Minutes
BSHC CDWG11 Meeting
5-6 February 2019
Aalborg, Denmark

29 March 2019

Minutes

1. Welcome and formalities

The meeting started at 9:00 am on February 5th. The Chair, Thomas Hammarklint, welcomed all participants to the meeting [CDWG11 List of Participants] [CDWG11 Photo] and thanked the host that the meeting could be carried out on the premises of the Danish Geodata Agency (GST).

Some participants were new to the group since the last meetings and a presentation round was carried out. Poland's first participation at the CDWG meeting was particularly appreciated. Apologies have been received from Dr. Sergey V. Reshetniak (Russian Federation), Patrick Westfeld (Germany) and Aksel Voldsund (Norway).

The chair suggested that a group photo should be taken on the roof later.

Mr. Lars Jakobsson was elected as the secretary for the meeting. Election of a permanent CDWG secretary is part of agenda item 12. Lars proposed that everyone should consider being able to take on that role.

The chair reviewed the program [CDWG11 Program] and agenda [CDWG11 Meeting Agenda] for the meeting. Both the program and agenda were accepted.

2. Review the work of the CDWG and actions since the last meeting

The chair reported in detail on the result and status of actions and other initiatives since the last meeting. Several presentations were given at conferences. Meetings and major outcomes and initiatives 2018 and planned for 2019: see Chairman´s Report to CDWG11 [Chair´s Report to CDWG11].

The minutes from CDWG10 [CDWG10 Minutes] were briefly reviewed and then accepted without adjustments. It was noted that participation at the CDWG10 meeting at Arkö [CDWG10 Photo] included dedicated participants from most Baltic countries.

The chair reviewed the action list from CDWG10 [CDWG10 List of Actions]. The chair has also supplemented the list with some additional actions since the last meeting as a consequence of the BSHC23 meeting; ref. BSHC23 Action #21-23. Only a few actions remain to be finalized. Status of commented CDWG10 Actions:

Action 2. Letter sent to Russian HO asking for a point of contact responsible for geodetic data and other information in the Russian Federation. New CDWG11 Action 11: Continue to contact Russian HO about a contact person on gravimetry data (responsible: Thomas).
Action 3b. Dr. Patrick Westfeld BSH Germany has provided information indicating that previously reported differences between BSH77 and BSCD2000 need further review. New CDWG11 Action 6: Germany to provide information about MSL in BSCD2000 (responsible: Patrick).

Action 5. Jonas has produced a map showing differences between MSL2019 and BSCD2000. Both the map and data file is published on the BOOS web site [mwreg_boos_map] [mwreg_boos_df] but also linked from the CDWG web. Some adjustments of the map and the data file based on adjusted levels at some stations in the near future are necessary. New CDWG11 Action 3: Specify difference between old and new reference levels for each country. Receive info about MSL from some countries and update mwreg_boos.pdf (responsible: Thomas et.al.).

Action 6. Ongoing. All WG members have to provide Thomas with links to relevant national web pages. Thomas will add them to the CDWG web page [CDWG web page].

Action 8. Chair has compiled and published a summary of the implementation status in all countries on the CDWG web page [Implementation Status Summary].

Action 9. New info sheets produced by Sweden, by SMA and SMHI, were published on the CDWG and BOOS web page, both in English and Swedish [Info Sheet Sweden/Swedish] [Info Sheet Sweden/English]. Ref. the Estonian Info sheet, "*New Height System EH2000, Information for Navigators and Ports*", presented last year at CDWG10 [Estonian Info sheet]. Additional CDWG11 Action 14: Rewrite the Swedish info sheet about BSCD2000 for all Baltic countries and present it on the CDWG website (responsible: Thomas).

Action 10. Jonas has compiled a brief description of BSCD2000. This required some prior knowledge to understand. Initial paragraph describes what it is. The second paragraph contains explanations. The benefits are shown in the last paragraph. Poland considers that adjustments need to be made so that it is in line with the Specification of BSCD2000. The zero level of the BSCD2000 is in accordance with the Amsterdam level (NAP). Adjustments were made to the brief description from Jonas. Chair published the updated brief description of BSCD2000 at the CDWG website [Brief description of BSCD2000]. New action 1: Update the CDWG web with the short description of BSCD2000 (responsible: Thomas).

