BALTIC SEA HYDROGRAPHIC COMMISSION

IHO

Baltic Sea e-Nav and implementation of S-104 and S-111 in the Baltic Sea

27th NSHC Tidal Working Group meeting

4-5 February 2025 Taunton, United Kingdom

Thomas Hammarklint

SWEDISH MARITIME ADMINISTRATION

Baltic Sea Hydrographic Commission (BSHC)

BALTIC SEA HYDROGRAPHIC COMMISSION

IHO

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The Baltic Sea Hydrographic Commission,

which is an integrant part of the International Hydrographic Organisation (IHO), promotes the technical co-operation in the domain of hydrographic surveying, marine cartography and nautical information among the neighboring countries of the Baltic Sea region.

The main objectives of the Commission are the coordination of the production of the Baltic Sea INT Charts, the coordination of hydrographic re-surveys, harmonization of chart datums, harmonization of Baltic Sea ENCs, and the exchange of information and the harmonization of practices with regard to various issues related to hydrography.

The most recent development is the Baltic Sea Bathymetric Database – accessible via this portal.

International Hydrographic Organization
The International Hydrographic Organization is an intergovernmental consultative and technical organization that was established in 1921 to support safety of navigation and the protection of the marine environment. The object of the Organization is to bring about:
- The coordination of the activities of national hydrographic offices
- The greatest possible uniformity in nautical charts and documents
- The adoption of reliable and efficient methods of carrying out and exploiting hydrographic surveys
- The development of the sciences in the field of hydrography and the techniques employed in descriptive oceanography

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Chart Datum, Water level and Currents Working Group (CDWCWG)

Chart Datum, Water level and Currents Working Group (CDWCWG)

"To implement a common reference system, S-104 and S-111 in the Baltic Sea"

Photo: Chart Datum, Water level and Currents Working Group 1st meeting, 26-27 March 2024, Helsinki, Finland

https://www.bshc.pro/working-groups/cdwcwg

Members of CDWCWG:

Denmark	Mr Nikolaj Møller
Denmark	Mr Kristian Villadsen Kristmar
Estonia	Mrs Gabriela Kotsulim
Finland	Mr Jyrki Mononen
Finland	Mrs Anni Jokiniemi
Germany	Dr Patrick Westfeld
Latvia	Mr Bruno Špēls
Lithuania	Mr Mindaugas Zakarauskas
Poland	Mr Witold Stasiak
Poland	Mrs Alicja Olszewska
Russia	Mr Leonid Shalnov
Russia	Dr Sergey V. Reshetniak
Sweden	Mr Thomas Hammarklint (Chair)
Sweden	Mr Henrik Tengbert

Observers and Experts:

Estonia	Prof. Artu Ellmann
Estonia	Dr Sander Varbla
Estonia	Dr Nicole Camille Delpeche-Ellmann
Finland	Mr Jarmo Mäkinen
Finland	Dr jani Särkkä
Finland	Dr Mirjam Bilker-Koivula
Finland	Dr Timo Saari
Germany	Dr Gunter Liebsch
Germany	Dr Joachim Schwabe
Latvia	Mr Armands Murans
Latvia	Mr Krists Dzenis
Lithuania	Mr Emilis Tertelis
Lithuania	Mr Romuald Obuchovski
Norway	Mr Aksel Voldsund
Poland	Mr Krzysztof Pyrchla
Poland	Mrs Małgorzata Pająk
Poland	Dr Monika Wilde-Piórko
Poland	Dr Malgorzata Szelachowska
Sweden	Dr Jonas Ågren
Sweden	Dr Per-Anders Olsson
Sweden	Mrs Johanna Linders

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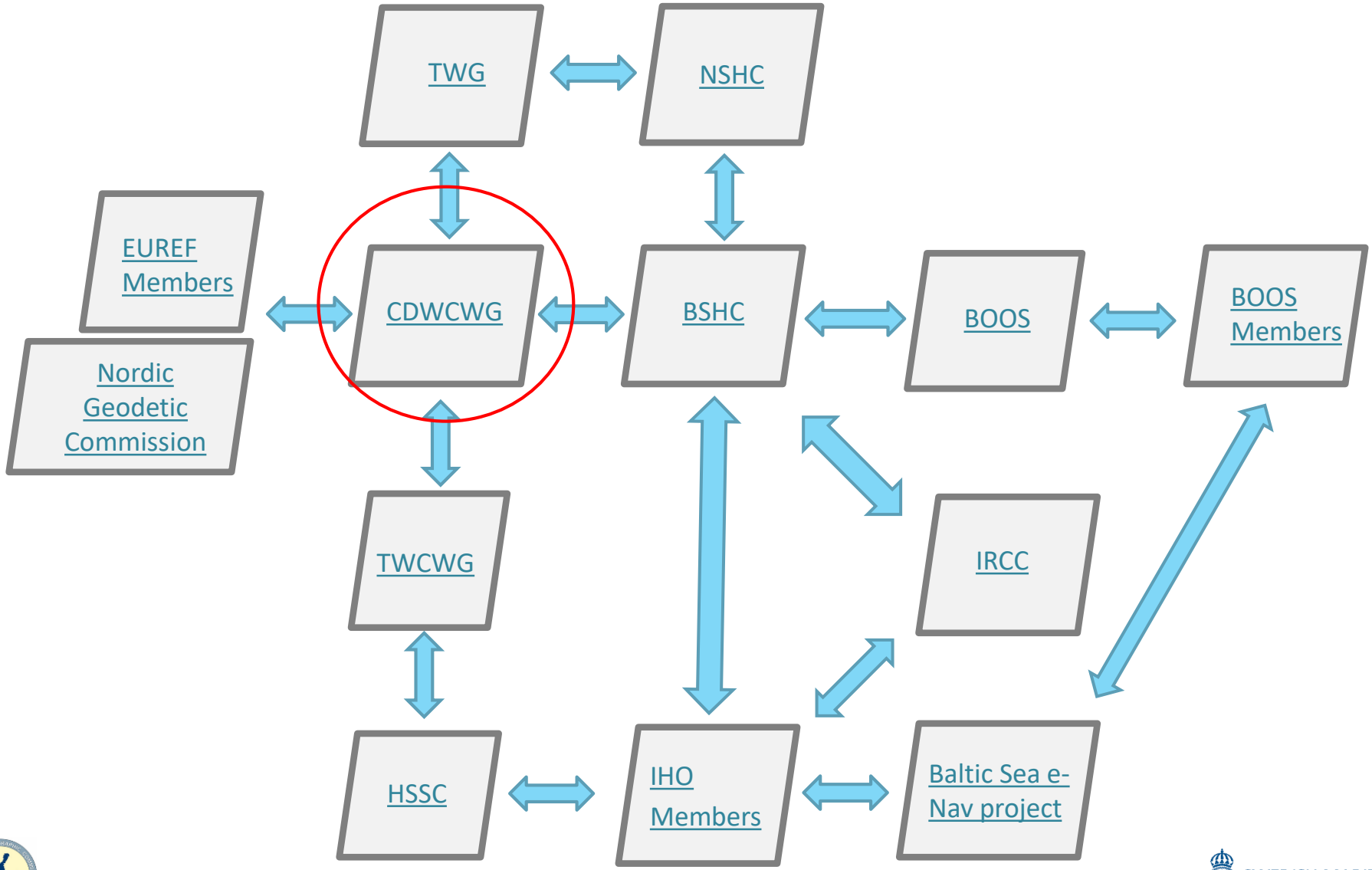
CDWCWG International relations



