

GEBCO Digital Atlas Manager Report

Submitted by UK / British Oceanographic Data Centre (BODC) of the National Oceanography Centre (NOC)

SUMMARY

Executive Summary: This report covers the work carried out at BODC in support of GEBCO since the previous GEBCO meetings in January 2021. Annex I includes statistics on the distribution of GEBCO's data sets. Annex II includes information on access to the GEBCO and the Nippon Foundation-GEBCO Seabed 2030 web sites.

Action to be taken:

Related documents: None

1. Overview/Introduction

BODC, of the UK National Oceanography Centre (NOC), acts as the Global Center for the Nippon Foundation-GEBCO Seabed 2030 Project. The primary role of the Global Center is to compile the global GEBCO grid from data provided by the Seabed 2030 Regional Centers, and to maintain and deliver the grid on behalf of the GEBCO project.

The Center also maintains and updates the GEBCO and Seabed 2030 web sites and carries out a number of activities in support of GEBCO's work. This work is detailed below.

Staff involved in work for GEBCO at BODC:

- Dr Helen Snaith, Head of the Seabed 2030 Global Center
- Ms Pauline Weatherall, GEBCO Grid Manager
- Dr Chris Thompson, IT Developer
- Plus additional IT support from BODC's IT team

2. Delivery of GEBCO's bathymetric data sets

2.1 Development and release of the GEBCO_2021 global grid

The GEBCO_2021 Grid was released on 19th July 2021. It is a global terrain model for land and oceans at 15 arc-second intervals. It is the third GEBCO grid produced through the framework of the Nippon Foundation-GEBCO Seabed 2030 project. The data set is accompanied by a Type Identifier (TID) Grid that indicates the type of data (e.g. multibeam,

single beam or interpolated etc.) that the corresponding cell in the bathymetric grid is based on.

Acting as the Seabed 2030 Global Center, BODC was responsible for compiling the global bathymetric grid by combining regional bathymetric grids provided by the Seabed 2030 Regional Centers with a base grid (SRTM15_plus v2.2) developed at Scripps Institution of Oceanography (SIO).

Before final publication, an initial draft grid was produced. It was made available for feedback, via a review application developed at the Center for Coastal and Ocean Mapping at the University of New Hampshire, to the Regional Centers; members of the GEBCO TSCOM and SCRUM committees and members of the SRTM15_plus team.

The feedback on the draft GEBCO grid was passed to the Regional Centers and SRTM15_plus team. Revised data sets were then generated by the Regional Centers and passed to the Global Center who compiled the final version of the GEBCO_2021 Grid, Type Identifier (TID) Grid and accompanying data contributions list and metadata.

The primary GEBCO_2021 grid contains land and ice surface elevation information – as provided for previous GEBCO grid releases. In addition, for the 2021 release, a version of the grid with under-ice topography information for Greenland and Antarctica has been made available. The sections of the global grid showing under-ice topography have been developed by the Arctic and North Pacific Seabed 2030 Center Team based at Stockholm University and the Southern Ocean Center team based at the Alfred Wegener Institute.

The GEBCO_2021 Grid and accompanying Type Identifier (TID) Grid can be accessed from: https://www.gebco.net/data_and_products/gridded_bathymetry_data/ and via: <https://download.gebco.net/>.

A list of the data sets included in the grid is included on GEBCO's web site: https://www.gebco.net/about_us/acknowledgements/our_data_contributors/

A Digital Object Identifier (DOI) has been minted for the data set by BODC on behalf of GEBCO: [GEBCO Compilation Group \(2021\) GEBCO 2021 Grid \(doi:10.5285/c6612cbe-50b3-0cff-e053-6c86abc09f8f\)](https://doi.org/10.5285/c6612cbe-50b3-0cff-e053-6c86abc09f8f).

For the period, 1st January 2021 – 31st March 2022, there have been over 345,000 downloads of GEBCO's data sets via GEBCO's web site.

Statistics on downloads of GEBCO's data sets can be found in Annex I.

