Report of the GEBCO Guiding Committee

Submitted by:	Chair
Related Documents:	IHO CL 13/2017 dated 9 February 2017 IHO CL 30/2017 dated 3 April 2017 IHO CL 57/2017 dated 2 November 2017 IHO CL 58/2017 dated 2 November 2017 IHO CL 63/2017 dated 14 November 2017 IHO CL 16/2018 dated 13 February 2018 IHO CL 18/2018 dated 14 February 2018 See Annex C for IHO Publications and Resolutions

Chair:	Shin Tani, Japan
Vice-Chair:	Martin Jakobsson, Sweden
Secretary:	David Wyatt, IHO
Member States:	Australia, Chile, Germany, Italy, Japan, New Zealand, Republic of Korea, Russian Federation, Sweden, UK, USA
Expert: Contributors:	Fugro

See Annex A for full details

1. Meetings Held During Reporting Period

The 34th meeting of the GEBCO Guiding Committee (GGC) was held in Busan, Republic of Korea, from 16 to 17 November 2017; the meeting was chaired Mr Shin Tani (Japan). The GEBCO Technical Sub-Committee on Ocean Mapping (TSCOM), the Sub-Committee on Regional Undersea Mapping (SCRUM) and Outreach Working Group held a joint meeting from 13 to 14 November 2017; the meeting was co-chaired by Dr. Karen Marks (USA), (Chair of the TSCOM), and Dr Vicki Ferrini (USA) (Chair of the SCRUM). These meetings were followed by the GEBCO Symposium Day, which was held on 15 November 2017. 54 delegates from 15 member States participated across the five days. The Sub-Committee for Undersea Feature Names (SCUFN) held its meeting in Genoa, Italy, 2 to 6 October 2017; the meeting was chaired by Dr Hans-Werner Schenke (Germany).

2. Work Programme

For the eleventh consecutive year, the GEBCO project organized a symposium, formerly the "GEBCO Bathymetric Science Day" on the theme of 'Map the Gaps'. The symposium, which included poster sessions and contributions from a broad

spectrum of institutions involved in all aspects of ocean mapping, featured 24 presentations on a diverse range of topics.

At its 34th meeting, the GGC received reports from key personnel performing functions on behalf of GEBCO as well as reports from its parent bodies - IHO and IOC, on activities since the previous meeting.

The Chair of the Sub-Committee on Undersea Feature Names (SCUFN) highlighted the number of members who were coming to the end of their terms and the challenge of finding suitably qualified replacements. He presented some proposed revision to the SCUFN Terms of Reference (ToR) and Rules of Procedure (RoP), which were aimed at clarifying the procedures for future meetings. The GGC did not approve the amendments and advised the Chair SCUFN to continue to operate under the current ToR and RoP with an option to review the situation prior to the next GGC meeting.

The GGC discussed outreach and ways to raise the profile of the GEBCO project among the different stakeholder and user communities including the IHO and the IOC Member States, the maritime and scientific community and the general public. It was noted that different strategies would be required for each of these groups and that it was a key component of the GEBCO activities, which involved and influenced all aspects of the future of the GEBCO Project. The GGC agreed to elevate the status of the OWG to a new Sub-Committee in order to reflect the importance of external relations and communications. It was agreed that ToR and RoP for the new Sub-Committee should be drafted along with a new communications strategy. The GGC devoted considerable time to discussions on the Seabed 2030 Project, including its structure, governance, oversight and reporting. The Seabed 2030 Project Establishment Team requested GGC endorsement to continue the development of the project, including the selection of Project Director and the necessary structure to oversee the project.

The GGC also reviewed its current financial situation in relation to proposed planned projects. The Committee addressed the budget submissions from its subordinate bodies and approved revised allocations to ensure a contingency balance of 13,000€ was maintained for 2018 to cover emergent items. The IOC confirmed the annual allocation of 10,000€ to the GEBCO Project and it was agreed that this should be used to commence work on upgrading and improving the GEBCO website. The draft consolidated GEBCO Work Plan and budget will be reported to the 10th meeting of the IHO Inter-Regional Coordination Committee (IRCC) and the 51st meeting of the IOC Executive Council, for their consideration and endorsement, see Annex B.

It was agreed that the 35th meeting of the Committee would take place, together with meetings of TSCOM, SCRUM and the GEBCO Symposium, in Canberra, Australia, during the week 12 to 16 November 2018.

3. Progress on IRCC Action Items

Decision 36: to endorse the withdrawal of IHO Publication B-7 GEBCO Guidelines.

