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SEABED 2030 – WIND IN THE SAILS REPORT – PHASE 1 OBJECTIVE 1

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THE NIPPON FOUNDATION-GEBCO SEABED 2030

By

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Introduction

The Nippon Foundation – GEBCO – Seabed 2030 Project's vision to map the world's oceans to a 100m resolution by 2030 is both insightful and ambitious. At present 80% of the oceans have yet to be charted to the required resolution and with that a demanding timeline has been set to complete the exciting Seabed 2030 mission. In order to deliver its stated objectives, the Seabed 2030 Project will need to develop a comprehensive strategy that clearly articulates the environmental, social and economic benefits that will be achieved if 100% of the seabed can be mapped to a gridded depth variable resolution by 2030.

The "Wind in the Sails" proposal supports the Seabed 2030 Project by providing empirical evidence to enable the development of a prioritised targeted survey strategy. The ultimate aim of this three-phase project is to unite the global hydrographic community and operators within the maritime domain around a global seabed mapping priority list, underpinned by a robust evidence base that articulates the true need and value of mapping the seabed in its entirety to a gridded depth variable resolution. The findings within this report cover Phase 1 and Objective 1 of the overall recommended three phase approach.

Before a strategy can be developed there is a need to understand the baseline of extant global survey work and activity that will support and may contribute to Seabed 2030 and, also, which users want hydrographic data, what type of data is wanted and where should Seabed 2030 surveys be focused and prioritised. The first task was to conduct a rapid evidence review; this was followed by an online survey cascaded to a wide international audience seeking the views across all sectors of those who work within the maritime domain. The third and final task was to review and analyse the collective views and the evidence gathered from extant programmes collecting hydrographic data. A breakdown of the work and activities conducted can be found at Annex A.

Executive Summary

This document is the final report of the Seabed 2030 – Wind in the Sails Phase 1 Objective 1 project. This self-standing report provides a complete description of all the work completed in this study from May to July 2020. These results will form the basis of evidence and information to progress to the next phases.

There was overwhelming support and recognition that the world's oceans need to be mapped and that this is a high priority for respondents. In addition, there were resounding plaudits for the Nippon Foundation-GEBCO-Seabed 2030 project and a strong view that crowdsourcing is a critical methodology in ensuring the remaining 80% of the world's uncharted oceans are mapped by 2030. There is clear evidence creating an appropriate crowdsourcing tool/map could and would enable easier data gathering.

The total number of responses (366) to the online survey far exceeded all expectations and with responses coming from 65 countries it ensured that a global perspective was provided. The survey generated detailed and comprehensive evidence, showing the need for geospatial data across every maritime sector in the marine domain and that the demands were of an equal footing across governments, industry and academia/science. Key findings from the survey include:

- 40% of online respondents considered the *main* benefit of mapping the ocean floor to be 'to advance scientific understanding of seabed characteristics', with 11% highlighting the need 'to monitor environmental challenges over time'.
- Although bathymetric data (81.67% of respondents) is the most desired geospatial information, it is not that far ahead of environmental data (69%), oceanographic data (65.33%) and classification of seabed features (63.33%).
- Respondents were interested mostly in water depths less than 200m (33.57%) and greater than 5750m (31.12%).
- An overwhelming majority of respondents (58.31%) would want access to any data sets via an online marine data portal.

It was found that current survey/environmental strategies and initiatives offer little alignment and no evidence of a joined-up, coordinated approach. It is also clear that programmes being run by industry and environmental bodies are not complementing national hydrographic office strategies. With so many programmes operating in isolation there is real potential that scarce resources are not being used efficiently.

1. Few geospatial (the exploitation and analysis of imagery and geospatial information that describes, assesses, and visually depicts physical features and geographically referenced activities on the Earth) survey models were identified and those that were tended to focus on safety of navigation in shoaler waters with high traffic density. Whereas the online survey

showed needs and requirements spanning safety, security, trade, climate and environmental, to create a global survey prioritisation model that reflects all maritime domain sectors will be complex process.

The final, key factor that came to light in the online survey is that over a quarter (27.05%) of respondents stated that they had or would have data that they will willingly contribute to Seabed 2030. This is extremely encouraging news and many of these offers can be followed up in the next phase of activity.

Data Gathering

Rapid Evidence Review – methodology

The evidence review was based on non-exhaustive research of the seabed mapping landscape from the perspective of recent and ongoing mapping initiatives and projects that support the need for quality seabed information. It showed the level of interest and variety of projects that are either currently in action or have had outputs that are feeding into other programmes.

The Rapid Evidence Review explored eight ocean mapping initiatives/strategies and 13 programmes supporting the need for seabed mapping. Added to this were inputs from four major hydrographic offices and/or organisations, a Seabed 2030 RDACC and the Seabed 2030 GDACC.

Where possible this review highlighted programmes and initiatives that are not already part of the Seabed 2030 Project. However, due to the reach of the Seabed 2030 Project and the length of time it has been running, there are inevitably going to be some overlaps.

Online survey – methodology

The Seabed 2030 – Wind in the Sails online survey was the lynchpin task within Phase 1 Objective 1 work. The main purpose of this survey was to get cross-sectional understanding of all maritime domain actors across the world, gaining what the needs and requirements were for hydrographic data as well as gaining views on the urgency and need to map the world's oceans. This survey was developed such that it reflected the views and needs of every community and in doing so, no one sector was marginalised or excluded. This open and unbiased survey ensured that the results reflected the unanimous views of the global marine communities. The survey itself was constructed around three key themes "What, Where and Why?" What hydrographic geospatial data is needed, to what depths and to what density. For the where, can we identify those areas with a higher priority to survey, what should the criteria be to identify this and more importantly identify those key criteria to be incorporated into any survey prioritisation model. Finally, for the why, identifying why people feel it is important to map the world's ocean, gaining an understanding of the criteria to do so.

To ensure that the survey was seen by as wide an audience as possible, several different sources were used, these included the Seabed 2030, NLA International, the World Ocean Council and IHO-GEBCO websites. In addition, social media sites were used, and these included over 13,000 Twitter followers of NLAI, as well as the British Oceanographic Data Centre Facebook and Twitter feeds. Some 3,000 targeted NLAI LinkedIn connections with marine geospatial and related interests were curated and invited to complete the survey. In addition, an article was issued under the Director of

Seabed 2030 highlighting the importance of marine geospatial data and how it is the cornerstone of the Blue Economy and this can be found at Annex C of this report.

Responses by geography

The total number of responses to the online survey – 366 – far exceeded expectations. It was pleasing to see responses from 65 countries across the world, covering all continents, and generating an initial evidence base across every maritime sector.

Overall, 41% of respondents came from either the UK (21% – 73 responses) or USA (20% – 69 responses). Contributions from the other 63 countries ranged from 0.3% (33 countries with 1 response) to just over 6% (New Zealand – 22 responses) individually and collectively made up 55% of the total respondents.

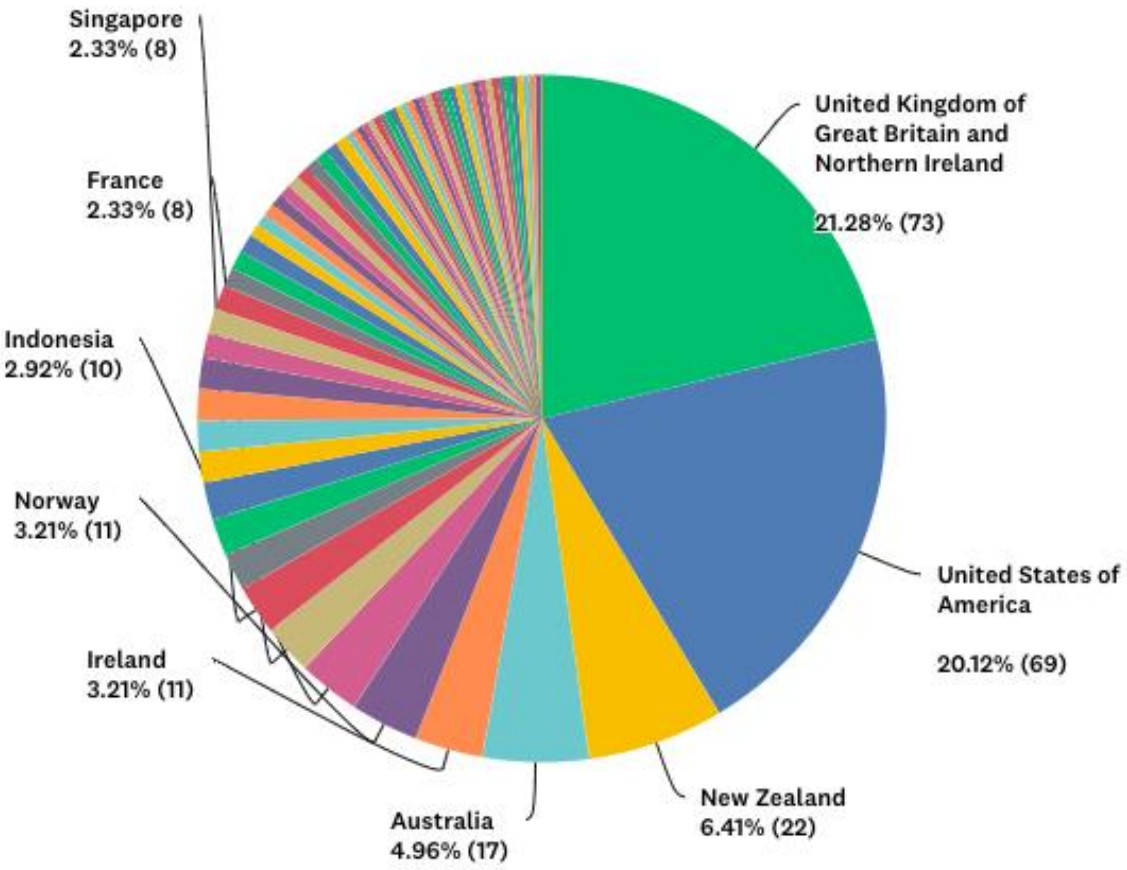


Figure 1: *In what country do you mainly work?*

Responses by sector

Sectors most represented in the survey were government (31.65%), industry (27.45%) and academia (18.77%). There were several responses marked 'Other' but on examination of the line data, most of these fitted in these top three categories.