Action 11. Minor updates have been made to the road map and the sketch of the implementation process, including Sweden´s answer to the questionnaire [Road Map].

Action 12. Jonas, with the support of Gunter and Jyrki, has updated the BSCD2000 Specification with the earlier agreed on adjustments [Specification of BSCD2000]. As shown in the German answer to the questionnaire and other correspondence with Chair, Germany requires an official version of the Specification as soon as possible to support ministry decisions on using DHNN2016 for all water level stations in the Baltic Sea.

Action 13. Chair participated in the NHC meeting and discussed the connection of various Chart Datums in Skagerack. Chair has not yet participated in NSHC TWG [NSHC.pro] but intends to participate in the next meeting.

Action 19. Chair has added this action after CDWG10; ref. BSHC23 Action #21 [BSHC23 documents]. Chair proposes adding the following task to the Work Program: ”Invite member states to consider gravity measurements and geoid computation.” Jonas believes that this is already done within FAMOS.

Action 20. Chair has added this action after CDWG10; ref. BSHC23 Action #22 [BSHC23 documents]: “*Add task to Work Program to provide an overview where additional gravity measurements are needed*”.

Action 21. Chair has added this action after CDWG10; ref. BSHC23 Action #23 [BSHC23 documents]: “*To write letter to GI Registry Manager to include BSCD2000 to the IHO GI Registry*”. Chair showed excerpts from the register.

3. Outcome of the BSHC 23rd Meeting

Chair presented the outcome of the BSHC23 meeting, especially with reference to the aforementioned CDWG10 Actions 19-21, and other relevant comments to BSHC23 Minutes and BSHC23 Actions #21-23 [BSHC23 documents].

Welcome greeting by GST Director-General

Director-General Pia Dahl Højgaard joined the meeting momentarily. She welcomed the meeting participants to the Danish Geodata Agency (GSA) [Danish Geodata Agency] and wished the meeting participants success. She also mentioned that the organization is relatively new and has great challenges to deal with. The agency is responsible for the recording of real estate in Denmark and nautical charts concerning Denmark, Greenland and the Faroe Islands.

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4. Review the national implementation plans and the status of implementation

Chair summarized the national implementation plans and the status on the basis of his compilation, included last in the Chairman´s report to CDGW11 [Chair´s report to CDWG11].

Germany was not represented at the meeting but wanted the official definition of BSCD2000 to be published [German´s answer to the Questionnaire 2019]. Germany need an official version of the Specification as soon as possible to support a ministry decree to use DHNN2016, and thus implement BSCD2000 for all water level stations in the Baltic Sea. Jonas believes that it is a living document that need to be kept up to date. The German height system does not strictly meet the European solution according to Jonas. Unclear whether Dr. Gunter Liebsch at the Federal Agency for Cartography and Geodesy (BKG), who has previously been involved in designing the text, accepts that land uplift will also apply to Germany.

Denmark: the situation was the same as last year [Denmark´s answer to the questionnaire 2019]. Denmark will not make any changes to existing charts until the connecting Swedish charts are updated - then (only) text in Danish charts will be changed. Chair mentioned the difference that SMA pilots and SMA HO have observed between Swedish and Danish water levelling data. SMA HO is doubtful as to whether the Danish water level reference is based on DVR90; it seems rather be MSL. SMA HO hopes to arrange a meeting with the organizations involved to sort this out.

Estonia's update of printed charts and ENC is ongoing, but with limited resources [Estonia´s answer to the Questionnaire 2019]. A new vertical reference homepage section with information for ports and mariners havs been published [Information for ports and mariners]. Articles have been written in two different maritime magazines. Some do not understand why this change is happening - the new reference level is lower and it looks like draught is lost. Estonia shows an amusing and informative film, worth watching [Estonian Film]. The transition will take time, at least until 2025.

The **Finnish** implementation is similar to the Swedish method [Finnish answer to the Questionnaire 2019] [Finnish presentation]. Organizational changes have been implemented and are still ongoing. Several authorities have been restructured into the Finnish Transport and Communications Agency (Traficom), including the HO, TraficManagement/VTS and the Transport Infrastructure Agency (TIA). This was described in detail in the presentation. The HO consists of the Vessels department, the Hydrographic Survey Data Management, etc. A newly implemented bathymetric management system was based on BSCD2000. In addition, a new Chart production system was installed.