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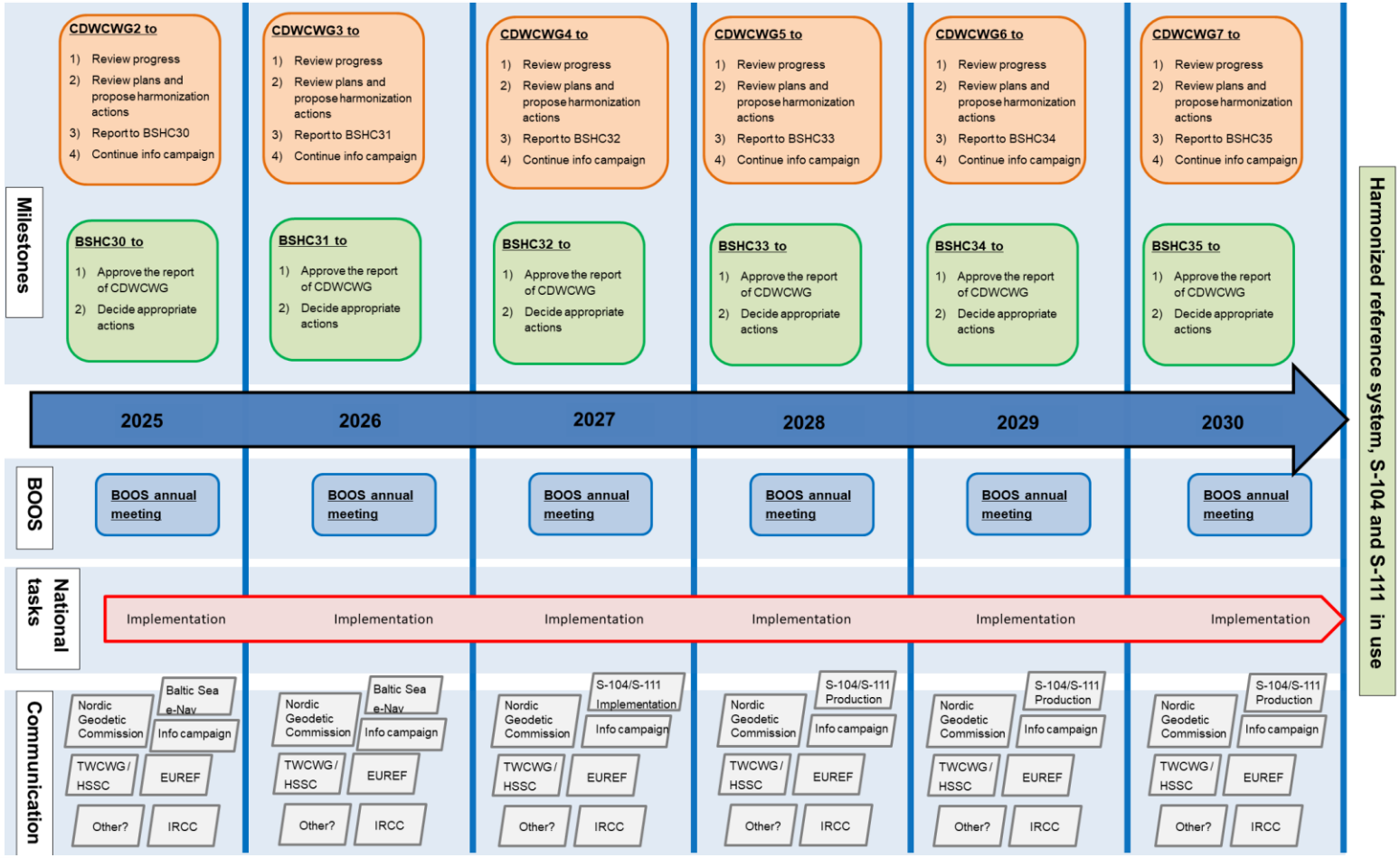
CDWCWG Roadmap

RoadMap
BSHC CDWCWG / Harmonized Reference System / S-104 and S-111 Implementation / Time Line
2024-10-11