2.2 Access to historical GEBCO grids and imagery through the download application

The GEBCO grid download application (<https://download.gebco.net/>) has been extended to allow:

- download of data for user-defined areas for previous releases of the GEBCO grid, i.e. GEBCO_2020 and GEBCO_2019.

- download of imagery based on the GEBCO_2021, GEBCO_2020 or GEBCO_2019 grids as either shaded relief or colour shaded for elevation in JPEG and PNG formats.

2.3 Development of a Web Map Service (WMS) for the GEBCO_2021 Grid

A WMS has been setup for the GEBCO_2021 Grid. This includes displaying layers showing:

- shaded relief imagery
- colour shaded for elevation
- versions showing ice surface and sub-ice topography
- TID grid colour coded for TID value
- Inclusion of a layer showing areas based on measured data or pre-generated grids

Information on how to access the WMS layers can be found on GEBCO's web site:

https://www.gebco.net/data_and_products/gebco_web_services/web_map_service/

Example GetMap call to display layer showing only those areas based on measured data or pre-generated grids:

https://www.gebco.net/data_and_products/gebco_web_services/web_map_service/mapserv?request=getmap&service=wms&BBOX=-90,-180,90,360&crs=EPSG:4326&format=image/jpeg&layers=gebco_latest_3&width=1200&height=600&version=1.3.0

WMS layers for previous GEBCO grid releases are also available:

https://www.gebco.net/data_and_products/gebco_web_services/web_map_service/previous_wms.html

2.4 Delivery of the International Bathymetric Chart of the Arctic Ocean (IBCAO) V4.1 Grid

In August 2021, version 4.1 of the bathymetric grid for the Arctic Ocean area, IBCAO, was made available from GEBCO's website in netcdf and data GeoTiff formats:

https://www.gebco.net/data_and_products/gridded_bathymetry_data/arctic_ocean/

The previous version of the grid is accessible from:

https://www.gebco.net/about_us/committees_and_groups/scrum/ibcao/ibcao_v4.html

3.0 Maintaining and updating GEBCO's web site

GEBCO's web site (<https://www.gebco.net>) and the Nippon Foundation-GEBCO Seabed 2030 Project web site (<https://seabed2030.org>) are maintained and updated at BODC. News items; meeting information and ad hoc page update requests from the GEBCO committees have been added to the web sites throughout the year.

BODC has worked on the migration of the GEBCO site to a new management platform (Drupal). The new platform will allow users external to BODC to manage sections of the site and give more options for future development of the site. The majority of the site content has been migrated to the new platform and awaits feedback from the web site Working Group

before release. This migration work was directly funded through an additional budget line provided through TSCOM

Annex II provides information on access to GEBCO's web site.

4.0 Acting as a trusted node for crowdsourced bathymetry data

BODC, as the Seabed 2030 Global Center, has implemented a workflow to be able to act as a trusted node for crowdsourced bathymetry data. This involves acting as an intermediary between data collectors and the data repository at the IHO DCDB, processing the collected data to a format that can be uploaded to the DCDB. This activity is funded through the Seabed 2030 project but directly supports the CSB working group and provides data to the DCDB.

5.0 Miscellaneous activities in support of GEBCO

5.1 Providing GEBCO data set user-support

At BODC, we answer enquiries relating to GEBCO's data sets and products. The enquiries may be of a number of forms:

- Feedback on the GEBCO grid/reporting errors – we work with the relevant Seabed 2030 Regional Center, and with the SRTM15_plus team at SIO, to investigate any errors reported in the grid and provide feedback to the enquirer. We keep a log of 'known issues' in the grid on GEBCO's web site and aim to fix them in subsequent grid releases.
https://www.gebco.net/data_and_products/gridded_bathymetry_data/data_set_errata/
- Technical – we respond to enquiries relating to how the grid was produced; the grid file formats or advice on how to use the data in particular systems
- Information on sources of bathymetry data – users may ask about the availability of source bathymetric data sets for a particular region, we endeavour to advise about available source data sets and provide links to where the data can be accessed.
- Request for imagery based on GEBCO's data sets – we receive requests for imagery generated from GEBCO's grids for use in publications, exhibitions etc.

