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

CDWCWG Report to the BSHC 30th Conference

The CDWCWG Terms of Reference (TORs) requests the CDWCWG to report annually to the BSHC.

1. Status of Work of CDWCWG since BSHC 29th Conference

Since the BSHC 22nd Conference 2017, *Mr Thomas Hammarklint* has acted as a Chair.

At the BSHC 28th Conference, 2023, the new name of the working group was approved and changed from Chart Datum Working Group (CDWG) to Chart Datum, Water level and Currents Working Group (CDWCWG), with the important addition or subtitle: "To implement a common reference system, S-104 and S-111 in the Baltic Sea".

The TORs and Work Programme have been partially amended and needs to be approved. In addition, the implementation road map and time line have been updated (CDWCWG Roadmap). The BSHC CDWCWG - web pages (CDWCWG Website) were also updated and maintained.

CDWCWG has supported the implementation of the Baltic Sea Chart Datum 2000 (BSCD2000) and reviewed the progress of implementation, developed and released in November 2023 a first version of the BSCD2000 Height Transformation Grid (Geoid Model) for the Baltic Sea and on behalf of the BSHC has begun to coordinate the implementation of the IHO products S-104 Water Level Information and S-111 Surface Currents. The working group has cooperated with several international bodies and projects, i.e. the Interreg project Baltic Sea e-Nav, which aims to implement the first pilots of S-104 Water Level and S-111 Surface Currents in the Baltic Sea. Two partner meetings were held in Tallinn, Estonia, 3-4 December 2024 (event link) and in Rauma, Finland, 9-11 April 2025 (event link). The work has also been presented at numerous national and international conferences and meetings.

A face-to-face Chart Datum Working Group meeting (CDWCWG2 Minutes) was held 25-26 March 2025 in Tallinn, Estonia. Several new experts and members dealing with the implementation of S-104 and S-111 were welcomed to the working group. Next working group meeting (CDWCWG3 Program) will be organized as a face-to-face-meeting in Riga, Latvia.

All the BSHC member states have nominated members to the working group, however not all have been active or participated at the meetings. Observers and experts are nominated from Swedish National Land Survey, Swedish Meteorological and Hydrological Institute, National Land Survey of Finland, Finnish Meteorological Institute, Tallinn University of Technology (Estonia), Institute of Geodesy and Cartography (Poland), Federal Agency for Cartography and Geodesy (Germany), and Norwegian Mapping Authority and contributes greatly to the activities within the CDWCWG´s area of interest and responsibility.

Baltic Operational Oceanographic System (BOOS) has nominated a Point of Contact (CDWCWG Chair), mainly to cooperate on the transition to BSCD2000 for water level information (tide gauge observations, water level forecasts and warnings). Already in 2014, BSHC and BOOS signed a Memorandum of Understanding (MoU) to collaborate on this. CDWCWG Chair usually attend the BOOS Annual meetings and present the work done within CDWCWG.

Members of CDWCWG:	Denmark	Mr Kristian Villadsen Kristmar
	Estonia	Mrs Gabriela Kotsulim
	Finland	Mr Jyrki Mononen
	Finland	Mrs Anni Jokiniemi
	Germany	Dr Patrik 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 Xaver Lange
	Germany	Mr Thorben Knoop
	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	Dr Monika Wilde-Piórko
	Poland	Dr Malgorzata Szelachowska
	Sweden	Dr Jonas Ågren
	Sweden	Dr Per-Anders Olsson
	Sweden	Mrs Johanna Linders

The List of Members and other documents can be found at the CDWCWG Website.

3. CDWCWG 2nd meeting, 25-26 March 2025 in Tallinn, Estonia

An ordinary working group meeting (face-to-face meeting only). Focus on the meeting was to review national plans and status of implementation of the Baltic Sea Chart Datum 2000, S-104 and S-111 (Summary of the Implementation Status 2025).

The TORs and Work Programme (Annex 1 and 2) have been reviewed and some amendments are proposed to the TORs (Annex 1). Both are to be approved at BSHC30.

Several new actions to be handled within the working group have been listed in the CDWCWG2 Action list. For example, we decided how to continue the transition to Baltic Sea Chart Datum 2000 for all water level observations from all stations located in the Baltic Sea that reaches the BOOS, Copernicus Marine Service and EMODNET (Action #11-12, Reference levels in the Baltic Sea). From these services, almost all oceanographic observations from stations located in the Baltic Sea can be downloaded.

