Joint meeting of the

GEBCO Technical Sub-Committee for Ocean Mapping
GEBCO Sub-Committee for Regional Undersea Mapping
GEBCO Outreach Working Group

TSCOM/SCRUM/OutreachWG Notes

Welcomed by Karen Marks, Chair TSCOM, followed by Eunmi Chang on behalf of HSK and KHOA.

Administration from Eunmi Chang, including week programme.

Karen Marks (KM) and Vicki Ferrini (VF) introduced the agenda.

KM gave a presentation on the activities of TSCOM over the past year. Noted the need for new members. Highlighted the interaction with the establishment of Seabed2030 Project and the work on the revision of the IHO resolutions, noted the need for input from the CSBWG and Seabed2030 before submitting to the GGC. Highlighted the current availability of data including new acquired datasets. Highlighted the Earth and Space Science article 'A new digital bathymetric model for the world', noting how regularly the article has been used and referred to since publication. Activities of CSBWG and IHO DCDB web portal were highlighted. OutreachWG developments were detailing including creation on information web pages and GEBCO project and community videos. Global Multi-Resolution Topography dataset was noted. Further developments of the IHO-IOC GEBCO Cook Book, noted a live publication which had been up dated twice in 2017. Highlighted GEBCO Symposium 2017 under title 'Map the Gaps' and Nautical Chart Adequacy Workshop hosted by NOAA.

VF gave a presentation on the activities of SCRUM. She provided a quick background on the goals of SCRUM and noted the current membership. Highlighted the MH370 data, which has been included into the grid; highlighted the AORA activities and the gap analysis tools, which may need to be developed for Seabed2030. Highlighted some of the interactions with Seabed2030 and Global Seabed Mapping Oceans17 panel discussions and the recording made of the event. 2017 American Geophysical Union Autumn meeting with 7 sessions devoted to ocean mapping. Highlighted a number of videos created to support GEBCO and outreach as well as the new Seabed2030 video.

Chairs asked all participants to introduce themselves.

Secretary noted the status of relevant IHO publications and GEBCO maps. Highlighted the withdrawal process underway for B-7 and noted the requirement for the GGC to ensure any information not already covered by the GGC ToRs or B-11 was moved into the relevant publication from B-7.

Status reports on individual programmes were provided:

Updating the GEBCO Grid – Pauline Weatherall (BODC, UK)
Seabed2030 – Martin Jakobsson (UoS, Sweden), which included briefs on the four Regional Data Assembly and Coordination Centres (RDACC):

Southern Ocean (Boris Dorschel, Alfred-Wegener-Institut für Polar-und Meeresforschung, Bremerhaven, Germany);
South and West Pacific Ocean (Geoffroy Lamarche, National Institute of Water and Atmospheric Research Ltd, Wellington, New Zealand);
Atlantic and Indian Oceans (Vicki Ferrini, Lamont–Doherty Earth Observatory, Columbia University, New York, USA); and
North Pacific and Artic Oceans (MJ, -Stockholm University, Sweden/Larry Mayer, Center for Coastal and Ocean Mapping/Joint Hydrographic Center University of New Hampshire, USA)

Global Data Assembly and Coordination Centre (GDACC) – Pauline Weather (PW) (BODC)
Canadian Hydrographic Service (CHS) ocean mapping activities – Serge Lévesques (SL) (CHS, Canada)
European Marine Observation and Data Network (EMODnet) Bathymetry – Thierry Schmitt (TS) (SHOM, France)
SHOM DEM – Thierry Schmitt (SHOM, France)
Compilation of a 100m bathymetric grid for the Arabian Plate: Red Sea, Arabian and Oman Seas, Persian Gulf, Northern Indian Ocean – John Hall (JH) (Geological Survey of Israel)
Undersea Feature Modelling – Tony Pharaoh (TP) (IHO)
Availability of scanned GEBCO sheets – Tony Pharaoh (IHO)
CSBWG – Secretary for Chair IHO CSBWG
IHO DCDB – Krisa Arzayus (KA) (NCEI-NOAA, USA)
OutreachWG – Hyo Sung (HS) (Ewha Women's University, Korea)
OutreachWG online jigsaw puzzle for GEBCO World Map – Eunmi Chang (EC) (University of Seoul, Korea)
Global Multi-Resolution Topography – Vicki Ferrini (LDEO, USA)
GEBCO/NF Indian Ocean bathymetric compilation (IOBC) – Robin Falconer (RF) for Rochelle Wigley (UNH, USA)
GEBCO Symposium – Tim Kearns (TK) (Ocean Aero, USA)/Jaya Roperez (JR) (NAMRIA, Philippines)

