THE NIPPON FOUNDATION-GEBCO SEABED 2030

SUT Society for Underwater Technology

SEABED 2030

Energizing Ocean Floor Mapping

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THE NIPPON FOUNDATION · GEBCO · 120 1903–2023 · International Hydrographic Organization / Organisation Hydrographique Internationale IHO · unesco Intergovernmental Oceanographic Commission · 2021 2030 United Nations Decade of Ocean Science for Sustainable Development

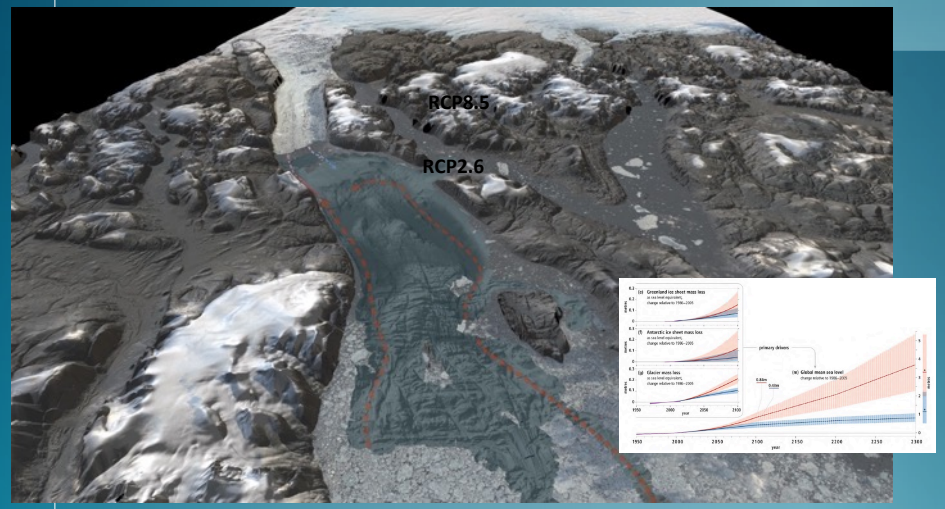
COLUMBIA CLIMATE SCHOOL
LAMONT-DOHERTY EARTH OBSERVATORY

SEABED 2030

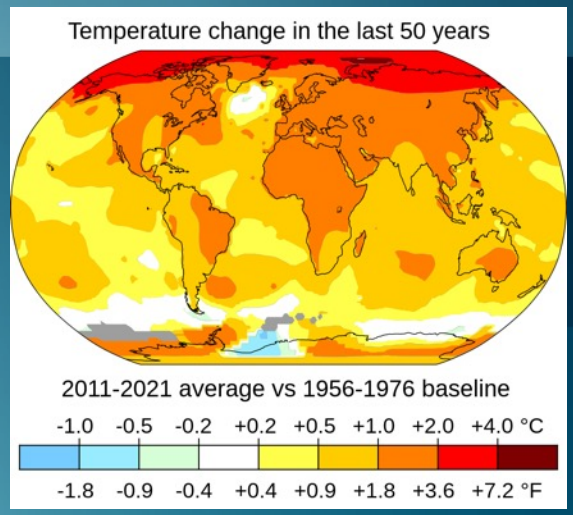
Why is ocean floor mapping data important?

14 LIFE BELOW WATER

- Nautical charts
- Oil and gas exploration
- Safety and storm surge/tsunami inundation models
- Ecosystem identification and management
- Emergency response
- Satellite verification models
- Offshore infrastructure
- Ocean Models
- Coastal/Marine Spatial Planning
- Coastal Hazard Assessment
- Ocean Exploration
- Coastal Change Analysis
- Sea Level Rise Mitigation
- New Energy Siting
- Marine Heritage
- Blue Economy



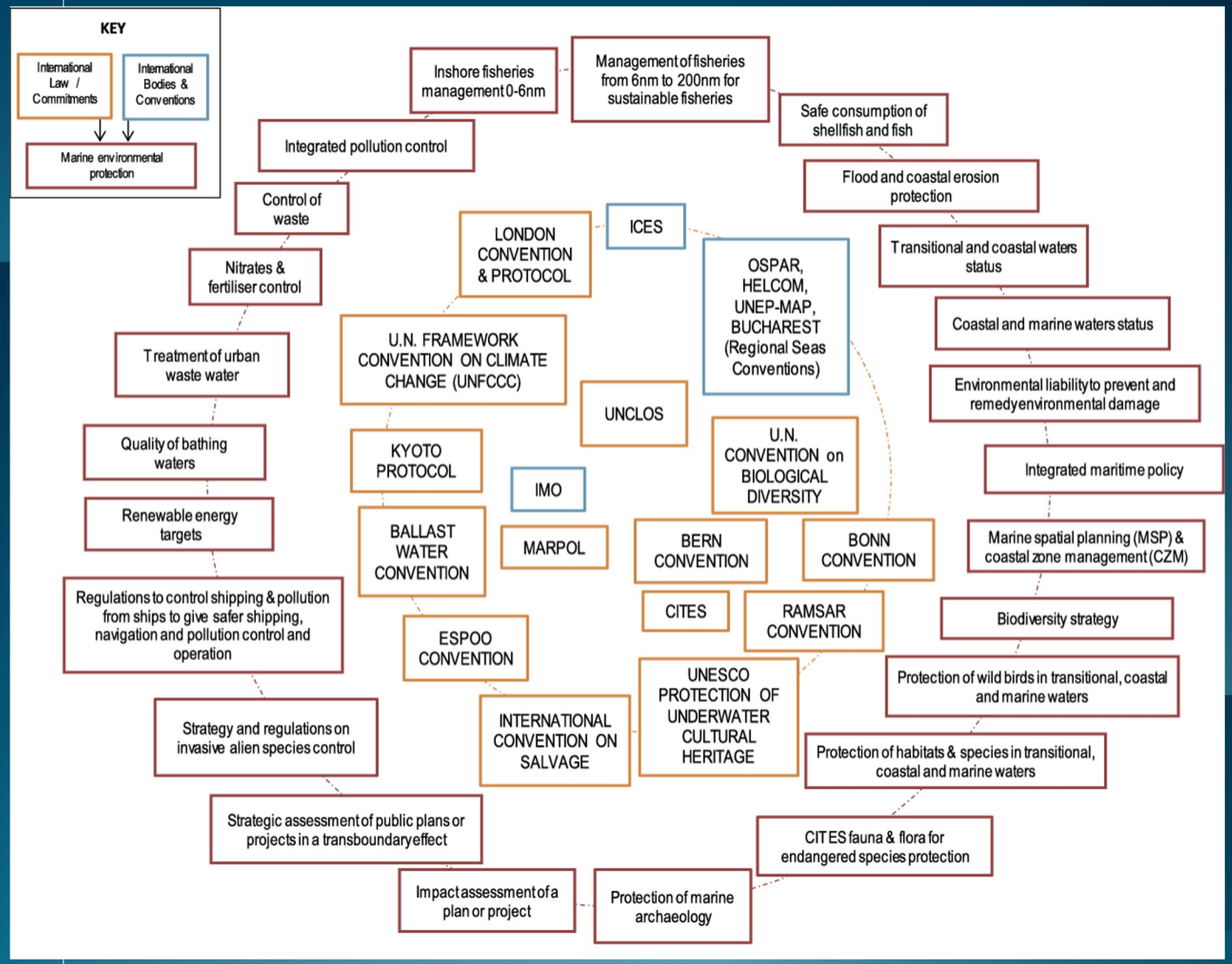
Courtesy: Martin Jakobsson, SU

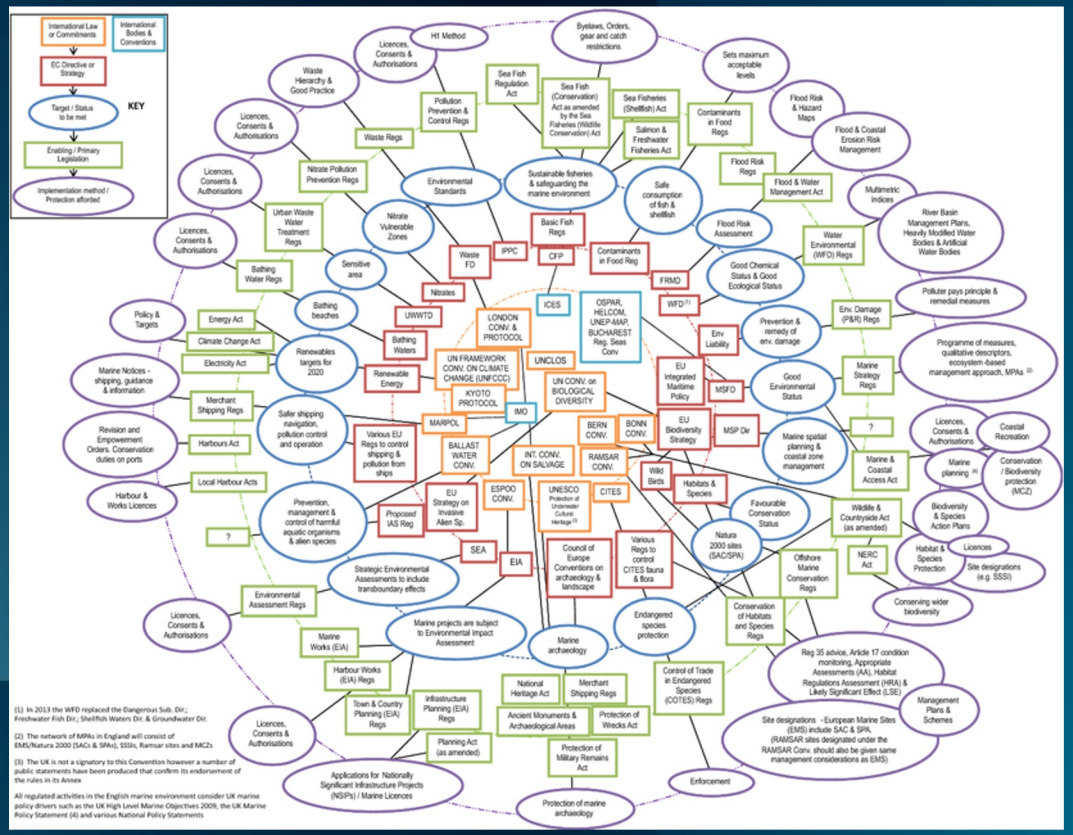


Courtesy: NASA

Courtesy: NOAA

Mapping underpins legislation





You can’t manage what you haven’t measured! Lots of data are needed!

Figures by Boyes & Elliott, Univ. of Hull, illustrate ocean-related rules, conventions & laws that apply to UK & EU nations - will be similar for most nations.

What is Seabed 2030?

The Nippon Foundation - GEBCO Seabed 2030 Project is a collaborative project to inspire the complete mapping of the world's ocean by 2030, and to compile all bathymetric data into the freely-available GEBCO Ocean Map.

