Danish Geodata Agency

NHC
National Report of Denmark

April 2021

Executive summary

This report gives a summary of the main activities within the Danish Hydrographic Office since the last report given at the NHC Extra Ordinary Online Meeting (April 3rd 2020).

1. Hydrographic Office

The Danish Geodata Agency (DGA) is part of the Danish Ministry of Climate, Energy and Utilities. The Ministry consists of the Department, the Geological Survey of Denmark and Greenland, the Danish Meteorological Institute, the Danish Energy Agency, the Danish Geodata Agency, the Danish Energy Regulatory Authority, Energinet.dk and the Agency for Data Supply and Efficiency.

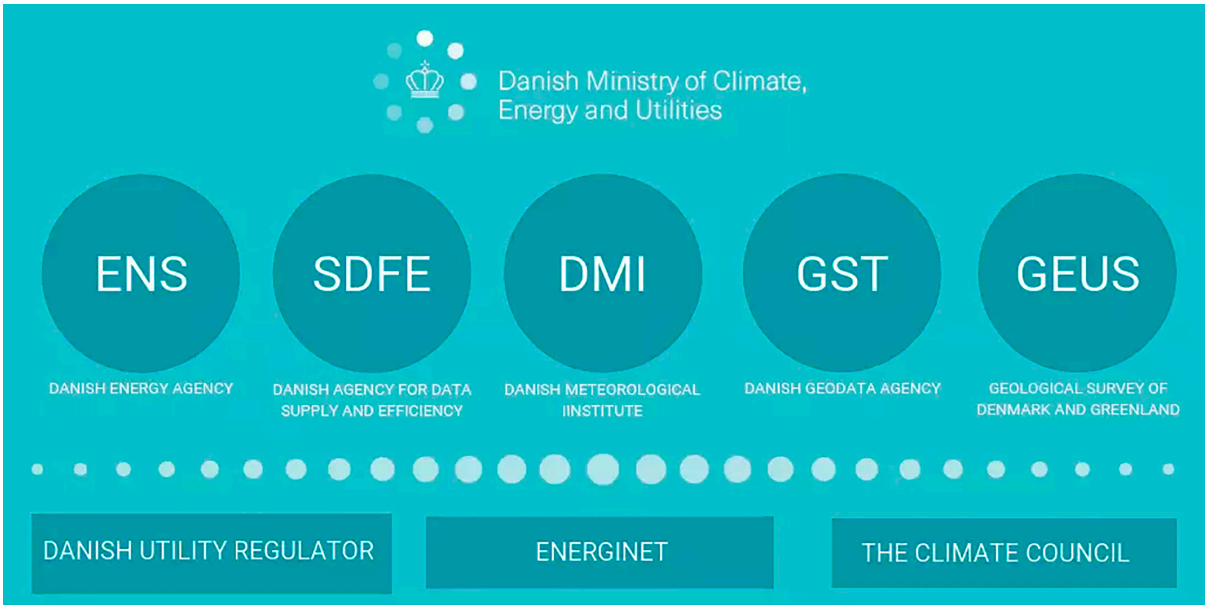

Figure 1. Ministerial institutions.

DGA in its role as a hydrographic office has responsibility for hydrographic surveys and charting in Denmark and Greenland. It is responsible for the production of nautical charts of the waters surrounding Denmark and Greenland, just as the DGA is responsible for the Danish MSDI and represents Denmark internationally within the marine geodata field (MSDI). DGA is responsible for charting, and issuing Chart Corrections and related nautical publications such as INT 1 and pilots (sailing directions) and for technical support to delimitation of the Danish maritime boundaries.
The practical work of hydrographic surveys is done with personnel and ships from the Royal Danish Navy (Danish Hydrographic service). Survey personnel from the Navy are part of the organization of DGA.
The Danish Geodata Agency works closely together with the Danish Maritime Authority, which is responsible for issuing of Notices to Mariners and List of Lights. Tide tables and operational tide gauges are the responsibility of Danish Meteorological Institute.