The BSCD2000 implementation plan was completed in 2018. The update of charts has started from the north. Depth data management is in progress. The reference level changed 10-20 cm depending on reference definitions and up to 60 cm due to land elevation. No change of inland water was included. The authorized draught in fairways may in some cases decrease by 20 cm. The BSCD2000 will be published in charts starting in 2020, and the update of the charts will take 6-8 years [The new reference system N2000]. Cooperation with FMI has started. FMI is responsible for sea level data and manages 14 mareographs.

The current reference level consists of the theoretical MSL, but N2000 is used in some cases. The most important stakeholders have been contacted. Information about this is planned for 2019-2020. It is unclear when the change of reference level to BSCD2000 will take place for waterlevel data.

In **Latvia,** BAS-77 is still in use and differs 16 cm from the new EVRS-based national height system LAS2000,5 [Latvian answer to the Questionnaire 2019]. Info included in all charts on how to transform depths between BAS-77 and LAS2000,5/BSCD2000. Ref. also to Latvian answer to the questionnaire 2019. Tide gauge data usually provided in old BHS77, but there is a note on how to recalculate by yourself if needed.

Lithuania had no representative present at the meeting. Chair referred to the summary that he compiled and Lithuanian answers to the questionnaire [Lithuanian answer to the questionnaire 2019]. The new Lithuanian height system, LAS-07, which is in principle the same as BSCD2000, came into force 2016-01-01. All charts are still using the old reference system, Baltic Height System 1977 (BHS-77). The paper charts have a note on how to calculate depths from BHS-77 to LAS07. The mean difference between the old and the new reference systems is about 13 cm.

In **Poland,** the update of charts is ongoing [Poland´s answer to the Questionnaire 2019]. Poland's current legislation clarifies that WGS84 and MSL must be used for charts. But the decision has been made to use the vertical reference system PL-EVRF2007-NH for new editions of nautical charts (ENC) from the beginning of 2020 [Polish presentation]. Discussion is ongoing between the Polish HO and those responsible for water levelling; HO wants to verify that the used difference between MSL and PL-EVRF2007-NH, currently being used is correct. Control will be done to ensure that the height system has the right relationship to Amsterdam. Unclear if Jonas plots based on MSL. Poland is using 11 sealevel stations from the Institute of Meteorology and Water Management. Collaboration with FAMOS regarding gravimetric measurements is going on. Online services lack reference level information. New CDWG11 Action 10: Poland check members of CDWG (responsible: Witold) and CDWG11 Action 12: Present data from Polish gravimetry campaigns 2019 (responsible: Witold).

Russia wsd not represented at the meeting and left no answer to the questionnaire 2019. The Russian answer to the questionnaire last year (2018) [Russian answer to the Questionnaire 2018] showed that any decisions concerning the transition to the harmonized vertical reference may be done not earlier than the end of 2020. See also the summary at the last page in Chairman´s Report to CDWG11.

Sweden is working to adapt the charts to BSCD2000 according to the time schedule for the Chart Improvement Project [BSCD2000 in Swedish Charts] [Swedish answer to the Questionnaire 2019]. SMA, coordinated with SMHI, will transition to BSCD2000 as the reference for water level data, forecasting and warning services (for unusually high and low water) in June 2019. New info sheets describing the change, produced by SMA and SMHI together, are published on BOOS web page, linked to CDWG web page, both in English [Info Sheet Sweden/English] and Swedish. SMHI has also published an article describing the change in Swedish [Article SMHI/Swedish]. A road trip will be carried out this spring and all

pilot stations will be visited for to give pilots and harbor personal information about the new reference level. Clear explanations are needed for the users. 60 tide gauges are connected to BSCD2000. Data shows that depth is decreasing around the coastline, excluding the Swedish west coast, due to land uplift and sea level rise. An overview shows which charts (or more correctly: areas) have been upgraded to BSCD2000 and which areas are in progress; the current status, from December 2019, is reported on the last page of Sweden's answer to questionnaire 2019. Finland is wondering how Sweden intends to handle changes of depth in the fairways and associated information shown in nautical publications. Lars replies that it is not part of the Chart improvement project, but we run a parallel project which aims to find ways to inform about nautical supplementary information. A discussion arose about rules that govern the use of fairways. Finland uses a safety margin. It is important to focus on the real-time water level instead of the reference level.

