52nd NHC Meeting
06 -07 May 2008
Norrkøping

NHC/ 52/2D
National report
NORWAY

NATIONAL REPORT
NORWAY

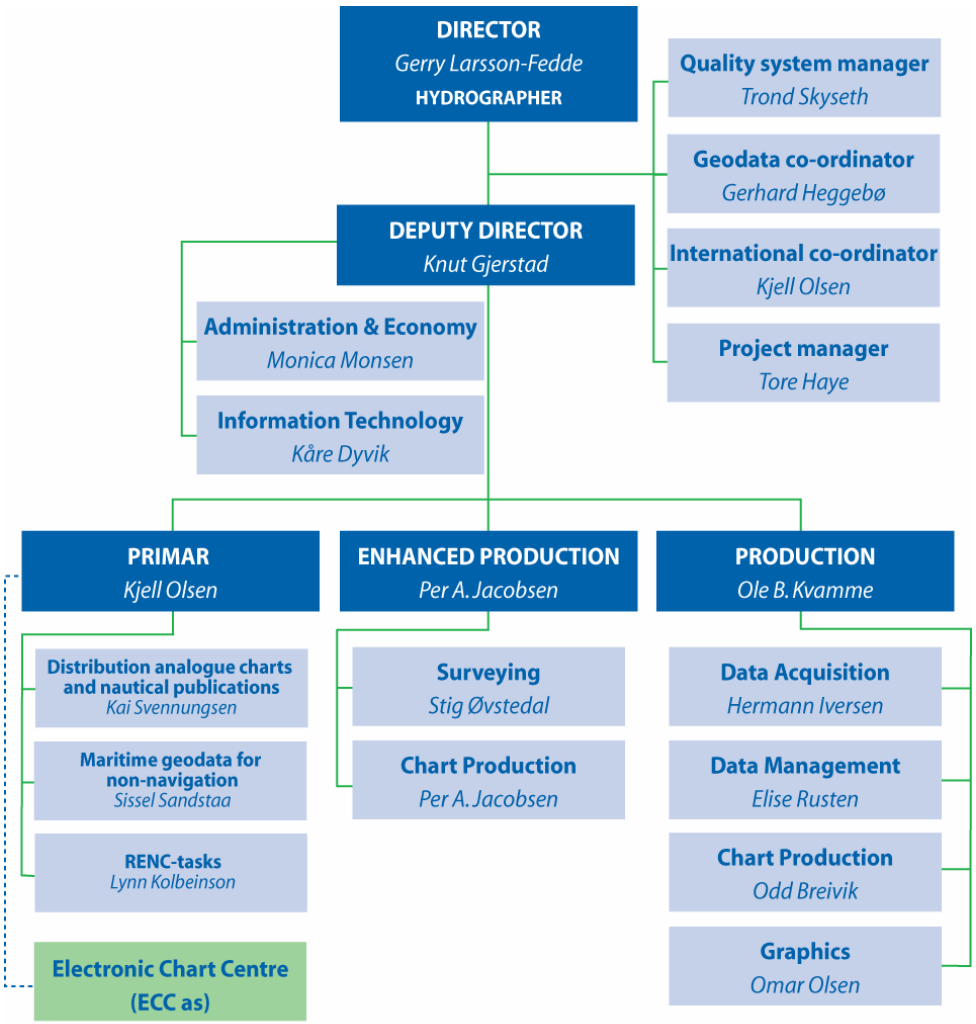
Executive Summery

This report gives the summary of the activities that has taken place within the Norwegian Hydrographic Service since the last report given at the NHC/51 meeting in Copenhagen, April 2007.

1. Hydrographic Office

The IHO Yearbook was updated November 29th 2007

Administrative information:



Deputy Director Terje Langvik retired from his position September 1st 2007; Knut Chr. Gjerstad has taken over the post as new Deputy Director. Director of PRIMAR Jon Leon Ervik decided to leave his post November 21st 2007, Kjell Olsen was ordered to take the position temporary. He has permanently taken over as Director of PRIMAR from April1st 2008. Director Frode Klepsvik resigned from his post as Director for NHS December 1st 2007. New Managing Director for Gerry Larsson-Fedde started his service at NHS February 20th. 2008. This is the changes in the administration of the NHS and PRIMAR since the Copenhagen meeting.

