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|  | <p style="text-align: center;"><b>SAIHC 17<sup>th</sup> Meeting</b><br/> <b>2 – 4 February 2021</b></p> | <p style="text-align: center;"><b>SAIHC</b><br/> <b>National Report</b><br/> <b>NORWAY</b></p> |
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***NATIONAL REPORT  
NORWAY***

**Executive Summery**

This report gives the summary of the activities and events that have taken place within the Norwegian Hydrographic Service (NHS) since the last report given at the SAIHC16 Conference in Cape Town, South Africa in 2019. Some highlights:

- ) Pilot project for digital nautical publications*
- ) New Hydrographic Infrastructure project*
- ) Testing of condensed depth curves*
- ) Pilot project for Marine Base Maps in Norway*
- ) Development of a marine spatial planning tool*
- ) Continued high activity in the Mareano project in both coastal and open sea arctic areas*
- ) Capacity Building projects with Albania and Montenegro*

**1. Hydrographic Office**

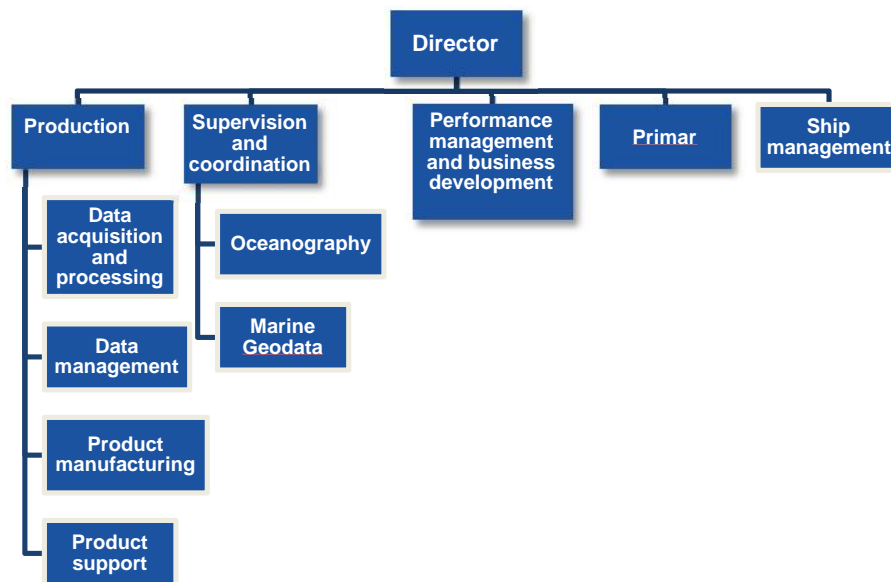
2020 has been yet another eventful and challenging year for the Norwegian Hydrographic Service (NHS), and indeed for the entire Norwegian Mapping Authority, of which we are a part. 2020 started as normal, but in March, Covid affected us in Norway as it did the rest of the world. As of March 13, we went in to a national lock down in Norway. At the NHS we were all sent home, our survey vessel M/S Hydrograf was ordered to port, and the crew sent home. The next few weeks were quite chaotic. Not all of our employees were able to work from home. Some of our production systems were not adapted to working online, and some of the data we handle are subject to restrictions making it illegal to work on them via the internet. Our IT department and some of our software suppliers worked around the clock, and within a matter of weeks our production line was operational again albeit at a slightly reduced rate. A gradual return to the office was planned for August, but due to a flare up in Covid cases after the summer holidays, the return was postponed, and as of October, most of our employees have again been working from home.

A new director-general to The Norwegian Mapping Authority (NMA) was appointed last April. After serving for two terms, our former director-general Mrs. Anne Cathrine Frøstrup retired, and our new director-general Mr. Johnny Welle took over. One of the first activities Mr. Welle has initiated is the formation of a new strategy. All four divisions have been involved in this work, and a team of dedicated and experienced representatives from all parts of the NMA was established to support management in their work. This group has among many things, been tasked with conducting a PESTEL

analysis for the whole organisation. The PESTEL analysis has served as input for the strategy process.