5. Review and update the joint road map, time line, and communication plan

Development of the CDWG Website [CDWG Website] is important. Chair wonders if there is any missing information on the CDWG web. Finland will need to adjust the links to the new authorities.

The Joint Road Map for Implementation of Harmonized Vertical Reference System needs to be extended [Joint Road map]. Lars believes that BSHC expects that CDWG will continue to have control over the implementation for several years to come so that no country falls behind. Chair suggests that he update and extend the time line to 2023. New CDWG11 Action 5: Update joint Road map. Delete 2016-2017. Add until 2023 (responsible: Thomas).

6. Draft specification for Baltic Sea Chart Datum 2000

Jonas describes the draft for the specification of the Baltic Sea Chart Datum 2000 [Draft Specification BSCD2000], including the origin, the structure of the specification, and the definition (e.g. equipotential surface connected to Amsterdam and vertical coordinate specified by Normal heights). The concept is based on national realizations of vertical and spatial co-ordinate systems. Goal: a standard uncertainty better than 5 cm. In Denmark and Germany, the national realizations do not meet the definition, but nonetheless deviate no more than 2-3cm. However, from the Swedish side, we are hesitant about this, given the observations of Swedish and Danish water levels that we have made over the years. Against EVRS2007 everything looks ok according to Jonas. An exception to this is Russia, which needs to transform the national reference frame to connect. Offshore, BSCD2000 shall be realized with the support of the national GNSS positioning services. Land uplift corrections shall be applied in areas with significant land uplift. Jonas has written a draft proposal; when to correct for land uplift. The text describes why negligible land uplift does not need to be considered. Lars asked how future dynamic reference systems will affect the latter text? In case PPP / SSR GNSS service is used, you get the result in the global ITRF frame and need a "Pasi Mäkinen"-transformation that includes land uplift management. New CDGW11 Action

4: Update the Specification of BSCD2000 (new map etc.) and upload it to the CDWG Website (responsible: Thomas, Jonas, Gunter, Jyrki).

Jonas's map [mwreg_boos map], which he thought was based on MSL relative BSCD2000 for all reported countries, should be adjusted. Ref. also [mwreg_boos pdf]. Chairman suggests that we produce a new map showing old reference level relative to BSCD2000 (Kronstadt - BSCD2000). Jonas wonders how Finland calculates MSL. Ref. [FMI – Theoretical MSL]. Chairman mentions various traditional methods to calculate MSL in different countries; for example Poland uses 19 years to calculate MSL, but they only use MSL for statistics. The information in the mwreg-file/map for at least Poland needs to be adjusted so the correction to BSCD2000 is correct. New CDWG11 Action 3: Specify difference between old and new reference levels for each country. Receive info about MSL from some countries and update mwreg_boos.pdf (responsible: Thomas, Jonas, Gunter, Jyrki).

7. Cooperation and communication with BOOS

Chair presented BOOS news [BOOS News] relevant for CDWG. MoU between BSHC and BOOS on the transition to a harmonized vertical reference was signed in 2014. SMA is a BOOS partner since 2017. BOOS creates access to oceanographic data services related to buoys, tide gauges, wave heights, fixed platforms, ferry boxes, etc. via BOOS data portal. Copernicus Marine Environmental Monitoring Service (CMEMS) in cooperation with EmodNet, EuroGOOS Tide Gauge Task Team, INSTAC and many others, provide oceanographic observations from European Seas. "*Mean Sea Level 2019*" for reference levels can be accessed from both the BOOS and the CDWG web page. Jonas asks about the role of BOOS regarding the Hydrodynamic model. Chair believes that it is probably better to go to the Copernicus web [Copernicus hydrodynamic models], where several Baltic Sea countries cooperate. Anni and Chair seem to agree that it is important with greater involvement from different institutions and, above all, greater coordination and alignment of methods and routines. New CDWG11 Action 7: Support BOOS specifying vertical datums for the presented services (responsible: all).