Action 28: IRCC Chair and IHO Secretariat to submit a recommendation to the 1st Session of the IHO Council to withdraw the IHO Publication B-7 GEBCO Guidelines (deadline: in time for C-1).

B-7 withdrawn as detailed in IHO CL 18/2018 dated 14 February 2018.

Action 29: RHC Chairs to encourage Member States to organize contribution of bathymetric data in shallower coastal areas to GEBCO in order to support the production of higher resolution gridded data products and report back to IRCC (deadline: IRCC10).

4. Problems Encountered

The GEBCO Ocean mapping programme is dependent on the availability of bathymetric data and undersea feature information. In order to achieve its goals, GEBCO proactively collects, stores and disseminates bathymetric data for the world's oceans. GEBCO has worked towards improving its participation in regional mapping activities and has also appointed representatives to participate in selected RHC meetings.

Traditionally GEBCO has focused on areas deeper than 200m, however, it is now actively collecting data in shallower water areas to support activities such as coastal zone management and the mitigation of seaborne disasters such as storm surges and tsunami inundation. IHO Member States are encouraged to contribute bathymetric data in shallower coastal areas to support the production of higher resolution gridded data products. See Annex D for current areas where ENC sounding data have been provided to GEBCO. Some new data was received in response to IHO CL 11/2016 dated 1 March 2016 – *Request for shallow water bathymetric data*; however the rate of contribution continues to be slow despite IRCC9 Action 29; data was received in 2017 from Argentina and French Guiana with New Zealand data anticipated in 2018.

Undersea feature names are to identify undersea topographic feature by the specific name combined with the specific name, for providing unified names to Hydrographic Offices to be used in nautical charts, and to wide communities such as scientific communities. However in some cases it may be misunderstood that undersea feature names and naming actions are relevant to national jurisdiction and sovereignty. This misunderstanding brings stress to the consideration by SCUFN when proposals could be considered politically sensitive or controversial.

GGC will encounter multiple vacancies in coming years, which may bring difficulties in terms of continuity. The IHO and IOC agreed to commence the nomination process ahead of the actual vacancies. The importance of participation by possible candidates in several GEBCO meetings before nomination was recognized in order to maintain the stability and smooth transition of GGC members.

The GEBCO Gazetteer of Undersea Feature Names is accessible via a web map application, hosted by the IHO Data Centre for Digital Bathymetry (IHO DCDB) co-located with the US National Centers for Environmental Information (NCEI). Much of the errors and inconsistencies of the contents were removed for the past year by an IHO contractor. However it is understood that there still remains many errors and

inconsistencies in the current Gazetteers. Because SCUFN members' contribution has to concentrate in the examination of new and pending proposals, the IHO contractor's contribution is and will be much appreciated. Securing necessary budget for the contractor is crucial for the credibility of GEBCO Gazetteer. Another problem of GEBCO Gazetteer is the maintenance of software and hardware of web map service. NCEI has encountered a very severe financial situation in maintaining the GEBCO Gazetteer service.

5. Any Other Items of Note

GEBCO continues to promote the importance of bathymetric data to the international community. A significant outreach event is the annual GEBCO Symposium, formerly the GEBCO Science Day, which includes oral presentations and poster displays on topics relating to ocean-floor mapping and its applications. The event is held before the GGC meeting, normally on the day between TSCOM/SCRUM meetings and the GGC meeting, to maximize GEBCO community participation.

Capacity building for the future generation of ocean mappers has been successful. Since 2004 the Nippon Foundation has provided funding for GEBCO to train a new generation of scientists and hydrographers in ocean bathymetry. The 12-month course, leading to a Postgraduate Certificate in Ocean Bathymetry (PCOB), is held at the University of New Hampshire, USA. Almost all the 78 GEBCO Scholars, the graduates of the NF-GEBCO training course are active in the bathymetric field and 6 are now being trained and new 6 are being selected.

The GEBCO Cook Book (IHO publication B-11) is a technical reference manual that has been developed to assist and encourage participation in the development of bathymetric grids. It is an important GEBCO reference document that is used by academic institutions and hydrographic organizations. The Cook Book covers a wide range of topics such as data gathering, data cleaning, gridding examples and provides an overview of different software applications used for producing bathymetric grids.

The Cook Book was first released as IHO Publication B-11 in April 2012 and as an IOC Guide Document in October 2012. The Cook Book has been adopted as an important resource by the University of New Hampshire, the Texas A&M University and various other educational institutions.