A uniform reference system from land to sea

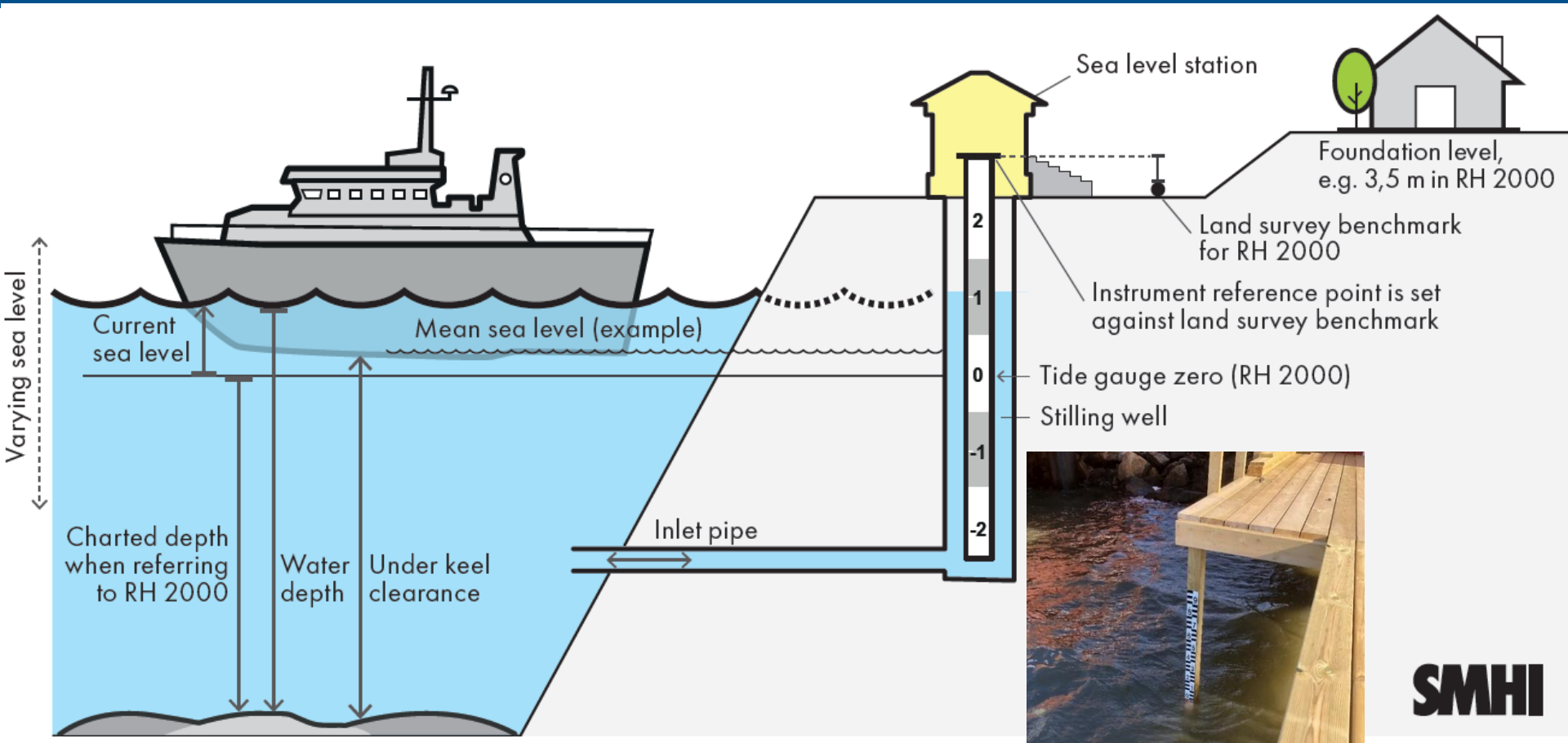


Illustration Veronica Wärn SMHI

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Implementation status Baltic Sea 2024

Summary implementation of BSCD2000, S-104 and S-111 status 2024:

Country	Status BSCD2000 for charts	Status BSCD2000 for water level (see mwreg_boos)	Status S-104/S-111
Denmark	Chart datum in practice close to EVRS-based chart datum (DVR90). BSCD2000 is implemented in ENC and will be implemented in paper charts In the order of reprinting.	All Danish water level stations are connected to DVR90 (BSCD2000). Data distributed to BOOS/CMEMS in relation to DVR90. Responsibility of Danish Meteorological Institute (DMI), Danish Coastal Authority (Kystdirektoratet) and Danish Environmental Protection Agency (Miljøstyrelsen).	DMI and FCOO (Forsvaret Center for Operativ Oceanografi) is responsible for water level and current information. Aim to have a plan for S-104 and S-111 in 2024. DGA and DMI coordinates the work.
Estonia	All decisions are taken and the implementation is ongoing. Official use in charts and water level information from 2018-01-01. Notices to Mariners 2022-12-01. Info Sheet. Web application Nutimeri displays Estonian Transport Administration's official electronic navigational charts.	All Estonian water level stations are connected to EH2000 (BSCD2000). Data distributed to BOOS/CMEMS in relation to BK77 (old system). The difference between BK77 and EH2000 reaches up to 26 cm in the Gulf of Finland. Responsibility of Taltech Marine Systems Institute (MSI) and Estonian Environmental Agency (EEA).	Discussions are ongoing between EMA and MSI. MSI and EEA are responsible for water level and current information. EMA coordinates the work.
Finland	Ongoing. All decisions are taken already in 2008 and 2015. Approach charts from Tornio to Vaasa have been published. The publication status of N2000 charts and Finnish nautical charts portfolio. New video about the N2000 fairway and nautical chart reform.	Water level information provided in both systems, mean sea level (MSL) and N2000 (BSCD2000). The differences between MSL and N2000 is provided as a Table. Water level observations and forecasts will be available in N2000 for the public simultaneously with Traficom nautical charts. Data distributed to BOOS/CMEMS in relation to MSL. Responsibility of Finnish Meteorological Institute (FMI).	The first test products of S-104 and S-111 will be created by FMI in the Baltic Sea e-Nav-project until 2026. FMI is responsible for water level and current information. Traficom and FMI coordinates the work.
Germany	EVRS realization in use in practice. The vertical chart datum of BSCD2000 is close to the national height system of Germany (ETRS1989+DHHN2016). All published products will refer to this datum. In August 2021, BSCD2000 was officially introduced as chart datum for German waters in the Baltic Sea. The official introduction was decreed in January 2018 and is binding for all institutions coming under the jurisdiction of the Federal Waterways and Shipping Administration (WSV).	All German water level stations refers to the national height system DHHN2016 (BSCD2000). Data distributed to BOOS/CMEMS in relation to DHHN2016, but metadata refers to SNN76/Kronstadt (old system). Responsibility of Federal Waterways and Shipping Administration (WSV).	BSH is responsible for water level and current information. BSH coordinates the work.
Latvia	Implementation continues. New national height system LAS-2000,5 (BSCD2000) into use in 2015. LAS-2000,5 to new editions of charts in a following sequence – harbour charts, coastal charts, general charts. Harbour charts are either already implemented to LAS-2000,5 or they are in progress. Differences between BAS-77 and LAS-2000,5 is well known and shown in chart notes.	All water level stations is connected to LAS-2000,5 (BSCD2000). Data distributed to BOOS/CMEMS in relation to LAS-2000,5. Responsibility of Latvian Environment, Geology and Meteorology Centre (LVGMC).	Meeting between MAL and LVGMC officials has been held about S-104 and S-111. MAL coordinates the work.
Lithuania	National height system LAS-07 (BSCD2000) came into force 2016-01-01. BHS-77 still used. The difference between BHS-77 and LAS-07 is well known (about 13 cm) and is also written in nautical charts.	All water level stations is connected to LAS-07 (BSCD2000). Data distributed to BOOS/CMEMS in relation to BHS-77 (old system). Responsibility of Lithuanian Hydrometeorological Service (LHMS).	Data owner has been identified. LHMS is responsible for water level information and Klaipeda University (KU) for currents. LTSA coordinates the work.
Poland	A written decision was issued by HOPN in July 2021 - Guidelines and timetable for the implementation of PL-EVRF2007-NH (BSCD2000). Bathymetric data transferred to the vertical reference system PL-EVRF2007-NH. Information campaign about the new chart datum. 2021 and onwards new editions of all INT harbour, approach and coastal charts.	All water level stations is connected to PL-EVRF2007-NH (BSCD2000). Data distributed to BOOS/CMEMS in relation to Amsterdam NN55, but metadata refers to BHS77. The difference between the NN55 and PL-EVRF2007-NH is less than 9 cm. Responsibility of Institute of Meteorology and Water Management (IMGW-PIB).	Agreement with IMGW and Institute of Oceanology of the Polish Academy of Sciences (IOPAN) to provide observed and modelled water level and surface currents data, respectively. HOPN coordinates the work.
Sweden	Ongoing. All decisions are taken. Many charts (ca 50%) already published. Implementation is a part of the "Chart Improvement Project", to be concluded at the latest in 2030. Information compaigns is ongoing for ports, pilots and other interested parties. Notices to Mariners 2019-05-15. Several articles written in magazines and on webpages.	All water level information is presented in relation to RH2000 (BSCD2000), since 2019-06-03. Some applications can also present data in relation to mean sea level (MSL). The differences between MSL and RH2000 is provided in this Table. Data distributed to BOOS/CMEMS in relation to BSCD2000. Responsibility of Swedish Maritime Administration (SMA) and Swedish Meteorological and Hydrological Institute (SMHI).	Discussions started between SMA and SMHI. SMA take part in the BS e-Nav-project in cooperation with FMI on this. We will investigate this in 2024 and take further actions in 2025. SMA coordinates the work.