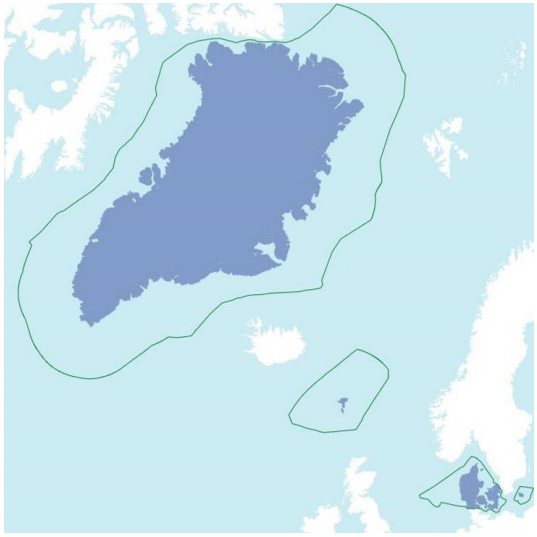

Figure 2. Greenland, Faroe Islands and Denmark.

Due to Covid 19, almost the entire Denmark was shut down in the spring 2020. This also included employees in DGA where the daily work had to take place from home. Quite shortly after the closure of public workplaces, DGA's employees were working online from home, and most of the work could continue as before. DGA has given the employees the possibility to establish more permanent workplaces at home including furniture
and IT equipment and support. Generally, the work efficiency has been increasing on operational tasks and the employee's sickness rate has gone down, whereas strategic development has been challenged and taken longer than planned.

In 2020, a new organization was established in the Danish Hydrographic Offices reflecting the existing demands, the implementation of a new production system covering both Greenland and Denmark and the expectation for future development. The two existing Hydrographic Departments, covering Greenland and Denmark and Faroe Islands respectively, were merged to one Hydrographic Department, with the new name Danish Hydrographic Office having Elizabeth Hagemann and Niels Tvilling Larsen as the two heads of department. The Director General of the Danish Geodata Agency, Pia Dahl Højgaard, is National Hydrographer.

Nine new functions have been established with the following areas of responsibilities;
- Hydrographic Surveyors (HS)
- Hydro (Hydro)
- Data management and data deliverables (DML)
- System, Application and Support (SAS)
- Case Handling and Updating (SOP)
- Nautical Chart Production (SØP)
- Standards and Quality Control (SQC)
- Strategic Production Development (SPU)
- Policy, Utilisation and Business Development (PAF)

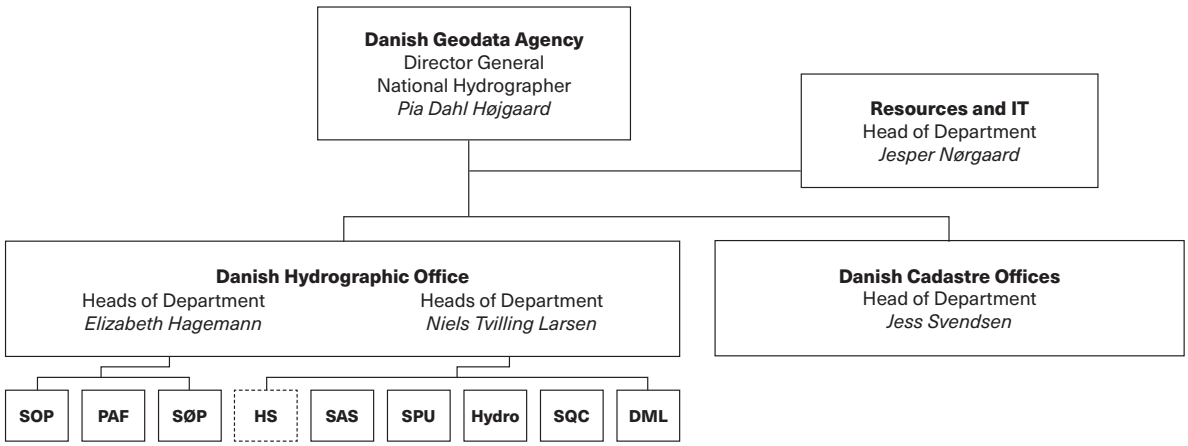

Figure. 3: New organization in the Danish Hydrographic Offices.

January 2020, the Faroese Government took over the responsibility for surveying and mapping the waters around the Faroe Islands. A cooperation agreement between Umhvørvisstovan and DGA has been signed in order to ensure the safety of navigation and the ongoing development of competences in Umhvørvisstovan. According to the cooperation agreement, Umhvørvisstovan will gradually take over the operational responsibility for the different hydrographic areas during 2021.

In the future, on behalf of the Kingdom of Denmark, DGA will still have the responsibility for areas related to foreign, security and defense policy for the Faroese waters. These are e.g. visualization of limits and boundaries in nautical charts, INT charts, nautical charting for the Defense, negotiations in international forums etc. and representing the Kingdom of Denmark in IHO and IHO related workgroups.