> *Seabed 2030 aspires to empower the world to make policy decisions, use the ocean sustainably, and undertake scientific research that is informed by a detailed understanding of the global ocean floor.*

GEBCO – General Bathymetric Chart of the Oceans

Aim: provide authoritative, publicly-available bathymetry (depth) data sets of the world's oceans

Operates under the joint auspices of

- The International Hydrographic Organization (IHO)
- The Intergovernmental Oceanographic Commission (IOC/UNESCO)

Established 1903

IHO International Hydrographic Organization

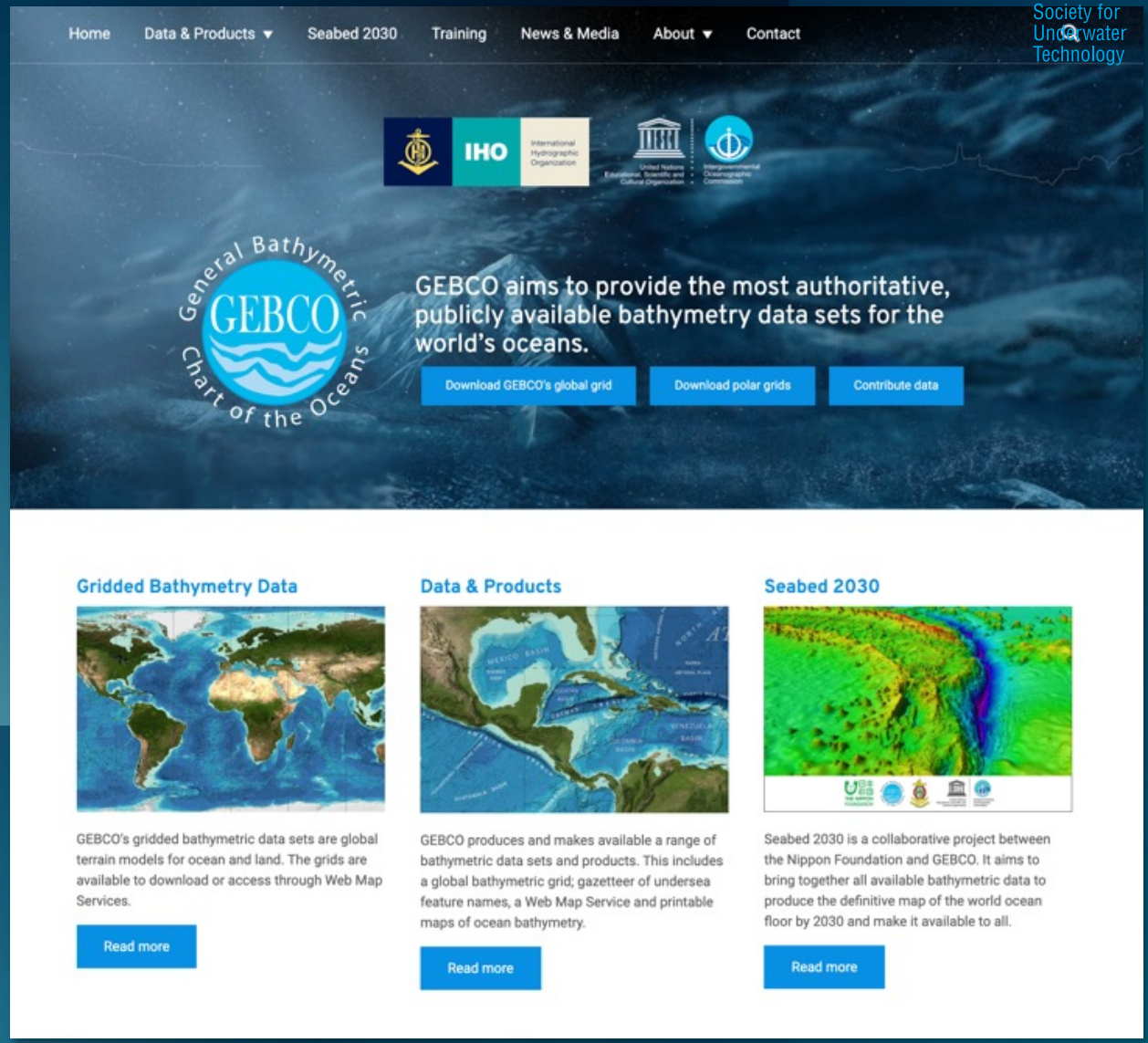
unesco Intergovernmental Oceanographic Commission

General Bathymetric Chart of the Oceans GEBCO

GEBCO Guiding Committee

GEBCO Products

- Global gridded bathymetric data
  - ➢ 2014: 30 arc-second grid
  - ➢ 2019 - 2023: 15 arc-second grid
- Gazetteer of Undersea Feature Names
- Grid viewing software
- Printable maps
- Web Map Service (WMS)
- IHO-IOC GEBCO Cook Book



Download the GEBCO grid from: gebco.net or seabed2030.org

Accessing the GEBCO Grid

Home | Data & Products ▾ | Seabed 2030 | Training | News & Media | About ▾ | Contact

Gridded Bathymetry Data

Home » Data & Products » Gridded Bathymetry Data

Global ocean & land terrain models

GEBCO's gridded bathymetric data set, the GEBCO_2020 grid, is a global terrain model for ocean and land at 15 arc-second intervals. It is accompanied by a Type Identifier (TID) Grid that gives information on the types of source data that the GEBCO_2020 Grid is based.

- Download global coverage grids
- Download data for user-defined areas

More information about the grid, its terms of use and attribution.

Download global coverage grids

The GEBCO_2020 Grid and TID Grid can be download as global files in netCDF format or a set of 8 tiles (each with an area of 90° x 90°), giving global coverage, in Esri ASCII raster and data GeoTiff formats. The data filea are included in a zip file along with the data set documentation.

GEBCO_2020 Grid	netCDF (4 Gbytes, 7.5 Gbytes uncompressed)	Data GeoTiff (4 Gbytes, 8 Gbytes uncompressed)	Esri ASCII raster (5 Gbytes, 20 Gbytes uncompressed)
GEBCO_2020 TID Grid	netCDF 90 Mbytes, 4 Gbytes uncompressed)	Data GeoTiff (96 Mbytes, 7 Gbytes uncompressed)	Esri ASCII raster (108 Mbytes, 9.5 Gbytes uncompressed)

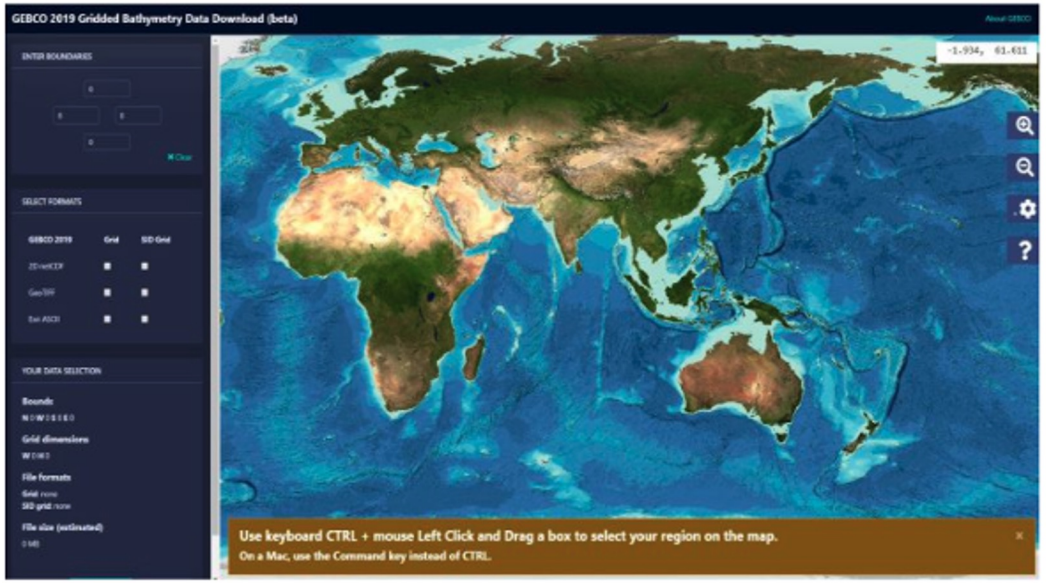
Jump to

- > Seabed 2030
- > Contribute data
- > IBCAO_v4
- > GEBCO Web Services
- > Printable maps
- > Historical GEBCO data sets
- > Imagery
- > Undersea feature names
- > Historical GEBCO charts
- > IHO-IOC GEBCO Cook Book
- > History of GEBCO book

Share this

Download data for user-defined areas

Use our application to select and download data in netCDF, Esri ASCII raster and data GeoTiff formats.



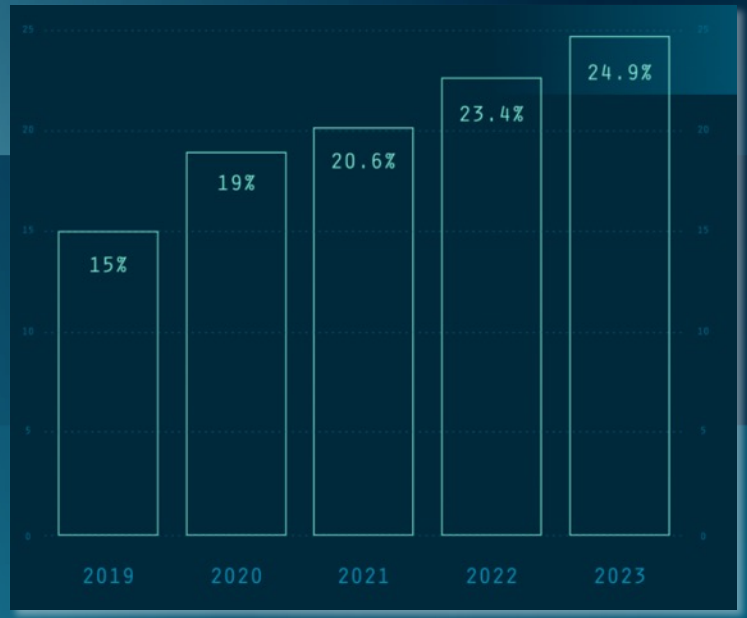
Download the GEBCO grid from: gebco.net or seabed2030.org

Why is Seabed 2030 Important?

- Bathymetry data is an essential ocean observation
- Seabed mapping data has broad use and value
- Ocean processes extend beyond territorial waters
- Mapping the entire ocean can only be achieved through cooperation and coordination
- Only ~25% of the ocean has been mapped with direct observation (GEBCO 2023)
- Seabed 2030 is an **accelerator** for GEBCO

Only 6% of the ocean floor was mapped to an adequate resolution when the initiative first started...

Seabed 2030 was launched at the first ever UN Ocean Conference in New York in 2017. Today, we've seen the figure grow to a quarter of the seabed mapped.



