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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (of UNESCO)

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Item **4.5** of the Revised Provisional Agenda

FIRST REPORT OF THE IOC REGULAR WORKING GROUP ON USER REQUIREMENTS AND CONTRIBUTIONS TO GEBCO PRODUCTS

Summary

Through Decision EC-XLIX/4.4, the IOC Executive Council at its 49th session (Paris, 7–10 June 2016) decided to establish the Regular Working Group tasked to collect, integrate and assess the user requirements to GEBCO products and address ways of potential contributions to GEBCO data and products.

This document contains the results of the review conducted by the working group, established in 2017, and recommendations for consideration by this Executive Council. The responses to the questionnaire conducted during the intersessional period are appended hereafter in English only.

There are no financial and administrative implications.

The proposed decision: The Executive Council is invited to consider the recommendations presented in the document for further action and the draft decision referenced EC-LI/4.5 in the Action Paper (document IOC/EC-LI/2 Prov.)

Introduction

1. The Regular Working Group on User Requirements and Contributions to GEBCO Products conducted the review during the intersessional period by correspondence. The objectives of the report are described below:

(i) collect, integrate and assess the user needs and requirements to GEBCO data and products;

(ii) facilitate and guide the use of GEBCO datasets and products through the user communities that represent relevant IOC technical and regional subsidiary bodies.

2. In accordance with the terms of reference of the Regular Working Group, members are representatives of IOC Member States and experts nominated respectively by the GEBCO Guiding Committee and relevant IOC technical and regional subsidiary bodies (namely GLOSS, JCOMM, IODE, TOWS-WG, IOCARIBE). The list of members of the group is attached in Appendix I.

3. Dr Alexander Postnov, IOC Vice-Chair, representing the Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG), was elected the Chairperson.

4. A questionnaire was developed by the IOC Secretariat in consultation with some members of the GEBCO Guiding Committee, to collect, integrate and assess the user needs and requirements to GEBCO data and products from the relevant IOC technical subsidiary bodies. Member State representatives were also able to provide inputs to part or whole of the questionnaire. The questionnaire and the responses received are compiled in Appendix II. TOWS-WG, the International Oceanographic Data and Information Exchange (IODE), China, Japan, Mexico, and Tanzania participated in the survey.

5. The group summarized the answers as follows:

PART I – REQUIREMENTS

Relevance of GEBCO products[1] (questionnaire items 1–3, 6)

6. All respondents are aware of the GEBCO products and designate the GEBCO's gridded bathymetric data sets as the most popular and pertinent product. Many of IOC bodies also indicated the GEBCO Undersea Feature Names digital gazetteer as very popular and pertinent. On the other hand, respondents from IOC subsidiary bodies consider the History of GEBCO book as the least pertinent product.

7. Possible areas of improvement of GEBCO products are proposed as follows;

- Gridded bathymetric data sets
  - Accuracy, assurance and coverage of the gridded data, especially in the south hemisphere and shallow water;
  - Metadata information of the source data such as positioning method and surveyed year;
  - Accessibility for downloading the gridded data.
- Grid display software
  - Data accessibly/usability by supporting international formats;
  - Display of profile along a specified line.
- GEBCO Digital Atlas
  - Display of profile along a specified line;
  - Accuracy at national/local level;

[1] The list of data and products can be found at https://www.gebco.net/data_and_products/

  - Coverage of locally known undersea features.
- Undersea Feature Names
  - Zooming functions in the map window;
  - The high resolution bathymetric picture of undersea features on the map window or else;
  - Distribution of the data though the Internet using Web Map Service;
  - Regularly improved/updated coverage.
- GEBCO web service
  - No proposal
- Printable maps
  - A variety of maps useful for outreach of GEBCO project as well as for education.
- The IHO-IOC GEBCO Cook Book
  - Development of other language versions;
  - Update of some parts especially outdated recommended links.
- Historical GEBCO Charts
  - No proposal
- Imagery
  - A variety of images useful for outreach of GEBCO project as well as for education
- Hard copy charts
  - No proposal
- History of GEBCO
  - No proposal

8. TOWS-WG stressed the importance of the development of a comprehensive bathymetric database in particular in the coastal zone for the development of high resolution tsunami inundation modelling. At the same time, whilst TOWS-WG and IODE have had no direct contacts with GEBCO, these programmes use GEBCO products.