B-11 was last updated in December 2016. The updates include a new chapter on mosaics, a new chapter covering "Nautical Chart Adequacy" and updates to the sections on Satellite Derived Bathymetry and some of the internal references.

6. Conclusions and Recommendations

GEBCO is entering to a new stage, where GEBCO becomes the inevitable component of the world for its sustainable development. Climate change and ocean acidification, tsunami and storm surge mitigation, preservation of marine bio-diversity, development of living and non-living resources, marine renewable energies, safety of navigation including unmanned navigation, national jurisdiction

and sovereign right, search and rescue, science, hydrography and much more require detailed, fine resolution, accurate and reliable bathymetry. GEBCO has to respond such needs in a timely and responsible manner. Seabed 2030 project is a major tool to change the business style of GEBCO. IRCC is invited to provide due priority to GEBCO's activities for the sustainable development of the world.

Along with the bathymetric data, undersea feature names are another important component of the description of ocean floor. Web map service of GEBCO Gazetteer is widely used but the contents need to be cleaned and the hardware/software has to be properly maintained. GEBCO's Gazetteer has been much improved but still needs lots of care, and can any time become endangered. IRCC is invited to learn the importance and danger of GEBCO Gazetteer.

7. Justification and Impacts

Although the entire ocean floor is covered by the 30 arc-second GEBCO grids, most of the values of the grids (depth) are not supported by real soundings. More than 80 percent of the grids have gotten its value as a estimated depth guided by the surface gravity field or the satellite altimetry.

The sad MH370 tragedy revealed the lack of dependable bathymetry in the open ocean. Long range propagation estimate of tsunami also needs reliable bathymetry of the deep ocean floor, and coastal inflation and inundation of tsunami does definitely need far much detailed shallow water bathymetry. Global ocean circulation modelling, especially for the vertical convection of deep ocean current, requires much finer resolution of bathymetry.

Coastal management, including the establishment of marine protected areas also requires much finer bathymetry.

Seabed 2030, which aims to leave no features of the world ocean floor larger than 100m unmapped by year 2030. It is not an easy goal but the outcome will and should provide much better understanding of the sea floor topography and contribute to the world.

8. Actions Required of IRCC

The IRCC is invited to:

a. Note the contents of this report;
b. Continue to encourage RHCs to organize contribution of bathymetric data in shallower coastal areas from their member states to GEBCO in order to support the production of higher resolution gridded data products of GEBCO;
c. Encourage RHCs to invite and communicate with GEBCO members to their meetings as appropriate; and
d. Take any actions deemed necessary.

IHO-IOC GEBCO GUIDING COMMITTEE
(GGC)

List of GGC members - 1 January 2018

1.	**IHO Appointed Members:**	**Term Period:**
	Mr Shin Tani (Japan) *(Chair)*	(2013-2018)
	Rear Admiral Patricio Carrasco (Chile)	(2013-2018)
	Dr Hyo Hyun Sung* (Republic of Korea)	(2014-2019)
	Dr Graham Allen (United Kingdom)	(2015-2020)
	Vacant	

2.	**IOC Appointed Members:**	
	Dr Martin Jakobsson (Sweden)* *(Vice-chair)*	(2013-2018)
	Dr Robin Falconer* (New Zealand)	(2013-2018)
	Dr Marzia Rovere (Italy)	(2014-2019)
	Dr Johnathan Kool (Australia)	(2016-2021)
	Captain Leonid Shalnov (Russian Federation)	(2016-2021)

3.	**Ex-officio Members:**	
	Dr Vicki Ferrini (USA)	*(Chair of SCRUM)*
	Dr Karen Marks (USA)	*(Chair of TSCOM)*
	Dr Hans-Werner Schenke (Germany)	*(Chair of SCUFN)*
	Ms Jennifer Jencks (USA)	*(Director of IHO-DCDB)*

* Members serving a second 5-year term.

4.	**Secretary:**	
	Mr David Wyatt (IHO)	(2015-)

1.1. IHO-IOC GEBCO Guiding Committee (GGC) Work Plan 2018-2019

1.1 GGC Tasks

A Organise and conduct GGC XXXV meeting in 2018 (IHO Task 3.6.1)

B Ensure conduct of TSCOM, SCRUM and SCUFN meetings in 2018 (IHO Tasks 3.6.1)

C Ensure effective operation of IHO DCDB (IHO Task 3.6.2)

D Encourage the contribution of bathymetric data to the IHO DCDB (IHO Task 3.6.3), identify priority areas for regional mapping (IHO Task 3.6.3) and promote data contribution through GEBCO participation in RHCs meetings (IHO Task 3.6.3)