These reports generated numerous questions and broad reaching discussions. SL reported on the CHS ocean mapping activities covering ocean mapping and data management; he highlighted the Ocean Protection Plan, a government drive initiative. IHO updated on the progress with B-12 – *IHO Guidance on Crowdsourced Bathymetry* – and next phase. KA provided details on the most recent developments of the DCDB for data discovery and the SeaID and Rosepoint Navigation pilot projects. HS provided an update on outreach activities, particularly in preparation for support to Seabed2030; highlighted the educational tools and interactive web applications developed. She highlighted the development of the questionnaire designed to reveal the perception of GEBCO and stakeholders. Highlighted the strategic goal to increase the use of GEBCO products by the international scientific community. Noted progress on actions from previous meeting. EC demonstrated the online world map jigsaw puzzle. VF provided an update on developments of the GMRT and grid compilations. RF provided an update on progress with the IOBC and the NF alumni scholars involved. TK provided a briefing on the GEBCO Symposium and its objective.

MJ provided a briefing on the Seabed2030 Project to help set-up the breakout sessions and posed a number challenges to be considered and addressed.

MJ provided a background brief covering the current state of the resolution of bathymetric coverage and what should/could be the target resolution for the Seabed 2030 project and the future GEBCO-grid. He noted the vision was 100% bathymetric coverage by 2030 but at what resolution is appropriate and achievable using current technology.

HS provided a brief on proposed future actions and interactions to support the Seabed 2030. She highlighted a number of commonalities between the current ToRs and objectives of the OutreachWG and the communications and outreach plan detailed in the Seabed 2030 roadmap. This generated a number of comments and a wider ranging discussion.

VF presented the feedback from breakout group one, the key items of which were:

How can the GEBCO Community help aggregate information about existing data?

- *Sources we may not know about (Multibeam, Singlebeam, digitized soundings etc)*
  - *Establish a chain of communication and a mechanism for people to provide information about data
    - person to person
    - mailer and promo information – well-crafted message
    - Passive strategy
      - Outreach, presentations
      - Hydro International piece
    - *Active* strategy
      - Identify people and points of contact at companies
      - Engage GEBCO community to spread the word and solicit contributions
  - *Identify communities that might hold data – reach out to them
    - Hydrographers
      - Hydro International
    - Scientists
      - AGU – webform for contributing data. ["Join us" video]
    - Fisheries
      - Crowd-source bathymetry
      - They want anonymity
    - Communities that record data
      - Oil & Gas, Mineral extraction
      - Oceaneering (transit data)
      - Cargo ships
    - *GEBCO needs a presence at industry events and non-traditional meetings (Ocean Business, American Fisheries Society, Boston Seafood, IEEE)
    - International Seabed Authority
    - IHO
    - Secretariat of the Pacific – send message inquiring
    - High Profile people: Sylvia Earle, Kathy Sullivan, Sandra Whitehouse – tweet every few months on large scale accounts [other non-Americans]
    - TSCOM, SCRUM, GEBCO-NF Alumni
    - Universities that are developing AUV-gliders, drifters that might be able to provide data
  - Carrot
    - Acknowledgement – contributed to completing the puzzle
      - e.g. ESRI does this with broad acknowledgement
    - Ask potential participants about what they'd need as response
    - Attribution
  - Other legacy formats
    - Worldwide ENCs, Charts
    - Senior members of the science community – possibly targeting institutionally

- *Metadata necessary to help with gap analysis (where, when, how?) for different source types*
    - Develop minimum metadata requirements for submission as well as optimal metadata (similar to R2R strategy)
        - Generate a score based on completion and quality of metadata.
        - TSCOM input for optimal metadata, RDACCs/GDACC focus on implementation and minimum requirements
    - ISO is a good place to start but the key is to identify specific extensions
        - Sensor type, make, model + config settings
        - Platform
        - Storage format (file format) [caution: some formats like XBF are nuanced]
- *Technical strategies and solutions for data assembly, aggregation, delivery*
    - Need to develop mechanisms for acknowledgement
        - ESRI – carrot of acknowledgement
- *Lessons learned about data contribution and/or aggregation workflows?*
    - Need to establish a simple mechanism for contribution

What is the role/relationship between TSCOM, SCRUM, OWG and Seabed 2030?