Enquiries come from all parts of the world and all sectors, i.e. commercial companies, academic institutions, students and private individuals.

A form has been setup on the GEBCO web site to allow users to provide feedback on how they are using GEBCO's data sets:

https://www.gebco.net/data_and_products/gridded_bathymetry_data/feedback/

5.2 Maintenance of mailing lists and Google drive space for committee use

BODC manage a google workspace, with the domain groups,gebco.net, primarily for serving group mailing lists on behalf of GEBCO and its sub committees. The primary group is the gebco_folk mailing list taken over from NCEI management in 2020. The use of the workspace has expanded to serve other group lists, including the web working group and the cookbook editorial board and a shared drive has been set up for use by SCOPE.

BODC would be happy to extend the use of this workspace to provide email accounts, group mailing lists and shared workspaces for GEBCO and its sub committees, as required.

6.0 Action

None.

Annex I - statistics on the distribution of GEBCO's data sets

Internet downloads of GEBCO's gridded bathymetric data sets

https://www.gebco.net/data_and_products/gridded_bathymetry_data/

To note: statistics relating to the number of downloads of GEBCO's data sets and access to its web sites are given for the reporting period: 1st January 2021 – 31st March 2022.

GEBCO's latest bathymetric grid, the GEBCO_2021 Grid, was released at the end of July 2021. GEBCO's previous grids: GEBCO_2020, GEBCO_2019, GEBCO_2014 and the GEBCO One Minute Grid are made available as global grid files to download, through the '[historical data sets](#)' section of GEBCO's web site and for user-defined areas through the GEBCO download app (<https://download.gebco.net/>).

Total number of downloads of data from GEBCO's gridded data sets during the reporting period:.

Downloads for reporting period (1st January 2021 – 31st March 2022) split by grid type:

- GEBCO_2021 Grid: 262,872 (Global grids: 201,580)
- GEBCO_2021 TID Grid: 33,069 (Global grids: 13,752)

- GEBCO_2020 Grid: 151,876 (global grids: 93,310)
- GEBCO_2020 TID Grid: 42,232 (global grids: 7,435)

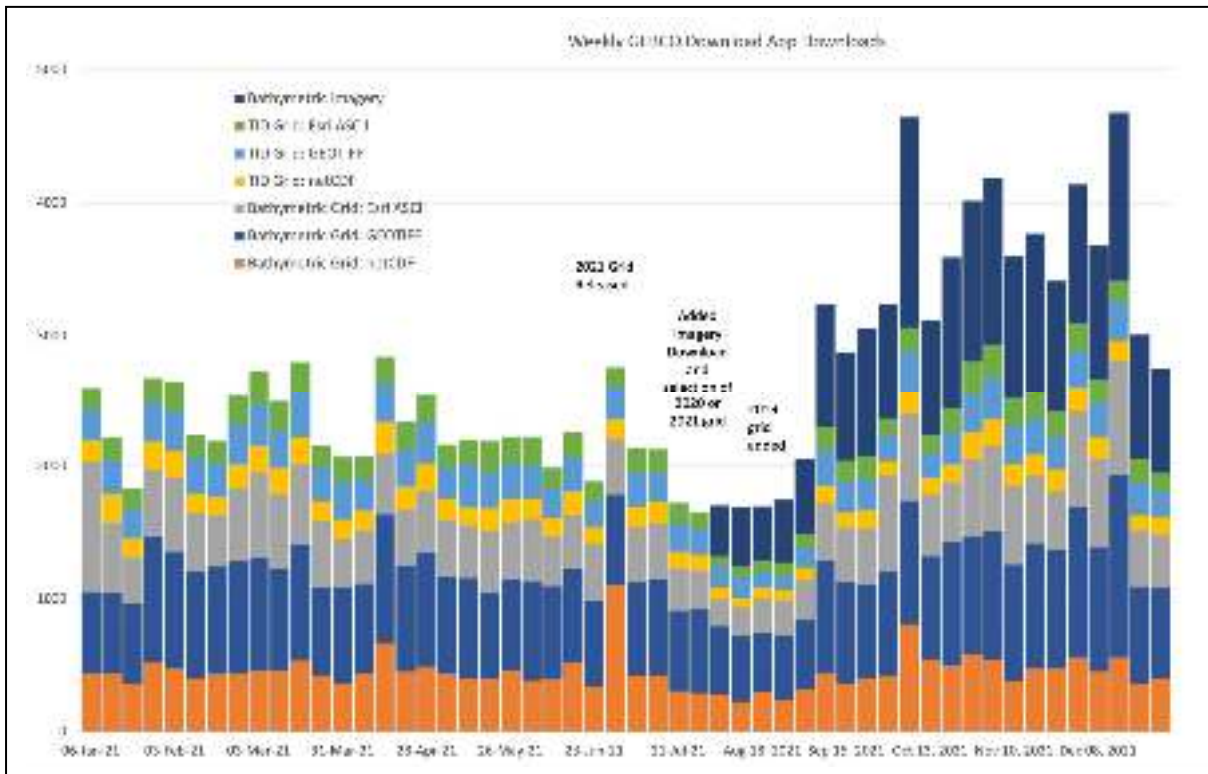
- GEBCO_2019 Grid: 27,767 (global grids: 26,715)
- GEBCO_2019 TID Grid: 883 (global grids:416)