E Maintain IHO bathymetric publications (IHO Task 3.6.6) including: B-4, B-6, B-8, B-9, B-10 and B-411

F Develop the on-line function of B-4 (Information concerning recent bathymetric data) (IHO Task 3.6.2)

G Contribute to outreach and education about ocean mapping (IHO Task 3.6.7) by development of outreach and educational materials (IHO Task 3.6.7) and printing of IHO-IOC GEBCO World Map (IHO Task 3.6.7)

H Ensuring IHO-IOC GEBCO Web site is kept current and updated regularly (IHO Task 3.6.8)

I Develop short course and course material on compiling digital bathymetric models (DBMs) to be included in GEBCO from a heterogeneous bathymetric source database (IHO Task 3.6.9)

J Update and enhance the GEBCO Gazetteer (B-8) for internet access (IHO Task 3.6.10) including providing the GEBCO Gazetteer as a web service via a geospatially enabled database (IHO Task 3.6.10), develop and make available public and management on-line interfaces to the Gazetteer (IHO Task 3.6.10) and develop the integration of undersea feature concepts in the S-100 framework

K Liaise with and provide support to Seabed2030 project (IHO Task 3.6.5)

Task	**Work item**	**Priority** H-high M-medium L-low	**Milestones**	**Start Date**	**End Date**	**Status** P-planned O-ongoing C-completed	**Contact Person(s)** *** indicates leader**	**Related Pubs/Standard**	**Funding Bid (€)**	**Approved Funding (€)**
A	Organise and conduct GGC XXXV meeting	H		2018	2018	P	Chair GGC Sec			0
B1	Ensure conduct of TSCOM, SCRUM and SCUFN meetings	H		2018	2018	P	Chair GGC, Chair, TSCOM, Chair SCRUM and Chair SCUFN			0

Task	Work item	Priority H-high M-medium L-low	Milestones	Start Date	End Date	Status P-planned O-ongoing C-completed	Contact Person(s) * indicates leader	Related Pubs/Standard	Funding Bid (€)	Approved Funding (€)
B2	Oversee work of subordinate bodies – TSCOM, SCRUM, SCUFN and Outreach WG – for completion of directed tasks	H		Continuous	Continuous	O	Chair GGC			0
C	Ensure effective operation of IHO DCDB	H		Continuous		O	Director DCDB			0
D1	Encourage the contribution of bathymetric data to the IHO DCDB	H		Continuous		O	All members of GEBCO GC through the Chair			0
D2	Identify priority areas for regional mapping and support the organization of regional mapping projects.	H		Continuous		O	Chair SCRUM			0
D3	Promote data contribution through GEBCO participation in RHCs and IOC regional meetings	H	Identify GEBCO people who are able to attend for meetings in 2018 – 2019	Continuous		O	All members of GEBCO GC through the Chair		5,000	10,000

Task	Work item	Priority H-high M-medium L-low	Milestones	Start Date	End Date	Status P-planned O-ongoing C-completed	Contact Person(s) * indicates leader	Related Pubs/Standard	Funding Bid (€)	Approved Funding (€)
D4	Organize regional mapping meetings/workshops	H		Continuous		O	Chair SCRUM			0
	Support participation at regional mapping meetings	H	Provide partial support, as necessary, for individuals to participate in regional mapping meetings	Continuous		P	Chair SCRUM		5,000	10,000
D5	Facilitate contribution of information about available data	H	Deploy web form for contributions of information about available data and contributors	Continuous		P	Chair SCRUM			0

Task	Work item	Priority H-high M-medium L-low	Milestones	Start Date	End Date	Status P-planned O-ongoing C-completed	Contact Person(s) * indicates leader	Related Pubs/Standard	Funding Bid (€)	Approved Funding (€)
E	Maintain IHO bathymetric publications	M	Update GEBCO global 30 arc-second grid with new compilations	Continuous	Continuous	O	All members of GEBCO GC through the Chair	B-4 - Information concerning recent bathymetric data		0
		M		2016	2017	O	Chair SCRUM	B-9 - GEBCO digital atlas		0
		M	Update GEBCO World Map to included updated versions of GEBCO grid and adopted undersea feature names from SCUFN.	2017	2018~~9~~	O	Chairs SCRUM/SCUFN	B-6 – Standardization of undersea feature names B-8 - Gazetteer B-9 - GEBCO digital atlas		0 0 0
		L M						B-10 - The history of GEBCO B-11 - GEBCO Cookbook		0 0
F	Develop the on-line function of B-4	M		2015	On going		Director DCDB			0
G1	Contribute to outreach and education about ocean mapping	H		Continuous		O	Chair Outreach WG	See G3 below	7,000	0
G2	Development of outreach and educational materials (jigsaw puzzle for World Map and presentation files)	H		2015	2018	P	All members of GEBCO GC through the Chair Outreach WG		2,000	2,000
G3	Printing of IHO-IOC GEBCO World Map	M		2015	2018		Chair SCRUM	B-9 - GEBCO digital atlas	2,000	0