UN Decade of the Ocean for Sustainable Development

- Clean
- Healthy & Resilient
- Productive
- Predicted
- Safe
- Accessible
- Inspiring & Engaging

DECADE OUTCOMES

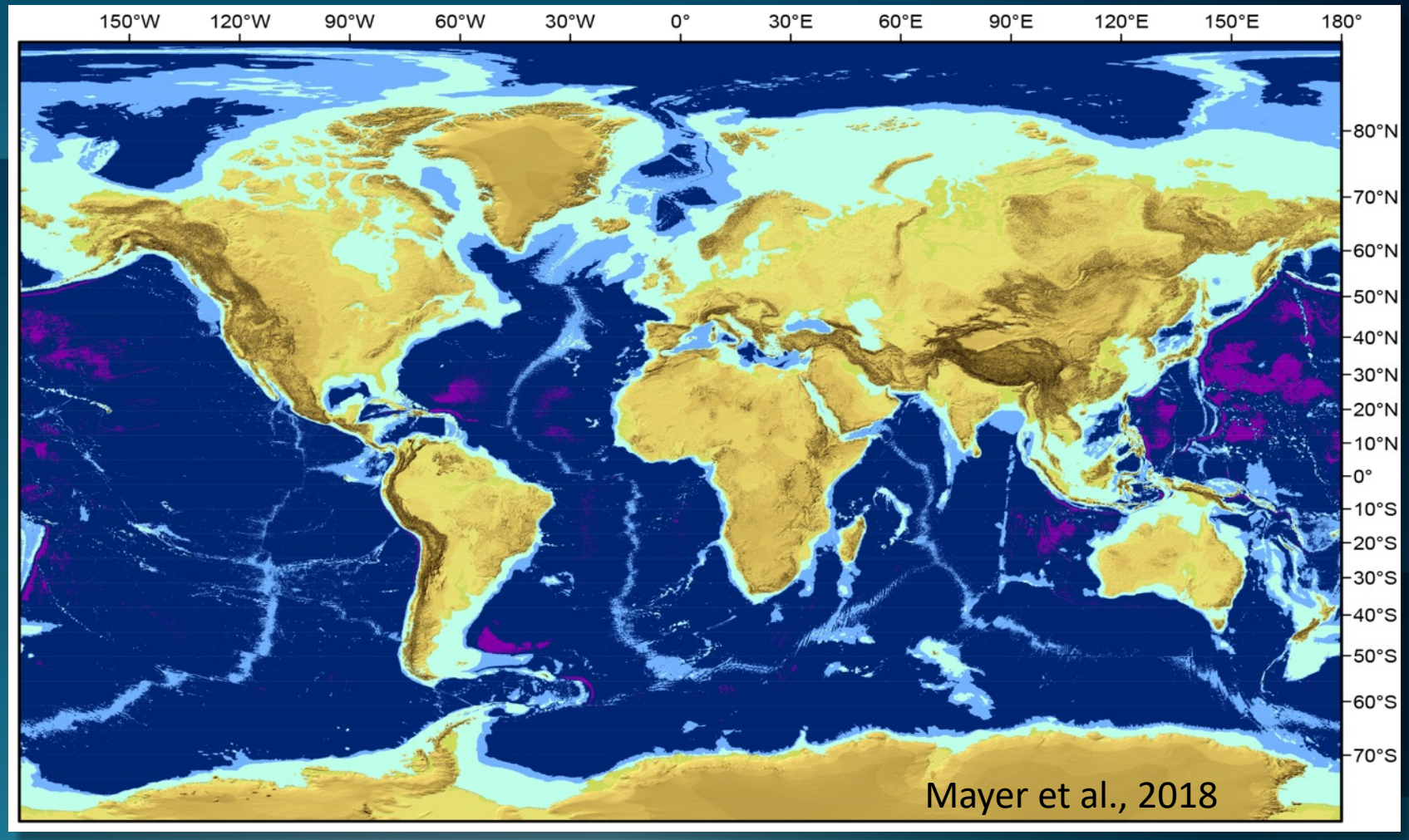
"THE OCEAN WE WANT"

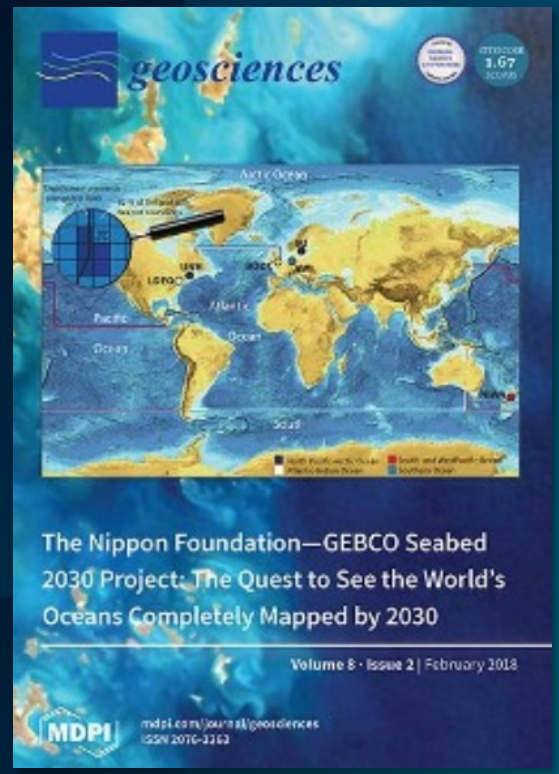
Flagship Programme

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

OCEAN DECADE CHALLENGES	RELEVANCE TO SEABED 2030
Pollutants	Coastal bathymetry
Ecosystems	Mapping central
Food from the Ocean	Bathymetry dependent
Ocean economy	Mapping intensive
Ocean-climate nexus	Modelling, SLR, etc.
Ocean-related risks	Bathymetry intensive
Ocean observing system	Bathymetry is foundational
Ocean digital representation	GEBCO grid: unified product
Capacity development	Mission critical
Behaviour change	Data acquisition & sharing

What does 100% mapped mean?

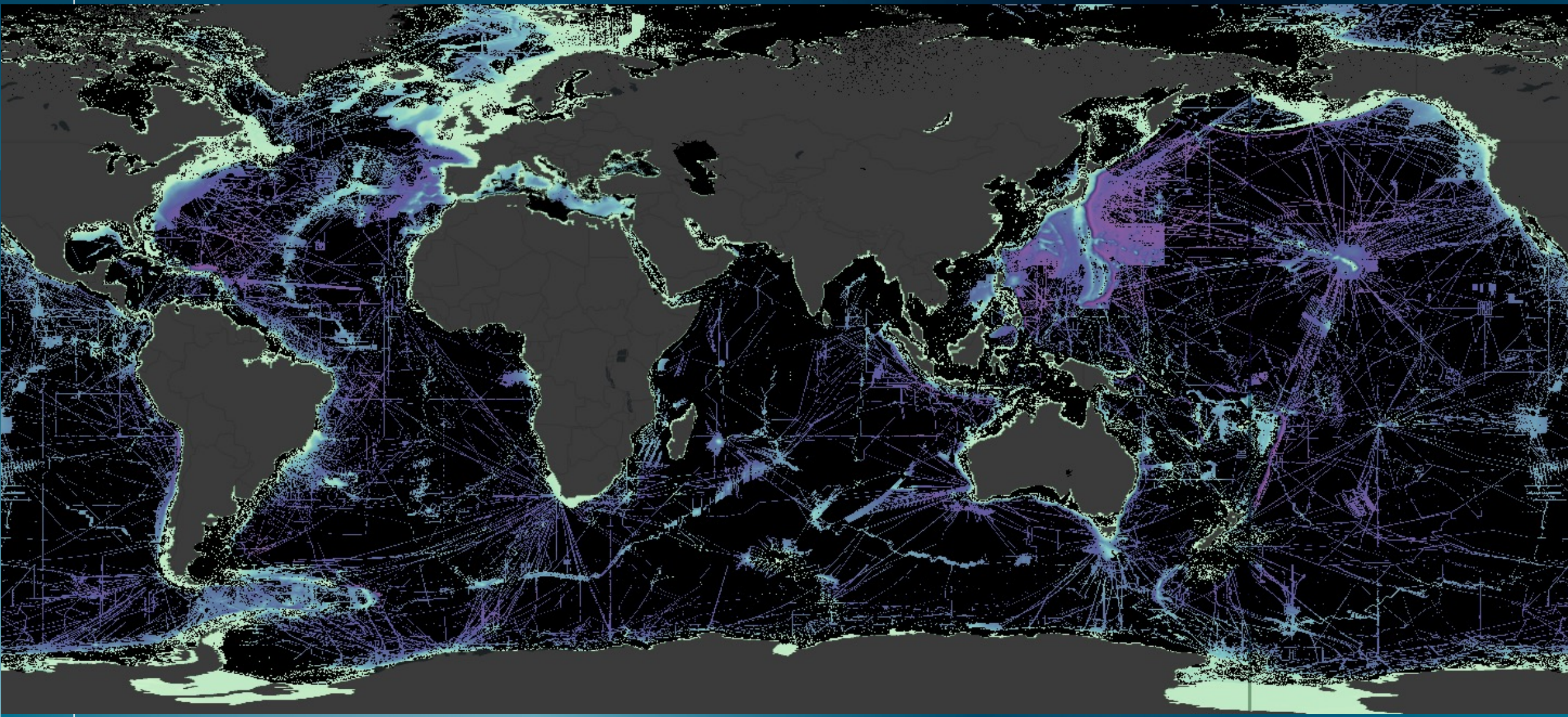




100x100 m (0-1500 m)
200x200 m (1500-3000 m)
400x400 m (3000-5750 m)
800x800 m (5750-11000 m)

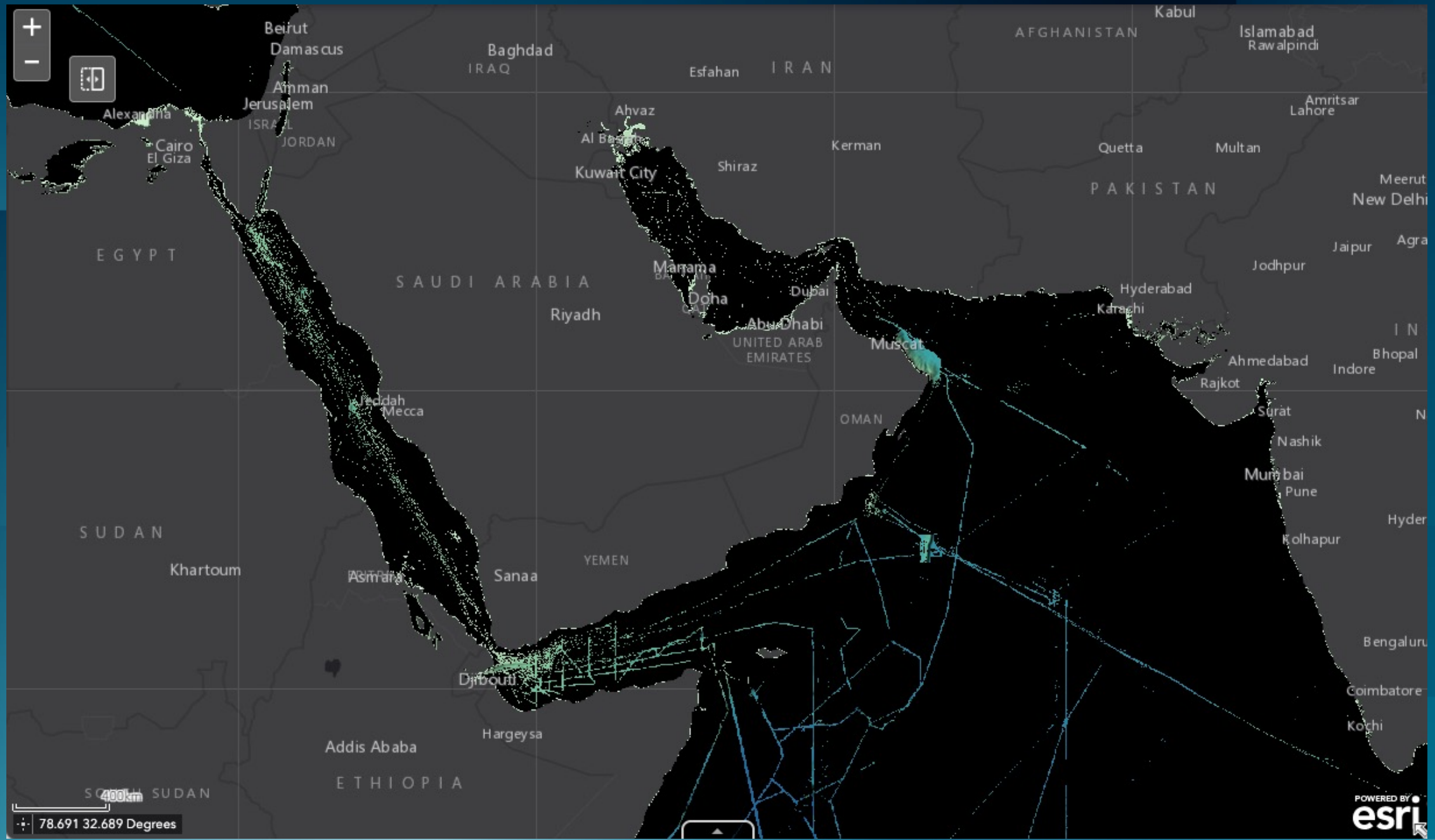
How much of the Ocean is Mapped?