2024-03-26

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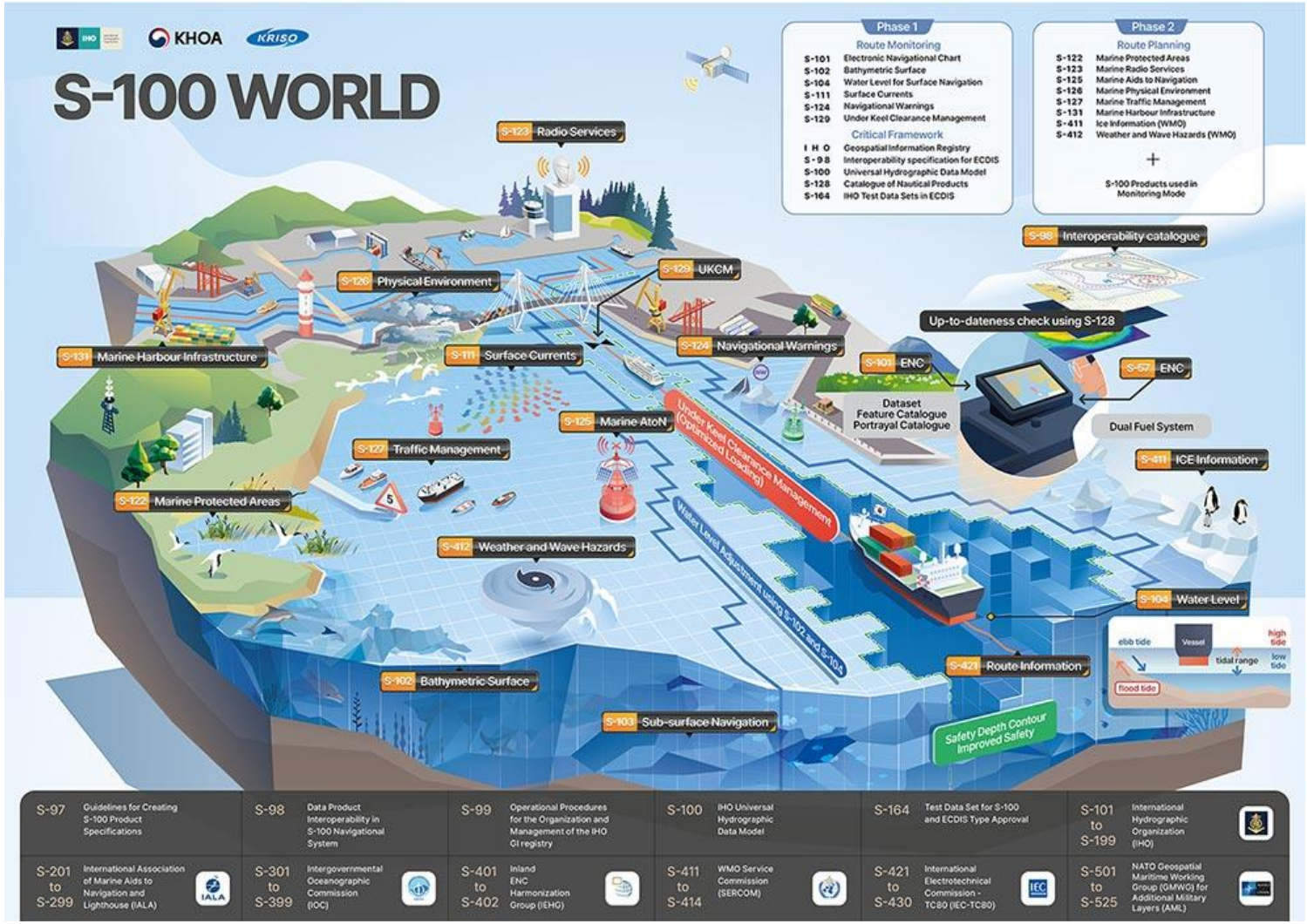
Future Maritime Services S-100



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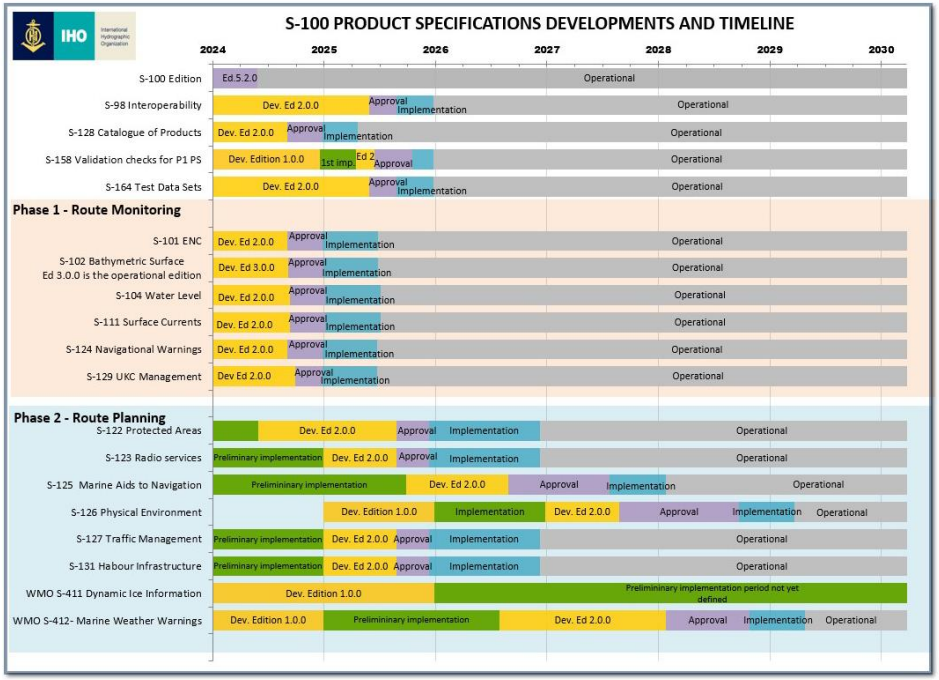
S-100 Implementation