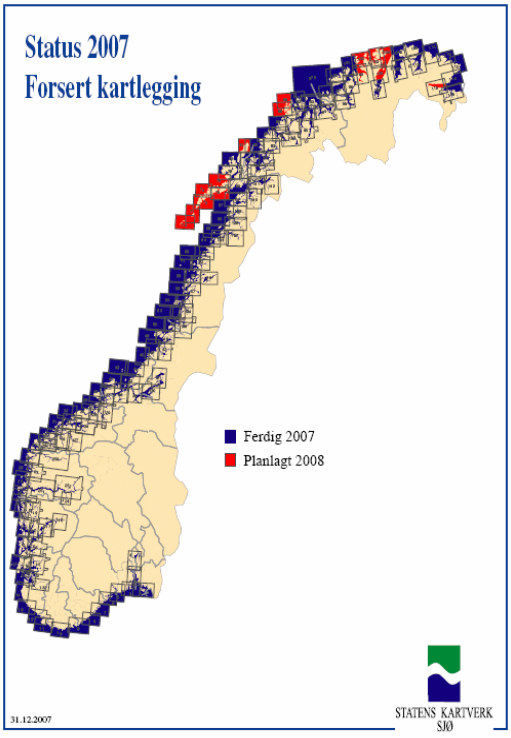
The Government has prolonged the "Enhanced Project" to continue until mid 2008. By then all major and secondary fairways along the Norwegian coast will be covered by modern official ENCs.

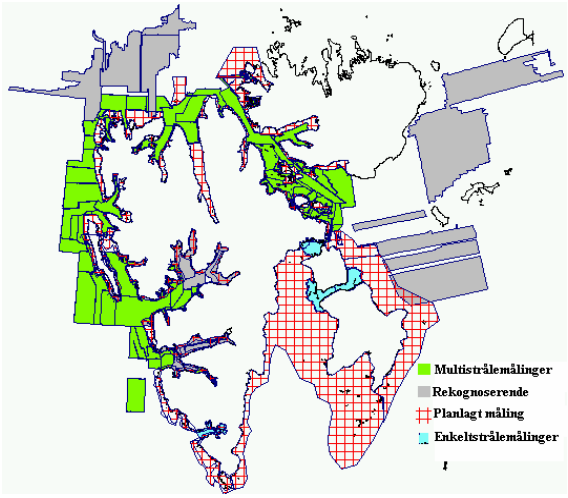
Total budget for 2008 is NOK 128.209 Mill.
Annual sales for 2007 were NOK 46.5 Mill.

2. Hydrographic Surveys

Internal surveying 2007
Svalbard

Two survey launches equipped with EM 3000D and one with EM 1002 have been operating on a 12-hour daily operation 2,5 month in 2007 outside Svalbard. The efficiency has been very good and a total of 685.5km^2 has been surveyed along the Svalbard coast, mostly in areas with water-depths less than 20 meters.





Norwegian coast

Two survey launches equipped with EM 3000D and one with EM 1002 have been operating on a 12-hour daily operation in 9,5 months in 2007 (before and after Svalbard survey campaign). The efficiency has been very good and a total of 804 km^2 has been surveyed along the Norwegian coast, mostly in areas with water-depths less than 20 meters.

Plans 2008

NHS has will install EM 710 on the main ship, m/s HYDROGRAF,- and will survey deep sea as part of the MAREANO project. The plan is to survey 4500 km^2 outside Lofoten, in period April – July.

There will be an autonomous survey campaign along Norwegian coast with the new surveying launch while Hydrograf is surveying deep water for MAREANO.

In period July-September the survey vessels will be used on coast near Svalbard, expected area to cover is 700 km^2.

The survey near coast of Norway is planned January – mid March, and after Svalbard for the rest of the year, expected to cover 700 km^2.

External sea surveying 2007
Status
Blom (renamed to Scan Maritime) has surveyed 191 km^2 in shallow waters, and this survey campaign ends the planned use of external survey companies as part of the enhanced ENC production project near Norwegian coast..