9. The establishment of a user database/mailing list to share survey information and the use of new technology to collect the user preference on GEBCO data and products through the websites were also suggested.

User needs for GEBCO data and products (questionnaire items 4–5)

10. The needs of particular GEBCO products emerged as follows:

11. The GEBCO traditional products (for areas with a depth exceeding 200 m) would be used for:

(i) Coastal hazards forecasting including tsunami for all duty scientists (resolution from 30-arc-sec to 4-arc-min);

(ii) Basic data for numerical model for scientists and researchers;

(iii) Basic data for marine spatial planning and hydrographic survey planning for decision makers;

(iv) Educational material;

(v) Basic information for marine engineering, construction, pipeline, cabling for enterprises;

(vi) Educational material for students;

(vii) Basemap for many purposes (GEBCO_2014_grid, 1- minute grid);

[Typical grid resolution of the GEBCO products applied for those activities is 30'' – 10".]

12. The GEBCO products focusing on shallow water (less than 200 m in depth) bathymetry would be used for a variety of purposes, including those listed below:

(i) Coastal hazards forecasting including tsunami for all duty scientists (resolution from 30-arc-sec to 4-arc-min);

(ii) Basic data for numerical model for scientists, researchers and organizations for disaster mitigation;

(iii) Basic data for marine spatial planning and hydrographic survey planning for decision makers;

(iv) Educational material for students;

(v) Basic information for marine engineering, construction, pipeline, cabling for enterprises;

(vi) Ensuring safety of ships for port authorities;

(vii) Basemap in the shallow water (high resolution seamless coastal digital elevation models (DEMs) including the uncertainty report and tools for transforming between the different vertical data);

(viii) Coastal activities, such as ocean use, coastal zone management, fishing, industries, agriculture, etc.

[Typical grid resolution of the GEBCO products for those activities is 5'' – 15''.]

13. It was suggested that GEBCO should develop and implement a communication strategy in order to stimulate potential users to identify specific needs for GEBCO products. It was also requested that relevant institutions/stakeholders contact their networks for identifying user needs and requirements about GEBCO data and products.

PART II – CONTRIBUTIONS

Contribution to GEBCO data and products (questionnaire items 8–9)

14. All Member States that responded to the questionnaire are aware of the GEBCO products. TOWS-WG stressed the importance of the development of a comprehensive bathymetric database in particular in the coastal zone for the development of high resolution tsunami inundation modelling. At the same time TOWS-WG and IODE report no direct contacts with GEBCO.

15. The Importance of instructions on data format and other metadata was stressed.

Options for strengthened cooperation for GEBCO data and products (questionnaire item 10)

16. Some Member States suggested additional supports to the development of the GEBCO data and products in addition to continue on-going contributions:

(i) Support to update the SCUFN gazetteer;

(ii) Exploration of the possibility to make some domestic bathymetric data or soundings available online;

(iii) Involvement in some regional mapping projects.

Approach to increase data collected through scientific activities (questionnaire item 11)

17. The Working Group members identified ways to increase the visibility of GEBCO data and products in order to promote and stimulate the provision of bathymetric data collected through scientific activities to GEBCO:

(i) Presentations delivered in scientific meetings where bathymetry data collection are discussed;

(ii) Direct contact with specific scientific groups;

(iii) Popularization and dissemination of GEBCO products and the needs of bathymetric data on the occasion of IOC related meetings;

(iv) Usage of social networks to promote the mapping projects;

(v) Promotion of the usefulness of GEBCO products among users and potential users.