) **Organisational changes**

2020 has also seen some organizational changes in the NHS. The new adjustments have mainly been initiated because of two factors: firstly the positive experiences we have had with the Nautical Charting Authority department has led us to also consolidate the roles managing the requirements related to bathymetric data and marine spatial infrastructure into a new department. In this new department we have located all roles managing requirements and user input to all of NHS’s products and services, and this will further ensure that the NHS focuses its resources where they give the highest benefits to society. It will also take some of the burden off the production line, as they will have clear requirements governing their everyday tasks. Secondly, we are preparing our production for the technological changes that will follow in the wake of the New Hydrographical Infrastructure project (Nautilus). The emergence of new technology will challenge the way we have organized the production line today, and some of these changes will demand a lot from all employees at the NHS. In order to manage the transitions in the best possible way, we will now merge all of our production into one department.



) **Marine Base Maps**

The pilot project is well under way. The project team has been staffed with representatives from the HNS, but also from the Geological Survey of Norway. Mapping, both bathymetrical, geological and biological has during 2020 been completed for two of the three project areas according to plan. The main focus this year, apart from the milestones in the project plan, is the work on a proposal to government for a national marine base map program.

) **UN-GGIM**

In June 2020 a UN report, written by a group of independent experts, was published. The report “White paper on Readily available and Accessible (Open) Marine Geospatial Information” mentions Norway as a best practice example on how to

organize a MSDI as well as a best practice on how to best utilize the content of MSDI in Marine Spatial Planning and resource planning.

) **Digital nautical publication**

The new digital Pilot guide for Norwegian waters was launched in November 2019 by the Minister of local Government and Modernization. The digital Pilot guide has now replaced the former PDF version as the official version of the Norwegian Pilot guide.

) **New Hydrographic Infrastructure**

In an effort to renew our digital production line, the NHS has launched a project named New Hydrographic Infrastructure. For 2020, we have hired a full time project manager, and our ambition for the project is to replace the current production system that was established in the late 1990.

) **Covid economic support package**

As a part of our government's relief plan for Norwegian businesses, the NMA received NOK 12 million earmarked for purchase of services from private industry affected by the national shut down. IN the NHS we used these funds to expand and improve the contents and services in the new Pilot guide for Norwegian waters. In close cooperation with harbors, private survey and consulting industry and NMA regional offices, we have launched harbor-surveying project. Ten different harbors across all of Norway have been selected for this project. Private contractors have surveyed the harbors, both onshore with Lidar and photography, and offshore with multibeam echo sounders. This gives a unique and complete picture of all features relating to harbors that are important to all parties involved in maritime operations. We are planning to make the data available to the public as high definition charts and services.

## **2. Hydrographic Surveys**

### **Internal conducted surveying 2020**

R/V Hydrograf and its two survey launches are working in the coastal waters of Norway and Svalbard. Reports on these activities therefor have little geographical relevance for SAIHC. Worth mentioning, is that the Norwegian Coastal Administration has started a process of identifying recommended routes for the entire coast of Norway. With exception of Northern Norway, all of Norway now has recommended shipping routes. These routes are used internally for our survey and cartography update plans.

### **Marine Base Maps in Norway**

Marine base maps in Norway is all about gathering detailed information and boosting the knowledge of the sea bed and marine coastal systems along Norway's coast. The aim is to provide new business opportunities, stimulating and/or optimising the growth of industries, better public administration and effective coastal zone management. Marine base maps in Norway will (i) map on a large scale the sea beds physical, biological and chemical environments (ii) analyse the data and (iii) distribute a set of standardised products in formats that would cater to the different needs of end users. The marine data collected can be distributed as stand-alone or combined with other datasets to create "Marine Base Maps".

It is a cooperation project with 3 partners; The Norwegian Hydrographic Service (leading the project), Geological Survey of Norway and the Institute of Marine Research. This cooperation will allow for a streamlined process from data collection to distribution. It also has the added advantage of better coordination and management of resources.

We are running a pilot project in three pilot areas along the coast for a 3 year period 2020-2022. The budget for the 3-year pilot is NOK 84 mill. The pilot projects will investigate and test new technology for data collection and processing and, in addition, develop a cost-effective model for the implementation of a Marine base maps in Norway program.

The surveys and data acquisition in two of the pilot areas are completed and the production of the terrain models, geological- and biological services are in production and so is the chemical environmental state services. The final pilot area is in the planning stage and will be surveyed in 2021.