IHO S-100 Implementation Strategy

Table A – IHO list of S-100 products with special focus	
First step – Route monitoring mode	
S-101	Electronic Navigational Chart (ENC)
S-102	Bathymetric Surface
S-104	Water Level Information for Surface Navigation
S-111	Surface Currents
S-124	Navigational Warnings
S-129	Under Keel Clearance Management
Critical Framework	
	IHO Geospatial Information Registry
S-98	Interoperability Specification
S-100	Universal Hydrographic Data Model
S-128	Catalogue of Nautical Products
S-164	Test Data Set for S-100 and ECDIS Type Approval
Second step – Route planning mode	
S-122	Marine Protected Areas
S-123	Marine Radio Services
S-125	Marine Aids to Navigational (AtoN)
S-126	Marine Physical Environment
S-127	Marine Traffic Management
S-131	Marine Harbour Infrastructure



This S-100 timeline is updated: 02 07 2024

2025 → **2026** Ships allowed to use S-products → **2027** → **2028** → **2029** S-products are mandatory

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Real Time Hydrographic and Environmental Information Service

Infrastructure

Co-financed by the Connecting Europe Facility of the European Union

Gravity surveys

Hydrographic surveys

Geoid model

Baltic Sea Chart Datum 2000

Bathymetry database

Oceanographic observations

Oceanographic model

COPERNICUS
MARINE ENVIRONMENT MONITORING SERVICE
Providing PRODUCTS and SERVICES for all marine applications

S-100 products

Bathymetry

S-101 ENC
S-102 Bathymetric Surface

Water Level

S-104 Water Level Information for Surface Navigation

Surface Currents

S-111 Surface Currents

Under Keel Clearance

S-129 Under Keel Clearance Management (UKCM)

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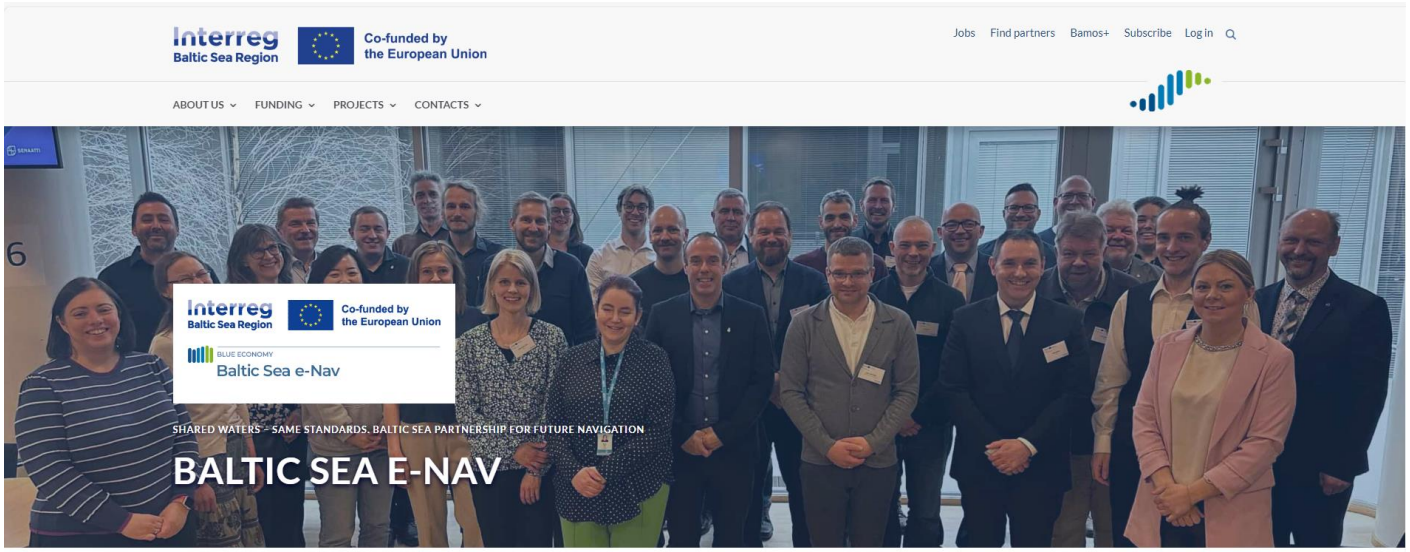
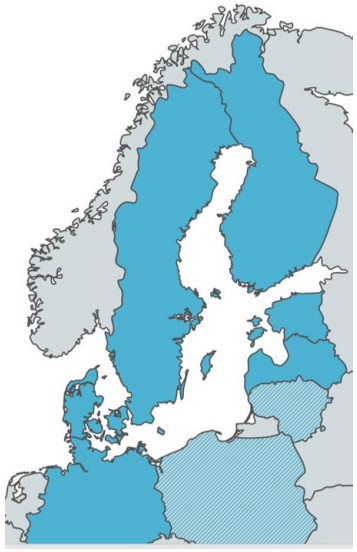
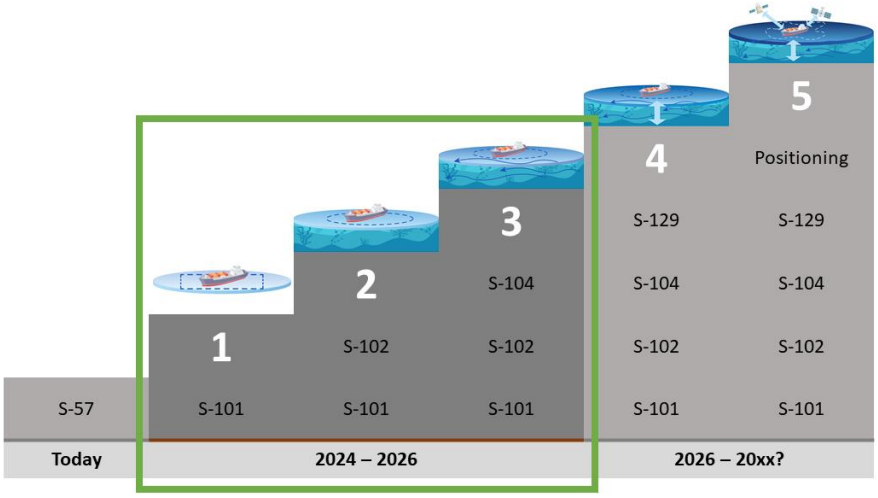
Baltic Sea e-Nav Interreg project 2023-2026