2. Surveys

2.1 Overall status and surveys 2020

The Survey Directive for the Danish waters reflects the decisions taken at the HELCOM Ministerial Council meetings in Copenhagen in September 2001 and October 2013 on the re-survey of the main navigation routes and other areas of interest for shipping in the Baltic Sea and inland Danish waters. The survey season in Denmark was delayed for three months due to Covid-19 lock down. Surveying was carried out in Danish waters during the period June to November. This resulted in a somewhat less result than planned. The target was to survey a total of 22.000 Km surveyed line in Danish waters. The result was 17.000 Km.

The Survey Directive for Greenland is based on the overall priorities of surveying areas in Greenland, which have been agreed with the Government of Greenland.

The overall priorities for surveying in Greenland in 2020 are as follows:

Priority 1.
The inland routes between the cities of Greenland's west coast from Nunap Isua (Cape Farewell) to Upernavik.

Priority 2.
Survey of sailing routes in coastal areas on the west coast of Greenland, where the general water depth is less than 200 meters and the basis of survey is insufficient. Examples of priority 2 may be coastal areas where inshore sailing is not possible, due to ice conditions and geography and surveys are of older date or completely missing.

Priority 3.
Surveying areas of particular interest for business and tourism development. Examples of priority 3 areas may be: Selected fjords with frequent visits of cruise ships and areas of impending mining where increased sailing with larger ships is expected.
The target for surveying in Greenland in 2020 was 6.500 km surveyed line. The result was 8.275 km even though the survey period was limited to two months due to Covid-19 restrictions.

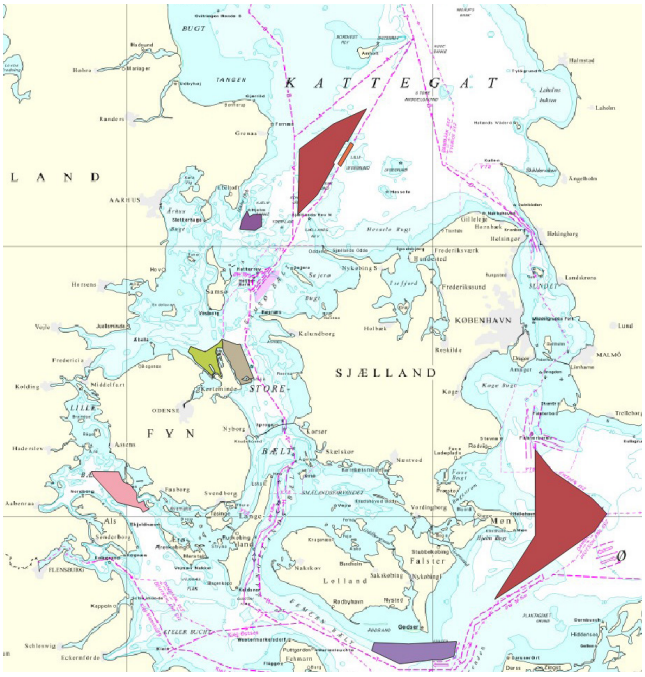

Figure 4: Planned surveys in Danish waters 2020 and 2021.

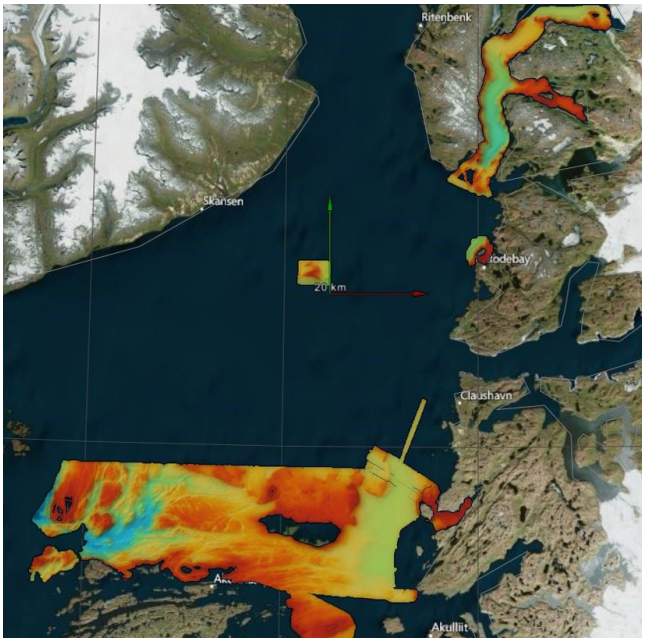

Figure 5: Surveys in Greenland.