- *Ideas on how to work together to most effectively meet the goals of GEBCO and the Seabed 2030 Project*
    - We envision TSCOM and SCRUM as being open and inclusive and aspire to add new members to the committees [coalition of the willing]
    - TSCOM can work with SB2030 to develop optimum metadata standards
    - SCRUM
        - Fold IBCSO and IBCAO into SCRUM – goal: have a rep from each RDACC on SCRUM
        - Include Alumni (currently 3: Mohammad Chowdhury, Hugo Montoro, Roxy)
        - Outstanding Action Item – identify key people to invite to be part of SCRUM
            - Craft recruitment mechanism – Jonathan Kool and Jennifer Jencks
- *Suggest one key milestone for each group in the coming year*
    - Technical advice developed by TSCOM on optimum and minimum metadata standards and recommendations. Concrete deliverable is proposed requirements and XSD.
    - TSCOM/SCRUM needs overview of mechanisms/pathways of submission so they can help solicit data contributions

How can we engage committees more effectively throughout the year?

- *GEBCO communication mechanisms (email, slack, website, other?)*
    - Mailing lists for committees (up to date)
    - Slack? GEBCO instance exists – can extend
        - Slack channel
    - Use versatile composition of GEBCO community to identify potential meetings that would be important to engage with or that people are participating in and can be opportunities
    - Social Media Moderator (outward looking)
    - Aspire to quarterly but at minimum have one time during year hold a skype call to gather TSCOM/SCRUM for more frequent engagement than once a year

- *Information sharing from outside of GEBCO*
    - Maybe a Google Calendar give access to many people within GEBCO to help share information about upcoming events
        - Hydro International runs a calendar of events that we could leverage [pull from].

What additional data delivery and display tools do we need for delivering GEBCO/Seabed 2030 products?

- Raster Web Processing Service (WPS) – enable cloud processing. Can create raster processing templates that allow web apps built upon it. Enables running analytics to look at complexity measurements, weighted raster overlays, machine learning. Opens up the data beyond traditional use. [Caitlyn and Jonathan are knowledgeable about these technologies].
    - Make it more available for integration with ocean modelling etc
- Service of contours
- Enhanced service for SCUFN feature names

What grid-cell size should Seabed 2030 target? How can we best make this decision?

- Recognize the need to be conservative
    - **~400m is reasonable target for global consistency**
    - Shallower areas will be mapped at higher resolution anyway bc of nature of systems
    - EEZs are out of our control and shouldn't define the vision/goal
- Be sure to factor in other mapping systems
    - legacy system geometries (Hydrosweep, Seabeam)
        - MORs are largely mapped and there's a lot of legacy data
    - Crowd-sourced sources
    - Single beam
- Caution – 400m is close to original GEBCO resolution so it's critical to stress that this is defined by at least 1 measurement per grid cell. *A data-constrained grid.*

How to communicate Seabed 2030 within the context of GEBCO?

- What is the general feeling about SB2030?
    - "It's our future"
    - Money is on the table and it's an important opportunity
    - We keep calling it a project, but it seems more like an initiative. Initiative sounds more exciting than a project.

What are your most pressing questions/concerns about SB2030?

- SB2030 – (re)invigorate the community is this analogous to GOOS in some ways? Can we learn from their approach?
- What is the workflow w.r.t. data? What is the role of the archive?
    - Agree that the DCDB: LTA but that this can't necessarily be the solution for all data contributions. There may be requirements that prohibit passing data to public archive.
    - remote structured archives for generating products
    - Do we need to have the data in one place?
    - Raw data must be preserved
- How do we handle acknowledgements and attribution? How do we gage and answer the needs of contributors? What are branding obligations on contributors?
    - We should assemble examples of how existing syntheses are doing this.