Capacity-development needs in relation to GEBCO (questionnaire item 12)

18. The Working Group members indicated the following capacity-development needs for communities willing to utilize the GEBCO data and products:

(i) Training courses to introduce GEBCO data and products;

(ii) Preparation of tutorials on social networks about how to use GEBCO products;

(iii) Training in the use of GEBCO data in ecosystem modelling and identification of coastal hot spots against tsunami, storms, etc.

19. IODE has promoted capacity development in oceanographic data management and applications through the Ocean Teacher Global Academy (OTGA). GEBCO products are part of the training material used in OTGA training programmes.

20. An open forum to exchange experiences in mapping efforts using the GEBCO software was also suggested as potentially useful.

Conclusion and recommendations

21. All members are interested in the GEBCO products and finds them useful for their activities. There are a number of IOC activities that require both “traditional” (for areas with a depth exceeding 200 m) and “shallow water” GEBCO products. The most important are “shallow water” GEBCO products because they are indispensable for such widespread activities as ecosystem studies, forecasting tsunami and storm surges for specific coastlines. The required grid resolution of the “shallow water” GEBCO products is from 30-arc-sec to 4-arc-min.

22. Communities utilizing the GEBCO products and producing their own bathymetric products require training in using the GEBCO data and products.

23. Given the indispensable nature of the GEBCO data and products to IOC activities, it is recommended that IOC continues its involvement in the development of the GEBCO project and the work of the regular Working Group activities, which is tasked to collect and integrate the IOC user requirements and potential contributions to the development of the GEBCO products.

24. The GEBCO project being a joint project of IOC and the International Hydrographic Organization, researchers in the IOC community are encouraged to increase cooperation with Hydrographic Offices in their country to promote the GEBCO data and products.

25. Finally, given that the needs of the user community may not evolve drastically from year to year, it is proposed that the review of User Requirements is conducted every four years, rather than on a biannual basis as originally decided by the IOC Executive Council. For the record, a similar exercise was carried out in 2015–2016. The results were published as IOC/EC-XLIX/2 Annex 8.

Proposed decision

26. In light of the foregoing, the IOC Executive Council may wish to consider EC-LI/Dec. proposed in the Action Paper (IOC/EC-LI/2 Prov.)

Appendix I

List of the members of the regular IOC Working Group on User Requirements and Contributions to GEBCO Products

1. Experts representing IOC Programmes/Subsidiary Bodies

No	Programme/ subsidiary bodies	Name	Institution
1	GEBCO JCOMM	Dr Enrique Alvarez-Fanjiul Dr Emanuela Clementi	Puertos del Estado Av. Partenón, 10, 28042 Madrid, Spain Email : enrique@puertos.es Instituto Nazionale di Geofisica e Vulcanologia (INGV) Via Marcantonio Franceschini, 31, 40128 Bologna, Italy Email : emanuelaclementi@libero.it
2	GLOSS	Prof. Gary Mitchum	College of Marine Science, University of South Florida 140 Seventh Avenue South, St. Petersburg, Florida 33701 USA Email: mitchum@usf.edu
4	IODE	Mr Norio BABA Prof. Desiderius Masalu	Director for Data Exchange Oceanographic Data and information Division, Oceanographic and Hydrographic Department, Japan Coast Guard (JHOD) Tel: +81-3-3595-3613 Fax: +81-3-3595-3639 Email: ico@jodc.go.jp Director Institute of Marine Sciences, University of Dar es Salaam Mizingani Road, P.0 Box 668 Zanzibar Tanzania Tel: 255-24-2232128 / 255-24-2230741 Email: masalu@ims.udsm.ac.tz
5	TOWS-WG	Dr Alexander Postnov Dr Dailin Wang	Deputy Director State Oceanographic Institute, 6, Kropotkinsky Lane 119034 Moscow, Russian Federation tel +7 499 246 01 67 fax +7 499 246 72 88 Email: alexander.postnov@mail.ru Oceanographer IRC/NOAA/National Weather Service Pacific Tsunami Warning Center (PTWC) 1845 Wasp Boulevard, Building 176 Honolulu, HI 96818 USA Tel: +1 808 725 6312 E-mail: dailin.wang@noaa.gov
7	IOCARIBE	Mr Félix Frías Ibarra	Instituto Nacional de Geografia y Estadistica (INEGI) Av. Heroe de Nacozari Sur No. 2301 Fraccionamiento Jardines del Parque Aguascalientes, Aguascalientes. MEXICO. CP 20276 Tel. :+52 (449) 910 5300 Ext. 5893 Email: felix.frias@inegi.org.mx