Workshops have been held in three pilot areas with planning staff of municipalities and provinces, government agencies and industry / commercial actors. We have identified and documented planning processes in a way that shows what type of marine geospatial information is needed, what the requirements are (level of detail, quality, update frequency) and what are the requirements for distribution of the data. In addition we aim to identify datasets that can become part of our official national geographical information baselayer (in Norwegian: DOK: det offentlige kartgrunnlaget) containing all official datasets required for planning and building processes in Norway. Once a geospatial information dataset is part of "DOK", it

- ) meets specific ISO-standards,
- ) is INSPIRE compliant
- ) is available in WMS, WFS and WCS, plus has atom feed
- ) can be harvested from our national geoportal "Geonorge"

Parallel with the pilots we are working towards a national program: Marine basemaps in the coastal zone and an investment proposal will be delivered to the Norwegian government in October 2021. A socio-economic analysis and uncertainty analysis is part of the scope as is fundraising from the users as the national program will be co-funded by the users.

### **3. New Charts and updates**

Since 2008, our paper charts are derived from our ENC's.

Our paper chart and ENC for Bouvet Island have not been updated for many years due to a combination of little demand and lack of resources. We shall check if more recent bathymetric data is available that would justify an update.

#### **Print On Demand (POD)**

The complete Norwegian chart portfolio (233 charts) is produced for POD only.

### **4. Nautical Publications**

The Norwegian Pilots Guide «Den norske los» was digitized and more customized for the

professional users in November 2019. The Norwegian pilot guide is available for browsers and tablets as an webapp. The content is based partly on our charts and partly on georeferenced information from external partners and our own survey.

After The Norwegian pilot guide has been in use for a whole year, we can now see that we have an average of about 3000 unique users every month.

By digitizing the Norwegian pilot we had to develop a new national port standard. The standard has been developed and approved and is available in Norwegian and in English.

We also participate to the work with NIPWG for the development of an international port standard and we will update our standard accordingly.

We have digital data from 17 ports in Norway in the database. A registration document has been prepared in Norwegian, so that all ports can register data themselves. An English version is under preparation. We hope this will quickly make it easier for the ports to enter data themselves and that during 2021 we will have many more ports with digital data.

Drawing rules have been made and new symbols are being prepared.

Efforts are being made to get more ports to register the data themselves. The data will be displayed in the Norwegian pilot guide, but can also be downloaded as a dataset in our national geoportal, geonorge.

By compiling the data into a common map database based on port information, we will have all the information in one place, which means that all information is correct and continuously updated.

All data will be available for download via APIs. It is a goal of NHO that all data can be used on different devices in the future.