Fugro-OSAE had intention to survey 13600 km^2 in deep water outside North Norway as part of the MAREANO project. Due to weather hindrance this demanding obligation was far from met.

Plans 2008
Fugro- OSAE will survey this season on deep water as part of MAREANO, with EM 710 and EM300, and revised survey scheme covers an area of 11 627 km^2.

3. Nautical Charts
3.1. General
The internal ENC and paper chart production was in 2007 continued in accordance with the NHS Long Term Plan (the Enhanced Project), and with a main goal to reach full ENC coverage for the Norwegian Coast within mid 2008. In 2007 the work was mainly concentrated to areas in the northern part of Norway, in the counties of Troms and Finnmark. As in previous year, the production was carried out by an extensive use of private industry. Quality controls and final approval of external production was accomplished in-house by NHS.

3.2. ENC production

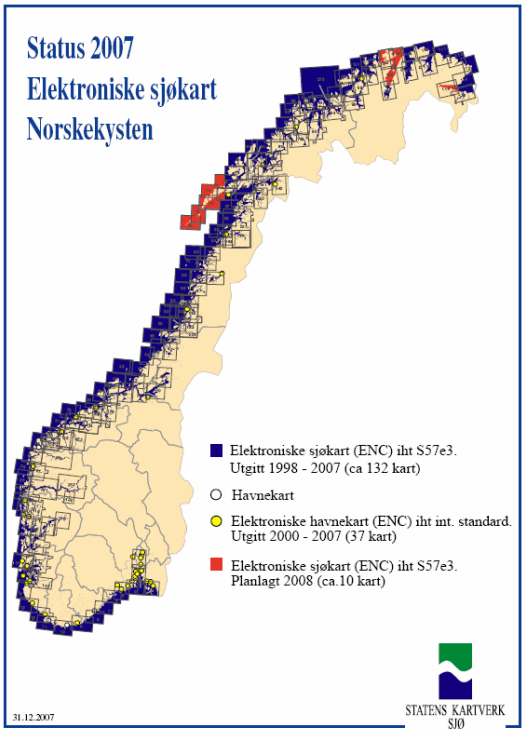


Figure 1

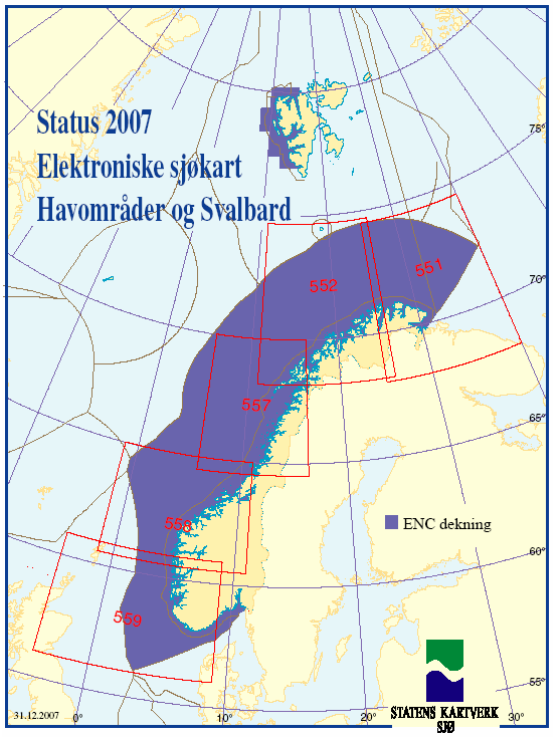


Figure 2

Figure 1: Shows ENC coverage for Norwegian internal coastal waters (ENCs in Approach User Band). Blue colour indicates coverage. Red colour indicates area to be covered in 2008.
Figure 2: Shows ENC coverage in General- and Coastal User Band inside the Norwegian Economic Zone, also including the Svalbard area. (Blue colour indicates ENC coverage).