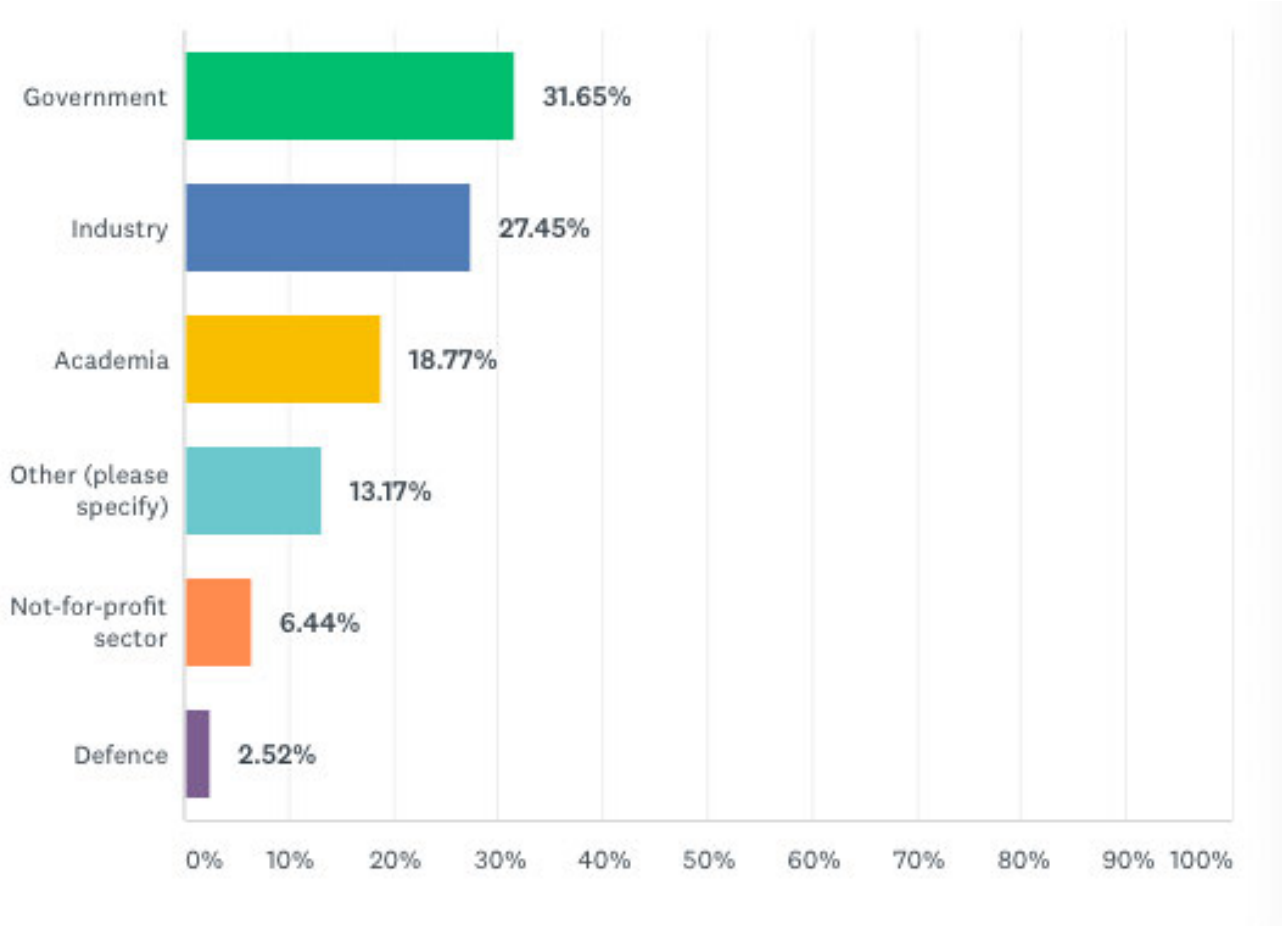


Figure 2: *What sector do you represent or work in?*

The report in full and finer details of the online survey can be found at Annex D. An overarching analysis of the survey and the standout factors can be found in the next section.

Findings

This section collates the findings from both the Rapid Evidence Review and the online survey.

Why map the ocean floor?

Although there are a good number of reasons to map the ocean floor, most evidence gathered points to environmental and scientific benefits when the respondent comments and the evidence review (where these are the backbone of a number of ongoing programmes) are taken into consideration. Safety at sea comes much further down the list; this is in stark contrast to the prioritisation models currently used by hydrographic offices where safety at sea and navigation is one of their top priorities. It was clear from the survey that the benefits of mapping the world's oceans are numerous, varied and to quote one respondent: ***"There is no single 'most important' reason but instead numerous complementary reasons. This is important as this approach will ensure collaboration. Of high importance to Governments is national sovereignty, security, sustainability and future economies. Science plays into all areas".***

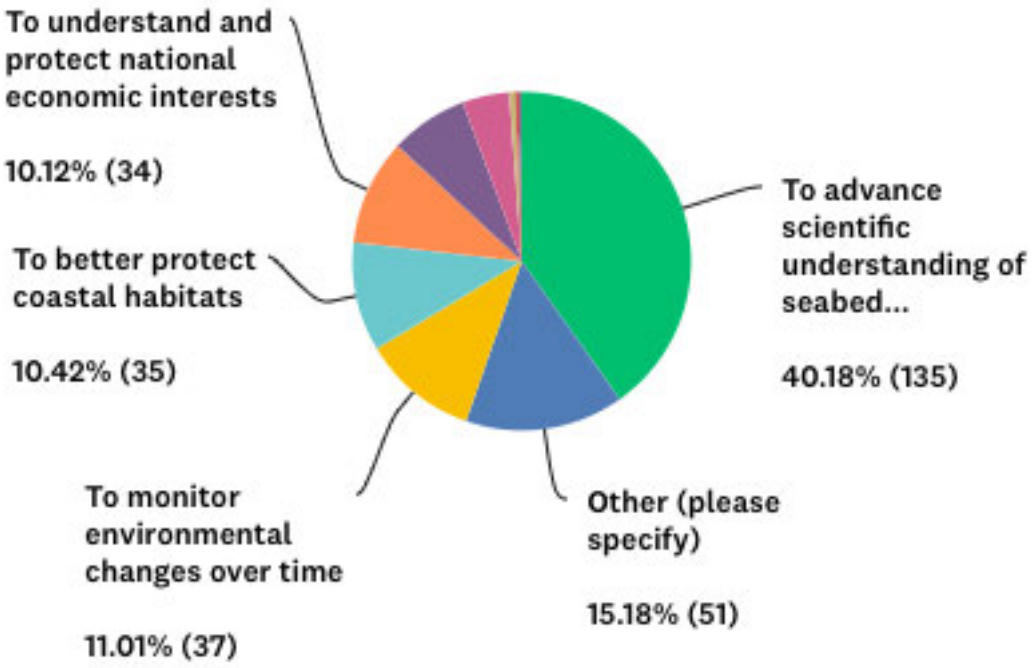


Figure 3*: What do you consider the main benefit of mapping the world's oceans to be?*

When comparing the factors for navigational safety and for oil and gas these both ranked quite low on the reasons for mapping the seabed. This would make sense as the evidence review has shown that a priority for hydrographic office surveys are the areas of highest shipping density (therefore catering for most seaborne traffic) and the oil and gas sector carry out their own survey's in high resolution for commercial reasons. This may well explain why although oil and gas represented 7%

of the survey respondents yet only 0.44% of people responded as this being a reason to map the ocean floor. There were also no programmes discovered by the evidence review specifically aimed at providing data for the oil, gas, or cable laying industries.

Although not offered as an option within the online survey the requirement to survey for habitat mapping featured strongly in the comments and this was corroborated in the Rapid Evidence Review where habit mapping appeared specifically in two of the current research programmes.

It is worth noting that this question only provided the option for respondents to identify their one main area of benefit, to help to establish priorities. However, several respondents did add comments that they are interested in several areas, or even 'all of the above'.

One respondent commented: ***"This question goes to the heart of a multiplicity of knowledge systems and values. The question can be essentially reframed to: 'What is the cost of not doing this?'"***

Required depth

Regarding depth, the survey responses would suggest that less than 200m or greater than 5750m are of greatest interest which may not be a surprise considering most maritime activities happen in the littoral regions and in depths of less than 200m of water, whereas the deepest oceans remain largely unexplored, as evidenced in the 'areas of ocean charting' gaps. Most of the reasons given for mapping the ocean floor also require more details of the areas of shallower water too than are currently provided.

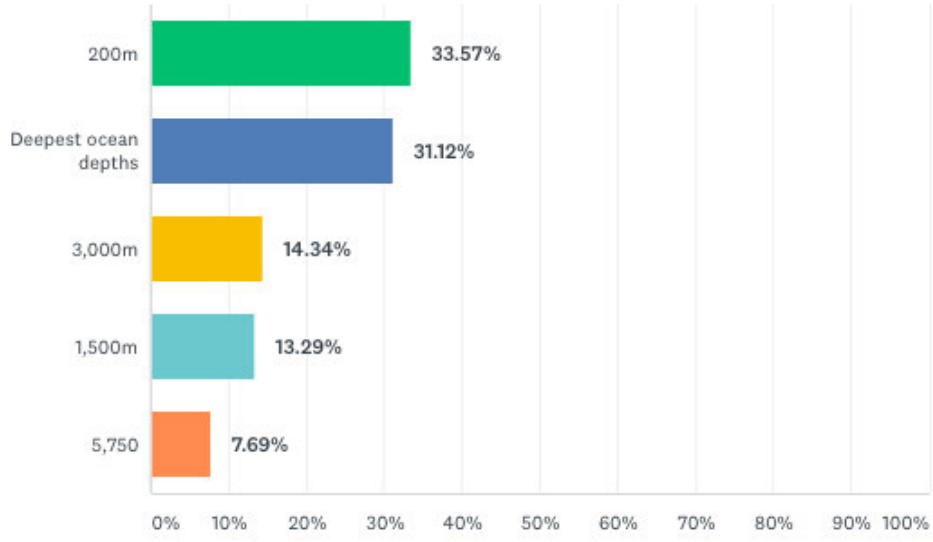


***Figure 4**: To what depths do you require marine geospatial information?*

What type of information is required?