2.2 Survey Vessels

The Danish naval survey fleet has moved from Copenhagen to the city of Frederikshavn in late 2020.
In connection to the new base port, a calibration target has been established on the seafloor next to the base. The calibration target in Copenhagen remains operational.

The ships used in Denmark:
I / F Jens Sørensen
(Danish Maritime Authority)
The surveying vessel FYRHOLM
(Danish Navy)
The surveying vessel BIRKHOLM
(Danish navy)
The survey boats SOM-1 and SOM-2
(Danish Navy)

Surveys were carried out in Greenland waters in June and July, with:
LAUGE KOCH Arctic patrol vessel
(Danish Navy)
The survey boat SAR-3
(Danish Navy)

Figure 6 New calibration target near Frederikshavn before placing on the sea floor.

Figure 7: POUL LØWENØRN was fitted with two new cabins, a larger mess and was built 5 meters longer.

2.3 Depth Database

DGA completed the implementation of DYBDB, a new depth data management system, in early 2020. During the year the following activities have been carried out in relation to the new system;
Migration of the existing depth data corresponding to the Danish territory. The task resulted in a much higher resource use than expected. Currently 84% of the Danish data volume is now in the new system. Data migration activity is planned to continue during 2021.
Further development of the automation tools and data model in order to optimize the system performance.

DGA expects the new system will increase flexibility in handling a diversity of depth data formats, as well as support the optimized delivery of depth data and depth data models.

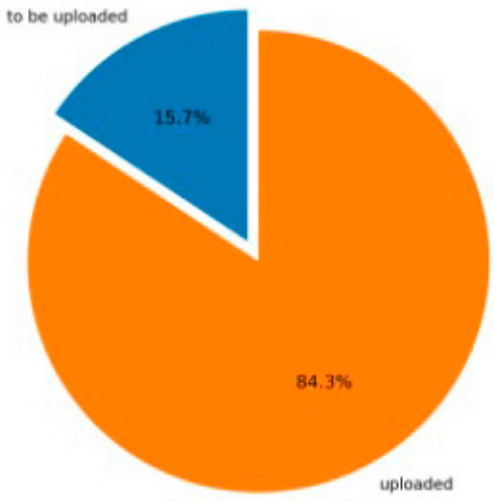

Figure 8: DYBDB migration. Overview of megabytes of uploaded data, DK.

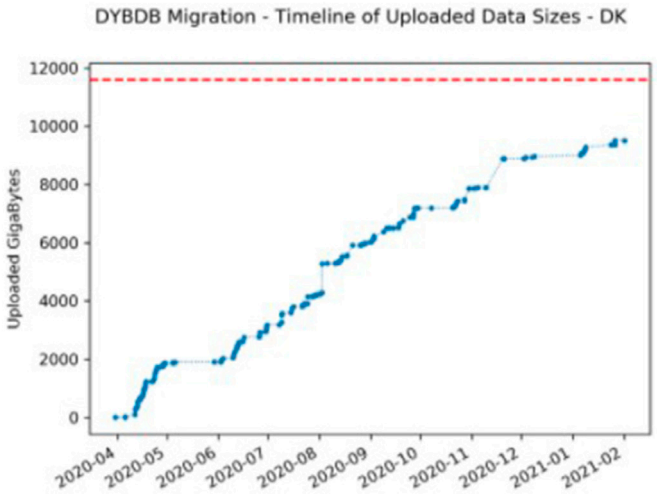

Figure 9: DYBDB migration. Timeline of uploaded data sizes, DK.

2.4 New Technology

Crowd Source Bathymetry (CSB)
In collaboration with Canadian Hydrographic Service DGA published a white paper describing our vision for the acquisition of Trusted Crowd-Sourced Bathymetry data. https://eng.gst.dk/media/2921056/trusted-crowd-sourced-bathymetry-from-the-trusted-crowd-to-the-chart20200621.pdf. The white paper was presented to the IHO-CSBWG.

DGA will continue the efforts to implement a pilot project for the collection of Trusted Crowd-Sourced Bathymetry data in 2021 following the principles described in the white paper.

Satellite Derived Bathymetry (SDB)
The satellite technology and remote sensing are expected to become more prevalent in the future and SDB is a technique that has gained a lot of attention in the recent years. It is a method that uses multispectral sensors and from the images taken by the satellite one can derive parameters like water depths and sea bed characteristics. The method has a large coverage and is very cost-effective, but it is also more limited in the depths achieved and object detection.