At the meeting, the group also decided to form a CDWCWG Harmonisation subgroup that will propose harmonisation actions for S-104 and S-111 in the Baltic Sea. The group will have a close cooperation with the Baltic Sea e-Nav project.

4. The results of the CDWCWG during 2024-2025

CDWCWG has promoted studies and development of a common geoid model for the Baltic Sea by supporting the FAMOS-projects. Within FAMOS-project several gravity-surveying campaigns were executed in the Baltic Sea during 2015-2018 and interim geoid models have been calculated during 2018 and further computations have been executed since 2020 within the FAMOS Continuation project (as an activity within the working group). A first version of the BSCD2000 Height Transformation Grid (Geoid model) was released in November 2023 (BSCD2000 Landing Page).

A good geoid model or height transformation grid for the whole Baltic Sea is an essential component for the Baltic Sea Chart Datum 2000 (BSCD2000). A release note has been published as an article in the International Hydrographic Review (IHR).

The Specification for the Baltic Sea Chart Datum 2000 have been updated. The specification is an essential document for applying and realizing the Baltic Sea Chart Datum 2000 in all BSHC member states. Baltic Sea Chart Datum 2000 has been registered in
IHO Geospatial Information Registry as Chart Datum number 44.

In cooperation with members states and BOOS partners, the CDWCWG have compiled a Table of the mean sea level in the Baltic Sea Chart Datum 2000 (BSCD2000), at sea level stations located in the Baltic Sea (see Map).

The CDWCWG work have been or will be presented at the following conferences and meetings in 2024-2026:

- NSHC TWG26, 6-7 February 2024, Göteborg, Sweden [Presentation, Minutes]
- TWCWG8, 20-23 February 2024, VTC
- BSHC CDWCWG1, 26-27 March 2024, Helsinki, Finland [Presentation, Minutes]
- Kartdagarna, 16-18 April 2024, Göteborg, Sweden [Presentation]
- BOOS, 6-8 May 2024, Copenhagen, Denmark [Presentation]
- BSHC29, 17-19 September 2024, Tallinn, Estonia [Report, Presentation]
- TWCWG9, 19-22 November 2024, Monaco [Presentation]
- NSHC TWG27, 4-5 February 2025, Taunton, United Kingdom [Presentation, Minutes]
- BSHC CDWCWG2, 25-26 March 2025, Tallinn, Estonia [Presentation, Minutes]
- Kartdagarna, 8-10 April 2025, Skellefteå, Sweden
- BOOS, 5-7 May 2025, Sopot, Poland [Presentation, Minutes]
- CDWCWG Harmonisation subgroup 1st meeting, 11 June 2025, VTC [Invitation]
- BSHC30, 22-24 September 2025, Riga, Latvia [Report, Presentation]
- TWCWG10, 4-7 November 2025, VTC [Presentation]
- NSHC TWG28, 3-4 February 2026, VTC [Presentation, Minutes]
- Kartdagarna, 10-12 March 2026, Uppsala, Sweden
- BSHC CDWCWG3, 24-25 March 2026, Riga, Latvia [Presentation, Minutes]
- BOOS, 4-6 May 2026, TBC [Presentation]
- BSHC31, 15-17 September 2026, TBC [Report, Presentation]
- TWCWG11, 3-6 November 2026, TBC [Presentation]

5. Status August 2025

Until now, one of the most important tasks for the working group has been to review national plans and status of implementation of the BSCD2000, S-104 and S-111. It can be concluded that most member states have made actions to implement the common vertical datum, see the Summary of the Implementation Status 2025 and started actions to implement S-104 and S-111. The detailed status of all member states can be found on the CDWCWG Website.

The first version of the BSCD2000 Height Transformation Grid (Geoid model) was released in November 2023 (BSCD2000 Landing Page). A BSCD2000 Continuity Management Plan (Version 1-1) has been produced for the long-term management of BSCD2000.

6. Future work of the CDWCWG

Already at the BSHC27 Conference, the working group was tasked to coordinate the implementation of the IHO products S-104 Water Level and S-111 Surface Currents in the Baltic Sea. This will be the major focus for the working group over the next years. This is a long-term commitment and requires focus from the working group to successfully complete the task.