Although bathymetric data is the most desired geospatial information it is not that far ahead of object detection, oceanographic data, or environmental data. Again, this is not a surprise as many users of maritime geospatial information want multiple datasets where bathymetry is just one of them. Once Seabed 2030 achieves its vision from a bathymetric perspective it may evolve to gather and collate other marine datasets.

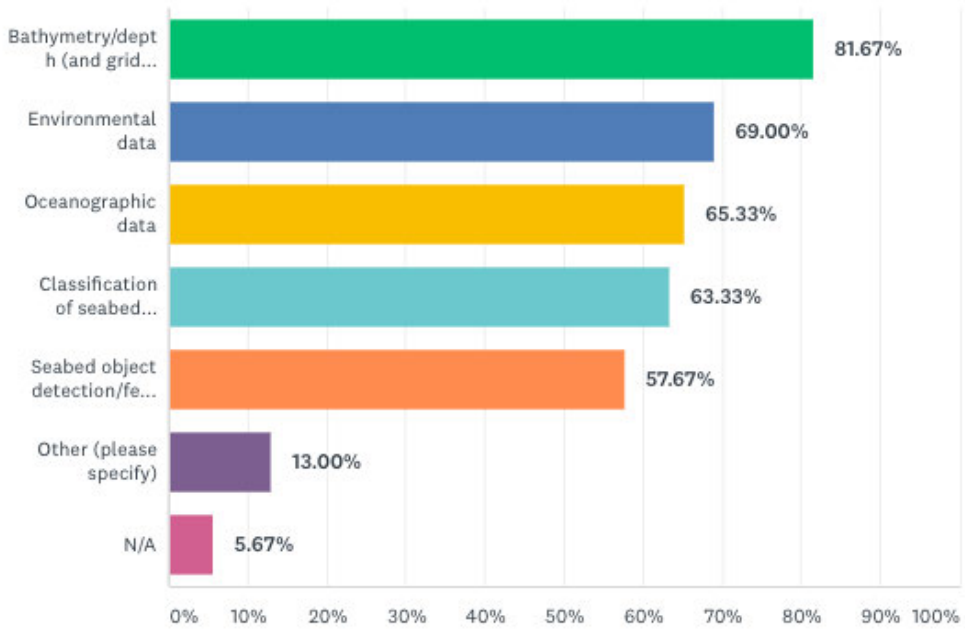
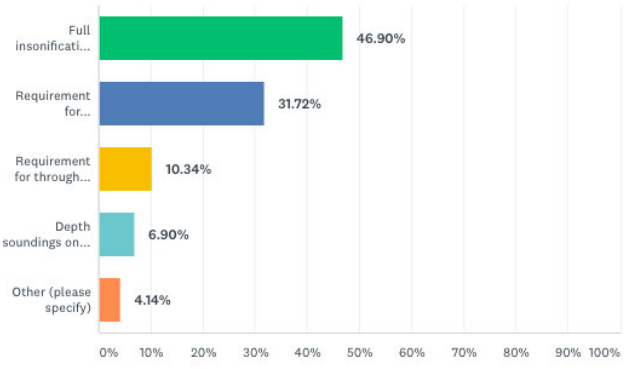


Figure 5: *What marine geospatial information is needed by you? Please tick all that apply.*



ANSWER CHOICES		RESPONSES	
Full insonification and complete coverage of the seabed		46.90%	136
Requirement for identification and classification of seabed features		31.72%	92
Requirement for through water column oceanographic data		10.34%	30
Depth soundings only, no greater than 100m apart		6.90%	20
Other (please specify)	Responses	4.14%	12
TOTAL			290

Figure 6: *What level of detail and density of geospatial data is needed?*

It should be noted that significantly more survey respondents had not estimated the environmental, social and economic value (68%) of mapping the seabed than had (31%). Yet when reviewing wider comments, it was observed that a significant number had not considered the economic benefits of mapping our oceans. The need to map the seabed has historically tended to focus on the scientific and environmental communities. Recent reports (including the UK National Seabed Mapping and Scoping Study) and the work of many respondents is suggesting there is real economic value in mapping the seabed.

Ocean mapping Initiatives

There are and have been, several regional ocean mapping initiatives and strategies, though nothing on the scale or with the ambition of Seabed 2030.

The evidence does not point to any preferred type of organisation to carry out seabed mapping surveys. Regional hydrographic offices are the largest suppliers of ocean floor data but there is a growing number of freely available quality sensors that allow commercial and private entities to collect high quality data at high resolution. The data collected feeds a variety of programmes, an overview of such programmes is shown at Annex B of this report.

Most of the initiatives identified appear to be focused on the European or Atlantic waters though initiatives from the US do extend into the Pacific. Surveys are carried out in all parts of the world by local hydrographic offices and private entities but not to any particular initiative and neither have they created a special report on the subject.

Crowd sourcing initiatives have been a long time in coming. Navigational instrument/sensor quality has shown much improvement over time along with the mechanisms to collect the data which is reflected in the growing amount and quality of the data collected. There are opportunities through these initiatives to gather data from areas that are not covered by commercial shipping and are not the focus of Hydrographic Office surveys. Initial scepticism of the quality of crowdsourced data is fading as the information becomes more readily available and the processed data is shown to be accurate. This view was corroborated within wider comments on the survey where there was clear support to contribute to Seabed 2030 by crowdsourcing data. Interaction with crowdsourced data from NOAA will surely enhance the perception of the quality and value of the data.

The numbers of seabed mapping initiatives emphatically demonstrate a need for the data.

Programmes supporting the needs and requirements for mapping/charting the world's oceans

There is a wide gamut of industries and programmes that require quality seabed data. For this review only a small cross section has been highlighted but the theme of ocean health through understanding the seabed and enabling sustainable use of the oceans resources is common to most of the studies. Whether it is mapping of an eco-system, managing wildlife stocks, or modelling the effects of natural and man-made disasters the programmes rely on quality seabed information. The higher the quality of the data input the better output there will be.

The UK National Seabed Mapping Programme – Scoping Study clearly shows that a by-product of maintaining the health of the oceans and understanding the marine eco system is economic growth.

It has always been a requirement of navigators to enable safe ship routing by knowing the contours of the seabed. With ships' navigation and propulsion systems becoming ever more autonomous the need for quality digital seabed data cannot be understated, to quote from the Chart-of-the-Future project "Quality bathymetric data is vital […] to feed the navigational decision support tools". The effects of accidents from errors in navigation can be immense ranging from environmental damage, huge cost to the world's logistics chain and potentially loss of human life.

There is a strong indication of the need for seabed data for a growing number of projects showing the value to science, commercial and environmental entities. During the Rapid Evidence Review several significant factors were observed, when first reviewing survey strategies and initiatives it was clear that there was little alignment and no joined-up approach as each stood on its own basis. Of those initiatives identified the majority were within the Atlantic region, there may be others in wider regions of the world, if so, they were not identified in this evidence review. The concern is that with so many programmes operating independently there is real potential of scarce resources not being used efficiently and that there could be duplication of effort.

When reviewing the programmes, a great proportion focussed on ocean health through understanding the oceans seabed which enables sustainable use of the ocean's resources. Whether it is mapping of an eco-system, managing wildlife stocks, or modelling the effects of natural and man-made disasters the programmes rely on quality seabed information. There was also clear evidence to indicate the need for seabed data for a growing number of projects showing the value to science, commercial and environmental bodies.

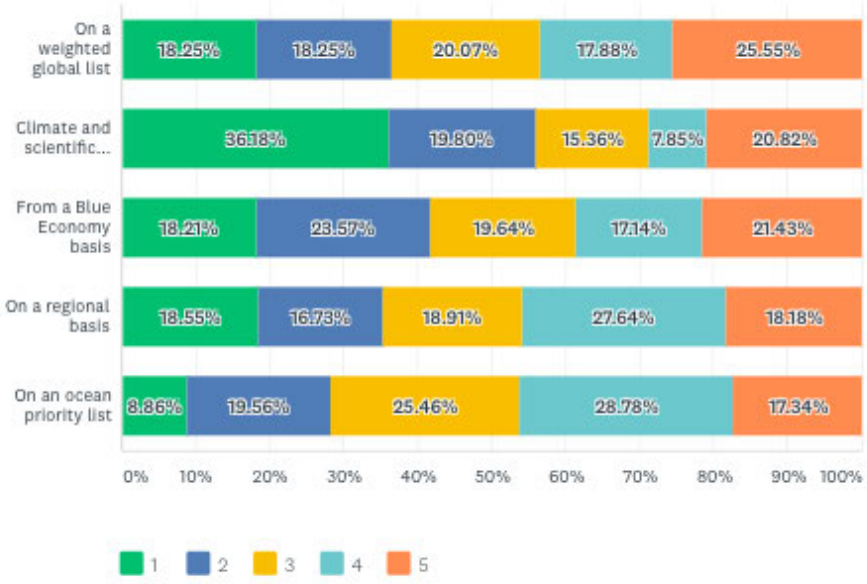
Finally, it is worth highlighting the MEDIN programme as one to watch as the whole project is to explore why ocean mapping is important. At the time of this review the programme was still ongoing with no report published.