In 2019, DGA acquired SDB data for three different areas in Greenland from different providers in order to assess the performance, depths achieved and uncertainties of SDB in the Arctic. The project is now finalized and the intension is in 2021 to evaluate how the results can create value for DGA.

The plan for 2021 is to buy new high-resolution satellite images and SDB for two new areas on the South and West Coast of Greenland. The purpose is to evaluate if the new high-resolution satellite images and SDB can provide value for optimizing the planning and safety of surveying in the area.

2.5 The role as depth manager

In 2019, DGA had the goal to establish the framework for strengthen its role as Denmark's depth data manager going forward with the aim of conducting an efficient and value-creating depth data collection, processing and distribution. DGA has prepared preliminary analysis for Denmark's depth data management, including vision and preliminary objectives. As an essential prerequisite for creating value with depth data, GST has established a depth database based on CARIS software (see section "Depth Database").

2.6 Implementation of S-44

The new edition of S-44 will be implement in this year's surveys in Danish waters. It is expected that the surveys will be able to fulfill "exclusive order" where necessary.

Due to more complicated tidal systems and lack of knowledge to LAT levels, surveys are not expected to reach "Exclusive order" in Greenland.

3. New charts and updates

3.1 New ENC and Paper Charts

All the produced ENCs and updates are distributed through IC-ENC authorized distributers. In 2020 all charts (paper as well as ENCs covering the Danish, Faroese, and Greenlandic waters) were produced and updated by DGA:

Denmark

The portfolio consists of 69 of Danish Paper Charts.
27 new Editions of Paper Charts were published in 2020.
The portfolio consist of 288 Danish ENCs.
208 New Editions (EN) and 581 updates (ER) were published in 2020.

Usage Band	Number of Danish ENCs
1 Overview	1
2 General	9
3 Coastal	6
4 Approach	18
5 Harbour	254

Faroe Islands

The portfolio consists of 8 Faroese Paper Charts.
No new editions were published in 2020.
The portfolio consists of 21 Faroese ENCs.
14 New Editions (EN) and 28 Updates (ER) were published in 2020.

Usage Band	Number of Faroese ENCs
1 Overview	0
2 General	1
3 Coastal	3
4 Approach	16
5 Harbour	1

Greenland

The portfolio consists of 103 Greenlandic Paper Charts
6 New Editions of Paper Charts were published in 2020.
The portfolio consists of 108 Greenlandic ENCs.
96 New Editions (EN) and 22 updates (ER) were produced in 2020.

Usage Band	Number of Greenlandic ENCs
1 Overview	5
2 General	0
3 Coastal	36
4 Approach	41
5 Harbour	26

3.1.1 ENCs with limited content

Four ENCs with limited content have been released in Prins Christiansund in Greenland in the beginning of 2021.

Following a successful pilot (ENC Simple) in 2018/2019, the DGA is adopting a new strategy in Greenland to release best quality data, necessary for safe navigation in official ENCs.

The aim of the ENCs with limited content is to increase ENC coverage of Greenland and to provide a digital foundation for new modern paper charts. These cells include accurate multibeam depth data, a new georeferenced coastline and navigational aids such as lights and beacons. Obstructions and dangers in the multibeam areas, such as cables and pipelines are captured. In areas outside of the multibeam, the mariner will need to use existing paper charts.

ENCs with limited content are made in areas where there is no existing ENC coverage and the additional data will be added in over time to bring the cells up to full capture content. The cells are available through the usual distribution channels and should be used as any other official ENC.

For further information, please refer to the press release:
https://eng.gst.dk/about-us/news-archive/2021/more-electronic-nautical-charts-for-greenland-are-on-the-way/

3.2 Distributions and sale

The Danish Geodata Agency has finished implementing a new licensing agreement aimed towards licensees that create derived products primarily for the leisure craft market. The new agreement has a single fee royalty sum per product sold, and as such deviates from earlier models with percentage based royalty models and area calculations. Other changes include new data protection provisions as well as a requirement for licensees to annually send an ISAE-3000 (High Assurance) report created by an accredited auditor.

The following figures show the paper chart and ENC sales in 2019 and 2020.