2. Member State representatives

No	Country	Name	Institution
9	Brazil	Lieutenant Romerson, Mr Xavier Veloso	Centro de Hidrografia da Marinha (Brazilian Navy Hydrography Centre) Rue Barao de Jaceguai, S/N Ponta da Armacao, Niteroi RJ, Brazil Phone : +55 21 2189 3230 Email: xavier.veloso@marinha.mil.br
10	China	Ms FAN Miao	Senior Engineer National Marine Data and Information Service, State Oceanic Administration of China 93, Liu Wei Road, Hedong District Tian Jin 300171 China Phone: +86 (22) 2401 0872 Email: fm_nmdis@163.com
11	Germany	Dr Boris DORSCHEL	Alfred Wegener Institute (AWI) Van-Ronzelen-Str. 2 D-27568 Bremerhaven, Germany Phone: +49(471)4831-1222 Fax: +49(471)4831-1977 Email: boris.dorschel@awi.de
12	Japan	Mr Norio BABA	Director for Data Exchange Oceanographic Data and information Division, Oceanographic and Hydrographic Department, Japan Coast Guard (JHOD) Tel: +81-3-3595-3613 Fax: +81-3-3595-3639 Email: ico@jodc.go.jp
13	Malaysia	Cap. Zaharuddin Mohd MaideenP	Deputy Under-Secretary of Strategic Technology and Science & Technology Application Division, Ministry of Science Technology and Innovation (MOSTI) Level 63, Block C4, Complex C, Federal Government Administrative Centre, 62662 Putrajaya, Malaysia Phone: +603 8885 8392 (Office) Email: zaharuddin@mosti.gov.my
14	Mexico	CC. Cap. Nav. CG EHC Leonardo Tun Humbert Deputy Expert Cap. Corb. CG EHC Francisco Javier Cabrera Alonso	Director de Hidrografia Direccion General Adjunta de Oceanografia, Hidrografia y Meteorologia Secretaria de Marina Eje 2 Ote Tramo H Escuela Naval # 861 Edif B 1er nivel, Los Cipreses, Coyoacán, México, DF, 04830, México Email: dl.mexico@unesco-delegations.org Subdirector de Levantamientos Hidrograficos Direccion General Adjunta de Oceanografia, Hidrografia y Meteorologia Secretaria de Marina Eje 2 Ote Tramo H Escuela Naval # 861 Edif B 1er nivel, Los Cipreses, Coyoacán, México, DF, 04830, México Email: dl.mexico@unesco-delegations.org
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20	Spain	María Gómez Ballesteros	Instituto Espanol de Oceanografia C/ Corazon de Maria, 8 28002 Madrid, Spain Email: maria.gomez@ieo.es Tel : +34 91 342 11 00
21	Sri Lanka	Mr S.U.P. Jinadasa	Principal Scientist, National Aquatic Resources Research and Development Agency (NARA) Crow Island, Colombo 15, Sri Lanka. Email: slncu@slt.lk

Appendix II

RESULTS OF QUESTIONNAIRE ON THE REVIEW OF USER REQUIREMENTS AND CONTRIBUTIONS TO GEBCO PRODUCTS

PART I – REQUIREMENTS

Q1 Relevance of GEBCO products
Please specify which products of the GEBCO project are especially beneficial for your Programme/Subsidiary Body. (For the details of each product, please refer to GEBCO website links provided under each products)