In 2007 ENCs equal to 33.5 D-cells (30' x 30') in the Approach User Band were produced, mainly covering areas in the northern part of Norway. In addition 9 ENCs covering the west coast of Svalbard, and a few ENCs in the Harbour User Band were published. As reported previously all new ENCs are compiled from source data (Primary Data).

By end of 2007 about 94% of Norwegian internal coastal waters was covered with ENCs. (See figure above).

The total number of Norwegian ENCs released and distributed through Primar is indicated in the table below. (Status as at December 31st 2007.)

Usage Band	*ENC Cells Produced*	*% Total ENC Coverage*
Berthing	3	-
Harbour	112	87% (Approx)
Approach	706	94% (Approx) See note 1
Coastal	22	See note 2

General	50	**100%** See note 3

Notes:
1. Covering Norwegian internal coastal waters
2. Covering areas at Svalbard west coast
3. Covering areas inside the Norwegian Economic Zone from Skagerrak northwards to the border with Russia

Updating via ER profiles were issued in accordance with *Etterretninger for sjøfarende* (Notice to Mariners), and distributed through PRIMAR. New Editions were issued as required.

Planned activities in 2008:
The ENC production for 2008 will be focussed on completing the remaining work in the northern part of Norway, and with the main goal of having full ENC coverage for Norwegian coastal waters about mid 2008. In addition the ENC coverage will be extended on Svalbard west coast from Van Mijenfjorden and southwards to around Sørkapp.
As in previous years, issuing of ER profiles and NE according to *Etterretninger for sjøfarende* (Notice to Mariners) will have priority.

3.3 Paper chart production

In 2007 a total number of 11 new charts in the Main Chart Series were published (see listing below). No harbour charts were published in 2007.
In addition 9 main charts were taken into the digital production line, reconstructed, transformed to WGS 84 datum and published as New Editions.

New charts published 2007:

Chart No.	Title	Scale
	(Main Chart Series)	
20	Sunnhordlandsfjordene	1: 50 000
69	Tranøy – Raftsundet	1: 50 000
76	Stokmarknes – Sortland – Malnes	1: 50 000
78	Hovden – Langenes – Risøysundet	1: 50 000
79	Risøysundet – Kvæfjorden – Harstad	1: 50 000
82	Andfjorden	1: 50 000
85	Ytre Senja	1: 50 000
86	Ytre Kvaløya	1: 50 000
94	Skjervøy – Kvænangen	1: 50 000
96	Altafjorden og Langfjorden	1: 50 000
99	Kvalsbotn – Revsbotn – Burstadsund	1: 50 000

Reconstructions[1] (published as New Editions) 2007:

Chart No.	Title	Scale
37	Tyrhaug – Trondheimsleia	1: 50 000
38	Trondheimsleia, Terningen – Kyrksæterøra – Ørlandet	1: 50 000
39	Trondheimsfjorden, Agdenes – Thamshamn – Buvika	1: 50 000

40	Smøla	1: 50 000
41	Frøya – Gjæsingen	1: 50 000
42	Gjæsingen – Halten	1: 50 000
43	Agdenes – Lauvøya	1: 50 000
44	Lauvøya – Halten – Roan	1: 50 000
130	Trondheimsfjorden, Trondheim – Skogn	1: 50 000

1. Reconstruction: Reconstruct a chart from Primary Data Base

Remarks:
- All charts are referred to WGS 84
- The charts are printed in 4 colours (CMYK)

Revised Reprints published in 2007:
87 charts were revised and reprinted (out of these 47 were updated through the Digital Production Line based on changes in the Primary Data Base). 10 of these charts were printed as New Editions due to insertion of new surveyed areas.

Since establishing of the Digital Production Line in 1996, a total of 128 charts were by end of 2007 produced digitally. This means that about 50% of the paper chart portfolio now is on WGS 84, and subject to maintenance through the NHS Digital Production Line. (Most of the remaining charts are still in ED 50 or Norwegian Datum.)

Reconstruction of charts:
9 Main Series Charts (scale 1: 50 000) were reconstructed, transformed to WGS 84, and implemented into the Digital Production line. The charts were published as New Editions.
Planned activities in 2008:

As for ENCs the paper chart production will be focussed on finishing the New Chart Scheme for the Northern part of Norway. This work is scheduled to be completed during second half of the year. Two new charts in scale 1: 100 000 are scheduled for the Svalbard area.