Also, a closer cooperation with Baltic Sea Operational Oceanographic System (BOOS) and North Sea Hydrographic Commission (NSHC) are needed, to invite members and experts dealing with water level and current information, necessary to implement the products S-104 Water Level and S-111 Surface Currents (Annex 3 and 4). Especially, the exchange with the NSHC Tidal Working Group (TWG) will be strengthen. With regard to the implementation of S-104 and S-111, both working groups will encounter similar issues and it could be worth trying to harmonise as much as possible.

However, CDWCWG will continue to guide and follow up the progress of the implementation of the harmonised vertical reference, following the TORs and Work Programme (Annex 1 and 2), even if the focus changes. These tasks will be coordinated by the CDWCWG, but will be carried out more in sub-groups of the CDWCWG with specially dedicated activity leaders. Such activities are for example to develop the "the specification for Baltic Sea Chart Datum 2000", finalize the BSCD2000 Height Transformation Grid for the whole Baltic Sea and promote studies and further development of dynamic topography of sea surface and promote improving precise real-time GNSS navigation.

The future work until 2030 of the CDWCWG (Roadmap) has been updated and expanded to include the implementation of S-104 and S-111.

Continue cooperation with BOOS concerning water level information. Cooperation is important for the implementation and usage of the harmonised vertical reference. Continue communication with relevant organisations and inform users by giving presentations and participating in relevant conferences.

To activate all the member states are encouraged to send representatives to the CDWCWG meetings. The CDWCWG plans to have its next meeting (CDWCWG3) 24-25 March 2026 in Riga, Latvia.

7. CDWCWG Harmonisation subgroup

At the CDWCWG2 meeting in Tallinn in March 2025 (Minutes), the group decided to form a CDWCWG Harmonisation subgroup (Task #14 in List of Actions). The Chair was appointed to establish and invite members to the group. The group will focus on to propose harmonisation actions for S-104 and S-111 in the Baltic Sea. The work will be done in a close cooperation with the Baltic Sea e-Nav project.

Two online meeting were held in June 2025 and a first version of a harmonisation document has been produced: Regional product harmonisation guidelines for S-104 and S-111, which has been endorsed by the CDWCWG. The group is now seeking confirmation and further guidance from BSHC30.

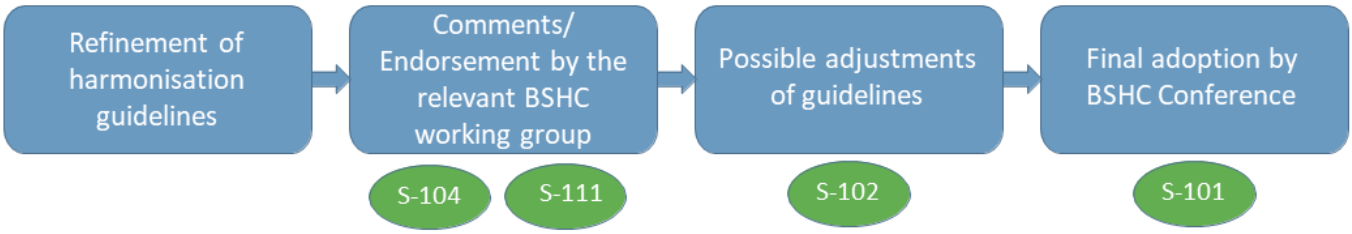
Harmonisation activities

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

BLUE ECONOMY Baltic Sea e-Nav

- Activity lead of harmonisation activities: Traficom
  - A2.3 Refinement of regional product harmonisation guidelines
  - A3.2 Formally adopt regional product harmonisation guidelines and establish delivery capabilities
- Standard-specific task forces (S-101, S-102, S-104 & S-111)

Workflow and status of harmonisation activities:



8. Actions for the BSHC 30th Conference

The BSHC 30th Conference is invited to:

1. Note this report
2. Approve the amendments to the Terms of References (Annex 1)
3. Approve the amendments to the Work Programme (Annex 2)
4. Confirm and give further guidance to the Regional product harmonisation guidelines for S-104 and S-111
5. Give further guidance to CDWCWG, as seen appropriate

Annex 1. Terms of Reference (TOR)

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

Terms of Reference

To be approved by the BSHC 30th Conference, 22-24 September 2025
Amendments marked in red, as proposed by CDWCWG2

The Working Group should

Report to the BSHC Conferences.

