and November). Important changes are reported in the Notice to Mariners.

Notices to Mariners (Etterretninger for sjøfarende)
Totally 24 editions were published in 2014. The publication was available both as printed version and in pdf-format for distribution by e-mail during the year. An official digital version of Notice to Mariners was launched 12 June 2014 kartverket.no/efs. The printed version is no longer available.

As a supplement to the NtM a digital tracings service is fully operationally on the same website.

5. MSI

The Norwegian Maritime Directorate is the responsible body for MSI in Norway.

6. C-55

The last update of C-55 was sent to IHB in March 2013. A revised version is in progress.

7. Capacity building

Norway participated in the annual meeting of the IHO Capacity Building Sub-Committee in May 2014. The IRCC and the CBSC encourage Member States from the most developed regions to be involved in capacity building by assisting CBSC activities or by other means.

NHS entered into a cooperation with Albania in September 2014. The project will last until the end of 2018. The main goals are related to building competence and capacity. Formal education and training in hydrography is planned for three persons and for one in marine cartography. A multibeam echo sounder system and a chart production system will be acquired. The Norwegian Ministry of Foreign Affairs finances the project. The budget is NOK 9.85 mil

8. Oceanographic activities

New web-pages with tidal information were launched in 2012, http://sehavniva.no, and response from the users are important in improving the pages. Based on 24 permanent tide gauges and discrete tidal zoning the users can search for a location and get tidal predictions and water level from most of the Norwegian coast. A figure with different tidal levels relative to Chart Datum and levels with return periods up to 1000 years are also shown for each location. An English version was launched in March together with an API that makes it easier for frequent users to download data without going via the web-page.

A permanent gauge was established at the remote island Jan Mayen in 2014. Data are transmitted to the office normally once per day.

In addition to observed water level and predicted tides we present a 5 days water level forecast from models run by the Norwegian Meteorological Institute (NMI). Near real time water level observations are transferred from NHS to NMI and are used to adjust the output from the model.

We have done several short term measurements, one month or more, of water level. The pressure gauges are spread around the coast and used for reduction of soundings, improving the tidal zones and transferring land-levelling datum to islands. The data will also be important for establishing a CD-surface relative to a common reference surface (the ellipsoid). We are working on better methods to control the accuracy, and have started to use two pressure gauges at each site. One gauge is mounted around Mean Sea Level at a known height relative to TGBM. With such a system, we have better control of drift in the sensors and can correct for density variations.

With our new program for processing, storing and distributing water level measurements we are able to analyse more series than we used to when part of the process was manual.

9. Other activities

9.1 TopoBathy pilot

The NHS is conducting a pilot test in 2014 using latest generation of a Riegl shallow water topo-bathy lidar system. The main goal was to verify that a topo bathy lidar system is capable of seamless data acquisition in the depth range from land down to approximately 5 meters. The final report was available in March 2015. The Topobaty project will be presented as a separate item at NHC59.

9.2 The PLECO Project

The NHS has carried out a project to replace the existing multibeam data processing tool. NHS chose Caris as the vendor of the system. The new tools are an extended version of the Caris' HIPS/SIPS. The final version was delivered in January 2015. The system will be used for both the data processing and data management on the survey platforms as well as at the data handling at the office. Implementation and training took place in the period January-March 2015.

9.3. The MAREANO Programme

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 has been The Management plan for the Barents Sea and the management plan for the Norwegian Sea (see figure 8 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 NHS is responsible for bathymetric data acquisition (including backscatter and water column data), and effective data management and distribution of survey data, derived products and services. An important facet of the programme is the web-based geodata distribution, and distributed data management as part of a National Spatial Geodata Infrastructure (NSDI)