GEBCO 2023



24.9 % mapped ~ 90 million km² ~ 5 x South America, ~ 3 x Africa

GEBCO 2014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JORDAN
Alexandria
Cairo
El Giza
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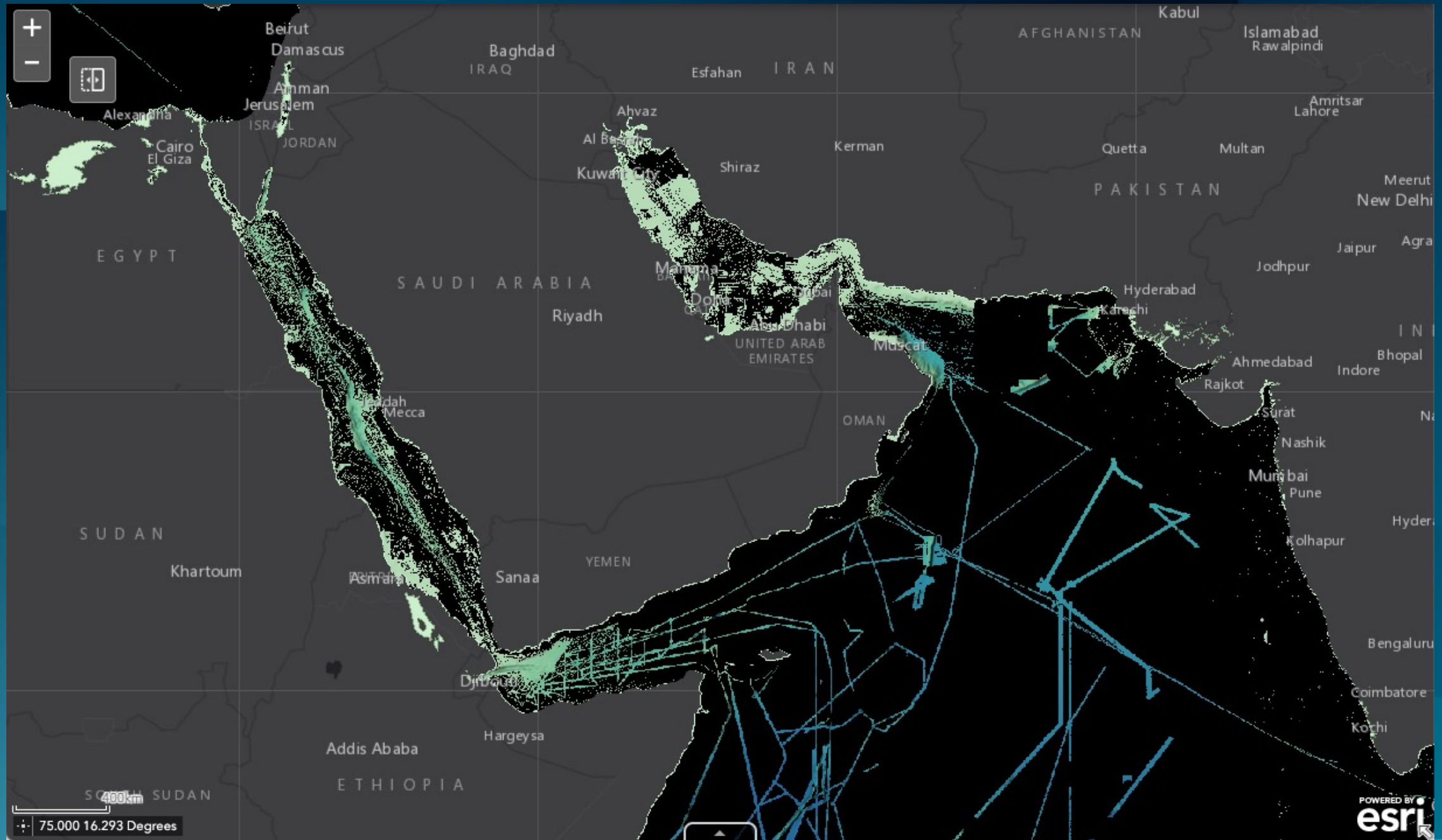
Al Basrah
Kuwait City
Shiraz
Kerman
AFGHANISTAN
Kabul
Islamabad
Rawalpindi
Amritsar
Lahore
Quetta
Multan
PAKISTAN
Meerut
New Delhi
Jaipur
Agra
Jodhpur
EGYPT
SAUDI ARABIA
Manama
Doha
Dubai
Riyadh
Abu Dhabi
UNITED ARAB EMIRATES
Muscat
Hyderabad
Karachi
Ahmedabad
Bhopal
Indore
Rajkot
Surat
Nashik
Mumbai
Pune
Kolhapur
Jeddah
Mecca
OMAN
SUDAN
Khartoum
Asmara
Sanaa
YEMEN
Djibouti
Hargeysa
Addis Ababa
ETHIOPIA
SOUTH SUDAN
Bengaluru
Coimbatore
Kochi
400km
78.691 32.689 Degrees
POWERED BY esri