1. To continue implementation of the Baltic Sea Chart Datum 2000 (EVRS with land-uplift epoch 2000), IHO S-100 products S-104 Water Level Information and S-111 Surface Currents in the Baltic Sea.

2. To prepare the road map for transition and implementation, including e.g.:

- to establish a network of relevant bodies involved into the transition and efficiently communicate and give guidance within this network
- to invite relevant organizations, like meteorological and oceanographic institutes, to the working group to strengthen the implementation
- to invite relevant bodies to inform the users
- to review of progress of national plans and actions
- to propose harmonisation actions.

3. To cooperate with relevant bodies on water level related issues e.g.:

- to promote studies on the validation, status and distribution of water level information, and to promote studies on interpolation and prediction of water levels
- to promote studies on displaying schemes for joint Baltic Sea water level information

- to promote studies on recommendations to IHO bodies how the sea level and its variations should be shown on nautical paper and ENC charts and publications, and conveying water level information to mariners [ref. IHO Technical Resolutions].

4. To support development of a common harmonised height reference, including maintenance and further development of a common geoid model for the whole Baltic Sea area:

- to promote geoid computations and gravity measurements in the Baltic sea, as is needed to realize the Baltic Sea Chart Datum 2000

- ~~to coordinate the finalization of the BSCD2000 height reference grid~~

- to establish a continuity management (future updates) of the BSCD2000 height reference grid

- to distribute BSCD2000 data products

- to support geoid and oceanographic studies relevant to these purposes

- to support the development of recommendations for transformation between national and global reference frames.

5. To cooperate with relevant international bodies, for example organizations responsible for delivering water level and currents information (e.g. BOOS, NOOS) and geodetic infrastructure (e.g. EUREF and NKG).

6. To liaise with relevant IHO bodies and study relevant IHO resolutions and specifications.

~~1. To coordinate the implementation of the IHO S-100 products S-104 Water Level Information and S-111 Surface Currents in the Baltic Sea:~~

- ~~to invite meteorological and oceanographic institutes to the working group to strengthen the implementation.~~

Annex 2. Work Programme

BSHC Chart Datum, Water level and Currents Working Group (CDWCWG)
Work Programme
20 September 2023

To be approved by the BSHC 30th Conference, 22-24 September 2025
Amendments marked in red, as proposed by CDWCWG2

Note: This Work Programme includes those Tasks which were identified as the priority issues and which are expected to be fostered from 2023 and onwards bearing in mind the resources the BSHC members have.

Tasks:

1. Guide the implementation process of vertical reference within the Baltic Sea region.
   a. To monitor and follow up the status of the relevant actions identified.
   b. To ensure efficient communication with relevant bodies.
   c. To propagate and explain the idea of harmonised chart datum.
   d. To foster national efforts for realization and coordinate the implementation of S-104 and S-111 in the Baltic Sea.

2. Review of progress of national plans and actions.

3. Propose harmonisation actions.

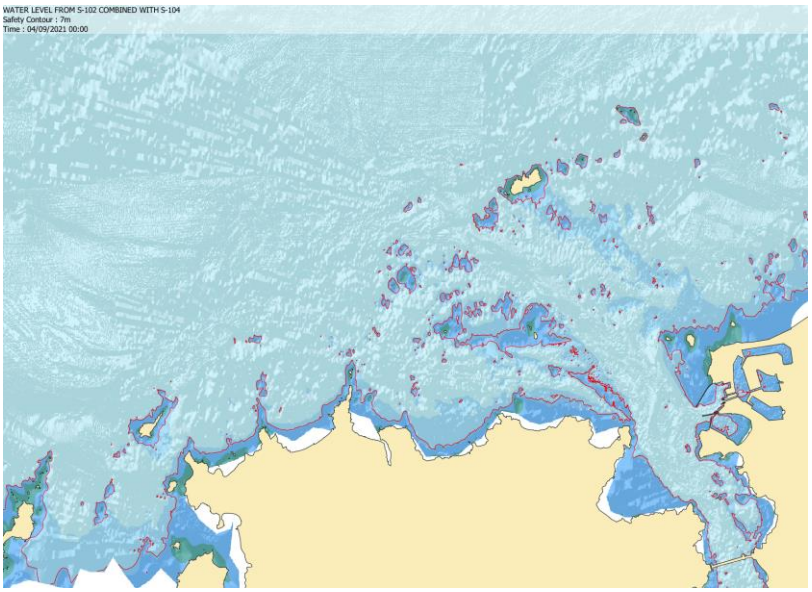
4. Promote studies and further development of a common geoid model and dynamic topography for the whole Baltic Sea, mainly by supporting and collaborating with relevant projects, e.g. organizing ship time for gravity measurements. Invite member states to consider gravity measurements and geoid computation and provide an overview where additional gravity measurements are needed.