The work of reconstructing charts on ED 50 or Norwegian Datum to WGS 84, and implement these into the Digital Production Line will be given priority. The objective is to complete this work within a period of five years.

3.4 Technology

The MINTEC-project:
NHS entered in 2005 into an agreement with HydroService (now Jeppesen) regarding development of a new technology for production and maintenance of ENCs and papercharts, based on dKart Office software (the MINTEC project). An effective interface with the Primary Database; in combination with effective tools for maintenance of the products were important pre-conditions for the project.

In October 2007 the new technology was declared operational, as most of the software development then was completed, tested and approved. Some remaining development items will, according to a revised project plan, be completed during the first six months of 2008.
Before full effect of the new technology can be reached the following tasks must be completed:

a) Training of the staff

The basic training in dKart Office software includes a one-week course in dKart Editor and a one-week course in dKart Publisher, followed by on the job training.

b) Transition of ENCs from Intergraph MGE to dKart Office

The transition of ENCs includes no conversion as the dKart Editor software is working on S-57 files. However, in order to create unique identifiers of objects as lights and beacons between ENCs and the Primary Database, all ENCs have to be issued as New Editions. This work will be carried out gradually, and probably not completed before 2009.

c) Conversion of paper charts from Intergraph MGE to dKart Office

Around 120 paper charts produced as design-files in the MGE system must be converted into the *pc.dcf-format* used in dKart Office. This work will be extensive, and due to lack of resources in-house, most of the work will be done by private industry. The work will not be completed until late 2008 or in the beginning of 2009.

Print On Demand (POD):

The NHS in 2007 initiated a project with the objective of establishing a Print on Demand service, and with technical solutions based on the dKart Office technology. Due to delay in the implementation of the dKart Office technology, the progress of the project was less than planned. The project will, however, continue in 2008, with an objective to report on technical- and operational solutions by end of this year, for further consideration and approval.

4. Nautical Publications

Production 2007:

The "Norwegian Pilot", Volume 2A was updated and published.

Production 2008:

The "Norwegian Pilot", Volume 4 was published in January.

5. MSI

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

6. S-55

S-55 was updated online April 7th 2008

7. Capacity building

A meeting in the Southern Africa and Islands Hydrographic Commission (SAIHC) was held in Malawi at the end of August 2007. Norway paid travel and accommodation cost for 8 delegates. We covered all expenses for a representative from INAHINA, Mozambique, attending a training course on oceanographic equipment in Norway.

The Ocean Mapping Group organized in cooperation with NHS a Multibeam Sonar Traning Course in Stavanger in March 2007. Four participants from developing countries were sponsored by NHS

8. Oceanographic activities

Water level system.

NHS needs a good model of Chart Datum relative to the ellipsoid in the open oceans surrounding Norway. We have a contract with the Norwegian Meteorological Institute who will run a tidal model that includes the North Sea, the Norwegian Sea and the Barents Sea. We will get harmonic constants and LAT (relative to the Mean Sea Level) in a 4 km grid. For hydrographic work we use a model of the Mean Sea Level (MSL) relative to the ellipsoid from the Danish National Space Center. The work will start in spring 2008.

The models are not detailed enough to be used inshore and we have started the work to find the MSL in regions between the permanent tide gauges. This work has just started and we will have to use GPS and tide gauges to find the vertical distance between the ellipsoid and the Mean Sea Level. Chart Datum relative to MSL is known from earlier tidal analyses.

9. Other activities

Participation in IHO Commissions and Working Groups

NHS has since the last meeting in Copenhagen actively participated in the following Commissions and working groups:
NSHC, NHC, SAIHC, HCA, CBC, PRIMAR, WEND, CHRIS, TSMAD, S-63, (chairman), S-44 WG, Tidal Working group, CSPCWG and CSMWG.

International

NHS has been engaged in work in Croatia, Mozambique, Angola, Sri Lanka, Madagascar, and actively participated in the work done by the IMO Correspondence Group on ECDIS

Experience of using the ellipsoid as vertical reference for seabed mapping.