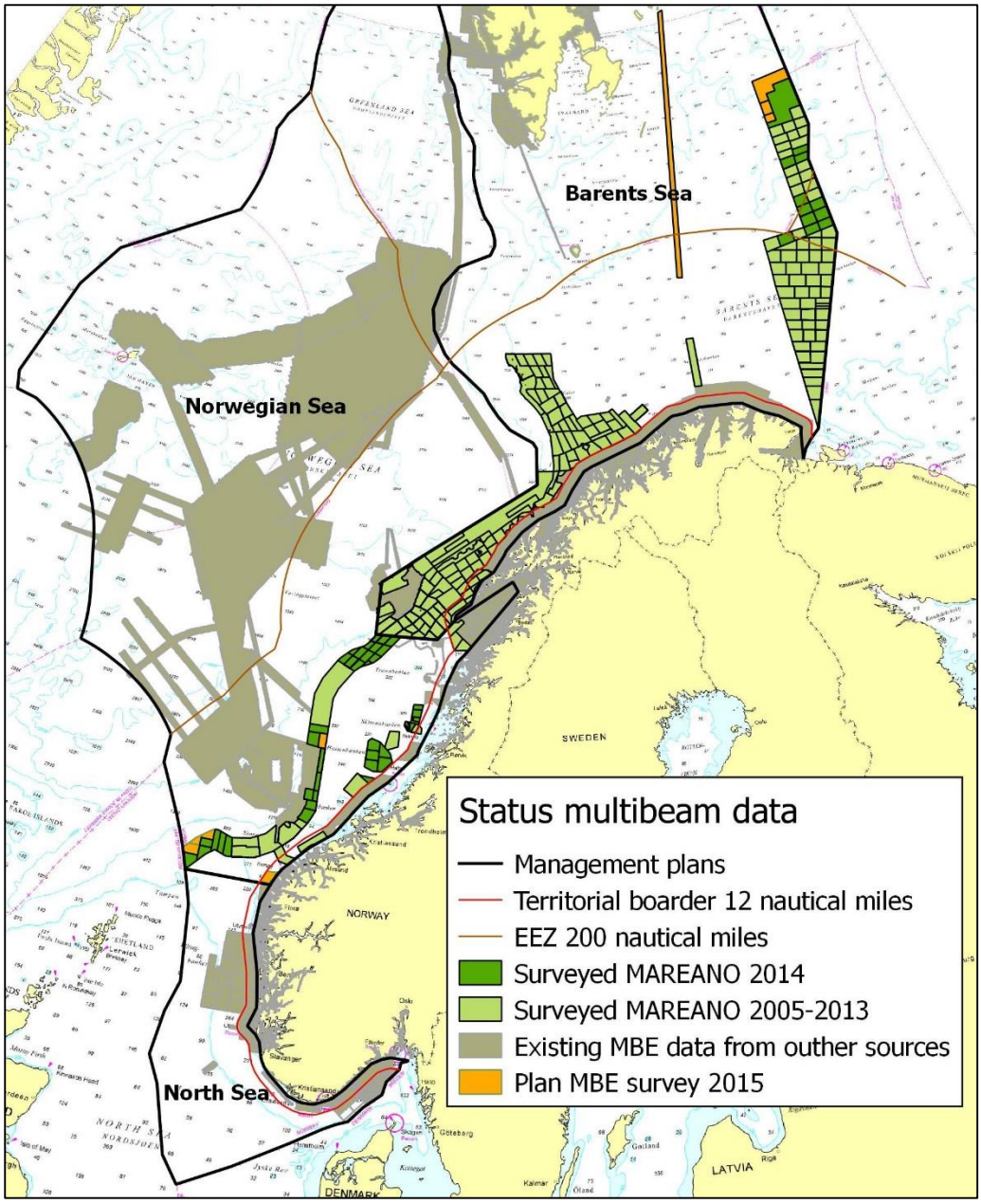


Figure 8. The Management plan areas and coverage of multi beam echo sounder data.

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

Results 2014: The MAREANO program received NOK 91.7 mill in total through earmarked funding. NHS received NOK 39.2 mill. 27 900 km^2 was surveyed in 2014.

Data distribution: The multibeam data has been modeled 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 www.mareno.no.

NSDI: According to the MAREANO data policy all geodata from the MAREANO programme will be published in the Norwegian spatial data infrastructure; *Norge Digitalt* www.geonorge.no .

MAREANO will be a major undertaking for the NHS in the years to come, and is mainly aimed at non-navigational purposes.