8. Cooperation with FAMOS

The point is expected to take more time than is left of the first meeting day and is therefore moved to the next day.

9. CDWG TORs

The WG members had no suggestions for changes of Terms of References [CDWG Terms of References 2019-2020] and thereby no need for amendments.

10. CDWG Work Programme for 2019-2020 and future work

With reference to BSHC23 Action #21 and #22, Chair proposes to add to point 4 in the CDWG Work Programme: "*Invite member states to consider gravity measurement and provide an overview where additional gravity measurements are needed.*" [CDWG Work Programme 2019-2020]. Supplementary measurements are probably needed to verify the quality of old gravity measurements. Support with permit management may be needed. Measurements are ongoing in several countries that should be able to be used together with other data. Gravity data from Poland would be an urgent addition. Chair shows a letter he sent to Russia with proposals for joint commitment. (Action 2: Add to Work Program "Invite member states to consider gravity measurements and geoid computation and provide an overview where additional gravity measurements are needed" (responsible: Thomas).

11. IHO Specifications and Resolutions

IHO resolution M3 3/1919, *Datums and benchmarks* [M3 including 3/1919] [Ref. IHO CL10/2017] is anxious to know. Some important parts of the content:

> 1. It is resolved that the datum of tide/water level observations and predictions for mariners shall be the same as chart datum (datum for sounding reduction).
>
> ***In geographical areas where the tidal range is negligible (for example less than 0.30m) and in non-tidal areas***
>
> 10. It is resolved that depths, and all other navigational information should be referred to Mean Sea Level (MSL) or other level as closely equivalent to this as is practical and acceptable to Hydrographic Offices.
>
> Note: The adopted level may be a well-defined geodetic datum as used for heights in land survey applications or an observed local Mean Sea Level (MSL) based on long series of water level observations.

IHO S-104 *Tidal Information for Surface Navigation* [IHO TWCWG including S-104]. Important for future development of water level services. IHO S-112 was considered unnecessary and has been withdrawn; instead the IHO TWLWG refer to IMO SN.1/Circ.289-02.06.2010 [Guidance on the use of AIS application-specific messages]. We need to ensure that the standard for gridded water level information is clearly specified in S-104 and not lost with S-112.

IHO S-111 *Surface Currents* [IHO TWCWG including S-111] including S-111 Data sets. The specification work has come a long way and been implemented in prototypes and products.

Within STM, concepts can be tested on more than 200 vessels participating in the project. The German ImoNav project presents, among other things, depth corrected for water level and currents information.

End of day

Tomorrow start with agenda item 8. *Cooperation with FAMOS*. After FAMOS we continue with agenda item 12. *Any other business*.

Chair shows the photo of the CDWG taken on the roof earlier.

Now we look forward to the joint dinner on board restaurant Princess Juliana at 7 pm.

Wednesday morning!

Chair welcomes everyone after yesterday's successful dinner.

8. Cooperation with FAMOS [FAMOS] and additional gravimetric survey activities

8.1 **Jonas** describes the work done in FAMOS Freja (2014-2016); "*Harmonising vertical datum"* and FAMOS Odin (2017-2019); "*Improving vessel navigation for the future"*; a work in line with CDWG ambitions [FAMOS Odin Activity 2]. Much credit to participants. Shipborne gravimetry measurements and processing: a lot of work is being done to gain access to ships, handle permit issues, etc. Gravimetric campaigns: DENEB 2017 (Germany) and Sektori 2017 (Estonia) and Piggy-back Campaign along a ferry link onboard M/V Urd (2017) between Travemünde and Liepaja and the Kattegat airborne Campaign has been completed. The total effort 2015-2018 covers large parts of the Baltic Sea and the water between Sweden and Denmark. Creation and maintenance of databases, gravity data updates and analyses and also geoid computations have been implemented. FAMOS gravity database released 2018-10-03. No data yet from Poland, but they are a partner in the next stage; Jonas is very happy about it. At present, tricky handling of areas without measurement is required.

Comparison between new and old measurement data involves extensive work. Rather promising, but some systematic differences exist in some areas. Difference between interim geoid and NKG2015 geoid noticed – the known weaknesses in the NKG2015 geoid can be corrected. Important to be able to fill in data representing the Poland area. Interim geoid computation is extremely time consuming; a calculation can take 3 months. Jonas shows a comparison of two interim geoid models calculated using the same database: LM6a and BKG2b_SPFOUR_hc, calculated with completely different methods; the difference is RMS 2-3cm.