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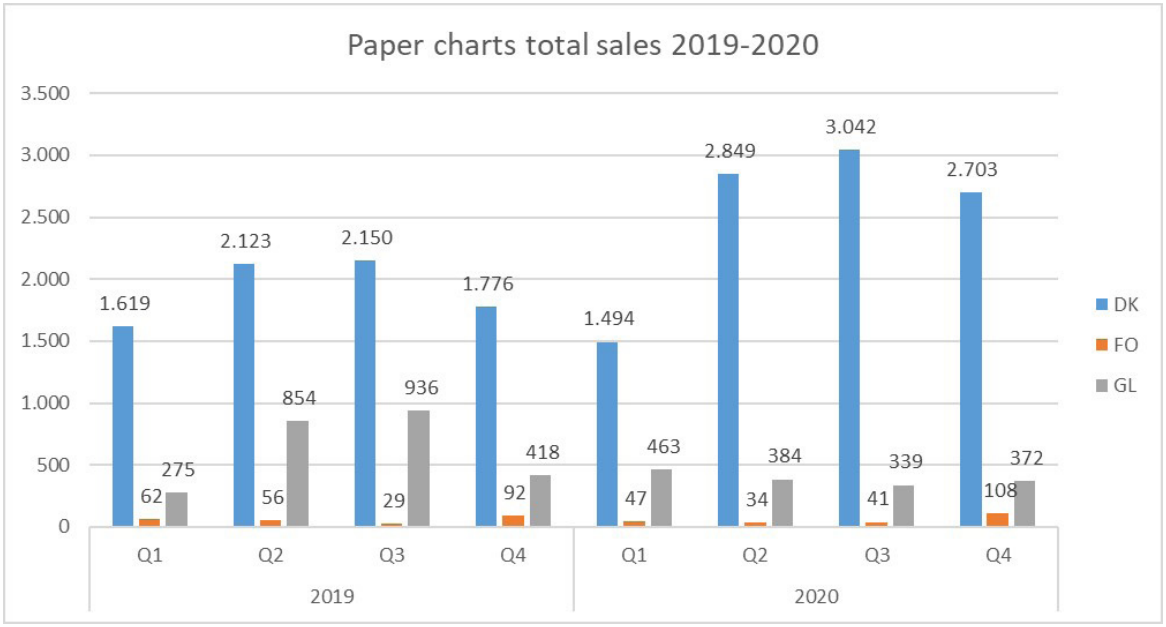

Figure 10: Paper charts total sales 2019-2020.

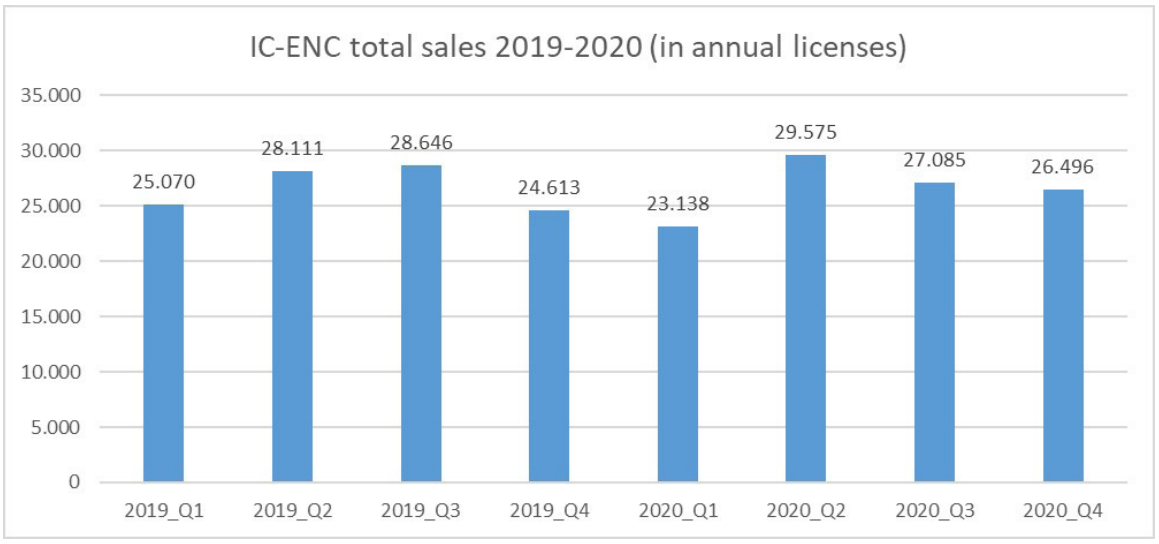

Figure 11: IC-ENC total sales 2019 – 2020 (in annual licenses).

3.3 Nautical Chart Production System - NCPS

Denmark is implementing a new Nautical Chart Production System (NCPS) based on Esri's ArcGIS for Maritime. The project has been delayed, mainly due to a need for more extensive testing and to performance issues that caused the Test of Delivery to be delayed.