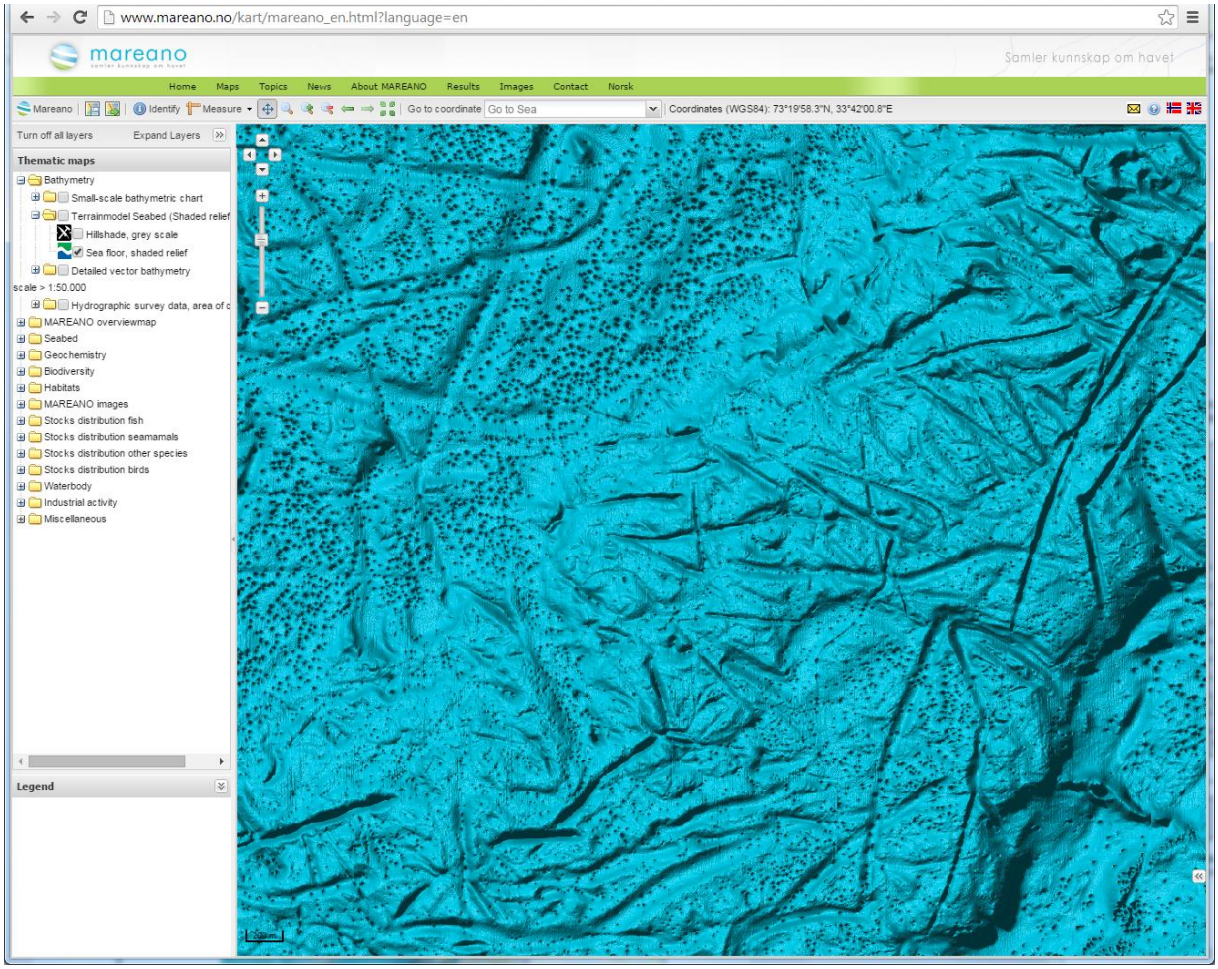


Figure 10. An example from the WMS shadow relief map service showing seabed with pockmarks and iceberg plough marks in the Barents Sea (screendump from map service on **www.mareano.no**)

9.4 BarentsWatch

The Norwegian Mapping Authority are participating in an intergovernmental cooperation on developing and establishing a general Information and surveillance system, covering the High North and the Norwegian coastal and sea areas. BarentsWatch aims to offer integrated knowledge and information services to the public, and will also support efficient coordination

between governmental services through a common information picture. A core part of the system consists of map services, based on geographic information services from official sources. Marine Spatial Planning became a separate activity in 2014. NHS participate in this work. So far, the cooperation counts 30 national partners. Ref.:
http://www.barentswatch.no/en/om/

9.4 International activities

The NHS is involved in several Working Groups, Committees and Commissions related to IHO. Norway has representatives in the following Working

Groups: S-100, DQ, ENC, NC, NIP, TWC, CSPC, IEN, MSDI and WEND. We have participated in the HSSC and the IRCC meetings in 2014. Norway is actively participating in 5 Hydrographic Commissions: ARHC, HCA, NHC, NSHC and SAIHC.

As operator of Primar we participate in all related meetings.

During the last few years we have contributed with a substantial part of high resolution bathymetric data, obtained through the Mareano project, to the GEBCO (and IBCAO) database. We have delivered data with resolution 50x50 meter for a greater part of our coastal waters to the EU project EMODnet.