NHS now utilizes the ellipsoid as vertical reference
for offshore work. To be able to use this method it is necessary to provide vertical positioning data with high accuracy. For this purpose we use TerraPos, which is a new GPS post processing software package.

To convert seabed data from ellipsoidal heights to mean sea level (MSL) we utilize a mean sea surface (MSS) model. There exist several MSS models, which are based on satellite altimetry data. Up to now we have utilized the KMS04 MSS model, but we will switch to the new DNSC07 MSS model in the near future.

Conversion from MSL to chart datum is done using tidal numerical models to calculate lowest astronomical tide (LAT) at high seas. At high seas chart datum is a distance (LAT) below MSL. We are currently cooperating with the Norwegian Meteorological Service (met.no) to improve LAT estimates for offshore areas. We also plan to use the same technology for near shore areas.

Experiences of using TerraPos positioning system

TerraPos is a new GPS post processing software package developed by the company TerraTec. TerraPos utilizes GNSS published ephemerides and clock corrections together with observations from high quality GNSS-receivers to compute accurate positions.

TerraPos has been in full production for over a year. The experiences with the system are absolutely positive and show a high degree of stability, although some minor issues have been raised – and solved.

The achieved accuracy from the system depends upon several factors: The type of ephemerides used, the GNSS geometry, number of satellites observed and multipath conditions. The accuracy is typically better than 10cm (95%) for the vertical and 6cm for the horizontal.

NHS has developed some programmes to integrate TerraPos into NHS production line, among which is a programme that makes the post processed positions available in the Neptune system. These programmes have been made available to those interested, free of charge.

TerraTec is currently developing a differential solution for the NHS. This solution will make it possible to use post processed GNSS solutions as a reference for a GNSS rover system, improving its accuracy drastically compared to stand-alone. Both solutions will be post processed when ephemeredes are available. This option will be used for surveying of on-shore objects, such as piers, quays etc. where stand-alone TerraPos is less suitable due to the requirement for 2-3 hours continuous observations

New logging software.

SIS, Kongsberg Maritime's logging and control software was finally installed on SKSK's vessel in the summer of 2007. The two Em3000D systems were simultaneously upgraded to Em3002D.
Our main vessel, R/V Hydrograf, was equipped with EM710 in the spring of 2008 and upgraded with the same software.

EM710 mounted on R/V Hydrograf

A new Kongsberg Maritime Em710 (0.5x1.0 degrees) is being mounted on R/V Hydrograf. The installation is finished in mid March 2008, and the first survey will be performed in April. The echo sounder system will mainly be used for MAREANO surveys in the depth range up to 1000 metres, but will also be used in shallower water during the summer survey campaigns to Svalbard.

The transducers are mounted fixed to the hull as shown in the photograph below. This mounting is only temporary, as an elevator mechanism is being produced. To our knowledge, our Em710 system will be the first being mounted on an elevator.

Ocean Mapping Group Multibeam Course
Norway will host the 50th Multibeam Course in Stavanger March 16-21 2009.
Further information will be given when the venue arrangement details are settled.

The NMDB Project (Norwegian bathymetric database)

The Norwegian Hydrographic Service has launched a project to enhance the production line with 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 programme, and the database will be the management system for the official and authoritative depth data in Norwegian waters.

The system 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 will include adapted functionality for the construction and visualization of terrain models with user controlled parameters. Emphasis will be 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 increasingly quality is available.

The data distribution shall be network 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 most important products will be terrain models such as grid and triangular models of various resolutions.

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.

The Dutch company Atlis B.V will deliver the system.

The NHS quality management system

No change since last conference.