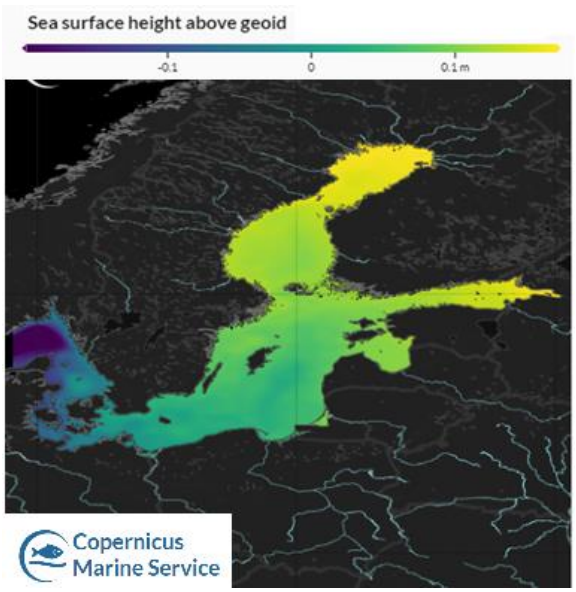
5. Promote improvement of precise real-time GNSS navigation for the future.

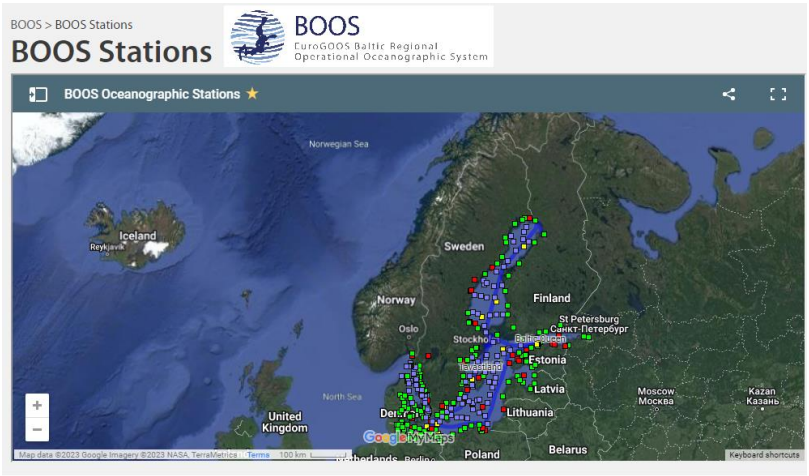
6. Cooperate with BOOS and invite other relevant institutes and organizations for the implementation of S-104 and S-111 in the Baltic Sea.

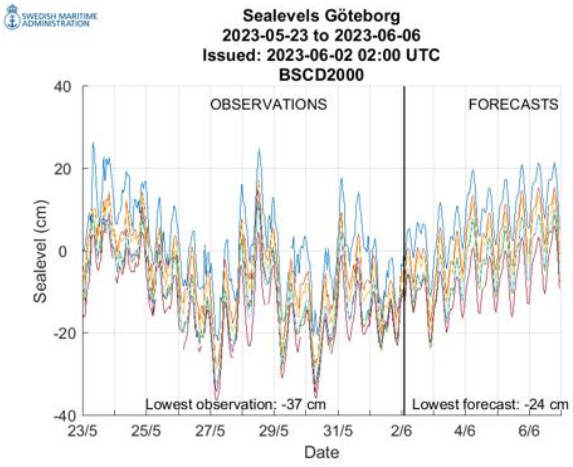
7. Support other IHO working groups and European projects in issues concerning water level, currents and reference systems.

Annex 3. Example of a potential S-104 Water Level product (Bay of Biscay, Port of Göteborg and upstream Göta River)









Annex 4. Example of a potential S-111 Surface Current product (Trollhättan Locks and Göta River)