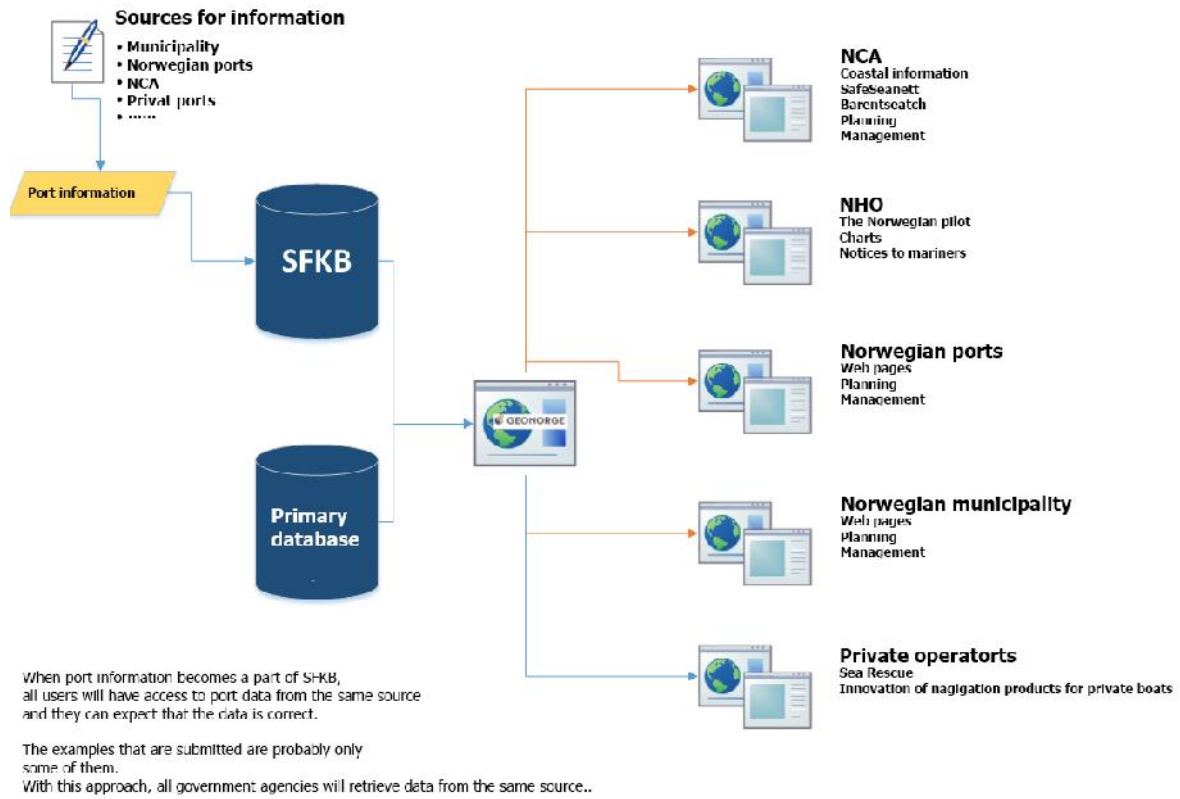


Figure 5: Data model for maritime information

This will make sure that we always have the correct data, everyone knows where the data exists and it will be easier to keep the data up to date and to share on different devices.

We did a test on data from FKB (the Norwegian common map database) without port information, versus a common map database including port information, they looked like this:



Figure 6. Illustration without port information from common map database. Like it is today.

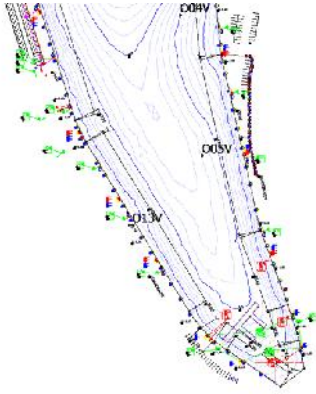


Figure 7. Data from Stavanger port



Figure 8. When we got the data into the common map database.

## 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 2020.

## 7. Capacity building

Norway chaired the annual meeting of the IHO Capacity Building Sub-Committee in May 2020. 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 lasted until end of 2017. The main goals were related to building competence, survey, and ENC production capacity. Two student have finalized a Cat B course (one at Skilltrade and one at the Italian HO) and one has participated in surveying at NHS. One student has finalized a Cat A course at the university of Genoa. A Data management and Chart Production system have been acquired and are operational. Relevant training has been delivered. A MBES with motion

sensor has been acquired and installed on a survey launch that is provided to the project. The survey launch is in operation.

To ensure long term results, Norway has decided to stay committed to Albania for an additional four years (2018 – 2021) with follow-up support.

## **8. Oceanographic activities**

The tide gauge network in Norway consist of 24 gauges including one in Ny-Ålesund at Spitsbergen. We do short-term water level measurements at locations between the permanent gauges. These are used to construct the tidal zones used to provide water level data and information for most places along the Norwegian coast. Professional users can download data from an API directly. Our website *Se havnivå* provides tide tables, observed water level and water level forecast for 5 days (from a model run by the Norwegian Meteorological Institute). We also present figures showing different tide levels, land levelling datum and return periods (up to 1000 years). The information in the figures are very important in coastal planning. The official Norwegian tide tables are now only available as a Pdf-file that can be downloaded from the website.

In most Norwegian tide gauges floats are used in stilling wells. The draft of the float depends on the water level. This dependency was studied, and is now corrected for in real time. The correction was implemented in 2019. A technical specification for water level measurements was also implemented. We have currently started an initiative to look into new techniques for permanent monitoring of water level. This is done with an aim to increase the number of permanent tide gauges in the Norwegian network.