The implementation is successful, and the system will be taken into production beginning of April 2021. All staff will have been trained in the new system by mid-May, 2021. When the NCPS is implemented, DGA will have one common, database-based production system for both the Greenlandic and the Danish productions. To guide the users, and to ensure consistency in editing and quality control, workflows have been designed and configured for all the main production tasks.

3.4 New Shipping Routes in Danish and Swedish waters

In 2020 the DGA published 10 paper chart new editions together with a new paper chart (No. 121). All of the paper charts covering the Skagerrak, Kattegat and the northern part of the Sound are thus replaced with paper chart new editions and the new chart. The paper chart new editions and the new paper chart allows shipping industry to deal with the major changes brought about by the routeing system. Including the changes to the navigational aids.

In addition to details of the new routing measures, new paper chart 121 also provides improved scale coverage of Skagen and Ålbæk Bay, where deep draft vessels carry out ship-to-ship transfer operations of cargoes such as oil, liquid gas and other bulk goods.
New chart notes detailing the minimum depth and maximum draughts of the recommended and deep-water routes have been included on these new publications.

Details about the new editions of paper charts and the new chart can be found in Danish Chart Corrections Corrections No. 13, 2020, which was released on April 3rd 2020.

DGA released new editions of the electronic charts (ENC), which presents the new routeing system and the changes to navigational aids. Notes on minimum depth and maximum draughts for the recommended routes and deep water routes are available in the new versions of ENC. They are associated with the individual route elements and can be called up using the function Pick Report.

DGA also released general information about the new shipping routes and updated charts on the DGA website: https://eng.gst.dk/danish-hydrographic-office/nautical-charts/new-shipping-routes-and-updated-charts/

3.5 S-100 Implementation

DGA has established a team to develop the S-100 Implementation Plan over the course of 2021.
This plan will form two parts, an internal and external timeline that fits with DGA's overall strategy.

The internal plan will focus on the products DGA will produce and how DGA will transition to dual production of S-57 and S-100 data. The external plan will focus on co-ordination with the relevant Danish authorities on distribution and interoperability of S-100 products, and with our neighbouring authorities.

4. New publications & updates

4.1. New publications

No new publications

4.2. Updated publications

The Danish Notices to Mariners (EfS) are available on the website of The Danish Maritime Authority:
https://www.dma.dk/SikkerhedTilSoes/Sejladsinformation/Advarsler/Sider/default.aspx
The Danish Meteorological Institute updates the tides tables:
https://www.dmi.dk/hav-og-is/temaforside-tidevand/tidevandstabeller-for-danmark/
(only in Danish)
The Danish Geodata Agency publishes a number of publications, which can be found at the DGA website:
https://gst.dk/soekort/nautiske-publikationer/

Figure: 12. Different Greenlandic pilots.

Publication	Formats			Available in English
	Paper	PDF	Digital	
Denmark				
Denmark Harbour Pilot			X	No
Denmark Pilot - General informations		X		No
Denmark Pilot II	X			No
Greenland				
Greenland Harbour Pilot			X	Yes
Greenland Pilot – General Information about Greenland		X		Yes
Greenland Pilot - Sailing Directions for East Greenland		X		Yes
Greenland Pilot - Sailing Directions for West Greenland		X		Yes
Greenland Pilot - Explanations of the place names		X		Yes
Faroe Islands				
Faroe Islands Pilot	X			No
Faroe Islands Pilot – Appendix 3		X		No
Harbour information for Faroe Islands	X			No
Other				
Kort 1 · INT 1	X	X		Yes
Behind the Nautical Chart		X		Yes
Danish Chart Corrections		X		Yes
Product Catalog	X	X		No
Mariners' Routing Guide Baltic Sea			X	Yes
Navigation.gl			X	Yes

5. MSI

NAV Warnings are available in English on the following web page:

Navigational warnings Denmark:
https://www.dma.dk/SikkerhedTilSoes/Sejladsinformation/Advarsler/Sider/default.aspx

6. C-55

C-55 was updated March 2021.

7. Capacity building

Denmark has not been active in the area of capacity building during the period.

8. Oceanographic activities

8.1 Water levels
The Danish Meteorological Institute (DMI) and other governmental bodies maintain a network of water level stations located across Denmark. The collected data are used in several ways: e.g. for safety of navigation, but they also represent an integral part of the national storm surge monitoring and prediction system. Newly collected data are transferred from the stations to the oceanographic database every ten minutes.