GEBCO products	TOWS-WG	IODE	China	Japan	Tanzania	
GEBCO's gridded bathymetric data sets	**X**	**X**	**X**	**X**	**X**	5/5
Grid display software	**X**	**X**			**X**	3/5
GEBCO Digital Atlas		**X**	**X**		**X**	3/5
Undersea Feature Names		**X**	**X**	**X**	**X**	4/5
GEBCO web service					**X**	1/5
Printable maps		**X**		**X**		2/5
The IHO-IOC GEBCO Cook Book		**X**	**X**		**X**	3/5
Historical GEBCO Charts			**X**			1/5
Imagery					**X**	1/5
Hard copy charts						0/5
History of GEBCO	**X**		**X**			2/5

No answer from Mexico

Q2 Order of priority
Please specify in order of priority which existing products of the GEBCO project your Programme/Subsidiary is most likely to use and least likely to use

- Most likely to use

GEBCO products	TOWS-WG	IODE	China	Japan	Mexico	Tanzania	total points
GEBCO's gridded bathymetric data sets	1	1	1	1	1	1	+18
Grid display software	2						+ 2
GEBCO Digital Atlas						3	+ 1
Undersea Feature Names	3			3	2	2	+ 6
GEBCO web service							0
Printable maps		2		2			+ 4
The IHO-IOC GEBCO Cook Book					3		+ 1
Historical GEBCO Charts							0
Imagery							0
Hard copy charts							0
History of GEBCO							0

Points No1 priority : +3 No2 priority : +2 No3 priority : +1

- Least likely to use

GEBCO products	TOWS-WG	IODE	China	Japan	Mexico	Tanzania	total points
GEBCO's gridded bathymetric data sets							0
Grid display software				1			- 3
GEBCO Digital Atlas			3				- 1
Undersea Feature Names							0
GEBCO web service							0
Printable maps							0
The IHO-IOC GEBCO Cook Book							0
Historical GEBCO Charts	1		2			3	- 6
Imagery					3		- 1
Hard copy charts					2	1	- 5
History of GEBCO		1	1		1	2	-11

Points No1 non-priority : -3 No2 non-priority : -2 No3 non-priority : -1

Q3 Possible areas of improvement of GEBCO products
Please describe which GEBCO products could be improved from a technical point of view? (eg this may be in relation to accessibility, format, coverage, spatial resolutions, additional services…)

GEBCO data & products	TOWS-WG	IODE	China	Japan	Mexico	Tanzania
GEBCO's gridded bathy-metric data sets	Accuracy of bathymetry near coastlines, especially in shallow water	quality and assurance of the gridded data, especially in the south hemisphere	1. Spatial resolutions in the shallow water; 2. Enhance the accessibility for downloading the gridded data, since now users can only download a small area within a coverage of 10800 pixels width by 10800 pixels height 3. Uncertainty assessment of the GEBCO's gridded bathymetric data sets	1. Accuracy and assurance of the gridded data, especially in the south hemisphere, because bathymetric survey is sparse in the south hemisphere 2. Metadata information of the source data such as positioning method and year surveyed would be useful to estimate the accuracy and assurance	Spatial resolution could be improved. It would be useful to have a Digital dataset in fledermaus SD format too.	Improve coverage to the shallow waters.
Grid display software				GEBCO should provide more effort on data accessibly/ usability by supporting international formats which are commonly used by popular soft wares.		Should display profile along a specified line

GEBCO data & products	TOWS-WG	IODE	China	Japan	Mexico	Tanzania
GEBCO Digital Atlas						Should display profile along a specified line
Undersea Feature Names			1. Zooming functions in the map window. The basemap disappears when it zooms in a large map scale 2. If possible, the high resolution bathymetric picture of undersea features should be viewed on the map window or somewhere else when it is searched	Distribution of the data though the Internet using Web Map Service. It will enable to use the undersea feature name information which a user wants on a GIS software directly through the internet.		Coverage should regularly be improved/updated
GEBCO web service						
Printable maps		A variety of maps which would be useful for outreach of GEBCO project and as educational materials		A various of maps would be useful for outreach of GEBCO project as well as for education		