Historical data sets (global grids):

- GEBCO_2014 Grid (30 arc-second): 782
- GEBCO_2014 SID Grid (30 arc-second): 321
- GEBCO One Minute Grid: 908

From the 4th August 2021 imagery based on GEBCO's grids has been available to download for user-defined areas in PNG and JPEG formats as a shaded relief image or as an image colour-coded for elevation. The table below shows the number of downloads of imagery for each grid.

Grid name	Number of image downloads
GEBCO_2021	34,594
GEBCO_2020	721
GEBCO_2019	789



The image above shows weekly downloads of bathymetry data and imagery through the GEBCO grid download app.

Access to the IBCAO Grid

In August 2021, the IBCAO V4.1 grid was made available from GEBCO’s web site, on behalf of the IBCAO project.

https://www.gebco.net/data_and_products/gridded_bathymetry_data/arctic_ocean/.

The data set is made available in netCDF and GeoTiff formats in polar stereographic projection co-ordinates. Versions of the data set are available with and without elevation information for the Greenland Ice Sheet.

The previous version of the grid is also available to download:

https://www.gebco.net/about_us/committees_and_groups/scrum/ibcao/ibcao_v4.html

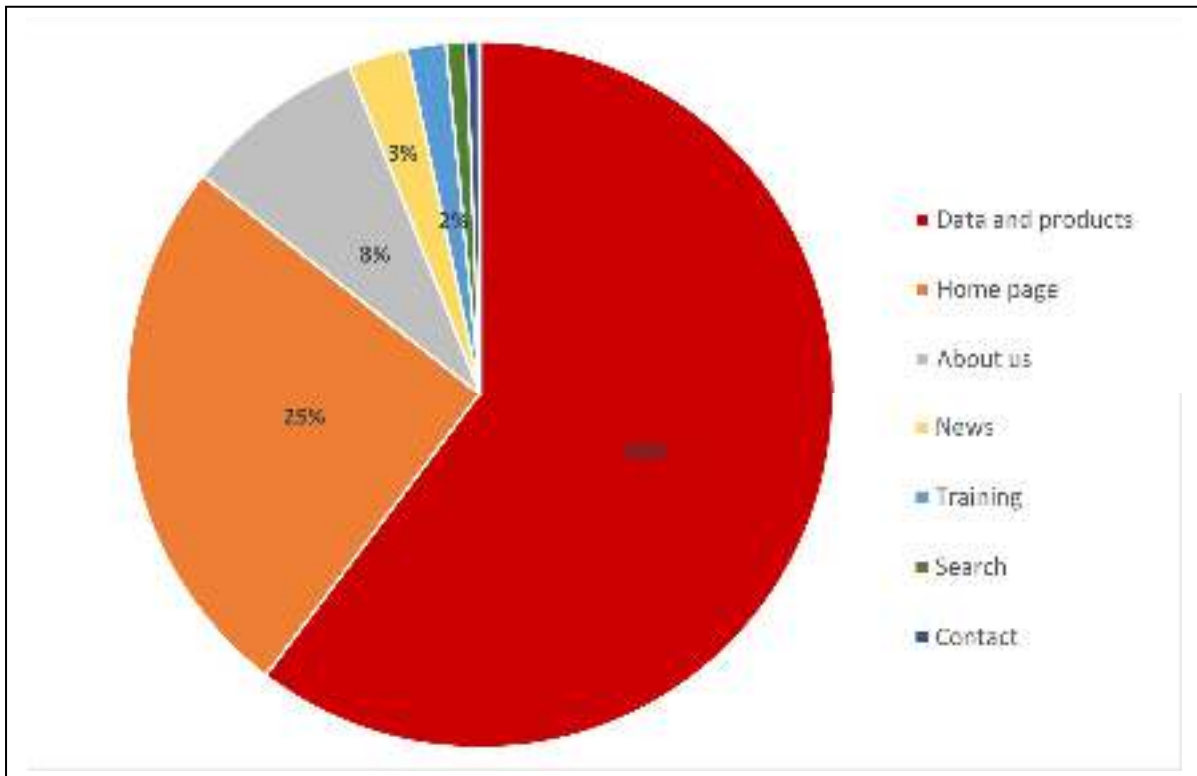
- Number of downloads of the IBCAO V4.1 Grid: 17,528
- Number of downloads of the IBCAO V4 Grid: 11,287

Annex II – Access to the GEBCO and Seabed 2030 web sites

The GEBCO and Seabed 2030 web sites are maintained by BODC on behalf of the projects. The following tables and images provide information and statistics on access to these web sites for the period (1st January 2021 – 31st March 2022).

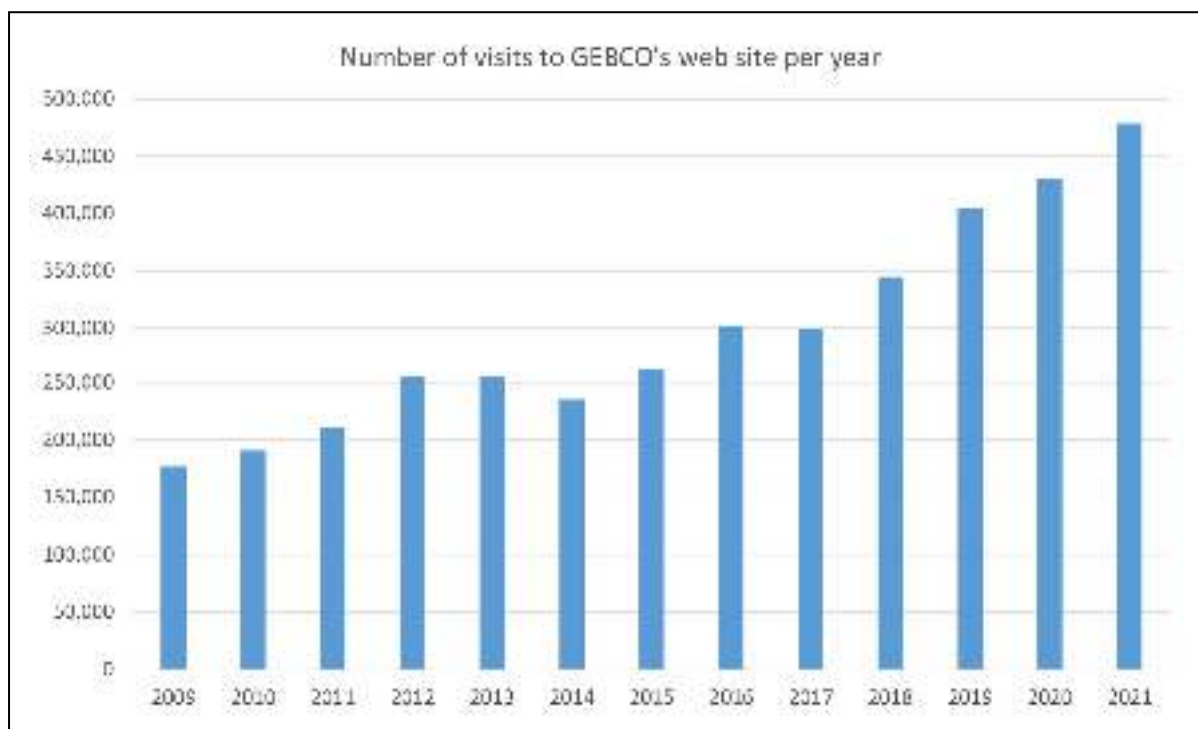
Access to GEBCO’s web site (www.gebco.net)