Models and tools used to identify charting needs, requirements and prioritisation for hydrographic surveys

Hydrographic offices have traditionally carried out surveys prioritized by safety of navigation based on traffic density, depth of water and seabed movement. This contrasts with the many needs of the scientific, environmental and commercial sectors. Some hydrographic offices are aiming to gather and provide richer data sets that suit more user needs and feed into the overmentioned sectors.

Most of the entities reviewed for this task were working on mapping projects other than Seabed 2030, but all will be able to feed into the Seabed 2030 project.

The number of models identified during the Rapid Evidence Review were relatively few in number, those that were identified tended to focus on safety of navigation in shallow waters with high traffic density, whereas when comparing against the differing strategies, initiatives and programmes in being all were seeking wider needs across differing sectors. This was borne out in the online survey where it was shown that across safety, security, traffic density, climate, environmental and trade there was broadly similar weighting proposed for prioritisation of geospatial surveys.



	1	2	3	4	5	TOTAL	SCORE
On a weighted global list	18.25% 50	18.25% 50	20.07% 55	17.88% 49	25.55% 70	274	2.86
Climate and scientific priority	36.18% 106	19.80% 58	15.36% 45	7.85% 23	20.82% 61	293	3.43
From a Blue Economy basis	18.21% 51	23.57% 66	19.64% 55	17.14% 48	21.43% 60	280	3.00
On a regional basis	18.55% 51	16.73% 46	18.91% 52	27.64% 76	18.18% 50	275	2.90
On an ocean priority list	8.86% 24	19.56% 53	25.46% 69	28.78% 78	17.34% 47	271	2.74

Figure 7: *How should we prioritise marine geospatial surveys?*

Which areas are poorly charted?

As highlighted by the Seabed 2030 project so far; over 80% of the world's oceans remains unmapped. Over 60% of the survey respondents rated surveying areas with scant oceanographic data of the highest importance.

Several ocean mapping initiatives and programmes would support this as they aim to gain a greater understanding of the unmapped areas. That is not to say that all the surveys currently taking place provide all the data that is required; over 90% of respondents to the questionnaire stated that they wanted to map the ocean floor for interests other than safety of life at sea.

From the perspective of the hydrographic offices identified in the evidence review, one of their top priorities is to map areas for safe navigation of these busiest waters and areas of seabed that change

often in accordance with the frequency of their use. Additionally, there is a direct economic reason for doing this to encourage safe navigation of ships to deliver cargo and enable tourism industry (cruise ships). There appeared to be no intent currently to map areas outside of their EEZs.

Most seabed mapping initiatives and programmes seem to be focussing on the Atlantic region. This compares favourably to most of the survey respondent's location of UK and USA. There is indication in the survey that other areas are of great interest. Particularly in less well surveyed areas.

There appears to be an inconsistent voice regarding the priorities of charting the ocean. The hydrographic offices are concerned with the most congested waters within their EEZ primarily for safe navigation, whereas science, environmental and commercial projects have a keen interest also in the open ocean and currently uncharted areas, the survey respondents mostly regarded areas prone to climate change or uncharted as the top priority.

List of charting needs

Why do we want to map the oceans? Many reasons were given in the survey results and evidence review. These are listed below where either 'science' or the 'environment' as simple answers have been excluded in favour of more quantifiable activities:

- Fish stock management/monitoring
- Precious mineral and natural resource discovery/monitoring/mining
- Pharmaceuticals
- Aquaculture planning and monitoring
- Wind farm (renewable energy) assessment and placement
- Climate change mitigation
- Monitoring of the impact of pollution
- Coastal erosion monitoring
- Safe navigation / mapping of hazards
- Conflict resolution (re national boundaries)
- Cable/pipe installation
- Efficient shipping
- Tourism and leisure activities
- Meteorological data analysis (Tsunami prediction)
- Habitat discovery, mapping and monitoring

Ocean wealth appeared quite often in the evidence review though this does cover any amount of activities relating to the Blue Economy; thus, it has not been included as an individual activity but is a topic of interest.

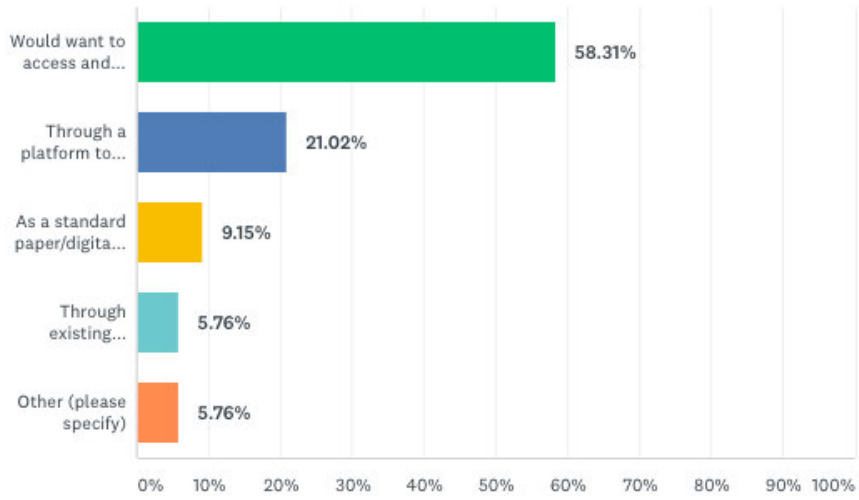
The list of requirements for mapping from the survey are corroborated to some extent with programmes being run to fulfil them. However, this is only on a regional or local scale, not global. Many regions may not be able to have the resources to carry out surveys but understand the benefits of mapping the ocean floor, this was indicated in the survey responses.

Geospatial data, models and access to data

With regards to the priorities of a geospatial modelling tool, again, environment and climate come out on top in the survey, however there was a consistent spread across safety, security, traffic density and trade. This again shows that outside of there being multiple reasons each appears equitable. If we then look at the prioritisation of where geospatial surveys should be conducted it may not come as a surprise to see an even split in large part across a weighted global list, on a regional basis, on an ocean priority and from a Blue Economy perspective. That said, again the factor that did show as the greatest prioritisation was climate and scientific. Interestingly when viewing the wider comments on where prioritisation should take place for geospatial surveys there was a significant number of comments stating that EEZs of maritime nations should be a priority.

Accessing the data

The final aspect of data that needs to be highlighted is that by far most people would want to access free marine geospatial data through a data portal.



ANSWER CHOICES		RESPONSES	
Would want to access and download through a marine data portal		58.31%	172
Through a platform to create a tailored fused product for own needs		21.02%	62
As a standard paper/digital chart		9.15%	27
Through existing models/services and publications		5.76%	17
Other (please specify)	Responses	5.76%	17
TOTAL			295

Figure 8: *How would you want to use, or access marine geospatial data collected?*

While not specifically asked, some respondents were keen to suggest that any resulting data portal should be free of charge, with one commenting: ***"When you collect the data please release it and let people interrogate it for themselves. Do not act as a benefactor when you are a beneficiary."***

What is missing?

One requirement missing, which is also hard to quantify, is that there is an indication that we do not know what we do not know yet. What are we missing by not mapping the seabed? From the Malaysia flight report it was seen that so many [scientific] interesting things were discovered as a bi product of the search for the missing airplane. Scientists had the opportunity to examine a previously unmapped seabed in detail. Not least it highlighted how an understanding of the ocean floor would have helped the search for the airplane as its decent through the water column could be better modelled.

Some ocean mapping projects, and related initiatives/programmes were brought out in the survey but not in the evidence research. This could be an indication that these activities are not well publicised; more evidence was identified within the survey where 39 out of 77 responders claimed that they have not yet articulated the value of their seabed mapping activities to a wide audience.

Most that had published their findings had revealed them to government and educational bodies. There appears to be little engagement with the wider global population.

Additional insights stemming from the research activities

There appears to be a significant disparity between direct benefits seen by current hydrographic offices' practices and the untold benefits of doing more. Governments may fail to see the 'wealth' that could be found in the world's oceans. However, if they have no control over it why would they do it. If they have no claim over an area, then can they claim the benefit/rewards.

Although there is a disconnect between hydrographic offices' priorities and the bigger picture of the benefits of seabed mapping, there is effort from NOAA and the UKHO to alter this balance in the future but the results of their efforts are yet to be quantified.

An interesting insight from the survey identified a need to create health products from minerals within the oceans. There will be benefit in engaging with the pharmaceutical community to better understand their potential needs and requirements.

Potential contributions to the Seabed 2030 database

When looking at marine geospatial data itself, one of the questions in the survey asked; *"Do you have any existing or forthcoming data that you could contribute to the Seabed 2030 mission?"* It was reassuring to note that nearly 30% of those who partook in the survey had data and indicated that they would be willing to contribute their data to Seabed 2030.