GEBCO data & products	TOWS-WG	IODE	China	Japan	Mexico	Tanzania
The IHO-IOC GEBCO Cook Book		Development of other languages version	1. Some parts need to be updated, especially some recommended links are out of date 2. It is appreciated if some parameters in the command lines could be detailed explained for those unskilled data processers, although the Cook Book have already done a lot.			
Historical GEBCO Charts						
Imagery		A variety of images which would be useful for outreach of GEBCO project and as educational materials		A various of images would be useful for outreach of GEBCO project as well as for education		
Hard copy charts						
History of GEBCO						

Q4 User needs in general
Who do you consider are (would be) users of GEBCO products in your Programme/Subsidiary Body? For what activities the users (would) use GEBCO products? How the users (would) use GEBCO products? What kind of products are (would be) used/needed? Please explain your needs and requirements to GEBCO products. (for example, mapping in a specific maritime area, type of products, resolution of products, web services, etc.)

	User	Activities	Type and specifications (e.g., resolution) of GEBCO products
TOWS-WG	-All duty scientists	-Tsunami forecasting	-From 30-arc-sec to 4-arc-min.
IODE	-Researcher -Decision maker -Education	-Basic data for numerical model -Basic data for marine spatial planning -Educational material	-GEBCO's gridded bathymetric data sets -GEBCO's gridded bathymetric data sets -Printable maps, Imagery
China	-cartographers, GIS specialists, decision makers, scientists, administrators, planners	-usage of GEBCO products as basemap -data processing, visualization and analysis -decision making in a specific maritime area -UNCLOS activities	-GEBCO's gridded bathymetric data sets, gebco_2014_grid, 1- minute grid -imagery showing the shape of the seafloor -gazetteer of Undersea Feature Names -GEBCO cook book
Japan	-Researcher and government organizations for disaster mitigation -Decision maker -Education -Enterprise	-Basic data for numerical model -Basic data for marine spatial planning -Educational material -Basic information for marine engineering, construction, pipeline, cabling	-GEBCO's gridded bathymetric data sets -GEBCO's gridded bathymetric data sets -Printable maps, Imagery -GEBCO's gridded bathymetric data sets, Printable maps
Mexico	-Directorate of Hydrography	-Planning of hydrographic Surveys in Areas where there is few o none bathymetry	-The best resolution the better to determine where to focus our effort
Tanzania	-Ocean science scientists/researchers -Ocean science students	-Research -Research	-Bathymetry is a key and basic data type of data in marine geophysical studies as well as for modelling in oceanography etc.

Q5 User needs as for shallow water
Traditionally, GEBCO's data sets and maps have shown the bathymetry of areas at the water depths of 200m and deeper of the world's oceans. In addition to those data sets and maps, the GEBCO project has been working to improve its gridded bathymetric data sets in the shallow waters (at the depth of less than 200m to the coastal zone), in cooperation with IHO.
As for the shallow water bathymetry, who do you consider are (would be) users of GEBCO products and for what activities the users (would) use GEBCO products products in your Programme/ Subsidiary Body? How the users (would) use GEBCO products? What kind of products concerning the shallow waters would you like the GEBCO project to produce? Please explain your needs and requirements to GEBCO products. (for example, mapping in a specific maritime area, type of products, resolution of products, web services, etc.)

	User	Activities	Type and specifications (e.g., resolution) of GEBCO products
TOWS-WG	-All duty scientists	-Tsunami forecasting	-From 30-arc-sec to 4-arc-min.
IODE	-Researcher -Decision maker -Education	-Basic data for numerical model -Basic data for marine spatial planning -Educational material	-GEBCO's gridded bathymetric data sets -GEBCO's gridded bathymetric data sets -Printable maps, Imagery
China	-cartographers, GIS specialists, decision makers, scientists, administrators, planners	-basemap in the shallow water -Coastal hazard forecast and assessment -data processing, visualization and analysis -coastal activities, such as ocean use, coastal zone management, fishing, industries, agriculture , etc.	-High resolution seamless coastal DEM, also include the uncertainty report -Tools for transforming between the different vertical datum
Japan	-Researcher and government organizations for disaster mitigation -Decision maker -Education -Enterprise	-Basic data for numerical model -Basic data for marine spatial planning -Educational material -Basic information for marine engineering, construction, pipeline, cabling	-GEBCO's gridded bathymetric data sets -GEBCO's gridded bathymetric data sets -Printable maps, Imagery -GEBCO's gridded bathymetric data sets, Printable maps