During the reporting period over 601,600 pages have been accessed on GEBCO’s web site. The image below shows the frequency of visits to the various areas of the web site.



The table below shows the pages viewed and number of visitors per calendar year.

Year	Number of pages viewed
2009	176,759
2010	191,037
2011	210,188
2012	255,241
2013	254,804
2014	235,273
2015	263,689
2016	302,252
2017	299,654
2018	344,657
2019	404,532
2020	430,198
2021	478,620



The figure above shows the number of visits to GEBCO’s web site per year since 2009.

Number of visits to individual web pages

The following table details the number of visits to the ‘top 20’ most popular pages on GEBCO’s web site for the reporting period.

Explanation of terms used:

Page title and URL	Title of the GEBCO web page viewed with URL
No. page views	The total number of pages viewed during the reporting period
Average time on page (minutes)	The average amount of time that visitors spent viewing this set of pages or page.

Page title and URL	No. of page views	Avg. time on page (minutes)
Gridded bathymetry data* https://www.gebco.net/data_and_products/gridded_bathymetry_data/index.html	173,448	02:51
GEBCO home page https://www.gebco.net/index.html	151,728	01:03
Web Map Service (WMS) page https://www.gebco.net/data_and_products/gebco_web_services/web_map_service/index.html	44,382	01:55
GEBCO’s data and products https://www.gebco.net/data_and_products/index.html	19,080	00:31
Printable Maps	16,339	02:07

https://www.gebco.net/data_and_products/printable_maps/		
GEBCO_2020 Grid info https://www.gebco.net/data_and_products/gridded_bathymetry_data/gebco_2020/	12,627	02:34
Arctic Ocean bathymetry (IBCAO) https://www.gebco.net/data_and_products/gridded_bathymetry_data/arctic_ocean/index.html	11,638	01:57
Undersea feature names https://www.gebco.net/data_and_products/undersea_feature_names/index.html	11,467	02:03
Seabed 2030 Project https://www.gebco.net/about_us/seabed2030_project/index.html	10,421	01:12
Training https://www.gebco.net/training/index.html	9,673	02:49
Information about the GEBCO_2019 Grid https://www.gebco.net//data_and_products/gridded_bathymetry_data/gebco_2019/gebco_2019_info.html	9,204	01:49
Imagery index page https://www.gebco.net/data_and_products/imagery/index.html	8,802	01:03
GEBCO grid terms of use information https://www.gebco.net/data_and_products/gridded_bathymetry_data/gebco_2019/grid_terms_of_use.html	7,640	03:17
Information about the GEBCO_2021 Grid https://www.gebco.net/data_and_products/gridded_bathymetry_data/gebco_2021/index.html	6,430	02:19
International Bathymetric Chart of the Southern Ocean (IBCSO) https://www.gebco.net/data_and_products/gridded_bathymetry_data/southern_ocean/	5,587	01:15
Search https://www.gebco.net/search/index.html	5,537	00:50
GEBCO web services https://www.gebco.net/data_and_products/gebco_web_services/index.html	5,463	00:26
Historical GEBCO data sets www.gebco.net/data_and_products/historical_data_sets/index.html	5,145	01:54
Polar grids https://www.gebco.net/data_and_products/gridded_bathymetry_data/polar_grids/index.html	4,775	00:30
How to contribute data www/about_us/contributing_data/index.html	4,094	01:28

* See Annex I for details on Internet downloads of GEBCO's gridded bathymetric data sets.