- Carrots/data shaming – promote participation

TS presented the feedback from breakout group two, the key items of which were:

Metadata

- Minimum metadata can be based on existing (Emodnet model, S101), and forthcoming one (CSBWG)
- Use standards (ISO19115, ISO1939) and controlled vocabularies/enumerates (Cf Seadatanet)
- See if existing templates/profile can be directly used
- The community can help with tools (software, scripts) to generate metadata, but we should not commit to provide a dedicated tool as each organisation has different internal data and metada structure
- Quality? Provide indicator (see EMODNET quality index, current HSPT/S44 review, CATZOC, /ISO1957) ---
- Not only bathy data should have metadata embedded but also other data sources (altimetric derived data)

Sources

- Through group of expertise (deep sea mining, cables company, international)
- International data sources UN SDI
- Dedicated person (RDACCs) to present the Seabed 2030 intention and even to do the job
- Make the data provider comfortable with the way their data will be used and redistributed (see metadata).
- Acknowledgement to the data provider
- Trying not to play the geopolitics

Delivery/added-value products

- Encoding (netcdf/bag—S102/multiple attributes per grid nodes)

Relation TSCOM, SCRUM, OWG

- Capacity building programs (and IBSC) may structurise metadata and data delivery courses. Can be provided by RDACCs representatives to data providing organisation (use technology, or/and presence lectures). OWG to provide some introductory materials.
- TSCOM, Scrum, OWG will be the same people as those acting in the Seabed 2030
- Keeping people engaged by reachable milestones (specific, achievable, timeline)
- MILESTONES: Scrum (identify sources, identify contacts, status of survey). Note see how hydrographic commission can play a role in identification of new data (table: C55)
- MILESTONES: TSCOM (specification for data/metadata provision).
- MILESTONES: OWG provide introductory materials for capacity building (data/metadata delivery courses) – need metadata and data defined first.

Engage committees

- Milestones and responsibilities are key.

- Main objective at the moment is to make the RDACCs able to work.
- Engage new people by showing the benefit to join
- Better describe what we are doing to help new people engage
- Engage with hydrographic societies.

Additional data delivery

- Use of the grid as a support to interpret (semi-automatically) the geomorphology (cf SCUFN discussion and Undersea feature name WG of IHO dealing with data modelling)
- Map/mask identifying the gaps. (do we want to prioritize gaps? No, let leave decision maker doing this). Will help monitor progress. Based on Martin's discussion on resolution. Also see the continuity of lack of coverage (isolated nodes or group of nodes). Provide this to GIS tools

Resolution

- Presentation of Martin seems wise. May be issues at the boundary between depth range groups with respect to grid-cell continuity.
- Still use single beam. Must also consider altimetric data.
- Achievable?? Apart from technical reasons there are multiple constraints (national restrictions in coastal areas, in EEZ)
- Outside of EEZ there are limited driving requirements except from scientific surveys (make the scientific community more committed)

Communicate Seabed 2030 in the context of GEBCO

- Not separate project.
- Provide a concise short line on how SB2030 fits within GEBCO (can also be brochures, website).
- Confusing as people from GEBCO are inherently people involved in SB2030
- Better describe the parent bodies (IHO, IOC, Nippon Foundation) and their involvement (also role of GCC).

Most pressing questions about Seabed 2030

- The only product that SB2030 will provide is the gridded product, what about source data collected by DCDB
- What will be the name of the gridded products? Versioning?
- Rewarding is important to each individual being part of the GEBCO community, find a way to reward everybody (from leaders, to sponsor, to data provider and all the members who contribute to the effort).
- What if we fail? How do we measure and prove that we are succeeding? (if we can show that we are progressing we can engage more people)
- Technical questions: coastline? vertical referencing, tidal adjustment? land data source?

KM presented the feedback from breakout group three, the key items of which were:

Write a Cook Book chapter, using illustrated step-by-step instructions, on how to use existing, publicly-available tool(s) (e.g. Galway, Google Earth, etc.) to find and investigate gaps to map.

Set up an email/discussion board method of communicating with each other. David W will investigate IHO hosting Data One system for TSCOM use.

Aggregate information on existing data

- Ask industry academic, government, equipment providers, and other organizations to evaluate their existing data archives in light of mapping gaps.
- Leverage existing GEBCO contacts and alumni network.
- Director should coordinate a mechanism to ask for data.
- GEBCO-S2030 badge or logo can go on websites of organizations that have contributed data- serves as an incentive.
- Use existing metadata guidelines.
- TSCOM can provide technical guidance on sustainable methods to add new data to base GEBCO grid (local remove-restore procedure versus algorithm to ingest data by regenerating global grid).