GEBCO 2023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Alexandria
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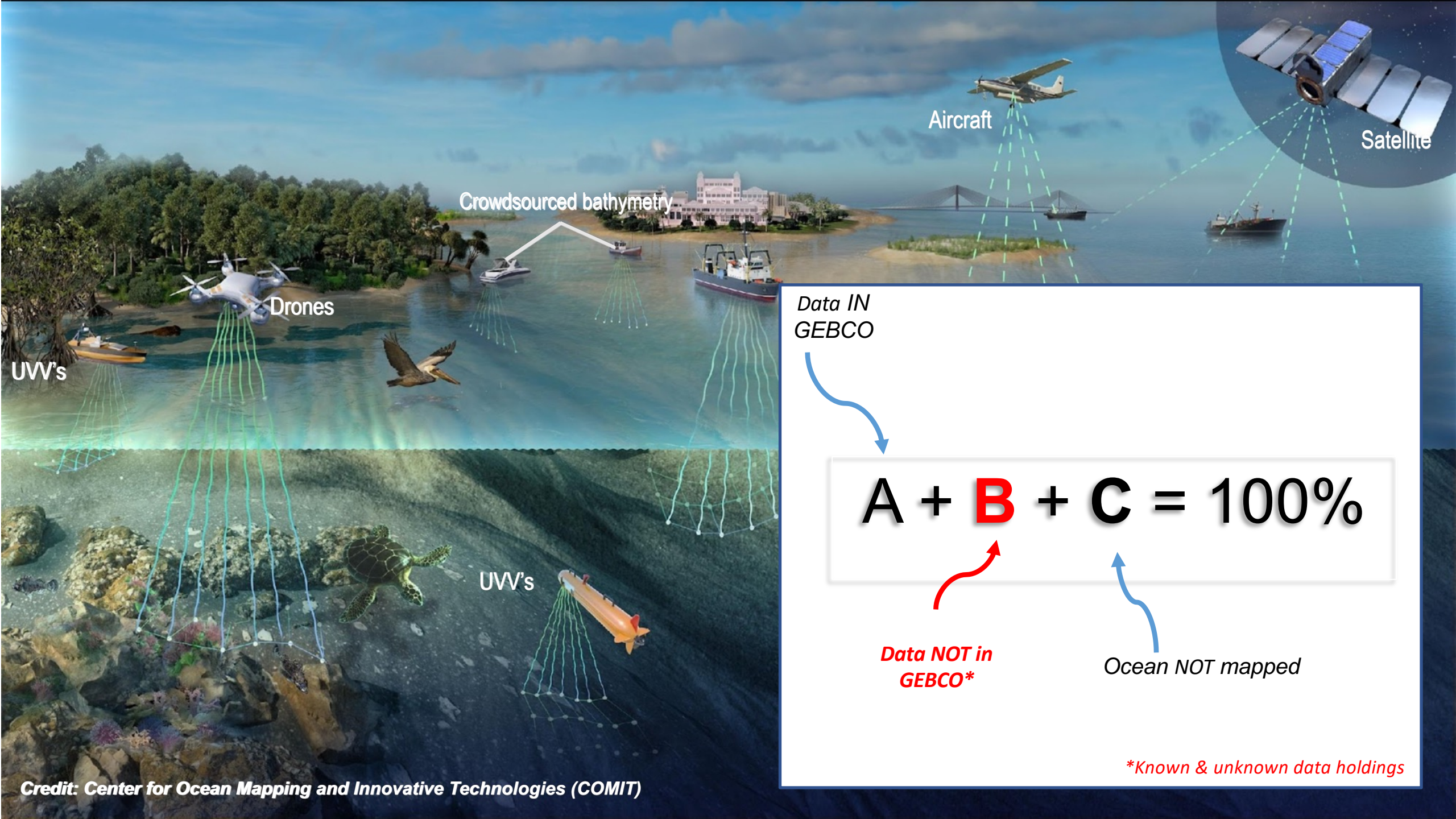
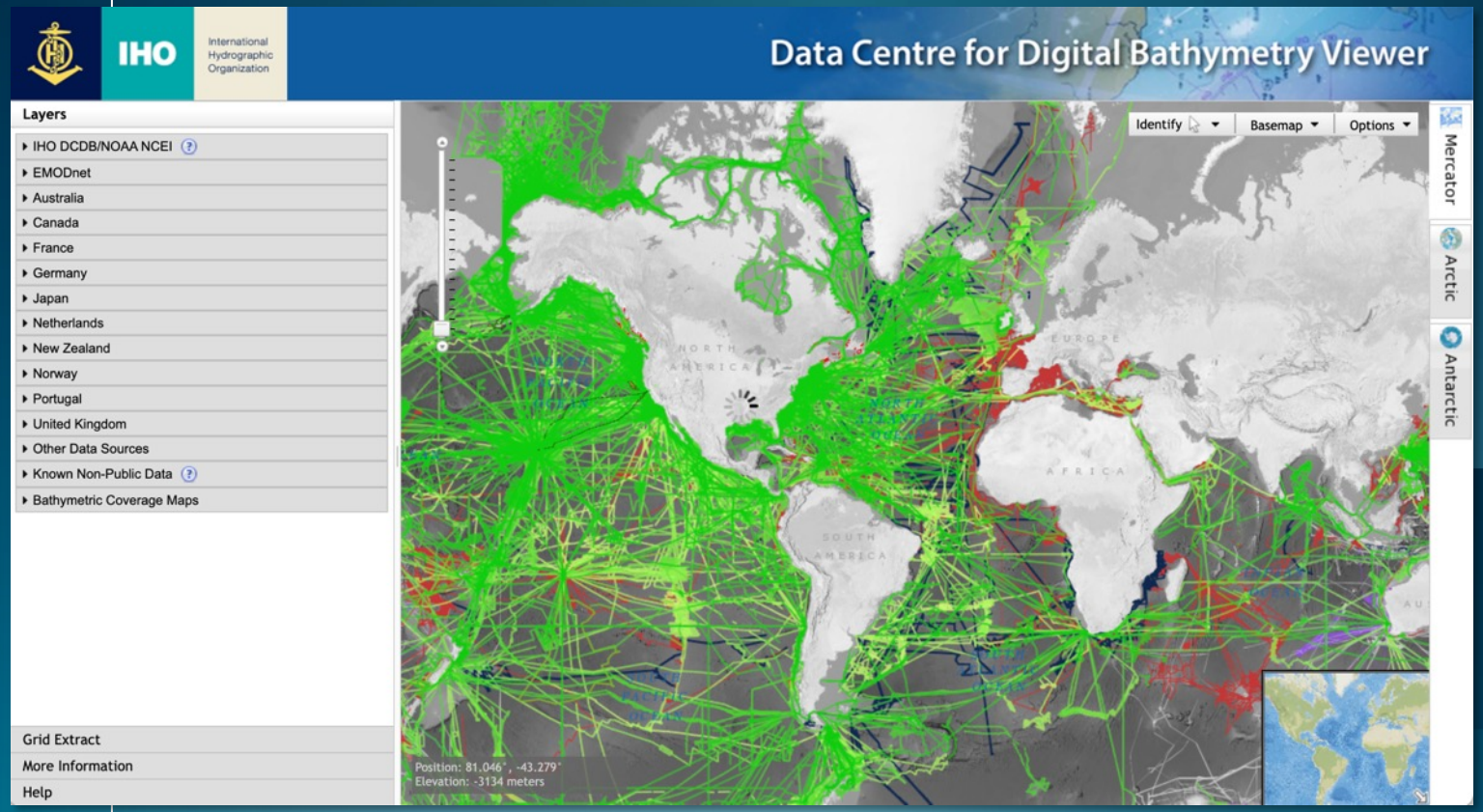
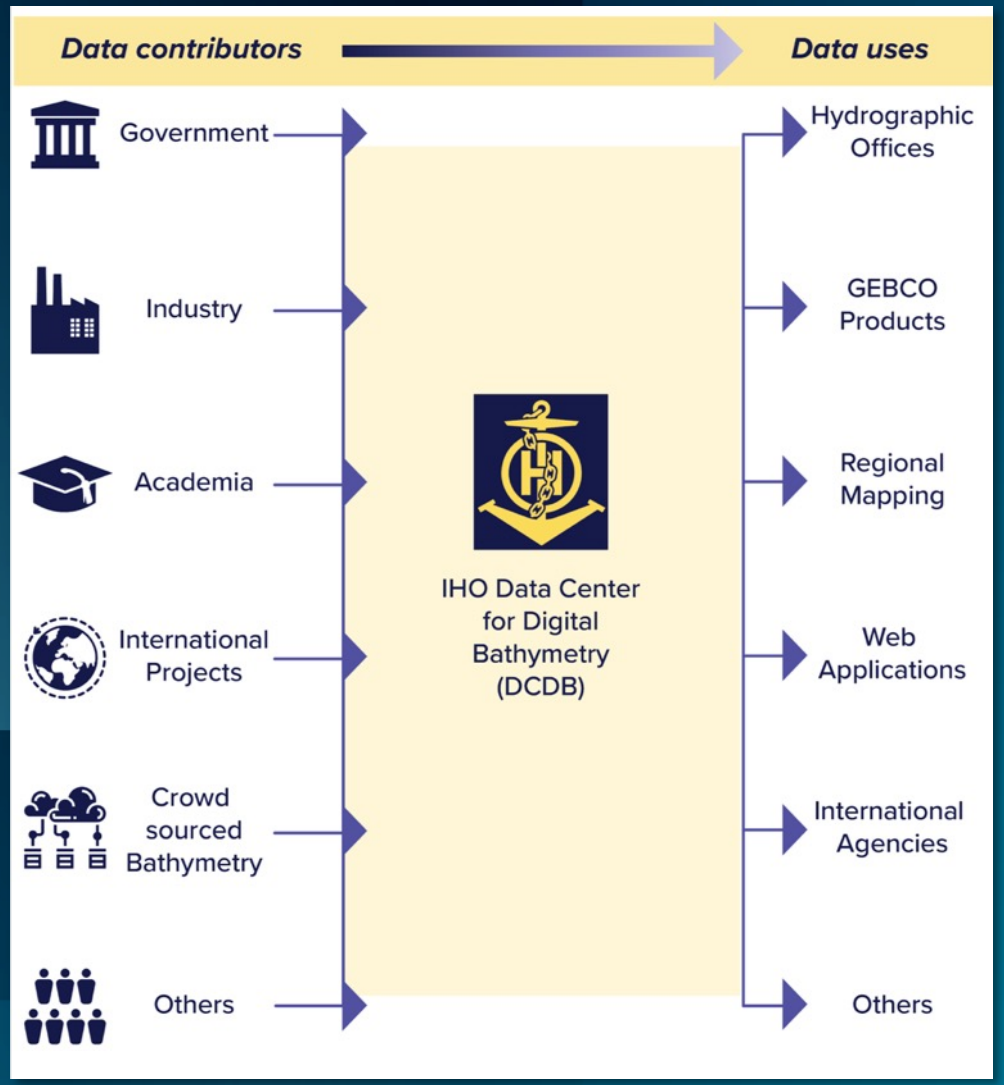
Shiraz
Cairo
El Giza
Kuwait City
AFGHANISTAN
Kabul
Islamabad
Rawalpindi
Amritsar
Lahore
Quetta
Multan
PAKISTAN
Meerut
New Delhi
Jaipur
Agra
Jodhpur
EGYPT
SAUDI ARABIA
Riyadh
Manama
Doha
Dubai
Abu Dhabi
UNITED ARAB EMIRATES
Muscat
Hyderabad
Karachi
Ahmedabad
Bhopal
Indore
Rajkot
Surat
Nashik
Mumbai
Pune
Kolhapur
Bengaluru
Coimbatore
Kochi
Jeddah
Mecca
OMAN
YEMEN
SUDAN
Khartoum
Asmara
Sanaa
Djibouti
Hargeysa
Addis Ababa
ETHIOPIA
SOUTH SUDAN
400km
75.000 16.293 Degrees
POWERED BY esri


Aircraft
Satellite
Crowdsourced bathymetry
Drones
UVV's
UVV's
Data IN GEBCO
A + B + C = 100%
Data NOT in GEBCO*
Ocean NOT mapped
*Known & unknown data holdings
Credit: Center for Ocean Mapping and Innovative Technologies (COMIT)

IHO Data Centre for Digital Bathymetry





https://www.ngdc.noaa.gov/iho/

Seabed 2030 Strategy: Regional Approach

OUR CENTERS

GLOBAL CENTER

SOUTHERN REGIONAL CENTER

ATLANTIC AND INDIAN OCEANS REGIONAL CENTER

ARCTIC AND NORTH PACIFIC OCEAN REGIONAL CENTER

SOUTH AND WEST PACIFIC OCEAN REGIONAL CENTER

IHO DATA CENTER FOR DIGITAL BATHYMETRY

Seabed 2030 Strategy: Regional Approach

- Coordinate with stakeholders
  - Build upon ongoing regional efforts
  - Understand needs
  - Promote a culture of data & knowledge sharing
- Ensure attribution of contributors
- Identify data gaps
- Assemble regional & global data products

Regional Data Assembly

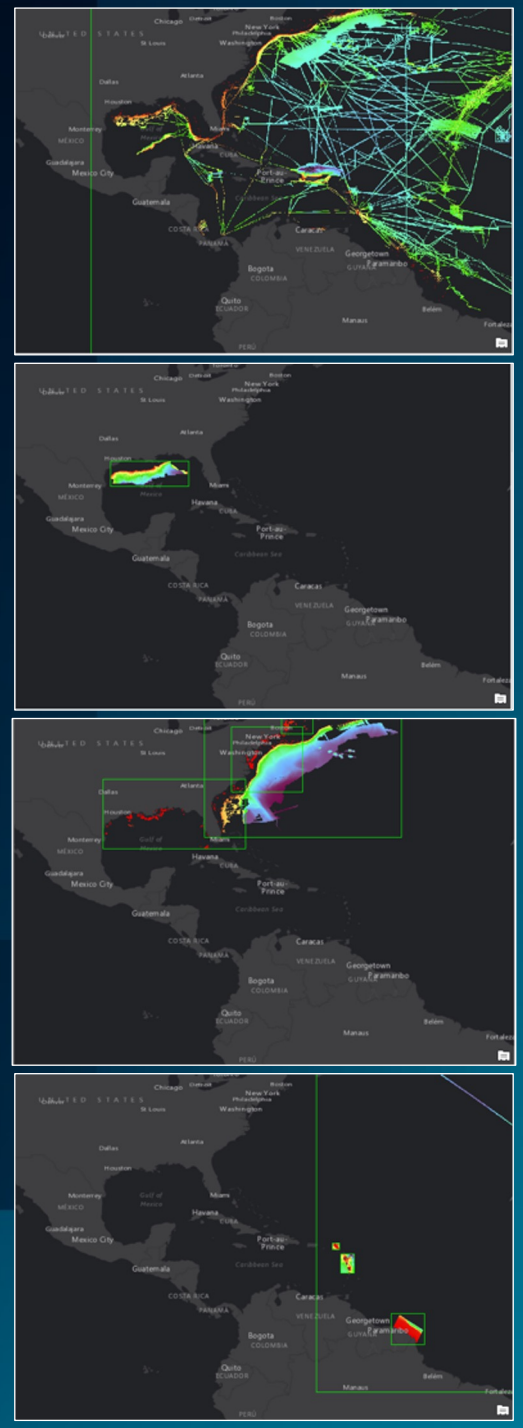
Regional Data Assembly

Data types received

- Multibeam
- Singlebeam
- Subbottom
- Seismic-derived
- Digitized contours
- Digitized soundings
- Isolated soundings
- Lidar
- Satellite-derived
- ENC
- Mixed