A project with our Geodetic institute to find a method for determining a common reference frame between sea and land so that Chart Datum (CD) and land levelling datum can be coupled is now finished. The last phase of the project was focusing on finding the mean dynamic topography (MDT) and the dynamic topography (DT) in the longest fjord in Norway, Sognefjorden. Sognefjorden is 200 km long and we measured water level at 20 sites. Long series (one year) provided us with information on seasonal effects. Other important data was GNSS measurements, existing gravity measurements and levelling to connect the tide gauges to the land levelling network. In collaboration with the Norwegian Meteorological Institute we also had a look at hydrodynamic modelling in this project. Comparison of the results from the project with satellite altimetry was done to see if altimetry could be used inshore. One important goal was to find a method that could be used along the Norwegian coast in a cost effective way. The project was ended in December 2019, and the results from the project will be published in a report, which is expected to become available soon. We have now started the process of making a first version of ellipsoid based reference levels covering the entire Norwegian coast and sea areas.

We have delegates in the IHO-working groups "North Sea Hydrographic Commission Tidal Working Group (NSHC-TWG)", "Tides, Water Level and Current Working Group



(TWCWG)" and an observer in "Baltic Sea Hydrographic Commission - Chart Datum Working Group" (BSHC CDWG). In addition we participate in the GLOSS Group of Experts and the EuroGOOS Tide gauge task team.

## 9. Spatial Data Infrastructures

### 9.1. Marine Spatial Data Infrastructure

MSDI is an integrated component of the [national SDI in Norway](#). The cooperation [Norway digital](#) counts for more than 600 organizations, where over 50% are involved in coastal and/or offshore activities. NHS is a key player in the development of relevant collaboration arenas between data owners, service providers and end-users to improve the user-value of marine and maritime geospatial services to society.

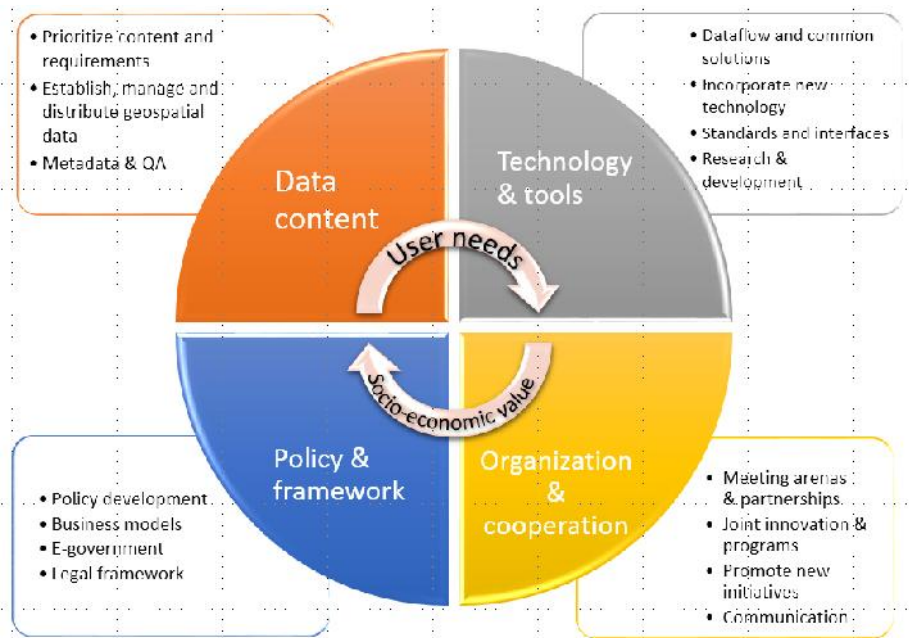


Fig. 6 Norwegian SDI approach

[Geonorge](#) is the national website for geospatial information in Norway. One of the core services offered is the [Geonorge Map Catalogue Service](#) where the users can search for, discover, and access geospatial data and services offered by public authorities in Norway.

A national governmental geospatial strategy worked out in 2017 has the ambition to improve the value of geospatial information and its usefulness to society in Norway. The main goals for this strategy is to:

- )] Establish a national platform of knowledge through geospatial information, in accordance to the user-priorities
- )] Incorporate technological tools and interoperability to increase efficiency and improve innovation
- )] Improve and further develop cross-sectorial cooperation and collaboration arenas

- J) Adapt policies and framework conditions to meet the challenges within geospatial infrastructure, e-governmental services and the digital society in general

The national geospatial strategy is underpinned by a national action plan containing major priorities ahead.