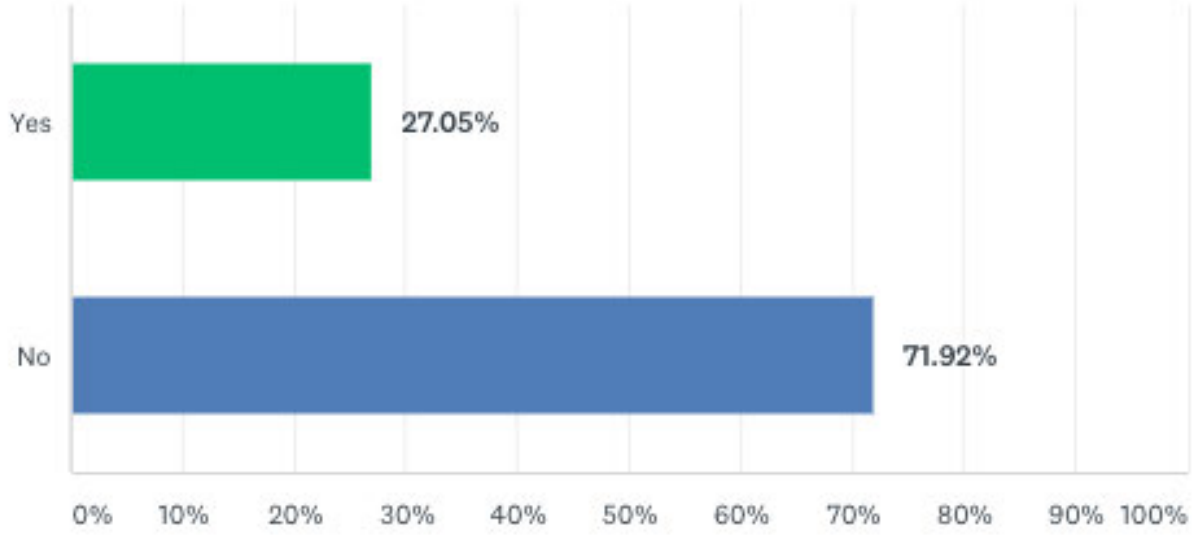


Figure 9: *Do you have any existing or forthcoming data that you could contribute to the Seabed 2030 mission?*

Conclusion

There was overwhelming support on both need and urgency to map the world's oceans and ringing endorsements on the work of the Nippon Foundation-GEBCO-Seabed 2030 Project's aim and aspirations. This research also corroborated a strong view that crowdsourcing was an important factor in facilitating and contributing to the 80% shortfall.

The online survey identified that:

- 40% of online respondents considered the *main* benefit of mapping the ocean floor to be 'to advance scientific understanding of seabed characteristics', with 11% highlighting the need 'to monitor environmental challenges over time'.
- Although bathymetric data (81.67% of respondents) is the most desired geospatial information, it is not that far ahead of environmental data (69%), oceanographic data (65.33%) and classification of seabed features (63.33%).
- Respondents were interested mostly in water depths less than 200m (33.57%) and greater than 5750m (31.12%).
- An overwhelming majority of respondents (58.31%) would want access to any data sets via an online marine data portal.
- Over a quarter (27.05%) of the respondents had data or would have data in the near future that they were willing to contribute to the Seabed 2030 Project.

The Rapid Evidence Review – while providing just a snapshot view of mapping programmes – suggests that few are aligned and many operate in isolation; the industry, environmental programmes are by and large not complementing national hydrographic office strategies. Drawing together all bodies would ensure that resources are used to maximum effect and efficiency. The assumption on why few hydrographic models could be identified is that to create a model that fits all the needs and requirements of each maritime sector as well as fixed factors such as safety, security, environment and resources available is complex at the very least. The ongoing work in Wind in the Sails Phases 2 & 3 seeks to determine how to create a model that will reflect the needs and requirements of all.

Phase 1 Objective 1 of the Wind in the Sails project has been a great success. It achieved all desired outcomes but what was most heartening was the global responses to the online survey. The total number of responses far exceeded expectations and with such diversity and depth across all sectors of the maritime domain greater weight and credence can be given to the questions answered and the survey overall.

The online survey was constructed in a careful and comprehensive manner, designed in such a way that it was inclusive of all maritime sectors and those needing and or using marine geospatial data. The total number of responses (366) far exceeding all expectations and covering 65 countries

ensured that a global perspective was provided. The survey has provided views and evidence not been seen before and showed in many areas that the needs for geospatial data transcends not only every sector of the marine domain but in many aspects is equal whether the need be from governments, academia/science or industry sectors.

What was overwhelmingly clear was the global need for the world's oceans to be charted and with that the importance and urgency placed on this. The Wind in the Sails Project is now perfectly placed to move forward to Phases 2 and 3 to provide the Nippon Foundation-GEBCO-Seabed 2030 Project a model and prioritised action map/tool that will enable Seabed 2030 to realise its vision and map the world's oceans to a 100m resolution by 2030.

Finally, when completing the online survey people were asked: *"Is there anything else you would like to add?"* As previously stated, the preponderance of responses highlighted the importance and need to map the world's oceans and the need for a holistic approach. It is right and appropriate to highlight but a few and these are:

"Acknowledge the great contribution of the Nippon Foundation & GEBCO"

"Great initiative"

"This should be a TOP priority for G7 & G20"

"May your hands be blessed".

ANNEXES

Annex A: Project Statement of Work

WIND IN THE SAILS PHASE 1 OBJECTIVE 1 WORK AND ACTIVITIES

This project was sub-divided into 3 main sections and they are as follows:

Objective 1: Collate known seabed mapping needs.

Task 1: Rapid Evidence Review

- A Rapid Evidence Review to collate as many reports or plans as possible across the globe that articulate the areas of greatest need in relation to unmapped areas of the seabed.
- Catalogue any models used to help quantify the values / benefits of such planned exercises.
- Open source, evidence be collated into one single source of reflection of global activities and seabed needs.

Task 2: Online survey

- To supplement the open source Rapid Evidence Review, an online proforma or survey will be issued and promoted heavily to the global hydrographic / ocean community, asking for input into what stakeholders feel are the most pressing areas of interest for seabed mapping and why.
- Specifically, they will also be asked to share any quantitative or qualitative benefit articulation models they used to arrive at such conclusions.
- Identify if bodies and organisations hold bathymetric data and determine if it can be shared with Seabed 2030.

Task 3: Collation and analysis of data

- Both data sets from tasks 1 & 2 will be combined and interrogated.
- Ongoing transcription of all qualitative data will take place throughout, as will thorough checking of quantitative data.
- Analyse collective and disaggregated sector views.

Annex B: Organisations and programmes identified in the Rapid Evidence Review

This Annex provides an overview of 8 bodies and or organisations identified in the Rapid Evidence Review that have initiated and undertaking seabed mapping initiatives and strategies. In addition, 13 programmes have been identified that support the need to map the seabed of the world's oceans. The final section looks at four of the major hydrographic offices and provides a précis of how each office is identifying the needs and prioritisation of hydrographic surveys. For each body or organisation listed a short overview and status of each programme is provided, as well as a link to each respective website.

Ocean mapping initiatives/strategies

UK national seabed mapping scoping study

https://www.maritimeuk.org/media-centre/publications/uk-national-seabed-mapping-programme-scoping-study/

Organisation: MCA, Crown Estate and Defra

Country: UK

Year: 2016

Status: This was merely a scoping study but revealed some compelling reasons to carry out a national survey. Includes cost benefit information.

An Atlantic Ocean Map

https://www.atlanticresource.org/aora/mapping-our-ocean

Organisation: Atlantic Ocean Research Alliance (AORA)

Country: Canada, EU and USA

Year: 2015 - current

Status: Work continues, though having mapped only 8% of the North Atlantic region to date there is a long way to go. The project has laid out a roadmap on how to achieve its goals.

AORA are collaborating on several different seabed programmes that feature in section 2 of this Annex.

Marine Environmental Mapping Program (MAREMAP)

http://www.maremap.ac.uk/index.html

Organisation: Natural Environment Research Council (NERC) initiative led by British Geological Survey

Country: UK

Year: 2010 – current (although last news feed was from 2016)

Status: The project aims to improve seafloor and shallow geological mapping to achieve national objectives such as habitat mapping, Quaternary science, coastal and shelf sediment dynamics and the assessment of human impacts and geohazards in the marine environment. Currently work is ongoing; interpreting this data and are producing a new generation of marine geoscience maps at 1:50,000 scale and making them available on-line.

SonarChart

https://www.navionics.com/gbr/charts/features/sonarchart

Organisation: Navionics

Country: USA

Year: Ongoing

Status: Crowd sourcing of sonar logs by one of the leading electronic charting companies in the leisure and sport fishing market. Garmin purchased Navionics in 2017 and continues to run the SonarChart 'feature' under the Navionics brand. Navionics accepts sonar logs recorded with most sonar/plotter brands and mobile devices. These are integrated with existing data, updating SonarChart to reflect the ever-changing conditions of sea, lake and river bottoms. Note: Due to the nature of the equipment being used the data collected does not include deep offshore parts of the world's oceans. However, as leisure craft venture to a lot of places that are not priorities for commercial shipping or military activities there is substantial information gathered from lesser known inshore areas.

BASE Platform (Bathymetry Service Platform)

https://www.eomap.com/mapping-ocean-floor-space/

Organisation: EOMAP

Country: EU

Year: Ongoing - although last workshop appeared to be in 2017

Status: The BASE Platform focuses on Satellite Derived Bathymetry and combines it with tidal modelling and crowd sourced data collection techniques for improved accuracy. These innovative remote sensing techniques can detect subsea surface and measure depth with an exceptional level of accuracy. Crowd sourcing is also key: Vessels chip in valuable data by recording depth soundings as they navigate.

TeamSurv

Organisation: TeamSurv

Country: EU

Year: 2012 Est - 2018

Status: Project was to distribute data loggers to the leisure boating community to crowd source bathymetry data of areas that large ships do not go and are not well surveyed. Due to Brexit the EU stopped funding the project and it has been put on hold. The technology, hardware devices and data are still available though.

US seafloor mapping strategy

Organisation: US administration

Country: USA

Year: 2019 - current

Status: The coastal waters of the United States cover an area dwarfing the nation itself. Yet more than half of that ocean floor is a blank—unmapped by all but low-resolution satellite imagery.

The White House has announced a new push to examine these 11.6 million square kilometres of undersea territory. President Donald Trump signed a memorandum ordering federal officials to draft a new strategy that would accelerate federal efforts to map and explore these reaches. This work will be carried out by NOAA and should be feeding onto Seabed 2030.