Role/relationship between committees and working groups

- TSCOM, SCRUM, OWG and SCUFN all to support S2030 project based on their expertise areas and align goals with SB2030. SB2030 is a GEBCO project, they are not separate.

How can we engage committees more effectively throughout the year

- Need for regular emails and updates. Investigate using discussion boards and other communications (e.g. Slack, Skype, Data One). Review communication mechanisms.

Additional delivery and display tools for GEBCO/S2030 products

- GEBCO front page should be a bathymetry map, and a map of the gaps.
- Front page should have a link to go directly to get the data.
- Project gazetteer names onto bathymetry map.
- Additional tools and more layers should be available.
- Study feasibility of achieving these website improvements.

Resolution

- Grid resolution size to use is as Martin presented. This is best case, but in reality, contribution may lower resolution for various reasons, especially in EEZs.

How to communicate S2030 within context of GEBCO

- There is already a media consultant that is communicating S2030. But GEBCO is falling aside. Considering a brand-building professional with digital communication skills who can recommend how to make GEBCO first and S2030 a GEBCO project.

Questions/concerns about S2030

- Is one person enough in RDACCs to actually do the job?
- Director needs to drum up more funding.
- Don't overlap with existing initiatives, instead establish fruitful partnerships.
- People don't realize how poorly mapped the oceans are and why they need to mapped (for OWG).

David Millar (DM) presented the feedback from breakout group four, the key items of which were:

How can the GEBCO Community help aggregate information about existing data?

a. Sources we may not know about

- Prepare a formal solicitation to known past and potential future data contributors
- This should be accompanied by formal announcement of the Seabed 2030 initiative and high quality communication about the initiative
- Create an e-mail address "datacontributions@seabed2030.com" or similar to serve as the one and only repository for offers of data contributions
- This will be included in all communication material
- For industry contributions of existing data, solicitation should probably allow for provision of polygons showing extents of coverage, as an initial step
- In order to reach industry data holders (survey companies, oil and gas companies, marine mining companies, etc.) we need to have a presence at major conference / trade shows
- Best global conference is Oceanology International in London in March 2018
- Should have a booth and a panel on Seabed 2030
- Other potential conferences to inform and attract industry data contributors from submarine cable industry are ICPS and SubOptic
- Other potential conferences to inform and attract government data contributors are Shallow Survey (Halifax in 2018) and ABLOS.
- Should prepare communication material (brochures / flyers) and consider a booth at some or all of these conferences
- Should also have panel sessions at each conference, especially Oceanology International

b. Metadata

- Should not reinvent the wheel and probably best to adopt the metadata standards used by EMODNet
- May be a reluctance by industry to provide full metadata with polygons showing extents of coverage
- In these cases, then metadata should minimally state if the data meets or to what extent it meets Seabed 2030 requirements

c. Technical strategies and solutions for data assembly, aggregation and delivery

- Again we should probably look to EMODNet for best practices

d. Lessons Learned about data contribution and/or aggregation workflows

- We should try and harmonize and unify workflows across regions via TSCOM and SCRUM
- Again we should adopt EMODNet standards where appropriate or practical

What is the role / relationship between TSCOM, SCRUM, OWG and Seabed 2030?

a. Ideas on how to work together to most effectively meet the goals of GEBCO and the Seabed 2030

- Extremely important that Seabed 2030 be treated as a project under GEBCO and utilize the existing infrastructure / organization of GEBCO
- The terms of reference for SCRUM and especially TSCOM are dated and should be revised now, given the initiation of the Seabed 2030 project
- There should be a SCRUM member in attendance at each regional data meeting
- All of the RDACCs should meet annually at SCRUM

b. Suggest one Key Milestone for each group in the coming year

- Suggest that the most important Year 1 goal should be to get polygons of existing data coverage, so we know where data exists and where we might be able to obtain existing data

How can we engage committees more effectively throughout the year?

a. GEBCO communication mechanisms

- Not really addressed, but the following partially addresses this
- There should be a SCRUM member in attendance at each regional data meeting
- All of the RDACCs should meet annually at SCRUM

b. Information Sharing from outside of GEBCO

- Industry conferences (see above)
- E-mail address to receive all data offers
- Need to develop strong communication material on Seabed 2030 to distribute at various locations and/or various means.