Geographic distribution of Internet Protocol (IP) addresses accessing GEBCO's web site

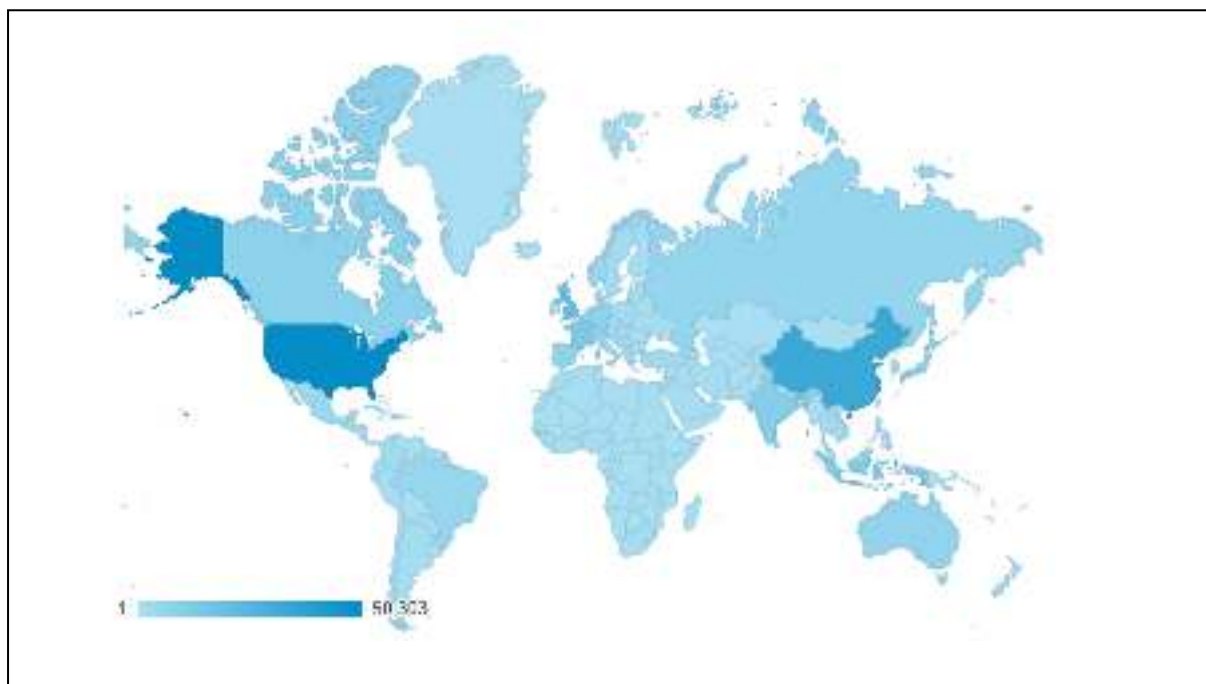
The table below details the geographic distribution by country (top 20 'number of visits' listed) of IP addresses accessing GEBCO's web site. Explanation of terms used:

Country/Territory	The name of the country or territory of the origin of the IP address accessing GEBCO's web site
Visits	The total number of visits to the site from this country/territory

Pages/visit	The number of pages viewed per visit
Average time on site (minutes)	The average amount of time that visitors spent on the site

Country/Territory	Sessions	Pages/sessions	Average time on site (minutes)
United States of America	50,303	1.91	01:28
China	33,408	1.93	01:44
United Kingdom	20,372	2.25	02:25
France	13,214	2.13	01:48
Indonesia	12,223	2.01	01:48
India	10,570	2.01	01:51
Japan	8,603	2.23	02:12
Canada	8,485	2.09	01:44
Germany	7,790	2.19	01:49
Spain	7,514	2.37	02:03
Australia	7,130	2.03	01:45
Italy	6,707	2.31	02:03
Russia	6,023	2.39	02:24
Brazil	5,441	2.14	02:16
Norway	4,637	2.17	01:55
Mexico	4,169	2.23	02:16
Netherlands	3,881	2.05	01:42
South Korea	3,666	2.61	02:41
Philippines	3,211	1.95	01:46
Turkey	2,896	2.27	01:51

The image below shows the geographic distribution of IP addresses accessing GEBCO's web site. The colour indicates the number of web site sessions for a particular country, from 1 (pale blue) to 50,303 (dark blue).