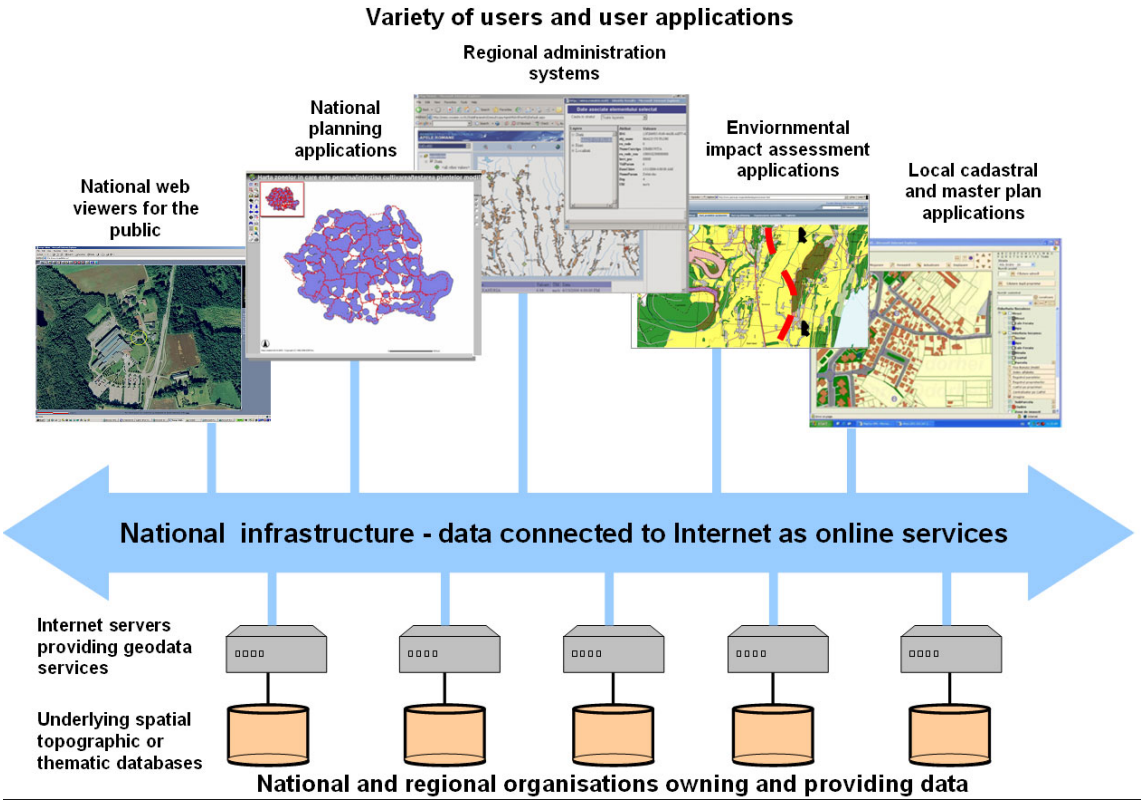
Integrated Maritime Services

The Norwegian Hydrographic Service and the Norwegian Coastal Administration are deeply committed to the development of a common infrastructure for geospatial information that makes the organisations more effective and robust in their contribution to improve safety at sea along the Norwegian coast. This effort is organised through the common project called Integrated Maritime Services.

The concept is based on integrated geospatial services that support daily activities within the fairway management and the Hydrographic services with updated geospatial information needed for effective accomplishment of the two organisations job tasks, products and services. At the same time, several of these daily activities are responsible themselves for keeping their respective geospatial information updated through their own data collection activities. With this approach, the geodata management becomes a common and integrated part of every process and activity that handles geospatial objects or situations related to them.

Norway Digital

It has been a very good progress for the national geospatial infrastructure Norway digital in 2007, with an increasingly support from both local, regional and national organisations. Norway digital now offers the community a broad range of geospatial content through a large number of internet services.



The Norwegian Hydrographic Service offers web map services containing bathymetry for non-navigational use.

The MAREANO Project:
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. A major focus is bridging the knowledge gap in a poorly mapped but very sensitive area. Especially the ocean areas have received little attention and coverage from modern surveys. High quality multibeam bathymetry is regarded as a premise for further geological and biological investigations. The Norwegian Hydrographic Service (NHS) is responsible for bathymetry data acquisition, and effective data management and distribution of survey data and derived products and services. An important facet of the programme will be web-based geodata distribution, and distributed data management as part of a National Spatial Geodata Infrastructure.