Crowdsourced Bathymetry Database

https://www.nauticalcharts.noaa.gov/updates/noaa-announces-launch-of-crowdsourced-bathymetry-database/#more-170963

Organisation: NOAA

Country: USA

Year: 2018 - ongoing

Status: The crowdsourced bathymetry database contains more than 117 million points of depth data, which have been used by hydrographers and cartographers to improve chart products and knowledge of the seafloor. NOAA, working with George Mason University, is using the database depths to assess nautical chart adequacy, determine when areas require updated survey information, and identify chart discrepancies before an incident occurs. The Canadian Hydrographic Service used this dataset to update several charts of the Inside Passage, a network of coastal routes stretching from Seattle, Washington, to Juneau, Alaska.

Data is contributed to the database through a variety of trusted sources (e.g., partner companies, non-profit groups)—referred to as "trusted nodes".

Programmes supporting the needs and requirements for mapping/charting the world's oceans

UK national seabed mapping and programme scoping study

https://www.maritimeuk.org/media-centre/publications/uk-national-seabed-mapping-programme-scoping-study/

Year: 2016

Summary: Value of wider blue economy to the UK economy estimated at £51 billion and could grow significantly with improved seabed mapping infrastructure. Benefits would be seen across both public and private sectors; oil and gas, renewables, telecommunications and cables sectors are highlighted. "Open access to increased quantity and quality of seabed mapping data via a national UK seabed mapping programme could lead to the development of new equipment and technologies, exports, job generation and other growth opportunities".

ATLAS

https://www.eu-atlas.org/

Year: Current

Summary: Changing environmental conditions and human activities have major impacts on the distribution and sustainability of living marine resources. This poses a serious challenge to the business and policy that communities are seeking to balance with the societal needs and with environmental sustainability. Large-scale ocean observation is needed to improve our understanding of how deep ocean ecosystems function, their roles as reservoirs of biodiversity and genetic resources, and their health under future scenarios of climate change and human use. ATLAS is

developing a scientific knowledge base that can inform the development of international policies to ensure deep-sea Atlantic resources are managed effectively. This will contribute to the European Commission's long-term "Blue Growth" strategy to support sustainable growth in the marine and maritime sectors.

SponGES

http://www.deepseasponges.org/

Year: Current

Summary: Deep-sea Sponge Grounds Ecosystems of the North Atlantic
an integrated approach towards their preservation and sustainable exploitation. A large part of the ongoing research is to understand the ecosystem and model it and to fill the knowledge gap about the extent and distribution of sponge grounds by collating known distributional data, and by collecting fine scale geological, hydrological, and biological data through in-situ surveys of different types of sponge ground ecosystems in case study areas.

AtlantOS (this project both contains an ocean mapping element as well as supporting the need for mapping)

https://www.atlantos-h2020.eu/

Year: 2015-2019, though some work continues through the outputs of the study

Summary: Coordinated by GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany (Prof. Dr. Martin Visbeck). AtlantOS was a BG 8 (Developing in-situ Atlantic Ocean Observations for a better management and sustainable exploitation of the maritime resources) research and innovation project that proposes the integration of ocean observing activities across all disciplines for the Atlantic, considering European as well as non-European partners. The EuroMapApp task WP2.5 aims to integrate the European deep seafloor mapping results in the High Seas into a seamless whole and put these results into a widely accessible format allowing immediate visualization of the seafloor for the specialist and non-specialist user alike. The data is to be in the GeoMapApp format and is intended to feed data into the rest of the project.

UN Decade of Ocean Science for Sustainable Development

https://www.oceandecade.org/

Year: 2021 -2030

Summary: On 5 December 2017, the United Nations proclaimed a Decade of Ocean Science for Sustainable Development, to be held from 2021 to 2030. This Decade will provide a common framework to ensure that ocean science can fully support countries' actions to sustainably manage the Oceans and more particularly to achieve the 2030 Agenda for Sustainable Development (https://www.un.org/sustainabledevelopment/oceans/). The project involves many aspects of studying the health of the world's oceans into which a map ocean floor plays a big part.

Mapping Ocean Wealth

https://oceanwealth.org/about/

Year: Ongoing

Summary: Mapping Ocean Wealth moves us from broad global numbers to specific local details, allowing us to evaluate nature as an economic asset. The data then become actionable and inform engineering, financial and policy language that lead to better planning, conservation and investment decisions.

MEDIN (Marine Environmental Data and Information Network)

https://www.medin.org.uk/

Year: 2020

Summary: MEDIN (Marine Environmental Data and Information Network), the Organisation for Economic Co-operation and Development (OECD) and Global Ocean Observing System (GOOS, IOC-UNESCO) are currently working on a joint initiative to gain a deeper understanding of the benefits of public marine data. The aim is to understand the uses of marine data made available via specialised data archive/management centres. UKHO is the involved as the UKs National Data Archive Centre for bathymetric surveys.

Coastal/Marine Hazards and Resources Program

https://wim.usgs.gov/geonarrative/cmhrp/

Year: 2020-2030

Summary: The U.S. Geological Survey's Coastal and Marine Hazards and Resources Program (CMHRP) envisions a Nation that uses scientific knowledge to prepare for, mitigate, and respond to short- and long-term environmental threats to coastal regions and to sustainably manage coastal

and marine resources. Management decisions that are guided by an understanding of persistent coastal and marine processes and extreme events (for example, storms, oil spills, submarine earthquakes, tsunamis) can minimize negative human, ecological, and financial consequences. The mission is to conduct, research and develop science-based tools that lead to safer, more productive coastal communities and improved stewardship of natural resources.

World Heritage Marine Programme

http://whc.unesco.org/en/marine-programme/

Year: 2005 - Current

Summary: Launched in 2005 as part of the UNESCO World Heritage Convention, the mission of the World Heritage Marine Programme is to ensure effective conservation of existing and potential marine areas of Outstanding Universal Value so they will thrive for generations to come.

CCOM Chart-of-the-future Project

http://ccom.unh.edu/theme/chart-future

Year: 2004 (date of publication of the project paper, the project still appears to be alive with papers written about various studies and publications branching from the initial study)

Summary: The goal of the Chart of the Future Project is to investigate ways to provide more effective information to mariners to maximize safety and efficiency of navigation.

This project, which is among the research conducted by the CCOM/JHC Data Visualization Research Lab, aims to develop proof of concept prototypes to test new ideas and utilize new technologies. Prototypes are evaluated either through interviews with potential users or by conducting more formal human factors studies.

Quality bathymetric data is vital to certain aspects of the project particularly to feed the navigational decision support tools.

UKHO - Admiralty Marine Data Portal

Country: UK

Year: Current

Summary: The ADMIRALTY Marine Data Portal provides access to marine data sets held by the UK Hydrographic Office within the UK Exclusive Economic Zone (EEZ). The ADMIRALTY Marine Data

Portal replaces the INSPIRE Portal as the place to search and download data sets regarding maritime limits and boundaries, ships' routeing measures, bathymetry and more.

As a Public Authority, the UK Hydrographic Office makes relevant data sets available under the Open Government Licence in compliance with the 'Infrastructure for Spatial Information in Europe (INSPIRE) initiative.

Agri-food & biosciences institute (AFBI) Habitat mapping

Country: UK (Northern Ireland specifically)

Year: Current

Summary: The Agri-Food and Biosciences Institute (AFBI) is a multi-disciplinary organisation with c650 staff involved in high technology research and development, diagnostic and analytical testing for DAERA and other Government departments, public bodies and commercial companies in Northern Ireland, and further afield.

Habitat maps aid the spatial planning of the seabed and inform the decision-making processes involved in managing the demands placed on our marine environment; by fishing and the extraction of oil, gas and aggregates (gravel extraction), the planning of cable routes for electricity and telecommunications. There are also increasing pressures from offshore windfarms/tidal turbine developments and leisure activities.

AFBI have their own research vessel equipped with multibeam sensor to carry out their research work.

Malaysia Airlines flight MH370

Country: Australia

Year: 2017

Summary: Although not a programme set up to map the seabed in particular; the search for the missing Malaysian flight MH370 required detailed ocean floor mapping to be carried out to understand where the plane may have come to rest. Only after new and extensive surveys of large amount of the ocean did the full picture emerge of the complexity of the task needed to locate the wreckage. The search has revealed interesting geological features in the remote southeast Indian Ocean that were previously unknown. To quote the report "High resolution and accurate maps of the ocean floor are essential for providing new insights into the Earth's geological evolution, modern ocean-floor processes, and benthic habitats."

Models and tools used to identify charting needs, requirements and prioritization for hydrographic surveys

LINZ (New Zealand Hydrographic Authority

Needs/requirements identification: A hydrographic risk assessment was done recently (2016), this was done by procuring AIS marine traffic for a period and combining that data with age of existing charts and survey adequacy (CATZOC) amongst other factors, the result was a heat map of risk across New Zealand. A report and GIS product were produced as part of this process. From this the results were classified into areas of heightened risk. More recently a sub Antarctic risk assessment was also done using a similar method, as the name suggests this encompasses the areas south of NZ which NZHA is responsible for maritime safety information. The risk assessment exercise is a GIS exercise which can be re-assessed at a later date with more up to date marine traffic if required, other factors can also be considered as part of the model. More information can be found at https://www.linz.govt.nz/sea/charts/annual-work-programme/new-zealand-hydrographic-risk-assessment

Prioritisation identification: The risk assessment is categorised into areas of heightened/high/moderate risk. The areas are then opened to key stakeholders (Maritime New Zealand, ports etc) for comment. From there survey areas are designed to encompass the higher risk areas and published in HYPLAN. Higher risk areas are prioritised more highly. More information on HYPLAN can be found at https://www.linz.govt.nz/sea/charts/annual-work-programme. HYPLAN was originally published in 2017 but was recently updated (see v1.1 at the bottom the webpage). The updates include areas surveyed from the original priority list.

UKHO

Needs/requirements identification: The UKHO's data gathering portfolio is extremely diverse by almost every measure; aims and objectives, location, data gathering techniques and funding sources. Consequently, how the UKHO prioritise data capture varies from programme to programme.