	User	Activities	Type and specifications (e.g., resolution) of GEBCO products
Mexico	-Directorate of Hydrography	-Planning of hydrographic Surveys in Areas where there is few or none bathymetry	-The best resolution the better to determine where to focus our effort
Tanzania	-Ocean science scientists/researchers/students -Port authorities -Coastal managements	-Modelling and study -Ensuring safety of ships -Modelling and ensuring safety of coastal communities	-GEBCO's gridded bathymetric data sets – shallow water coverage -Undersea Feature Names – need to be improved

Q6 Other beneficial mapping activities
Are there any products of ocean mapping activities from which your Programme/Subsidiary Body (would) benefit other than those currently developed under GEBCO data and products?
(yes / no):

	Activities
TOWS-WG	Any activities generating higher resolution bathymetry (in access of 30-arc-sec) could be useful.
IODE	Digital data set of high resolution coastal line and bathymetric contour lines The IHO-IOC GEBCO Cook Book in multi-language
China	No
Japan	Digital data set of high resolution coastal line and bathymetric contour lines
Mexico	No
Tanzania	Generic Mapping Tools (GMT) an open-source collection of computer software tools for processing and displaying xy and xyz datasets, which includes also rasterization, filtering and other image processing operations, and various kinds of map projections. It is script based and can handle different data types from the user. Surfer, a commercial contouring, gridding, and surface mapping package from Golden Software. It is a grid-based mapping software that interpolates irregularly spaced XYZ data into a regularly spaced grid. User can use own data.

Q7 Any suggestions
Beyond the IOC consultation process, please suggest any mechanism to identify user needs and requirement to GEBCO data and products and to provide them to GEBCO from the viewpoint of your Programme/Subsidiary Body:

	Activities
TOWS-WG	
IODE	Nothing
China	It might be helpful to establish a user database/mailing list in case there's not. Emails with user survey information could be sent to various users within the user pool regularly. Surveymonkey is a kind of powerful tool to make the online questionnaires. Also, the use of new technology such as big data could be explored to collect the user preference on GEBCO data and products when they visit the website.
Japan	Nothing
Mexico	It would be useful to have an open Forum to exchange experiences in mapping efforts and using the GEBCO software
Tanzania	Request relevant institutions/stakeholders to contact their networks for user needs and requirement to GEBCO data and products.

PART II CONTRIBUTION
Q8 Cooperation with GEBCO data and products
Has your Programme/Subsidiary Body cooperated with GEBCO data and products? (yes / no):

	Activities
TOWS-WG	No
IODE	No
China	China as the chief editor for some sub-regions has been actively participating in the IBCWP project (The International Bathymetric Chart of the Western Pacific), National Marine Data and Information Service has already compiled 23 sheets of the 1-million-scale bathymetric charts. In the meantime, we have involved in GEBCO activities in Undersea Feature Names Since 2009 and contributed more than 100 undersea feature names to B-8 gazetteer.
Japan	Japan has contributed to GEBCO project by providing survey data obtained by research institutes in Japan including Japan Coast Guard, JAMSTEC and Japan Antarctic Research Expeditions (JAREs), and also 500m Gridded Bathymetric Data around Japan which was developed using the surveyed data obtained by research institutes in Japan. Furthermore, at the updating GEBCO 30second gridded data in 2014, Japan provided vast bathymetry data in North-Western Pacific area.
Mexico	The Secretary of the Navy of México collects information which is given to the National Institute of Geography and Statistic, that collaborate directly with GEBCO on the IBCCA project.
Tanzania	We use GEBCO grids and Atlas which were provided through IODE for teaching.

Q9 Contribution of data to GEBCO
If your progamme has contributed data to GEBCO, which option did you use ?