Online observations and forecast are available on several web sites:
https://www.dmi.dk/dmis-vejrprodukter/vandstand/ (in Danish)
http://fcoo.dk/ (in Danish and English)

Tides are predicted for Danish, Faroese and Greenland waters, and the tables are updated once a year. In 2020, DMI provided tide forecasts for a total of 167 locations spread across 92 Danish, 66 Greenlandic and 9 Faroese sites. For the Greenland waters, the number of sites with calculated tides has been increased by 6 stations based on water level data collected by the DGA in 2019. These data are also used to contribute to the LAToid project. This project - coordinated by the Danish Agency for Data Supply and Efficiency (SDFE) with contributions from DGA and DTU Space - aims to estimate the LAT (lowest astronomical tide) height above the ellipsoid based on satellite altimetry, hydrodynamical modeling and local observations.

Tidal predictions are available in a tabular form on the DMI website: (http://ocean.dmi.dk/tides/tides_dk.php) and through a graphical interface on the Defence Centre for Operational Oceanography (http://fcoo.dk/).

9. Marine Spatial Data Infrastructure in Denmark

DGA is responsible for the Danish MSDI, which gathers around 100 authoritative marine datasets from 11 marine authorities and serves as an intergovernmental tool for viewing of marine data as well as access to the data on a day-to-day basis.

In Denmark, there is an increased demand for open and easy access to governmental spatial data, including marine data. To support this, DGA are planning following further developments of the Danish MSDI:
Public access to main parts of the Danish MSDI (delayed due to Covid-19 and technical issues and is now planned for release in April 2021)
An increase in marine dataset from new data sources, e.g. municipalities and NGO's
Development of new tools to support the retrieval and presentation of data, including time series

DGA is supporting the Danish Maritime Authority (DMA) in the process of drafting the first Danish Maritime Spatial Plan (MSP), which will be the first legally binding digital plan in Denmark. DGA have developed an intergovernmental MSP version of the national MSDI, which brings together all relevant MSP input data for use in preparing the Danish MSP. In addition, DGA are also supporting DMA in developing a legally binding MSP.

10. Innovation

New distribution platform
A user survey is planned to be carried out in 2021 in order to define the user needs with relation to a new distribution platform. A project plan, a tender and an implementation plan are expected to be completed by the end of 2021.

Other relevant activities are described under item 2.4 New Technology.

11. Other activities

11.1 International activities

Participation in IHO Working Groups
The Danish Geodata Agency has the chairmanship for the IHO MSDI Working Group and the Baltic Sea and North Sea MSDI Working Group (BS-NSMSDIWG) and has the vice chairmanship for the S-100 Working Group.

The Danish Geodata Agency will in the future also participate in the newly established IHO Hydrographic Surveys Working Group (HSWG) and the Tides, Water Level and Surface Currents Working Group (TWCWG).

The Danish Geodata Agency has been involved in the work done by e.g. IRCC, HSSC, S100-WG, ENCWG, WENDWG, NCWG, NIPWG, IENWG, CSBWG, DQWG, OGCMDWG and UNGGIM MWG.

Seabed 2030
The GEBCO Seabed 2030 project will facilitate mapping of the ocean floor by the year 2030. The aspiration is to compile all available bathymetric data into a high quality, high-resolution digital model and to promote international efforts to collect new data. Denmark will support this initiative mainly by submitting gridded bathymetry.

11.2 Arctic activities

Dundas mining project
In connection with a mining project in the north-western part of Greenland DGA is in the process of producing a number of ENCs and publish consequence corrections to the paper charts. The ENCs will include updated coastline and primarily existing depth information.

New Strategy for the Arctic 2021 – 2030
The Kingdom of Denmark (Denmark, Greenland and Faroe Islands) is in the process of making a new 10-year joint strategy for the Arctic as a replacement of the existing 2011 strategy that expired in 2020.

The Danish Geodata Agency have contributed to the 2030 strategy on several topics in relation to navigational safety and the need for increased surveying and charting in the Arctic. In addition, DGA have also promoted the work under IHO in the strategy and more specifically in relation to the following:
Denmark will actively support that IHO can become an observer of the Arctic Council.
In order to strengthen navigation safety and environmental protection Demark finds it very important that the collaboration between PAME and ARHC is strengthened in a forward-looking perspective.
Denmark would like to recommend, that the Arctic Council should support the joint work of PAME and the ARHC to identify the need for increased surveying and charting in the Arctic and for the development of a marine geographical data infrastructure.

Danish Geodata
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