Conclusions: Very good that FAMOS Odin is extended for 6 months so that the job can be carried out in the best possible way. FAMOS gravity database ver.3 is the most important result of subprojects FAMOS 2.1-2.2 and realize in practice the BSCD2000 at sea. Supplementing the database with existing gravity data over the Polish area would greatly benefit the work.

Per-Anders presented a number of gravity campaigns within the framework of FAMOS using the Swedish gravimeter ZLS-D13 [Marine and airborne gravity measurements with the Swedish gravimeter, ZLS-D13]. The gravimeter was installed on Jacob Hägg in 2017 and operated in an integrated manner with hydrographic measurements in the Sound and along

the Swedish south and south-east coast. The measurements gave very important crossovers; intersecting among others an old air gravimetric campaign. Jacob Hägg was also used in 2018. Mirjam planned the Geomari 2018 survey covering an area south-east of Helsinki. Fyrbyggaren also covered the area between Stockholm and Gotland and west of Gotland in 2018. An airborne campaign covering most of Kattegat and a large part of Skagerrak, conducted in 2018 together with the Technical University of Denmark (DTU) with a Stromberg Gravimeter, was a successful collaboration.

It is important to perform the installation correctly. The crew needs to check the equipment from time to time after the installation. Besides this and an occasional visit to port, the equipment takes care of the rest by itself. Crossover analysis shows that it needs to be filled in with more data. There was a malfunction with the ZLS D13 gravimeters in Fyrbyggaren 2018b. More campaigns are planned for 2019 with Fyrbyggaren or another vessel, perhaps together with Finland.

Mirjam presented FAMOS Activity 2.4 *Geoid model validation at sea* [Geoid model validation in the Gulf of Finland using GNSS-derived geoid heights]. FAMOS Freja showed it is possible to recover geoid heights from GNSS observations at sea and validate existing geoid models. Agreement (dN) was better than 5 cm in the Gulf of Bothnia based on the Geomari campaign 2018. Reductions were needed with respect to sea level, heave, roll, pitch and squat. Squat estimation based on measurements were tricky - had to be done with a formula instead. The NKG2015 geoid was compared with FIN2005N00. Conclusions: We can recover geoid heights from GNSS observations at sea and validate existing geoid models. In FAMOS Freja we found an agreement between GNSS-derived geoid heights and geoid models better than 5 cm in the Bothnian Sea. Relatively good conditions for this exist in the Baltic Sea since the availability of support data is good.

Important “if you want to do this at home”: Positioning of GNSS antenna - Common processing of base stations - Coordinate transformation to systems related to geoid model - Vessel with well determined internal coordinate system - Knowledge on relative locations of instruments and water line - Pitch and roll - Static draft and squat - Well-controlled area with good monitoring networks and models - Elsewhere modelling of tides may be needed.

Mikael presented FAMOS Odin 2.3 *Upgrade and harmonize the Swedish tide gauge network (SHIP)* [SHIP]. The station network is divided into four classes with a total of 59 stations. Achievements so far are as follows. 49 upgraded stations with new sensors in a joint Swedish tide gauge network. All stations are connected to the national precision levelling network, i.e. Baltic Sea Chart Datum 2000 (BSCD2000). New reference level will be implemented from 2019-06-03. Gothenburg city, as a 3rd part, contributes 3 extra stations. Measurement principles are based on radar sensors. Kalix-Karlsborg station equipped with ice protection (heating cable and insulation). The station at Landsort Norra equipped with heated house and well. New house built at Visby station. Comparison between old technique and new radar sensors shows interference around 0,5 cm. SMHI oceanographic warning and forecasting service was updated, with the new warning limits for disturbing high or low water levels based on needs. In Öresund, warnings occur frequently. Alerts broadcast on multiple channels.