Goal	Period
Develop production capabilities for S-101 ENC, S-102 bathymetry and to some extent S-104 water level	2023-2025
Establish **harmonization rules** for S-10x-products, under the BSHC umbrella	2024-2026
Test, evaluate and refine the S-10x products	2025
Commercial rollout for S-101 and S-102 in the Baltic Sea. S-104 in parts of FI.	2026



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Baltic Sea e-Nav

Interreg Baltic Sea Region — Co-funded by the European Union

BLUE ECONOMY Baltic Sea e-Nav

- A project to start the implementation of the S-100 products in the Baltic Sea
- Transnational cooperation: Partners from almost all Baltic Sea countries.
  - Mainly hydrographic offices, developing S-101 (ENC) and S-102 (Bathymetry) products
  - Finnish Meteorological Institute as the only oceanographic service in the project is also responsible to arrange co-operation to other providers of oceanographic data in the Baltic.
    - Developing S-104 and S-111

Interreg Baltic Sea Region — Co-funded by the European Union

BLUE ECONOMY Baltic Sea e-Nav

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Baltic Sea e-Nav – Financing

- Programme Interreg Baltic Sea Region
- Postponed with one year after rejection of the project the first attempt (September 2022)
- Financing approved (June 2023)
- Approximately 5 Meuro

Interreg Baltic Sea Region

Co-funded by the European Union

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Harmonization and validation issues

- Coordination of S-104 and S-111 in the Baltic Sea: Chart Datum, Water level and Currents Working Group (CDWCWG)
- S-104/S-111 production capabilities have been developed in the Baltic Sea, as a part of the Baltic Sea e-Nav project
- Responsibility for producing lies with the MetOcean Institutes of different countries
- So far, only some of the MetOcean Institutes have been active. However, there will be a joint meeting to try to get everyone involved.
- What is wrapping: HDF5 file acquisition, validation and signing?
- What is included in validation? A full validation according to S-158?
- There have been discussions about harmonization and the need for it;
    - Technical harmonization rules, i.e. the interoperability with S-102
    (see S-98, i.e. WLA=Water Level Adjustment - described in Part C and Cross-validation S-158:98)
    - National implementation
    - Production areas between member states/overlapping data
    - Need for a roll out plan
    - A report from BSHC to WENDWG15 will include issues on paper charts, S-57 ENCs and the implementation of the S-100 schedule and capabilities in the Baltic Sea
    - Guidelines in the Implementation of the WEND-100 principles

S-100 Implementation Sweden

Products	2024	2025	2026	2027	2028	2029	2030	2031	2032
ENC S-101									
Bathymetry S-102									
Ensuring confidentiality rules for S-102									
Catalogue of Nautical Products S-128 via PRIMAR									
Water Level S-104 (in cooperation with SMHI*)									
Surface Currents S-111 (in cooperation with SMHI*)									
Navigational Warnings S-124									
Marine Protected Areas S-122 (in cooperation with SwAM*)									
Marine Radio Services S-123									
Marine Traffic Management S-127									
Marine Harbour Infrastructure S-131									

*SMHI – Swedish Meteorological and Hydrological Institute, SwAM – Swedish Agency Marine and Water Management

