

Questionnaire to BSHC Member States on the implementation status of Baltic Sea Chart Datum 2000 (BSCD2000), S-104 Water Level and S-111 Surface Currents

Member state	Germany
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1. Are all the decisions done to implement the Baltic Sea Chart Datum 2000?

1.1 When the decisions have been done or planned to be done?

All decisions have been made.

1.2 What are the national decisive organizations?

German Federal Maritime and Hydrographic Agency (BSH).

2. What is the national status of implementation of chart datum?

2.1 What actions have already been done?

In August 2021, BSCD2000 (based on ETRS89/DHHN2016) was officially adopted as CD for German waters in the Baltic Sea. This was announced in Notices to Mariners (NfS, 1/2022). The BSCD2000^{DHHN2016} label was first used for chart "36 (INT 1352) – Travemünde to Gedser Odde", published in early 2022. All gauges in German coastal areas have also been successively resurveyed with reference to DHHN2016 to ensure consistency with BSCD2000.

2.2. What actions have been planned to be executed and what is the schedule?

None.

2.3 Which ENC Approach have been updated with the new reference datum? If possible, attach a chart datum overview covering Your countries nautical charts, designed graphically or as a table. If, possible include an attribute to each named chart describing the CD difference to BSCD2000 in cm (CD minus BSCD2000). Example attached at the end of the Questionnaire (Annex).

There is no need to update any ENC approach as the CD realisation has not changed.

2.4 If you implemented the attribute VERDAT in S-57 (ENC), are You using VERDAT=3 (Mean Sea Level)?

Yes.

3. Has Your country established the national realization of EVRS and are the water level stations connected to this new height system (BSCD2000)?

3.1 Which organization/-s is responsible for the water level stations/data in Your country?

Federal Waterways and Shipping Administration (WSV).

3.2 Which reference are used today to present water level information?
Does Your country planning to present water level information referring to BSCD2000?
Doing it already today? Date decided for change the reference to BSCD2000?

Water level information is provided in reference to DHHN2016 (gauge zero point) and, consequently, BSCD2000.

Following the introduction of BSCD2000 as the harmonised CD for the entire Baltic Sea region, the German Combined Quasigeoid (GCG2016) was updated by 2–3 cm in the Baltic Sea area in 2023. The model remains unchanged on land.

Since 2025, the official water level forecast has been referenced to BSCD2000.

Work is currently underway on updating the entire GCG. Its introduction is expected at the end of 2026.

3.3 Are there any plans for digital service/-s intended for the users to have the option to choose MSL or BSCD2000 as the reference level for water level information?

No.

3.4 GNSS supported UKC control/confirmation is probably the reality in a few years. We also need reliable water level predictions for carrying out optimal loading and real time water level data to check the GNSS data. Do we need a shared service in the Baltic Sea for water level information (predictions/real-time), which fulfils nautical needs and demands?

Yes.

3.5 Do we need to work together with the development of the IHO S-104 standard?

Yes.

4. Are the relevant national contacts and interest groups defined for the change of chart datum and water level reference?

4.1 What are the essential national interest groups in Your country?

On the user side are all the operators who use (hydrographic) survey data. The main administrative users are the German Federal Maritime and Hydrographic Agency (BSH), the German Waterway and Shipping Administration (GDWS) and the German Federal Institute of Hydrology (BfG).

4.2 Are the relevant point of contacts known and contacts been made to them?

Yes.

4.3 Are You planning any information campaign about the change of chart datum and water level reference? If, yes have you published information about this somewhere?

No, because the CD realization has not changed.

Additionally, users can find comprehensive information about CD in the German North Sea and Baltic Sea following <https://t1p.de/qoyy3>

5. Have You identified any obstacles or major issues concerning transition to the harmonised vertical reference?

No.

6. Connections to neighbouring countries

6.1 Which are the relevant countries to cooperate?

Denmark, Sweden, Poland.

6.2 Are the needed points of contacts already known?

Yes.

6.3 What actions have been agreed with the relevant countries (e.g. synchronising plans and schedules)?

Synchronised measurement campaigns and R&D knowledge exchange.

7. Are there any needs for support from BSHC?

No.

8. Do you have any other proposals or guidance to the CDWCWG to help and foster the transition process?

No.

9. Are you using GNSS and GNSS augmentation services for referring to your (bathymetric) surveys to the chart datum?

9.1 What GNSS augmentation service is used for hydrographic surveys? (If there are several augmentation services, list all of them.)