What additional data delivery and display tools do we need for delivering GEBCO / Seabed 2030 products?

- The current GEBCO website is clunky and does not attract or invite use and download
- There needs to be a simpler download mechanism / approach
- We also need to provide an intuitive and efficient data upload mechanism / approach
- DCBC should provide a layer that shows polygons of know existing coverage, but where data has yet to be obtained
- We should conduct a survey of current GEBCO users on what they like and what they would like to see changed / improved
- We should provide some basic products (like SD files or KML files) in addition to data itself

What grid-cell size should Seabed 2030 target?

- We agree with Martin's proposed approach
- This provides a good specification for contributions (existing data and new data contributions) and should be presented as what is acceptable now based on current technology
- We can use a higher specification where possible and appropriate for ocean basin mapping campaigns
- We should still caveat that we are striving for a 100m grid size goal in the longer term

How to communicate Seabed 2030 within the context of GEBCO?

- Extremely important that Seabed 2030 be treated as a project under GEBCO and utilize the existing infrastructure / organization of GEBCO

What are your most pressing questions / concerns about Seabed 2030?

- We need to develop a plan on how to manage and acknowledge partnerships and sponsorships under Seabed 2030

2018 Goals

TSCOM:

- Instructive Cook Book chapter on using illustrated step-by-step instructions, on how to use existing, publicly-available tool(s) (e.g. Galway, Google Earth, etc.) to find and investigate gaps to map;
- Set up email/discussion board methods of communicating;
- Develop technical advice on optimum and minimum metadata requirements and standards for contributing data to GEBCO. Concrete deliverable is the proposed requirements and XSD (used to validate metadata);
- Metadata guidelines pending Seabed 2030 input
  - Is Metadata Working group needed?
  - Can existing published Metadata guidelines (e.g., IHO DCDB, CSB B-12, others) be refined for Seabed 2030?

SCRUM:

- Should pursue both *active* and *passive* strategies for soliciting data contributions;
- Identify sources, contacts, and status of survey. Note see how hydrographic commission can play a role in identification of new data (table: C55);
- Develop a method (e.g. web form) for people to contribute information about available data that can be integrated into GEBCO/SB2030;
- To ensure that we effectively engage regionally, SCRUM membership should include:
  - NF-GEBCO Alumni
  - Representation from each SB2030 RDACC
- Need for additional SCRUM interactions throughout year;
- Refresh communication/collaboration tools:
  - Updated SCRUM mailing list
  - Online collaborative tools
  - Shared Google Calendar

- Web form to gather information about potential data contributions

OutreachWG:

- Review ideas within context of:
  - overall GEBCO needs
  - Seabed 2030 project development needs
- Provide introductory materials for capacity building, and data/metadata delivery courses;
- Prioritize activities considering effort, costs, needs, and timelines:
  - *Development of clean simple PPT slides for Ocean Science Researchers*
  - *Development of short video for Industry*
  - *Development of short video for Government Organization*
  - *Development of various education material for Teachers and Students*
  - *Development of short video or PPT slides for practical at-sea surveying experts*
  - *Stimulate and support opinion leaders and platforms*
  - *=> Final Products with various foreign languages subtitles*

All Subordinate bodies:

- Deploy a Google Calendar (with shared access across committees) for sharing information about upcoming events.
- Set up an email/discussion board method of communicating. Update TSCOM/SCRUM/OWG mailing lists. Encourage willing committee members to use GEBCO Slack Instance

Seabed 2030 engagement:

- Develop/deploy polygons of existing data coverage, so we know where data exists and where we might be able to obtain existing data, and where new data are needed
- TSCOM/SCRUM needs overview of mechanisms/pathways of submission so they can help solicit data contributions
- Refer to Seabed 2030 as an “Initiative” instead of a “Project”
- Consider/develop mechanisms for acknowledgement for Seabed 2030 data contributors
- Develop/deploy enhanced web services including Web Processing Service (WPS), service with bathymetric contours. Improve web services related to seafloor feature names.