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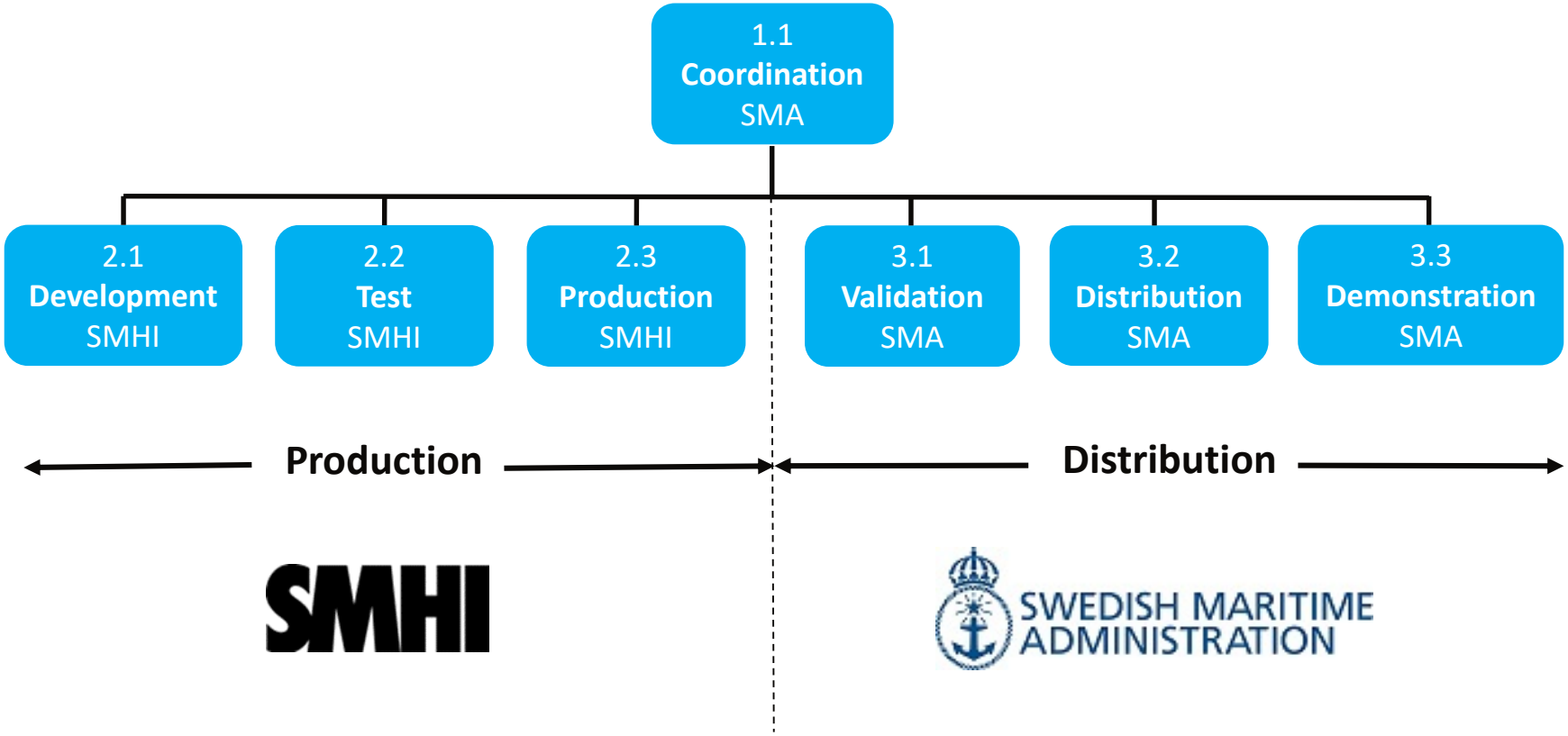
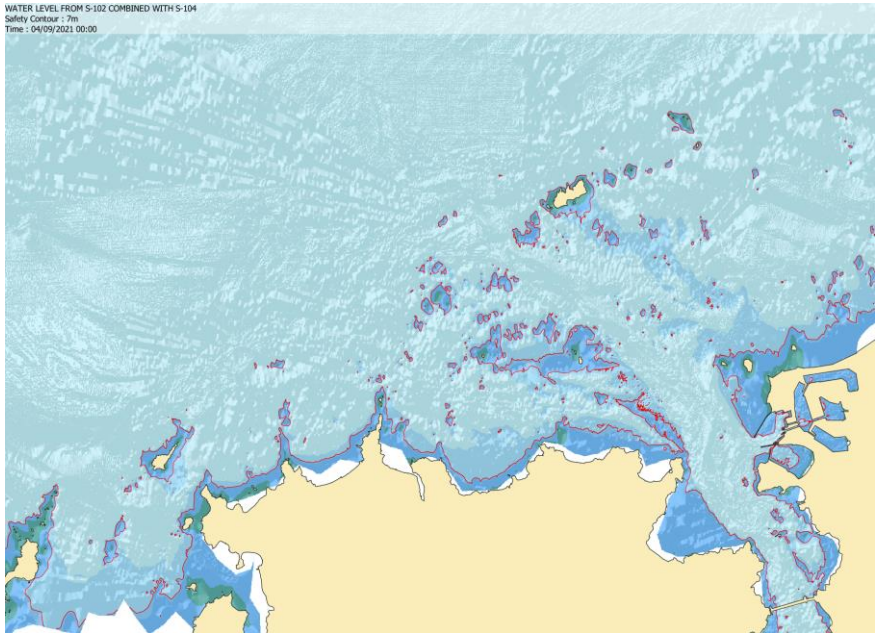
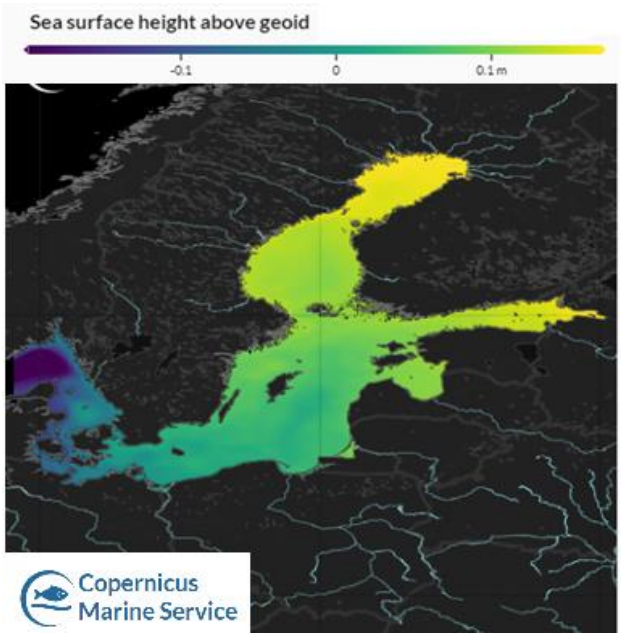
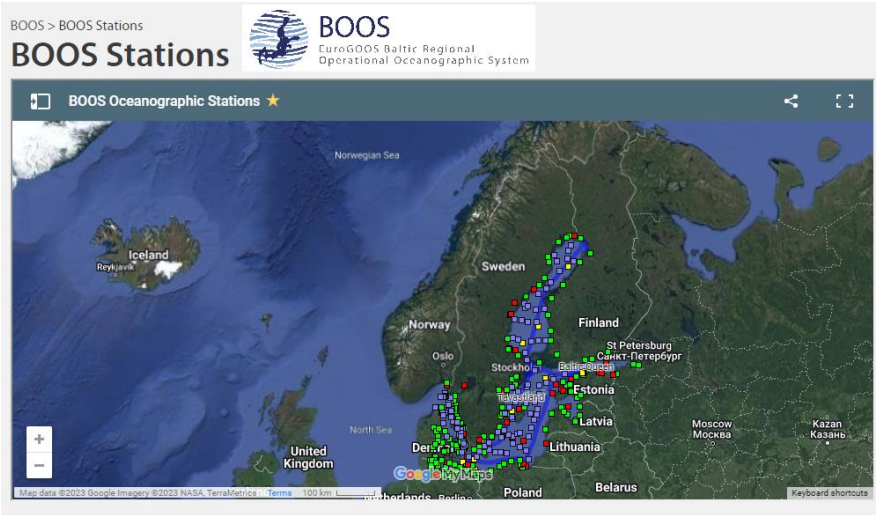
S-104/S-111 Production Sweden