Access to the Nippon Foundation-GEBCO Seabed 2030 web site
(<https://seabed2030.org>)

The Seabed 2030 web site provides information specifically related to this project. During the period 1st January 2021 to 31st March 2022 there have been over 129,500 visits to the site.

The table below shows the number of pages viewed on the web site per year since its launch in 2018.

Year	Number of pages viewed
2018	49,005
2019	74,708
2020	117,558
2021	100,488

The table below shows the number of visits to the various sections of the web site.

Page title and URL	Title of the Seabed 2030 web page viewed with URL
No. page views	The total number of pages viewed during the reporting period
Average time on page (minutes)	The average amount of time that visitors spent viewing this set of pages or page.

Page title and URL	No. page views	Average time on page (min)
Seabed 2030 Home page https://seabed2030.org	58,327	01:35
About Seabed 2030 https://seabed2030.org/about_us/	6,199	02:40
Resources for journalists https://seabed2030.org/resources_for_journalists/	5,769	01:06
Seabed Regional and Global Centers https://seabed2030.org/data_centers/	4,519	00:55
Get involved https://seabed2030.org/get_involved/	3,439	01:18
News https://seabed2030.org/news/	2,950	01:02
Frequently Asked Questions https://seabed2030.org/faq/	2,910	02:34
Link to download the GEBCO grid https://seabed2030.org/download-gebcos-global-grid	2,640	02:06
Atlantic and Indian Ocean Regional Center https://seabed2030.org/atlantic_indian/	2,065	01:45
Global Center https://seabed2030.org/gdacc/	1,892	01:12
South and West Pacific Ocean Regional Center https://seabed2030.org/pacific/	1,720	01:28
Seabed 2030 Partners https://seabed2030.org/get_involved/partners/	1,647	01:15
Mapping progress	1,567	04:13

https://seabed2030.org/mapping-progress		
Arctic and North Pacific Regional Center https://seabed2030.org/arctic_pacific/	1,248	01:16
Southern Ocean Regional Center https://seabed2030.org/southern_ocean/	1,156	01:15
Crowdsourced Bathymetry https://seabed2030.org/crowd-sourced-bathymetry	1,138	02:08

The table below shows the visits per country to the Seabed 2030 web site for the reporting period.

Country/Territory	The name of the country or territory of the origin of the IP address accessing the Seabed 2030 web site
Visits	The total number of visits to the site from this country/territory
Pages/visit	The number of pages viewed per visit
Average time on site (minutes)	The average amount of time that visitors spent on the site

Country/Territory	Sessions	Pages/visit	Average time on site (minutes)
United States	21,861	1.77	01:12
United Kingdom	8,312	2.3	02:28
China	4,107	1.59	01:09
Canada	2,662	1.86	01:23
India	2,363	1.71	01:31
Australia	2,260	1.83	01:15
France	1,818	2.22	01:54
Germany	1,568	2.11	01:46
Netherlands	1,200	2.08	01:18
Japan	1,592	2.49	01:56
Italy	1,216	2.28	01:38
Spain	1,041	2.03	01:27
Norway	1,013	2.06	01:28
Brazil	979	2.07	01:59
Russia	701	2.03	01:31
Indonesia	650	1.99	01:50
New Zealand	718	2.01	01:29
Mexico	613	1.87	01:49
Philippines	522	1.84	01:53

The image below shows the geographic distribution of IP addresses accessing the Seabed 2030 web site. The colour indicates the number of web site visits for a particular country, from 0 (white) to 21,816 (dark blue).