SAPOS (the German satellite positioning service) is used for high-precision, real-time kinematic positioning. Commercial PPP services are also used.

Furthermore, the potential of GEPOS, the federal RTK PPP satellite positioning service which has been in its initial operational and optimisation phase since 1 January 2025, is currently being investigated.

9.2 To which coordinate system, and vertical reference level/frame the GNSS augmentation service is referred to? (If there are several systems in use, list all of them.)

Ellipsoidal heights: ETRS89/DREF91/2016 (until 30 June 2025), ETRS89/DREF91/2025 (since 1 July 2025)*

Levelling heights: DHHN2016

National geoid model: GCG2016/2023 (updated in 2023 in the Baltic Sea for harmonization with BSCD2000 height transformation grid).

* The national GNSS augmentation service SAPOS introduced new coordinates for geodetic benchmarks and reference stations on 1 July 2025. These were determined from the national GNSS campaign 2021. The results originally obtained in ETRF2020 were fitted to the previous coordinates in ETRS89/DREF91/2016 (determined during GNSS campaign 2008) via selected geodetic benchmarks by means of a 7-parameter Helmert transformation. Therefore, the new realization ETRS89/DREF91/2025 in principle refers to the same datum ETRS89/DREF91/2025, both with respect to the horizontal coordinates and the ellipsoidal heights, and the coordinate differences are small (typically less than 10 mm). In particular, the differences in the ellipsoidal heights at the German coasts do not exceed 5 mm. Therefore, the national quasigeoid model remains unchanged until a completely new version is released (envisaged for end of 2026).

9.3 Does your HO require, in-house or procured, that Hydrographic survey system shall be prepared to be able to measuring the GNSS-height and refer the depth to the geoid?

At BSH, measured water depths are referenced to the geoid. Depending on the application or product, physical heights are transformed into values dependent on the water level at a later stage in the data processing chain (e.g. the LAT transformation for producing charts of the North Sea).

9.4 Do you discuss within your HO the need of an altimetric measured Mean Sea Surface (MSS)? (For example, in order to support hydrodynamic models, shipping and / or adjust existing depth data)?

Yes, partly.

9.5 Has your HO assessed the need for dynamic geodetic reference systems (time-dependent transformation relationship) between primarily national and global reference frames?

No.

10. What is the national status of the implementation of IHO S-104 Water Level and S-111 Surface Currents?

10.1 What actions have already been done?

Between 2017–2020, the R&D project "Integration von hochaufgelösten marinen Geodaten in elektronische Navigationssysteme (ImoNav)" focused on preliminary conceptual work and an accompanying pilot study in preparation for the introduction of S-104 and S-111 products.

Since 2023, preliminary conceptual work has been carried out to integrate the data sources and interfaces available at the BSH into the S-104 and S-111 standard.

Since March 2024, processing chains, interfaces, data management strategies, etc. have been developed with the aim of operationalising the production of S-104 and S-111 products and areal water levels. This will be the first step for the North Sea.

In 2025, work continued on the implementation of S-104 and S-111 production. Currently, preliminary test-datasets focusing on the Weser estuary are being produced.

Work on an operational production and development of S-104 and S-111 in the Baltic Sea are ongoing.

10.2 What actions have been planned to be executed and what is the schedule?

After the successful production of test-datasets for water level and surface currents, the development of an automated production of S-104 and S-111 over the North Sea and Baltic Sea is planned in 2026. Plans to expand S-104 to include long-term Tide predictions besides the water level forecast are also ongoing.

10.3 Are all the decisions done to implement S-104 and S-111?

From an organisational point of view, all decisions necessary for the implementation of S-104 and S-111 have been taken. With the release of the final product specification version of S-104 and S-111 before the implementation phase, most technical decisions have been done. A few decisions in regards to practical realisation are still to be made.

10.4 When the decisions have been done or planned to be done?

It is currently not possible to make a reliable statement here, as this depends on too many factors, some of which are external.

10.5 Which organization/-s is responsible for observed and modelled/forecasted water level (Refer to 3.1) and currents in Your country?

WSV and state agencies are responsible for providing daily updated water levels and currents for inland and coastal gauges.

BSH operates a numerical model system for the calculation of ocean, dispersion and water quality forecasts as well as climate projections in the North Sea and Baltic Sea. With this model system, forecasts of water level and currents for the next few days are computed several times a day.

10.6 How is Your country represented in the IHO Tides, Water Level and Currents Working Group (TWCWG)?

Germany is represented by Dr Andreas Boesch and Mr Thorben Knoop.