Data formats received

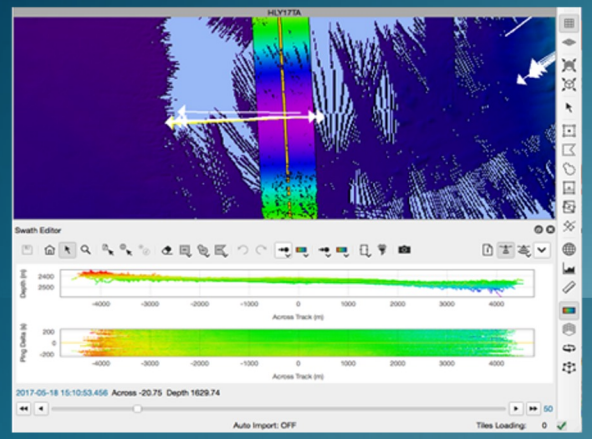
- Raw swath
  - Modern formats
  - Legacy formats
- Processed swath
- ASCII
  - Trackline
  - Swath export
  - Raster export
  - Digitized soundings
- Raster
  - With interpolation
  - Without interpolation
- Shapefile



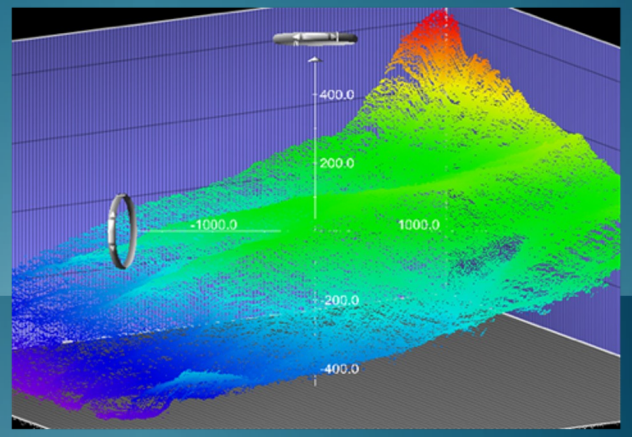
Regional Data Assembly

Ability to address data quality issues

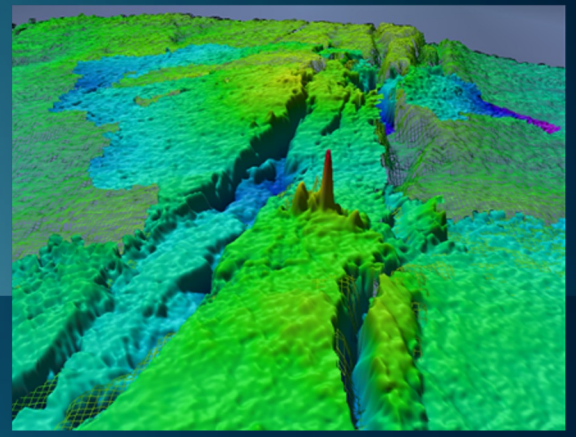
Swath Files



Point Clouds



Grids



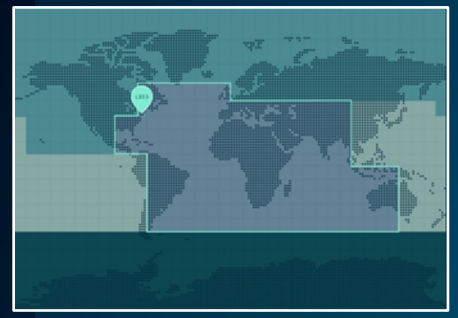
Images

Accessibility

Specialist Users

Non-specialist Users

Regional Data Assembly Tools and Workflow

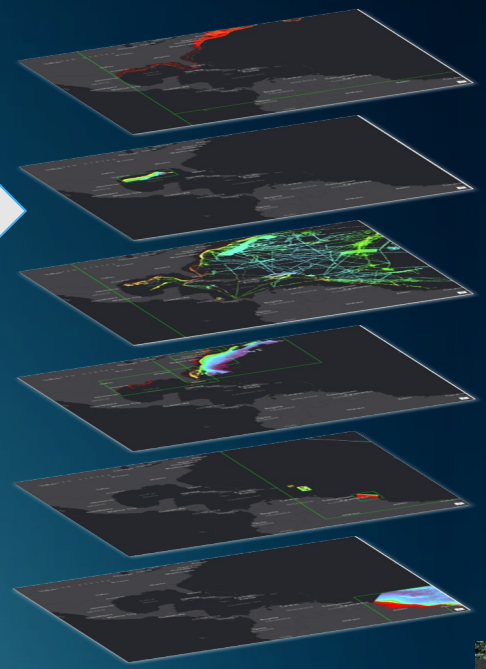


Contributed/Shared Data

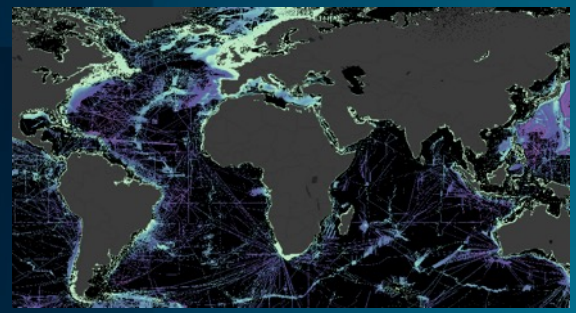
Data Processing & Cleaning

Creation of Raster Products

Prioritization



Regional Products



MB SYSTEM

GMT THE GENERIC MAPPING TOOLS

Qimera.

ArcGIS Pro

Explore our planet with GeoMapApp

GMRT

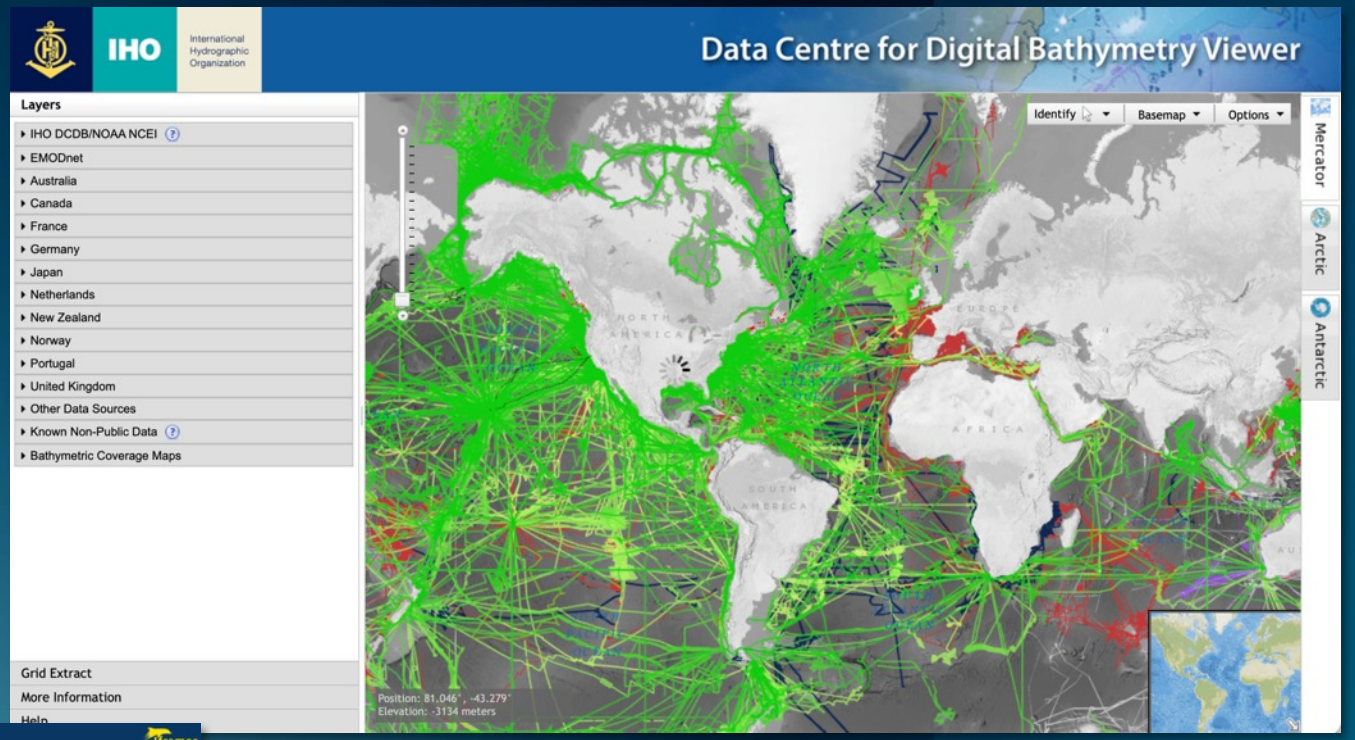
Open source and commercial software used for processing and visualizing bathymetry data

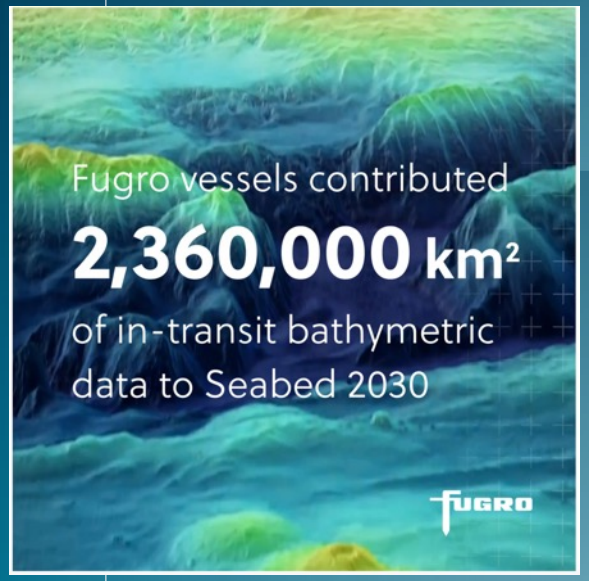
Partnerships: the key to success for Seabed 2030