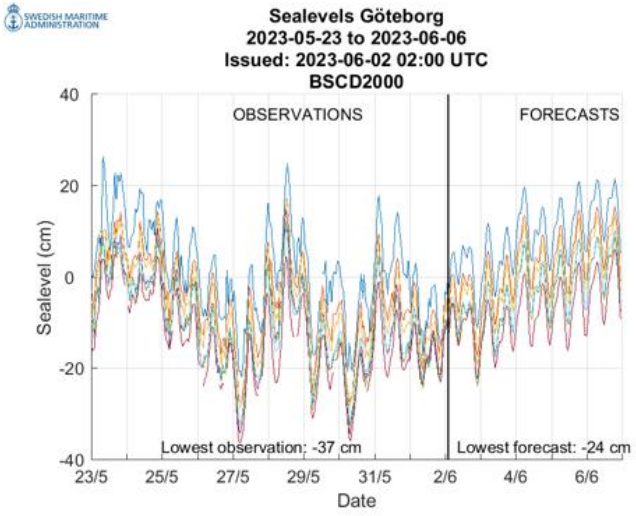


S-104 Water Level









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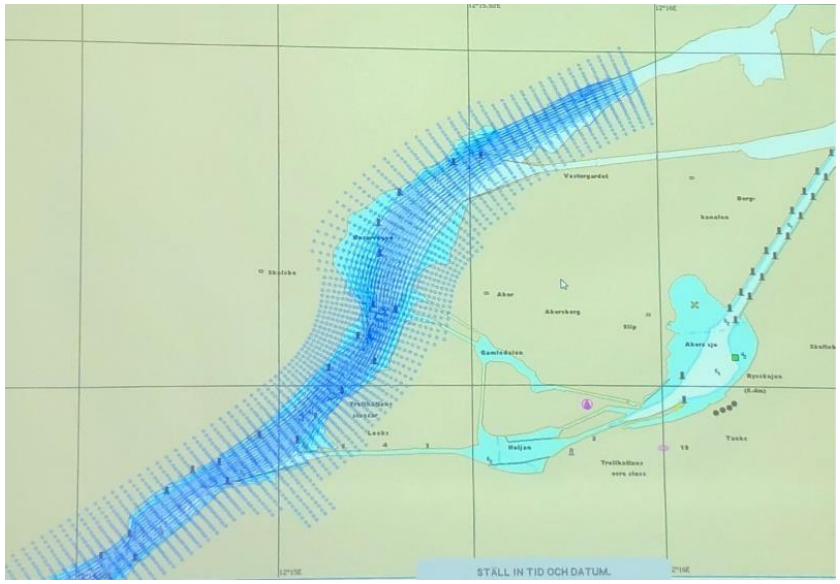
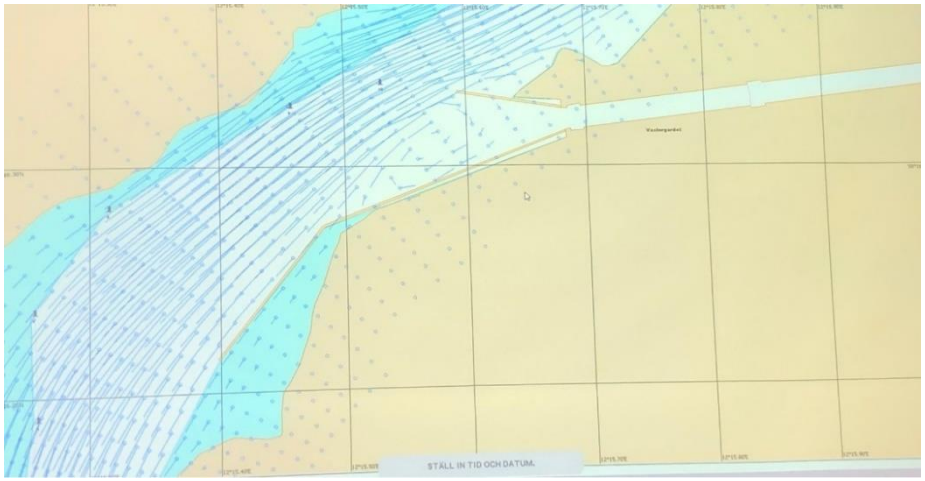
S-111 Surface Currents





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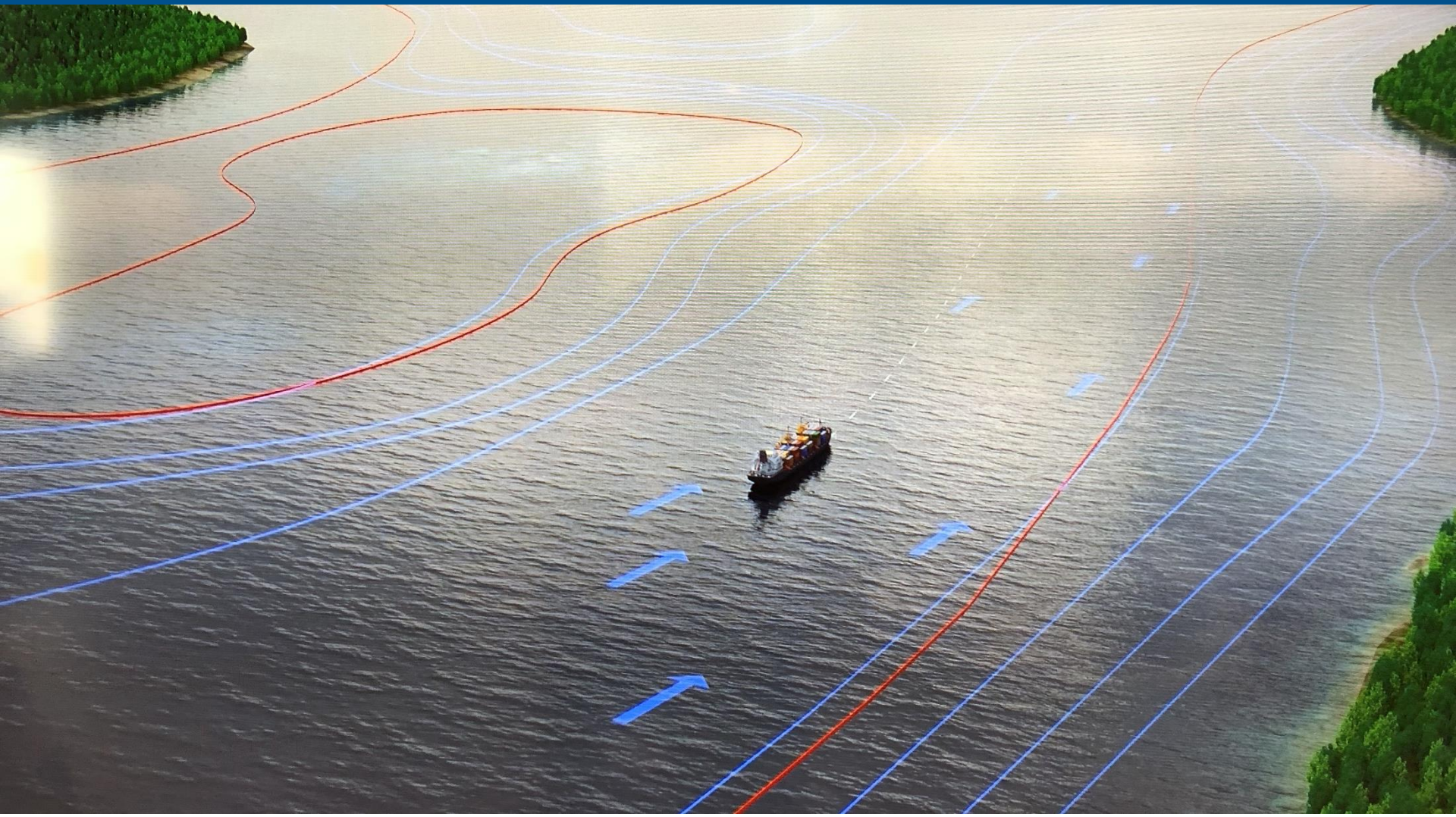
Future navigation



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Thanks!

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