1. Contributing data for public access

_ Data contributed sent to the International Hydrographic Organization Data Center for Digital Bathymetry (IHO DCDB)

_ Discovery metadata, spatial footprints and the retrieval URL for online Data provided to IHO DBCP

2. Contributed data for GEBCO's use only

_ data provided to GEBCO via GEBCO's data holding centre at the British Oceanographic Data Centre (BODC)

Any other mechanism (Please specify)

	Activities
TOWS-WG	
IODE	
China	Data contributed sent to the International Hydrographic Organization Data Center for Digital Bathymetry (IHO DCDB)
Japan	Data contributed sent to the International Hydrographic Organization Data Center for Digital Bathymetry (IHO DCDB). 100m gridded survey data obtained by the 51th to 54th expedition of JARE has been opened though Japan Oceanographic Data Center since 2017.
Mexico	Through the Mexican Member of the IBCCA project
Tanzania	Data contributed sent to the International Hydrographic Organization Data Center for Digital Bathymetry (IHO DCDB)

Q10 Potential possibility of contribution to GEBCO data and products
Do you consider there is any potential possibility that your Programme/Subsidiary Body will contribute to GEBCO data and products? (yes / no):

	Activities
TOWS-WG	No
IODE	No
China	Help to update the SCUFN gazetteer and involve in other activities in Undersea Feature Names Explore the possibility to make some bathymetric data or soundings of China available online To be involved in some regional mapping projects
Japan	Japan will continue the contribution to GEBCO project by providing the survey data and other products which will be obtained and developed by research institute in Japan.
Mexico	Through the Mexican Member of the IBCCA project
Tanzania	We will continue to contribute data as well as suggestions for improvements.

Q11 Proposals of approach to increase bathymetric data collected through scientific activities to GEBCO
Please suggest any potential approach to promote and increase the contribution of bathymetric data collected through scientific activities to GEBCO.

	Activities
TOWS-WG	Presentations in scientific meetings where bathymetry data collection are discussed. Direct contact with those groups, asking them if they could contribute.
IODE	
China	It is recommended to popularize and disseminate GEBCO products, the needs or requirements of bathymetric data on the IOC related meetings to increase the visibility of GEBCO data and products, involving and encouraging more and more scientists to contribute bathymetric data
Japan	Nothing
Mexico	Using Social networks to promote the mapping projects, meetings and different use of the people that use the bathymetric data
Tanzania	Promote GEBCO products among users as well as potential users. Once they appreciate the usefulness of the products they will be willing to contribute locally collected data and local undersea features to enrich information in their waters.

Q12 Proposals for needs of Capacity-Development
Please suggest any potential needs of capacity-development in relation to GEBCO products from the view point of your Programme/Subsidiary Body:

	Activities
TOWS-WG	
IODE	IODE has promoted capacity development on oceanographic data management and application through the Ocean Teacher Global Academy (OTGA). Products of GEBCO project have been utilized as basic data or information in many research activities such as numerical model, mapping and integrated coastal area management as well as in education. The Products of GEBCO could be utilized as a part of the training material in OTGA training programs.
China	It is better to hold some training courses to introduce GEBCO products and some techniques for state of art mapping, gridded bathymetric data sets combination, some cases for how to use the GEBCO products
Japan	Nothing
Mexico	It could be useful to have some tutorials on youtube or other social network about how to use the GEBCO software and how to use some software to make maps
Tanzania	Ecosystem modelling using GEBCO data Identification of hotspot coastal areas e.g., against tsunami, storms etc using GEBCO data

Q13 Any suggestions
Please suggest any further points to be considered in the review of contributions to GEBCO data and products from the view point of your Programme/Subsidiary Body:

	Activities
TOWS-WG	
IODE	Nothing
China	The instructions of data format and other necessary metadata should be given together with the data, so that to traceability of the data.
Japan	Nothing
Mexico	
Tanzania	Accuracy of the GEBCO Atlas at national/local level Coverage of locally known undersea features in GEBCO Atlas