## 9.2. Marine Spatial Planning

NHS is participating in the development of the Marine Spatial Management Tool (MSMT) for MSP in Norway. The MSMT project “Arealverktøyprosjektet” is a national cross-sectoral cooperation, developing and assembling standardized and harmonized geospatial services to underpin the MSP processes with integrated, multi-thematic geospatial information relevant for the marine management plans for the Norwegian sea-areas.

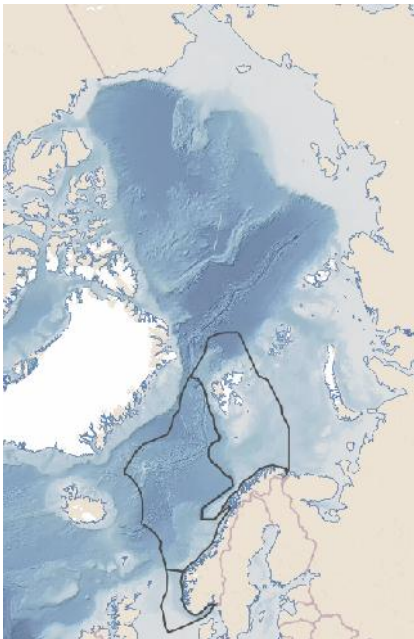


Fig. 7. Norwegian management plans for the Barents Sea, Norwegian Sea, and the North Sea & Skagerrak, representing an area of 2.3 mill. km<sup>2</sup>.

Although Norway has been working with MSP and produced [integrated management plans for Norwegian sea-areas](#) during the last 13 years, there has been a lack of proper SDI support. One of the objectives is to ensure proper interoperability between the MSMT and the national SDI in a way that will release expected synergistic effects like re-use of data and services, improved data flows and user-processes, richer data content, etc. A new [version of the MSMT](#) was released in November 2018. The development continues during 2019 to further improve usability of marine data and geospatial services for MSP in Norway.

The MSMT represent a major step forward in the process of integrating the marine component in the Norwegian SDI. So far, 11 governmental agencies have developed and are sharing their authoritative data through their geospatial services, harmonized and integrated through the Marine Spatial Management Tool.

## 9.3. Marine Base Maps in Norway

Marine base maps in Norway is all about gathering detailed information and boosting the knowledge of the sea bed and marine coastal systems along Norway’s coast. The aim is to provide new business opportunities, stimulating and/or optimising the growth of industries, better public administration and effective coastal zone management. Marine base maps in Norway will (i) map on a large scale the sea beds physical, biological and chemical environments (ii) analyse the data and (iii) distribute a set of standardised products in formats that would cater to the different needs of end users. The marine data collected can be distributed as stand-alone or combined with other datasets to create “Marine Base Maps”. It is a cooperation project with 3 partners; The Norwegian Hydrographic Service (leading the project), Geological Survey of Norway and the Institute of Marine Research. This cooperation will allow for a streamlined process from data collection to distribution. It also has the added advantage of better coordination and management of resources.

We are currently running a pre-project in three pilot areas along the coast. The pilot projects will investigate and test new technology for data collection and processing and, in addition, develop a cost-effective model for the implementation of a Marine base maps in Norway program.

Workshops have been held in three pilot areas with planning staff of municipalities and provinces, government agencies and industry / commercial actors. We have identified and documented planning processes in a way that shows what type of marine geospatial information is needed, what the requirements are (level of detail, quality, update frequency) and what are the requirements for distribution of the data. In addition we aim to identify datasets that can become part of our official national geographical information baselayer (in Norwegian: DOK: det offentlige kartgrunnlaget) containing all official datasets required for planning and building processes in Norway. Once a geospatial information dataset is part of “DOK”, it

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## **10. Innovation**

### **New Hydrographic Infrastructure**

NHS needs to renew its management, storage and production system for bathymetric and geo data in order to:

- ) more effectively serve existing and future users
- ) support new data formats, standards and products
- ) meet future requirements for automation, quality and lead time

NHS have therefore established a project “Nautilus” with the aim and goal to renew our Hydrographic management systems/solution.