Task	Work item	Priority H-high M-medium L-low	Milestones	Start Date	End Date	Status P-planned O-ongoing C-completed	Contact Person(s) * indicates leader	Related Pubs/Standard	Funding Bid (€)	Approved Funding (€)
G4	Development of webpage (for secondary school student etc.)	M		2015	2018	O	All members of GEBCO GC through the Chair Outreach WG		11,000	8,000
H	Ensuring IHO-IOC GEBCO Web site is kept current and updated regularly	M		Continuous		O	BODC		5,000	5,000
I	Add instructive chapters in IHO-IOC GEBCO Cook Book related to Seabed 2030 as needed	M		2018	2030	O	Chair TSCOM/All members of GEBCO GC through the Chair Outreach WG	B-11 - GEBCO Cookbook	0	0
J1	Update and enhance the GEBCO Gazetteer (B-8) for internet access	H		Annual	Annual	O	Chair SCUFN	B-8 – Gazetteer	15,000 /year	15,000
J2	Maintain the GEBCO Gazetteer as a web service via a geospatially enabled database	H		2016	Permanent	O	Chair SCUFN Director DCDB	B-8 – Gazetteer	43,000/year	USA to cover for 2018
J3	Develop and make available public and management on-line interfaces to the Gazetteer	M		2014	2018	O	Chair SCUFN KHOA	B-8 - Gazetteer		0
J4	Develop a S-100-based product specification for Undersea Feature Names	M / L		2015	2019	O	Chair Project Team (Rowena Orok)	S-100, B-6 Harmonized definitions of generic terms across B-6, S-32, IHO GI Registry		0

Task	Work item	Priority H-high M-medium L-low	Milestones	Start Date	End Date	Status P-planned O-ongoing C-completed	Contact Person(s) * indicates leader	Related Pubs/Standard	Funding Bid (€)	Approved Funding (€)
J5	Upgrade the quality of the geometry of major existing undersea features in the Gazetteer which are known as being inaccurate and ambiguous	M	10 features/ SCUFN member per year	2017	Permanent	P	SCUFN Members	B-8 Gazetteer		0
K	Support Seabed2030	H	Provide scientific expertise and outreach	2018	2030	P	Chairs TSCOM, SCRUM, OutreachWG, SCUFN			0

1.2 GGC Meetings (IHO Task 3.8.1.1 refers)

Date	Location	Activity
1-4 October 2012	IHB, Monaco	XXIXth Meeting
7-11 October 2013	Venice, Italy	XXXth Meeting
13-15 June 2014	IHB, Monaco	XXXIth Meeting
5-9 October 2015	Kuala Lumpur, Malaysia	XXXIIth Meeting
10-14 October 2016	Valparaíso, Chile	XXXIIIth Meeting
13-17 November 2017	Busan, Korea	XXXIVth Meeting
12-16 November 2018	Canberra, Australia	XXXVth Meeting

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Vice-Chair: Martin Jakobsson Email: Martin.Jakobsson@geo.su.se
Secretary: David Wyatt Email: adso@iho.int

IHO PUBLICATIONS AND RESOLUTIONS

Publications and Resolutions for which GEBCO is the lead or subject matter expert:

Title	IHO Number	IOC Number	Edition/date
Standardization of undersea feature names	B - 6	-	Edition 4.1.0 February 2017
Gazetteer	B - 8	-	V1.1.1
GEBCO Digital Atlas	B - 9	-	30" Grid March 2015
The History of GEBCO	B-10	-	April 2003
GEBCO Cookbook	B-11	Manuals and Guides 63	December 2016

Resolution3/1929 as amended (*Centralization of oceanic soundings*);
Resolution3/1932 as amended (*Collecting oceanic soundings*);
Resolution4/1932 as amended (*Metadata for oceanic soundings*);
Resolution2/1962 as amended (*Oceanographic observations*); and
Resolution8/1962 as amended (*Oceanographic information*).

AREAS WHERE ENC SOUNDING DATA HAVE BEEN PROVIDED TO GEBCO