

**Questionnaire to BSHC Member States on their implementation status of the transition to a Harmonised Vertical Reference, Baltic Sea Chart Datum 2000.**

Last three questions concerns GNSS-augmentation/correction services used in member states.

Please return to Mr. Jyrki Mononen by email (jyrki.mononen@liikennevirasto.fi) at the latest by **26 January 2018**.

Member state	Sweden
Date of reply	2018-01-26
Point of Contact	Thomas Hammarklint, Hydrographic Office (HO), Swedish Maritime Administration (SMA) Thomas.Hammarklint@Sjofartsverket.se

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

The change of chart datum in Swedish official nautical chart portfolio; the Chart Improvement project (Sjökortslyftet) is included in the Swedish HO "Vision 2020" (*Målbild 2020*), approved and decided 2014 of SMA HO management.

Chart Improvement project: The vertical reference and coastline will be updated and referred to Baltic Sea Chart Datum 2000^(RH2000) (BSCD2000) in all Swedish charts, except those covering inland waters, before the end of 2021. Lakes covered of official charts will be taken care of in similar way before the end of 2022.

Swedish Maritime Administration (SMA) and Swedish Meteorological and Hydrological Institute (SMHI) have a cooperation agreement covering this area of responsibility. Transition to the new vertical reference for the water level will take place during the same period. Discussions with SMHI on a specific date for the transition into BSCD2000 are on-going. It is possible to together with other countries concerned agree on this. The possibility for the user to choose between mean sea level and BSCD2000 will be implemented.

In the EU-financed project FAMOS, SMA and SMHI will harmonize and upgrade the [Swedish water level network](#) (2017-2018), including new sensors for 50 stations. All water level data will be presented in BSCD2000.

1.1. When the decisions has been done or planned to be done?

Year 2014.

1.2. What are the national decisive organizations?

Swedish Maritime Administration (SMA) includes Hydrographic Office (HO) and is representing Sweden in IHO and is also responsible for official Swedish nautical charts.

SMHI and SMA in cooperation: reference datum for water level and publishing water level information. Swedish Meteorological and



Hydrological Institute (SMHI) are among other things responsible for this INSPIRE Directive theme and responsible for the master national water level network and also a member of BOOS. SMA has been a member of BOOS since May 2017.

2. What is the national status of implementation?

2.1. What actions have already been done?

- All new hydrographic surveys started July 1, 2013 or later refer to BSCD2000.
- The Swedish depths database (DIS) was transformed to the Swedish realisation of the harmonized vertical reference (BSCD2000) 2013-05-23.
- All new charts in inland waters produced 2008 or later refer to BSCD2000 with added offset adapted for each lake.
- In September 2015 the Chart Improvement project started. Up to this date 10 paper charts and equivalent ENC's have been updated to BSCD2000.
- In areas where no modern surveying has been performed and only old analogue depth data is available these fair sheets has been scanned, transformed and uploaded into DIS (referring to BSCD2000). Digitalization has been finalized 2016.
- Vertical/Height information in the data base Poseidon, storing nautical object including light houses, refer to BSCD2000.
- All involved water level stations is connected to the BSCD2000 network.
- All water level data recorded at the stations owned by SMHI is stored referring to BSCD2000.

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

See answer 1.

3. Are the relevant national contacts and interest groups defined?

3.1. What are the essential national interest groups in Your country?

- Swedish Maritime Administration ("*Sjöfartsverket*" SMA) (including correspondence with local harbours through head of Pilot areas)
- The Swedish Meteorological and Hydrological Institute (SMHI)
- The Swedish National Land Survey ("*Lantmäteriet*" LM)
- The Swedish Transport Agency ("*Transportstyrelsen*" TS)
- The Swedish Transport Administration ("*Trafikverket*" TV)
- The Geological Survey of Sweden ("*Sveriges Geologiska Undersökning*" SGU)
- The County Administrative Boards ("*Länsstyrelserna*" Lst)

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

- SMA: Thomas Hammarklint (HO point of contact)



- SMHI: Fredrik Waldh (co-operation in progress)
- LM: Jonas Ågren and Per-Anders Olsson (co-operation in progress)
- TS: Johan Skogvik (HO point of contact)
- TV: Not yet (TBD)
- SGU: Björn Bergman (co-operation in progress)
- Lst: Not yet (TBD)

Also HELCOM SAFE NAV has been informed by SMA HO.

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

4.1. What are the major obstacles or issues?

The HO has replaced the former chart production system in 2016. There was a temporary disruption during September 2016 to December 2017 in the Chart Improvement project.

Information to the users about the transition to the chart datum Baltic Sea Chart Datum 2000 (BSCD2000) is a major challenge. To change into a new reference datum for water level to early might cause a misleading understanding about the true depths.

4.2. What measures has been planned to avoid them?

Extra time allocated in the plan but the time schedule is tight. The work started in the northern parts of Bay of Bothnia and the plan for 2018 is to reach the area south of Gävle and the area surrounding Gotland.

5. Connections to neighbouring countries

6.1. Which are the relevant countries to cooperate?

Sweden has boundaries to all other countries surrounding the Baltic Sea. To some extent cooperation is needed with all of them, but in practice handled through BSHC.

Sweden (and Denmark) has maritime borders adjacent to Norway in areas with limited tide. Norway applies different rules (compared to Sweden and Denmark) regarding the choice of reference level. As a result the reference level used in the charts shifts up to about a half meter along the border. There is need of an agreement between Sweden, Norway and Denmark regarding the delimitation and shift of Chart Datum towards the North Sea. Sweden has an action within the Nordic Hydrographic Commission to invite Denmark and Norway for this.

6.2. Are the needed points of contacts already known?

Necessary point of contacts is known.

Important to continue the dialogue between CDWG/BSHC and BOOS to get the water level operating institutions in the transition to the new reference.



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

There is no synchronising done in regards to time schedule. It is up to each and every member state to implement the agreed vertical reference system (EVRS) and Chart Datum. All steps towards EVRS will improve the existing situation.

Sweden has a fruitful exchange of information and experiences with Finland concerning harmonization within the FAMOS project and the Chart Improvement project.

6. Are there any needs for support from BSHC?

Support the dialogue with Norway and NSHC in order to handle the reference level difference at the border between Sweden and Norway (...and preferably also between Denmark and Norway). That kind of dialogue will probably support any future agreement concerning the reference level for high-resolution bathymetric data in European coastal waters.

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

The Chart Improvement project is included in the FAMOS project and has received EU co-financing from the Connecting Europe Facility (CEF Transport) for the years 2015-2018. For more information, see: <http://www.famosproject.eu/activities/future-navigation>

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

In areas with acceptable coverage we are using GNSS with RTK, either from own base stations or the SWEPOS Network RTK service provided by Swedish Land Survey "Lantmäteriet". In areas in open sea with poor coverage or where the height component is inadequate we only use the horizontal component from RTK or Network DGPS from SWEPOS or IALA DGPS. Depths are then corrected by tide models to the chart datum.

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

SWEPOS Network services provided by Swedish Land Survey, "Lantmäteriet" and IALA DGPS.

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

Coordinate system SWEREF 99 TM (extended UTM zone 33). We are using the geoid model SWEN08_RH2000 to convert from ellipsoid height to Swedish national reference level RH2000 (BSCD2000). From the beginning of the survey season 2018 we will use the new geoid model SWEN17_RH2000, which is calculated from the NKG gravimetric model.