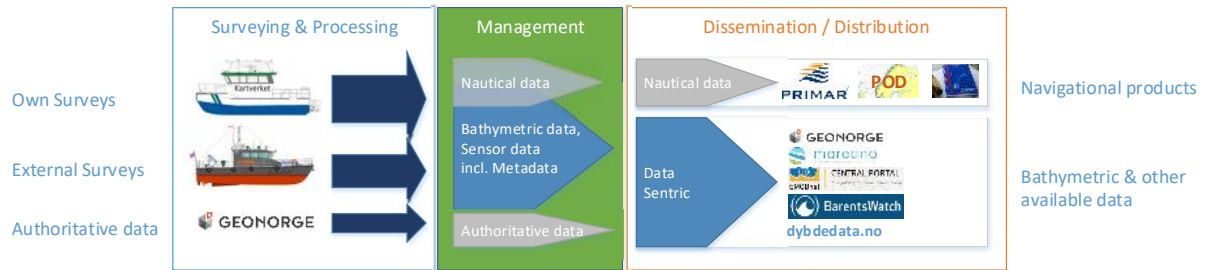
Norwegian governmental strategies set clear expectations to the solution and how to achieve an effective dissemination of different geodata and, at the same time, answer to user needs and grow their values.

Expected changes to the data classification act is understood to allow and define production and dissemination of new high-resolution geodata for the public, which also set requirements to the need for a greater degree of automation. NHS’s nautical product users expect navigation-critical data to be released faster and more efficiently. International commitments along with the need to support new nautical standards will also come in effect in the coming years.

Current requirements and processes for management and production system for bathymetric data are largely based on and defined by nautical production and products. This will change to a more data and product generic solution, not in any way relieving the importance of nautical products, but to better and more efficiently support new and future data users, requirements and use.

The new system is expected to be an integrated and complete management solution supporting effective preparation and dissemination of a broad range of geodata, including

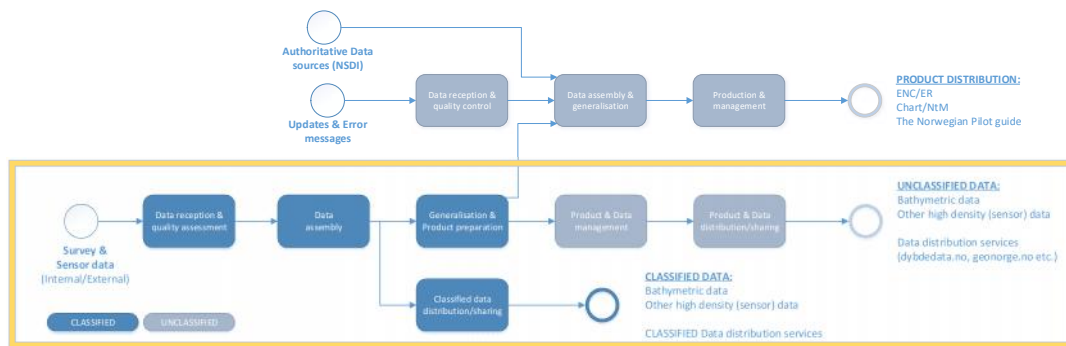
also bathymetric and derived bathymetric products. The solution must still ensure an effective production of authorized nautical products.



The new solution will be based on a modern technological platform that supports:

- ) integrated data management
- ) an efficient and integrated nautical production
- ) different digitization and data sharing solutions
- ) fast data access and effective bathymetric production (short processing time / increased automation)
- ) management of complete and original data (no or minimum generalization required)
- ) integrated product and data sharing solutions (machine-to-machine, APIs, etc.).

NHS has identified the following processes that will be supported in the new solution, whereas processes within the yellow frame are given priority within NHI program:



The Nautilus project is planned to take up to 5 years to complete, and will include organizational as well as technological changes.

## 11. Other activities

### International activities

The NHS is involved in several Working Groups, Committees and Commissions related to IHO. Norway has representatives in the following Sub-Committees and Working Groups: IHO Council, CBSC (Chair), S-100, DQ, ENC, NC, NIP, TWC, IEN, MSDI, CSB, GEBCO Guiding Committee (Chair) and WEND. We have participated in the HSSC and the IRCC

meetings as well as the IHO Council in 2020. Norway is actively participating in 5 Hydrographic Commissions: ARHC, HCA, NHC, NSHC and SAIHC.

The NHS is a member of the UN-GGIM Working Group on Marine Geospatial Information, and actively contributes to the Seabed 2030 project.

A model with grid size of 50x50 meter, based on all available survey data from Norwegian sea and coastal areas, has been developed. The information is made available to EMODnet.

NHS is a major contributor to EMODNET.

As operator of Primar we participate in all related meetings.