Malgorzata presented gravimetric measurements performed in cars and in ships together with IMU, integrated with the navigation system (not part of FAMOS) [Acquisition and exploration of gravimetric data of marine areas and its coastal zone]. The gravimetric measurements were first carried out by car, and later in ships, together with IMU and then integrated with the navigation system. They developed their own Matlab tool for managing data. Calibration and testing was performed around a lake. Gravimetric measurements were performed in around the coast and benchmarks were established in ports. Tidal measurements were performed. A calibration line was established; for calibration, a 20 km long railway was used where points were established and any drift of the gravimeter could be identified. Survey plan is available for the 2019 and next year's measurements covering most of the Polish maritime zones incl. economic zone. The plan is somewhat dependent on access to ships.

Chair presented the *STM FAMOS 2020-2022* plan for the future [STM FAMOS]. Sea Traffic Management (STM) is a concept influencing several projects and with many partners. All ships can see each other and everyone's routes. The global climate situation and the increasing digitalization of the world impose demands on shipping to become more efficient. STM FAMOS focuses on making the Baltic Sea a model region. By studying opportunities for efficiency, using new technologies, taking part in collaborations and experience-sharing, as well as analyzing the results of tests made, STM-FAMOS will be able to make an actual difference for shipping; an industry developing towards even greater efficiency, sustainability and security. More precise bathymetric data and a more accurate vertical positioning of ships are required to enable ships to optimize both loading and steaming.

The continued project is divided into four sub-activities:

1. Continuing implementation of existing HELCOM plan
2. Implementation of the BSCD2000
3. UKC LOAD – UKC GO - In a sea as shallow as the Baltic Sea, a ship's efficiency may be effected by the ration between its keel and the seabed during a whole voyage, from dock to dock.
4. Baltic Sea Model Region - Develop adequate processes for sustainable and long-term use of IHO S-1XX standards.

12. Any other business

Election of permanent CDWG secretary: Chair encourages everyone to step forward and nominate yourself for the permanent secretary role. Such engagement creates the conditions for interaction between Chair and Secretary and favors the group's driving force. When Thomas also handles the CDWG web, the total workload is too great to also handle the secretary role, completely or partially. New CDWG11 Action 9: Finland check if they can take care of ordinary secretary (responsible: Janina).

Update list of Members [CDWG List of Members]. Chair has tried to clarify who are currently the Russian delegates and has asked Dr. Sergey V. Reshetniak. Chair will update the list

based on the information available to him. New CDWG11 Action 10: Poland check members of CDWG (responsible: Witold).

Chair made a short report from the Tides, Water Level and Currents Working Group meeting (TWCWG3) in Valparaiso, Chile, 16-20 April 2018 [TWCWG3 documents].

Coming meetings and conferences:

- TWCWG4/GLOSSGEXVI meeting, Busan, Corea, 8-13 April 2019 [TWCWG4 documents]. Chair prepare to participate in the meeting.
- NHC63 meeting, Helsinki, Finland, 9-11 April 2019 [NHC63 documents].
- BOOS annual meeting, Rostock, Germany, 12-13 June 2019 [BOOS Annual Meeting 2019]. Chair prepare to participate in the meeting.
- BSHC24 meeting, Gdansk, Poland, 10-12 September 2019 [BSHC24 documents]. Chair prepare to participate in the meeting.
- NSHC34 meeting, Reykjavik, Iceland, 27-28 April 2021 [NSHC34 documents]
- NSHC TWG24 TBD [NSHC Website] Lars comment: The notes from the NSHC TWG23 Iceland meeting (probably October 2018) have not yet been published - they usually have a meeting every year. (Action 8: Sweden, Denmark, Norway)

13. Review of actions and unresolved issues of this meeting

The CDWG11 List of Actions was updated [CDWG11 List of Actions]

14. Report to BSHC 24th meeting

BSHC24 meeting will be held in Gdansk, Poland, 10-12 September 2019. Chair prepare to participate in the meeting [BSHC24 documents]. New CDWG11 Action 13: Write CDWG-report to the BSHC24 Conference (responsible: Thomas).

Status of Actions, especially number 19-21 [CDWG10 List of Actions] requested from BSHC23 meeting.

List of other matters to be reported.

15. Next meeting

Next meeting will be held in Poland, 3-4 March 2020, at the Polish Hydrographic Office. The Polish Hydrographic Office will in 2020 celebrate 100 years.

16. Closing of the meeting

Chair thanks all participants and for all contributions to the meeting.