Prioritisation identification: Under the Civil Hydrography Programme (CHP), the UKHO works closely with the MCA to use their GIS based prioritisation tool to agree the target areas that are relevant to

safety of life at sea concerns. Conversely, under the Commonwealth Marine Economies Programme (CME), we factor in economic drivers when deciding where to survey.

Routine re-surveys are undertaken in areas where the seabed itself is highly mobile. The UKHO analyse these surveys to identify changes that have occurred and apply updates to charts if necessary. The UKHO also assess whether the limits and survey frequency should be revised.

RDACC N. Pacific

They are involved with US projects to map the Extended Continental Shelf beyond 200 nm for Law of the Sea, a new US National Mapping Strategy, which calls for complete mapping of the U.S. EEZ and are constantly trying to map remote regions for both supporting climate studies (understanding the history of climate and ice sheets) and adding to SB2030.

Needs/requirements identification: From a SB2030 perspective they have several web-based applications that allow them to see existing data and then add layers like marine protected areas, airline routes that help prioritise.

Prioritisation identification: Prioritisation is based most importantly on absence of data and then other drivers like presence of critical habitats. The paper that discusses the approach is in the resources folder.

Canadian Hydrographic Service (CHS)

Needs/requirements identification: Canada has the largest coastline and EEZ in the world and has significant areas in its waters which are uncharted and or poorly charted. It is currently developing a Coastal and Ocean Mapping Strategy.

Prioritisation identification: Extract from the Standards for Hydrographic Surveys from the CHS giving an indication of priorities: When specifying depth accuracy, this standard departs from previous versions by specifying different accuracy requirements for different areas according to their importance for the safety of navigation. The most stringent requirements entail higher accuracy than previously specified, but for areas of less critical nature for navigation the requirements have been relaxed. Furthermore, this version makes the new requirement that surveyors strive to attribute all new data with a statistical estimate of its probable error.

NOAA

In November 2020, a US government initiative was created that is aligned with seabed 2030 requirements. The NOMEC (National Ocean mapping exploration and characterisation) strategy was published in June; all the regional US mapping strategies are to be to be aligned with this. All water

deeper than 30m is to be mapped by 2030 - 1/3 of the effort is to map 40m and deeper out to the EEZ limited yet 2/3 of the effort will go towards mapping waters shallower than 40m, with an aim for high resolution surveys greater than 100m.

Needs/requirements identification:

In the past tools and requirements have cantered around navigation risk using hydro health which is a set of algorithms for highlighting risky nav areas. However, in the future different user groups will have input into survey requirements leading to a more coordinated approach.

Prioritisation identification:

In the past NOAA has prioritised its resources in support of navigation. This is carried out via a risk assessment of use, depth and seabed movement. There is a change in the winds though. An ocean mapping plan is going to be produced soon that balances this with big ocean mapping. This will lead to development of reginal campaigns to capture regional priorities.

Annex C: Introductory online article

Marine geospatial data: the cornerstone of the Blue Economy

The Nippon Foundation – GEBCO Seabed 2030 Project launches study on the value of seabed mapping.

By Jamie McMichael-Phillips
Director, The Nippon Foundation – GEBCO Seabed 2030 Project

Our relationship with the seas and oceans is evolving rapidly. We have long understood the importance of protecting marine ecosystems. More recently, science has broadened our understanding of the important role the oceans play in regulating the Earth's climate. The shape of the seabed is a crucial parameter for understanding ocean circulation patterns that distribute heat between the tropics and poles. Bathymetry data also supports detailed assessments of future sea-level rise, as well as tsunami and storm surge modelling to provide the basis for actions to protect coastal communities.

Now, many coastal states are beginning to apply in-depth analysis of how all marine and maritime interests can come together. Integrated ecologically sustainable plans to develop and maximise each nation's Blue Economy – both to protect and benefit from their marine resources – are emerging at pace. That should come as no surprise when, globally, it's estimated that the Blue Economy will be worth more than £2.3 trillion by 2030, supporting 40 million jobs. As well as quantifying traditionally important marine industries such as maritime transport and tourism, the key Blue Economy report from the Organisation for Economic Co-operation and Development (OECD) highlights offshore wind, fish processing, industrial marine aquaculture, port activities and industrial capture fisheries as the top five growth sectors.

At the top of that list, offshore renewable energy is hurtling from promising concept to a core element of many nations' integrated energy planning. While, at present, over 80% of all offshore wind installations are located in the waters off the coasts of 11 European countries, more detailed plans are emerging across the globe.

While Japan only had a relatively small installed offshore wind power capacity of 66MW by the end of 2019, many more projects are also in the pipeline. In February 2020, plans were revealed to construct 33 new turbines in offshore wind farms at the Akita and Noshiro ports in the Akita prefecture. Japan's high population density and topography present challenges for land-based renewable initiatives, but it does have a lot of coastline, which allows offshore wind farm projects to be significantly bigger than those that can be built onshore. Last year, the International Energy Agency commented that by 2040 offshore wind power alone has the potential to meet Japan's total power demand nine-fold.

New horizons

To achieve such progress, the next frontier for the Japanese wind farm sector – as with all nations – will be to push further offshore. As much as 80% of the of the total potential for offshore wind power is estimated to be in deep waters, where winds are much more forceful. Japan is surrounded by deep seabed's, so has the potential to add significantly to the five

floating turbines they currently possess. With the floating wind farm sector predicted to be worth £32bn by 2030, the race is on.

Other nations will be watching progress keenly. Indonesia's electricity needs are predicted to grow by 7% annually until 2027, and its government has committed to providing 23% of all electricity generation from renewable sources by 2025 (from under 6% in 2015). Until now, offshore wind energy has not played a large part in Indonesia's total renewable energy goals as its application is considered too expensive in the deep waters of the Indian Ocean. Floating wind has the potential to change that view – of great interest as the country boasts the third largest coastline and sixth largest Exclusive Economic Zone in the world.
At the macro level, the challenge for coastal nations is to align seemingly disparate marine and maritime sectors into a coherent and measurable whole. At the start of June, the U.S. Bureau of Economic Analysis and the National Oceanic and Atmospheric Administration (NOAA) for the first time quantified the total value of America's marine economy. Including goods and services, it was estimated that America's oceans and Great Lakes contributed approximately $373 billion to the nation's gross domestic product in 2018 – thus growing faster than the nation's economy as a whole. Aligned to this potential, the U.S. has committed to map its entire EEZ (the second largest in the world), aiming to map its deep waters by 2030 and nearshore waters by 2040.

Over in Asia, Bangladesh has recently established a forward-thinking Blue Economy Cell (BEC) to co-ordinate relevant activities across sectoral ministries. The country has a coastline 710km long and boasts 1.1 million square kilometres of Exclusive Economic Zone in the Bay of Bengal. Economists predict that the sustainable utilisation of these marine resources could enable an additional £1.12 billion in revenues annually. Such a return would help to propel Bangladesh from lower-middle-income country to middle-income status, as defined by the World Bank. The BEC has identified 29 relevant sectors – from cruise and coastal tourism to fisheries – providing a crucial platform for further cross-sector analysis and activity.

Planning for success

Such complexity is repeated across the world's seaspaces, which are becoming increasingly congested. Modern, forward-looking marine spatial planning needs to factor in shipping lanes, fisheries, aquaculture, Marine Protected Areas, coastal tourism, the protection of marine cultural heritage and the roll-out of fibreoptic cables to feed a data-hungry world. Many factors will affect these sectors' ability to plan ahead, but there's no doubt that what they *all* need in order to establish planning certainty is an accurate, up-to-date map of the seabed, obtained using modern survey methods. Marine geospatial data is the cornerstone of the Blue Economy.

Some waters are relatively well charted; other nations are not so lucky, so are at an instant disadvantage in their ability to understand and sustainably manage their natural marine resource. Over 80% of the world's ocean remains unmapped with modern high-resolution mapping technology.

The Nippon Foundation – GEBCO Seabed 2030 Project (Seabed 2030) was established to revolutionise the world's understanding of the ocean floor. We want to catalyse policy decisions, sustainable actions and scientific research informed by detailed bathymetric information.

The project was launched officially by the Chairman of The Nippon Foundation at the UN Ocean Conference in 2017, with operational activity commencing in 2018. In time terms, therefore, we are now nearly a quarter of the way through our 13-year challenge of mapping the world's seafloor by 2030. We have been hugely encouraged by the support we have received to date from the marine geospatial community. Advice, support and enthusiastic encouragement has been gratefully received. Donations of huge amounts of bathymetry data from commercial marine survey companies and marine institutes has been hugely welcome. The rapid establishment of one Global and four Regional Data Centres has strengthened co-ordination and collaboration potential.

With this infrastructure in place, it's now time to really put the "Wind in the Sails" of our mission, and power towards producing the definitive, high resolution bathymetric map of the entire ocean by the year 2030.

Innovation in action

Thankfully, all sections of the marine data collection sphere are bursting with amazing examples of innovation. Incredibly versatile autonomous underwater vehicles (AUVs) and autonomous surface vehicles (ASVs) are collecting digital data at depths and rates considered impossible even five years ago. Such seabed innovation is matched in the skies; satellites are now able to provide bathymetry quickly and cost-effectively in coastal areas with the right environmental conditions. The proliferation of data collection rates is only worthwhile, though, if useful analysis can be applied. Fortunately, developments in machine learning make it possible to process and analyse volumes of data that far outstrip any potential human endeavours.

However, in order to prioritise the appropriate utilisation of these technologies, as a community we need to challenge ourselves to develop a coherent, evidence-based analysis of the value of such endeavours.

A body of evidence already exists that supports the relationship between ocean floor shape and the processes and issues that are touched on above. That said, while much of this is open source, it is not all in one place. We started the Seabed 2030 project with a strong commitment to avoid duplication and instead work towards fostering a close collaboration for the most efficient use of global resources. In that spirit, we are launching a short piece of work with Blue Economy solutions company NLA International to start to gather this evidence together.