The NHS is a programme partner with the Institute of Marine Research (IMR, programme management) and the Geological Survey of Norway (NGU). The phase 1 of the MAREANO programme, runs from 2006-2010, and covers 142 000 km^2 from Lofoten to South Barents Sea with a typical depth around 250-300m. The plans include a total budget exceeding 250 mill. NOK in which an excess of 100 mill NOK is estimated to cover the NHS' responsibility for bathymetry surveying and data management.

In 2007 the MAREANO programme received NOK 32.6 mill in total through earmarked funding to MAREANO through the National budget with a focus in the South Barents Sea. The NHS part was to survey 13600 km^2 in the area of Nordland VI and Troms II, outside of Andøya. By the end of the year 5000 km^2 was finished, but the operation continues in 2008.

Difficult weather- conditions is a major challenge. The results, however, show detailed and high quality EM710 data, providing the ample resolution for the follow up studies by the biologists and geologists.

All the multibeam data in the NHS north of Lofoton has been modelled in grids of various resolutions, and visualized through shaded relief maps. A Web Map Service has been developed, and is included in the map services on the Mareano webpage.

Further information and results will be available on www.mareno.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. A new web portal was published early 2007.

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

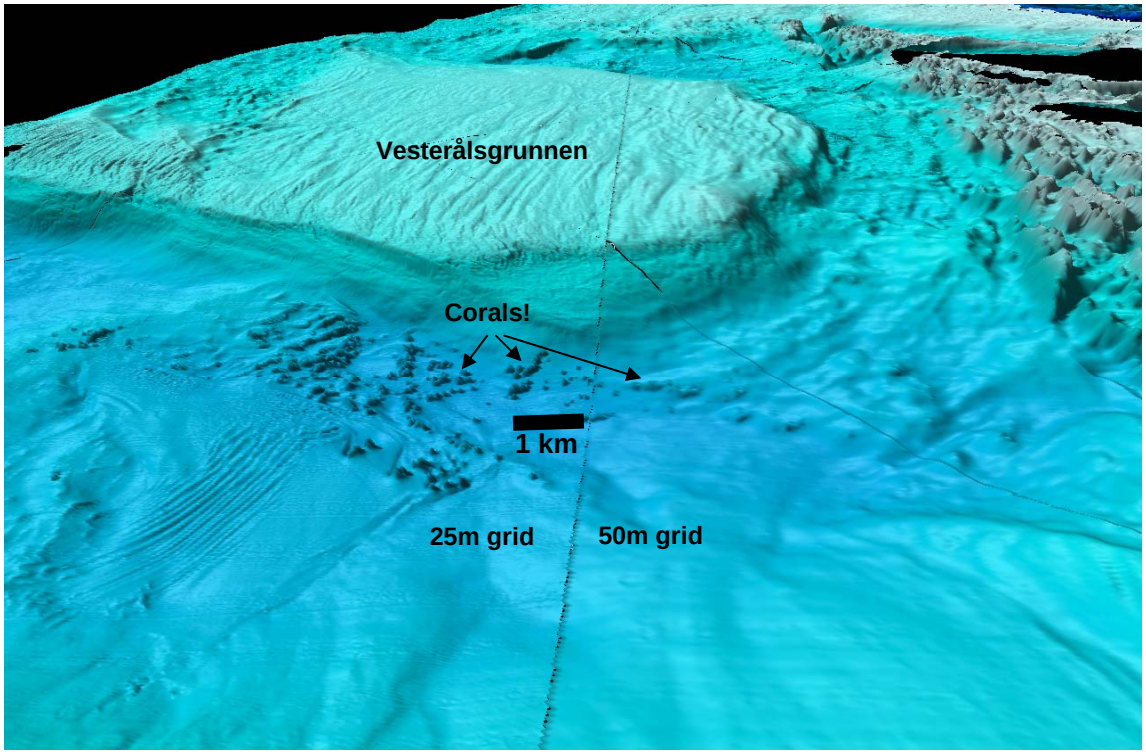


Figure: A screendump from www.mareano.no mapservices showing the extent of the shaded reliefs and grids based on multibeam data.