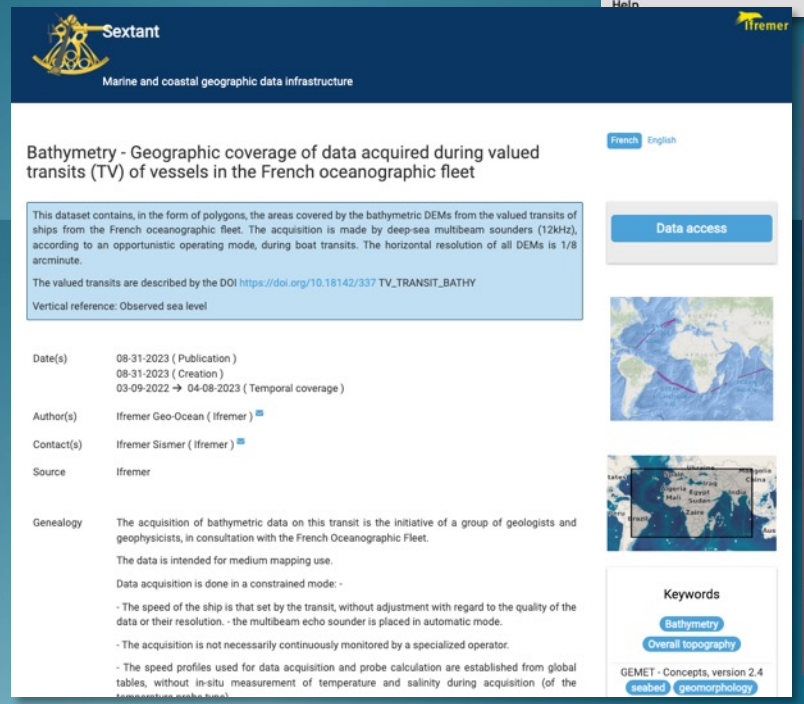
- Over 50 partners
- Partnerships across all sectors of maritime community
  - Academic institutions
  - Governments and Defense Agencies
  - Industry
- We build direct relationships with our partners
- Strong relationships with IHO, IOC and UN Ocean Decade
- There is a significant role to be played by groups whose members take part in ocean measurements
  - Trade Bodies, Advocacy Groups, Professional Bodies, Learned Societies

Emerging Solutions:
Transit Data Acquisition

- Raw data to IHO DCDB
  - Tools to support acquisition & processing
  - Community-led data processing
- Raw and processed data to IHO DCDB

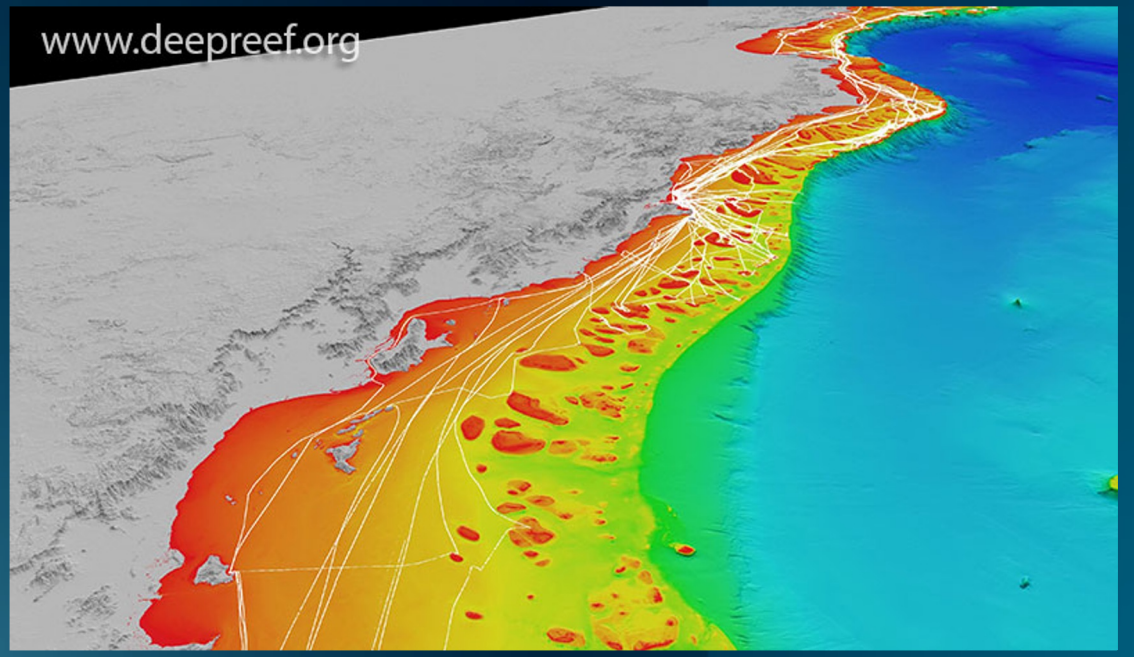






Emerging Solutions:
Crowdsourced Bathymetry Data

- Data with scientific, commercial & research value at no additional cost
- Fill gaps where data are scarce
- Useful along shallow, complex coastlines
- Supports charting efforts
  - Identify uncharted features
  - Assist in verifying charted information
  - Confirm whether charts are appropriate for the latest traffic patterns.
- Increasingly easy to log



...but only if vessels collect depth information while on passage!

Emerging Solutions:

The IHO Crowdsourced Bathymetry (CSB) Initiative

International Hydrographic Organization
Organisation Hydrographique Internationale

IHO DCDB Home | Contribute Data | Crowdsourced Bathymetry | CSB Mapping Projects

IHO Crowdsourced Bathymetry Initiative

Crowdsourced bathymetry (CSB) is the collection of depth measurements from vessels, using standard navigation instruments, while engaged in routine maritime operations. CSB can be used to supplement the more rigorous and scientific bathymetric coverage done by hydrographic offices, industry, and researchers around the world.

In 2014, the IHO recognized that traditional survey vessels alone could not be relied upon to solve data deficiency issues and agreed there was a need to encourage and support all mariners in an effort to "map the gaps." An initiative was established to support and enable mariners and professionally manned vessels to collect CSB. This approach leverages underway x, y, z, t data already being collected on vessels with common commercial echo sounders and Global Navigation Satellite System receivers.

Contributing CSB Data to the DCDB

The DCDB accepts CSB contributions through a network of "Trusted Nodes," which may be organizations, companies or universities serving as data liaisons between mariners (data collectors) and the DCDB. Trusted Nodes may supply data logging equipment, provide technical support to vessels, download data from data loggers, and be responsible for data transfer directly to the DCDB.

CSB data must be provided in either CSV or GeoJSON, and capture the minimum required information (XYZ, timestamp). Examples of both data formats can be found in our Ingest API documentation. As a trusted node, you will be asked to provide additional information about yourself (provider contact point/organization name, provider email, and unique ID).

Those interested in contributing data or becoming a Trusted Node should contact the DCDB at bathydata@iho.int.

IHO

International Hydrographic Organization

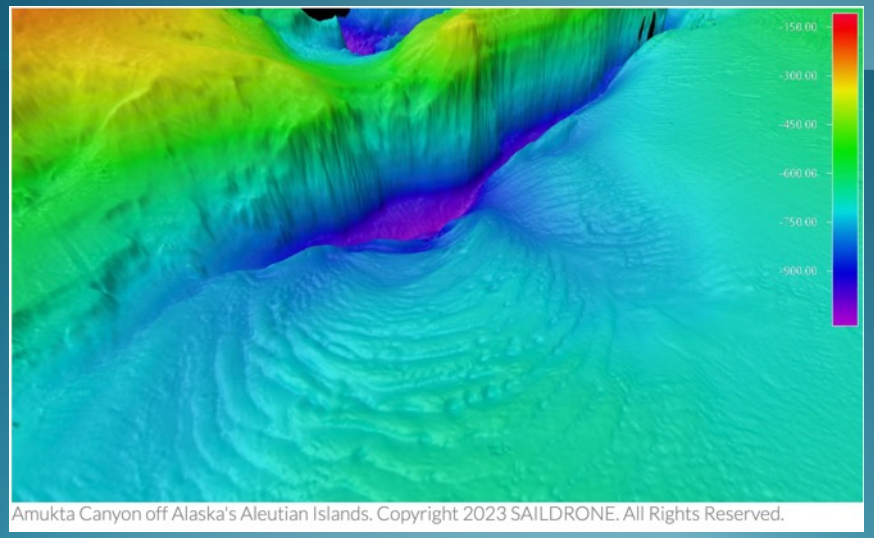
IHO CL 01/2020 & IRCC CL 21/2020

- All coastal States are requested to indicate their position on the ***provision of CSB data*** from ships within waters subject to their jurisdiction into the public domain
- To date, 34 coastal States (green) have replied positively*

iho.int/uploads/user/Inter-Regional%20Coordination/CSBWG/MISC/B-12_2020_EN_Acceptance_of_CSB_Data_in_NWJ_v3.0.pdf

Emerging Solutions:
The Rise of the Robots

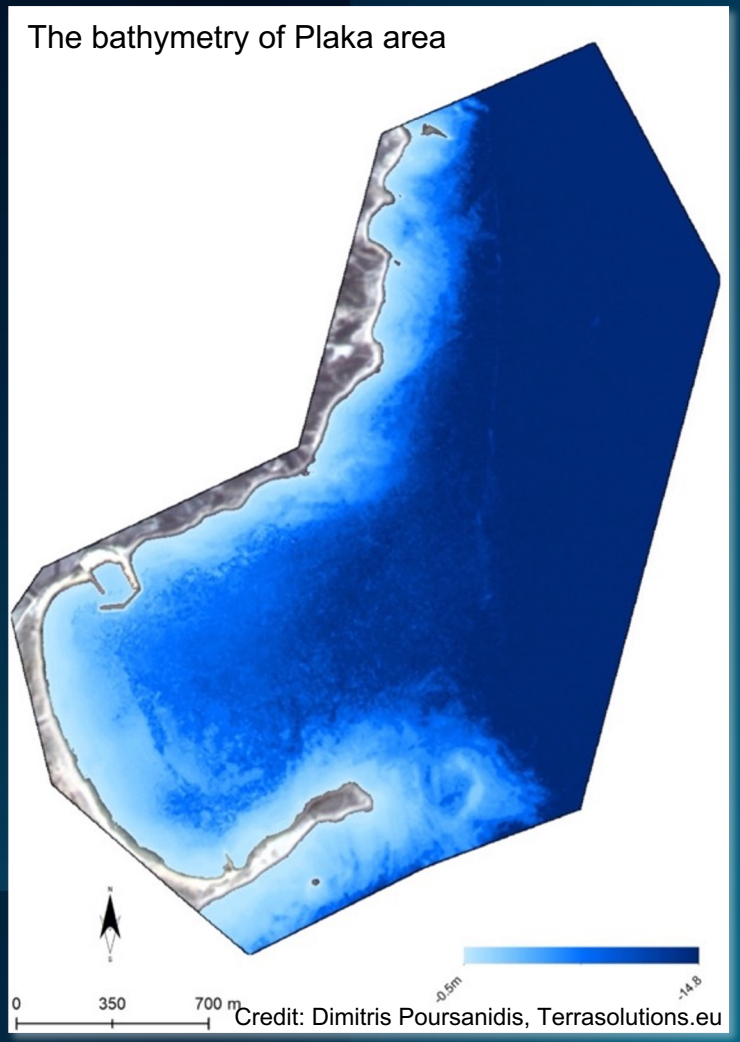
- Uncrewed systems operate at surface & subsurface
- Data from hard-to-reach places at lower cost
- Broadens access to mapping technology
- New generation sensors and technology solutions

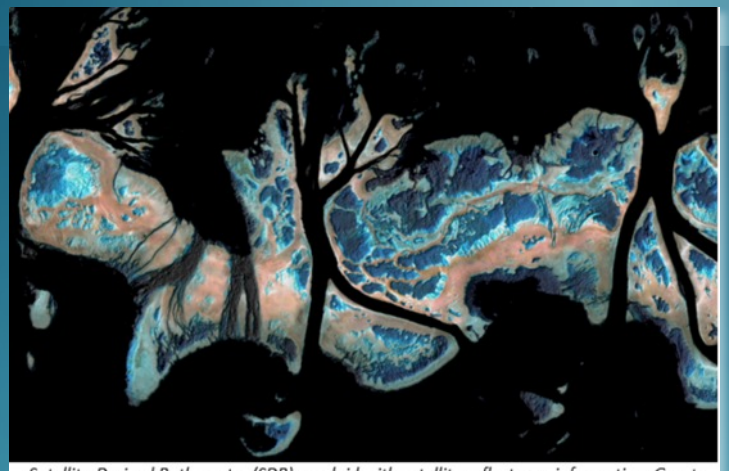


Amukta Canyon off Alaska's Aleutian Islands. Copyright 2023 SAILDRONE. All Rights Reserved.

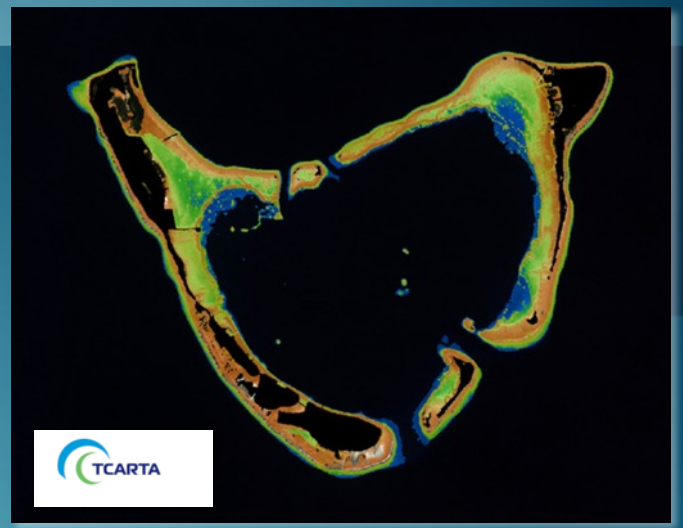
Emerging Solutions:
Remote sensing optical techniques

- Satellite-derived bathymetry (SDB)
- Light Detection and Ranging (LIDAR)
- High efficiency mapping approach
- Reconnaissance for ship-based surveys
- Depth limitations

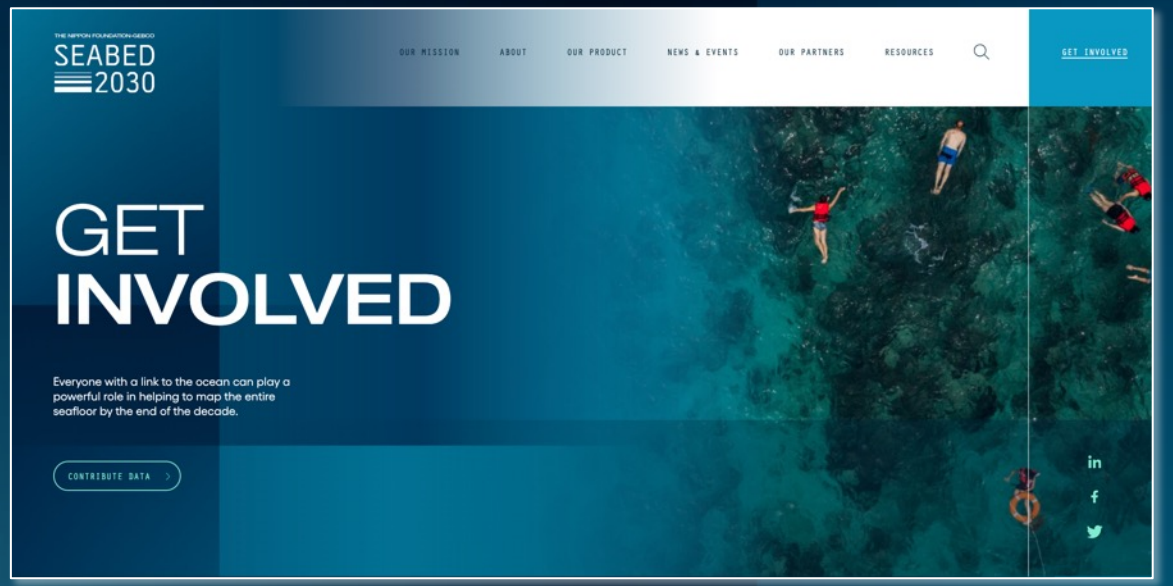




Satellite-Derived Bathymetry (SDB) overlaid with satellite reflectance information, Great Barrier Reef. Credit: EOMAP, 2021

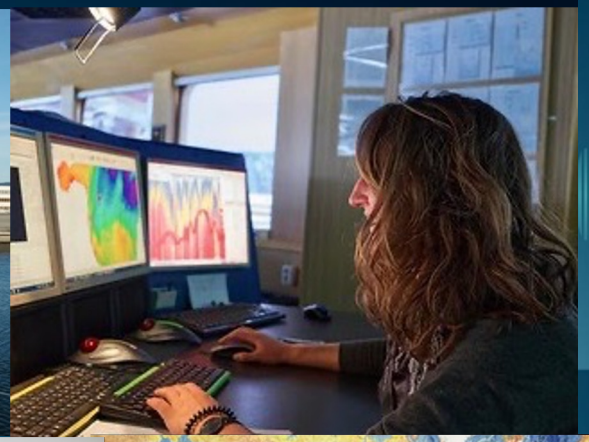


How to contribute data



- Visit https://seabed2030.org/get-involved
- The Seabed 2030 Team will gladly accept any data that can be contributed
- High-level of assistance available to make the process as smooth and straightforward as possible
- Contact us!

Helping us make it happen .....



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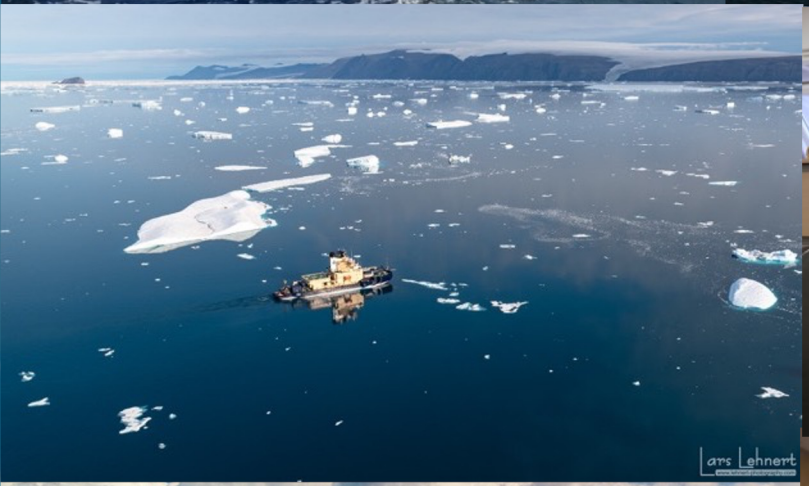


Together we can create a complete map of the global ocean

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Thank you!

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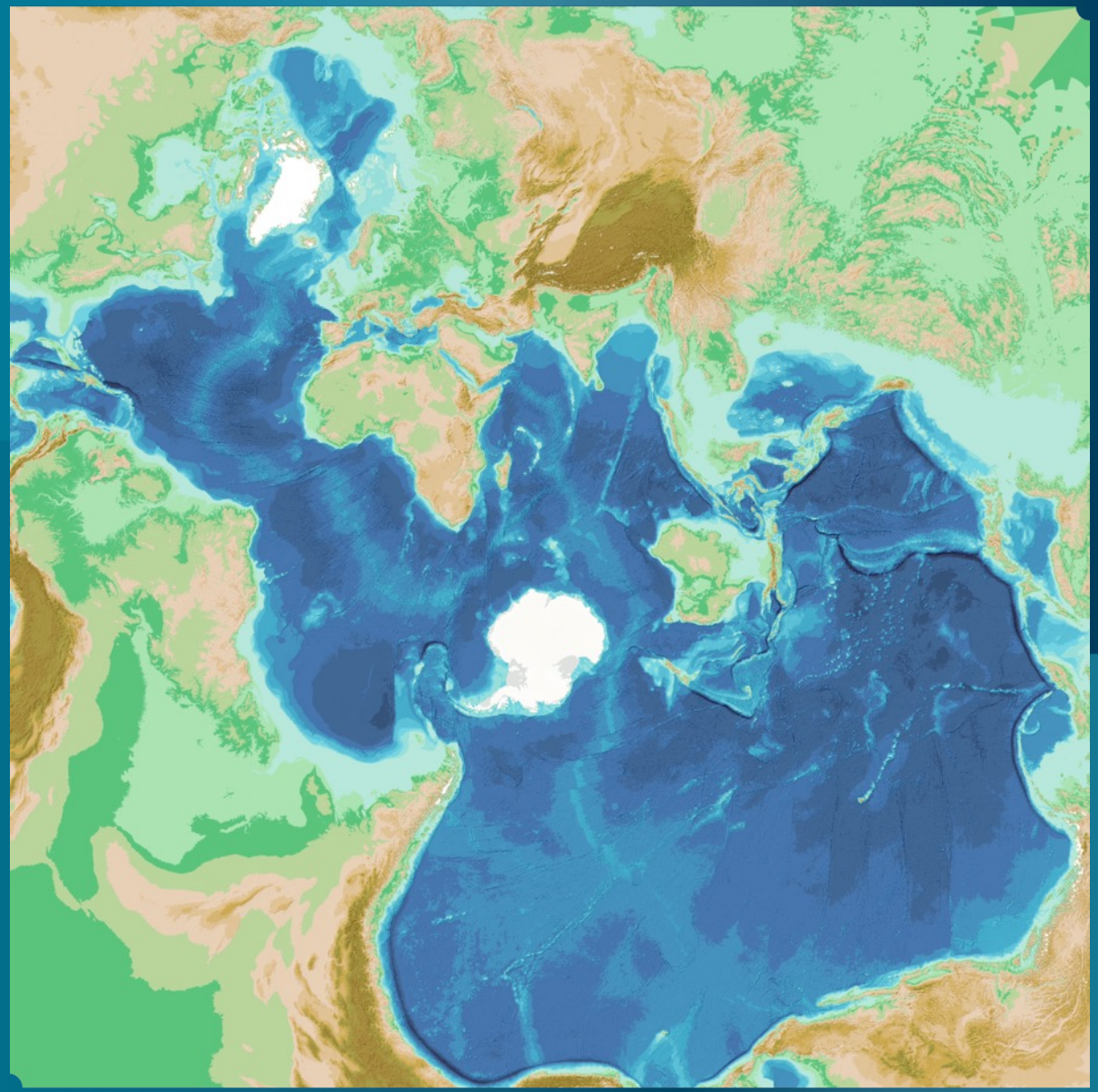
https://www.seabed2030.org

SUT Society for Underwater Technology



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