The more data we acquire about the details of seabed shape, the more we recognize that the ocean and its floor are more dynamic than we ever thought. By cataloguing models used to help quantify the environmental, social and economic values and benefits of seabed mapping, we will be in a much better position to articulate the areas in greatest need of being surveyed – and, crucially, why government, industry, academia and philanthropy should support such activity.

To contribute to the survey, please click here.

Annex D: Online survey detailed data

Qs 1-4 Respondent details

Name	Organisation	Job title
Brianna King	FINZ	Fishery Manager
Aaron Micallef	University of Malta	Associate professor
Adekola Oyenuga	Ao Blue Economy & Energy Consulting	CEO & Founder
Adrian Chiam	UKHO	Senior Account Manager
Alex Rogers	REV Ocean	Science Director
Alex Webb	Fugro	Senior Project Manager
Alexandra Bulgakova	Seastar Survey	Marine Ecologist
Ali AlBaz	Kuwait Institute for Scientific Research	Associate Research Scientist
Aliou DIOP	CALIGRAD	Aerospace Engineer and CEO
Alix Willemez	Independent	Sustainable Development Consultant
Alvaro Sardinha	ECONOMIAAZUL	CEO
Amaibi Opigo	AMAEX Earth and Environmental Company Nigeria Limited	Managing Director /CEO
Amber Batts	NOAA	GIS Data Manager
Amber Butler	NOAA	IOCM IWG Executive Secretariat
Amina Makori	Kenya Marine and Fisheries Research Institute	Assistant Research Scientist
Amon Kimeli	Kenya Marine and Fisheries Research Institute	Research Officer
Ana Carolina Mazzuco	Universidade Federal do Espírito Santo	Post-doc researcher
Andrea	University of Parma	Researcher
Andrea Fiorentino	Geological Survey of Italy - ISPRA	Researcher
Andres A. Chiarella	COMISION MULTISECTORIAL DE LA ACCION DEL ESTADO EN EL AMBITO MARITIMO - COMAEM	Consultant

Andrew Rudge	Maritime & Coastguard Agency	First Secretary Head of MCA Singapore.
Andrew Talbot	The UK Hydrographic Office	Bathymetry Advisor
Andronikos Kafas	Energias de Portugal Renovaveis (EDPR) UK	New offshore wind leasing opportunities manager
Anna Madarasz-Smith	Hawke's Bay Regional Council	Principal Scientist Marine and Coast
Annika Clements	Seafish	Regional Manager- Northern Ireland
Arild Hepsoe	Maritime Robotics	CTO
Arlo Hemphill	Greenpeace USA	Senior Ocean Campaigner
Arne Vogler	Offshore Renewable Energy Catapult	Senior Research Engineer
Arnis mangolds	C-2i Inc	Presidente
Atanda Hakeem	Nigerian Maritime Administration and Safety Agency	Hydrographic Surveying Services
AZMI ROSEDEE	NATIONAL HYDROGRAPHIC CENTRE MALAYSIA	STAFF OFFICER NUMERICAL MODELLING
Bakhalek Mustapha	InCoRe	CEO
Bart Stuck	Signal Lake	Managing Director
Ben Donnelly	Marine Geospatial Ecology Lab / Duke University	Research Associate
Ben Scott-Robinson		
BERGERON	ABYSSA	Associated director
Bob McConnaughey	NOAA Alaska Fisheries Science Center	Research Fishery Biologist
Bob Moshiri	Johnson Outdoors	Business Manager
Brandon Krumwiede	CSS Inc on contract to the NOAA Office for Coastal Management	Great Lakes Regional Geospatial Coordinator
Brandt Broussard	TDI-Brooks International	Geophysical Services Director
Buckle S	National Centre for Coastal Research	Project Scientist B
Cai Bird	Marlan Maritime Technologies Ltd	Director of research
Carlos Perez-Collazo	University of Vigo	SAFEWAY Project Manager

Carolyn Belak	Humboldt State University	MPA Dive Research Coordinator
Celeste Leroux	Virgil Group LLC	President and CEO
Célia Magaia	INAHINA	Nutical Cartographer
Chris Booth	United Kingdom Hydrographic Office	International Technical Trainer
Chris Bova	NC Wildlife	Resource Economist
Chris Ordoñez	Hefring Engineering LLC	Program Manager
Christi Linardich	Old Dominion University	Senior Research Associate
Christine Trickett		
Christopher Day		
Christopher Han		Senior Geoscientist
Colin Tay	UK Hydrographic Office	Account Manager
conor mullholland	Murphy's Surveys	Junior Surveyor
Crescent Moegling	NOAA	Navigation Manager
Curt Whitmire	NOAA Fisheries	IT Specialist
Cyril Juliani	NTNU	Postdoctoral Researcher
Dagoberto DAVID VITERI	Dirección General Marítima CIOH-C	Advisor hydrographic and Cartographic
Danai Lampridou	University of Athens	PhD student
Dani Gorgon	Elcome International LLC	Marketing Manager
Daniel Ierodiaconou	DEAKIN UNIVERSITY	ASSOCIATE PROFESSOR
Daniel Wright	Sounding Science, llc	Hydrographic Data Scientist
daniela accettella	OGS	technologist
Darren Hutchins		Surveyor
David A Armstrong	NGA	Bathymetrist
David Alexander	Eco Marine Consultants Limited	
DAVID CROSSMAN	IIC TECHNOLOGIES LTD	MANAGING DIRECTOR AUSTRALASIA
David Darbinyan	The European Marine Energy Centre	Senior Metocean Engineer

David Hanslow	New South Wales Department of Industry, Planning and Environment, Australia	Senior Team Leader, Coastal and Marine Science
David Harris	StatsNZ	Insights Analyst
David Wyatt	IHO Secretariat	Assistant Director/GEBCO Secretary
Declan Black	Irish Maritime Administration	Nautical Surveyor
Declan Black	Irish Maritime Administration	Nautical Surveyor
Denis Hains	H2i	President & CEO
Derek Sowers	NOAA	Physical Scientist
Derek T	GIHS	
Derrick Peyton	IIC Technologies Inc	CEO
Diana Kretzschmar		
Dimos Traganos	German Aerospace Center	Project Manager
Dodik Armansyah	Pushidrosal	Surveyor, Oceanographer
Don and Senia Hussong		
Douglas Wood	NOAA NOS	Physical Scientist
Dr A Downie	Scottish Environment Protection Agency	Unit Manager Marine Ecology
Dr Donna Roberts	CSIRO	Marine National Facility - Policy Coordinator
Dr Ifesinachi Okafor-Yarwood	School of Geography and Sustainable Development, University of St Andrews	Lecturer in Sustainable Development
Dr Joanne Preston	University of Porstmouth	Reader in Marine Ecology and Evolution
Dr Joseph Paul	Ishe Maricos	Consultant
Dr Nikki Chapman	Peace for Conservation	Programme Manager
Dr Steve Urlich	Lincoln University	Lecturer in Environmental Management
Dr. John Kendrick Hall	Geological Survey of Israel	Marine Geophysicist (Retired 2006)
Dr. Lloyd C. Huff	LCHUFFCONSULTANCY	Chief Engineer
Dr. Refik Orhun	NOAA Fisheries Service	Research Fishery Biologist

Duncan Bell	Andrews Survey	Hydrographic Surveyor
Duncan MacRae	Coastal Zone Management UK	Director
Duncan Tilley	Mumtaz Care Ltf	Director
Dyan Primana Sobaruddin	Indonesian Navy	hydrographer/cartographer
Earl M. Waesche	Earl M. Waesche	Legislative Director, National Boating Federation
ECA	AAL	Director
Edward Saade	Fugro USA	President
Edwynn Raxon	Ministry of National Defense Guatemala	Head of Hydrography and Oceanography department
Ekka Lusniady	PT CMS	Oceanographer
Emilie Reeve	The Renewables Consulting Group	Director
Emily Jateff	Australian National Maritime Museum	Curator, Ocean Science and Technology
Emma Burge	New Zealand Environmental Protection Authority	GIS Analyst
Emma Wise	ChartWorld Group	Navigation Expert
Erica Spain	NIWA	Marine geoscience technician
Ewa Burwicz-Galerne	GEOMAR Helmholtz Centre for Ocean Research Kiel	Postdoctoral researcher
Farah huda izzati	Sealife Malaysia	Entertainment, Education & Admission Host
Federica Foglini	CNR ISMAR	Tecnhologist
Francesca Adrienne	Department of Blue Economy	Director General, Maritime Boundary Management
Frank E Muller-Karger	University of South Florida	Professor
Frank Nitsche	Columbia University	Research Scientist
Freya	Marine Biological Association	PhD Student
Gail McAleese	Gavin and Doherty Geosolutions	Senior Geophysicist
Gary	Schlumberger	Sales and Commercial Manager
Gary Brogan	RN	International Liaison Officer

Gary Tan	UK Hydrographic Office	Account Manger
Gemma Hoyes		Postgraduate student
Geoffroy Lamarche	Office of the Parliamentary Commissioner for the Environment (New Zealand)	Chief Science Adviser
Gianluca Ragusa	International independent consultant - Fisheries and aquaculture specialist	Fisheries and aquaculture specialist
Glynn Straton		
Gustavo Adolfo Gómez-Pimpollo Crespo	Spanish navy hydrographic office	Technical secretary
Gustavo Gómez-Pimpollo Crespo	Spanish navy hydrographic office	Technical secretary
Guy Noll	Esri	Maritime GIS consultant and geodata services department manager
Heather Coleman	NOAA	Deep Sea Coral Research & Technology Program Coordinator
Hector Lindars	Chaffin works	Ecologist
Helen Lyman	University of Queensland	Associate professor oceanography
Helena Patton	Ukho	Ibte strategy manager
Helge Uhlen	Kongberg Maritime	Sales Manager
Houssem sadki	TNHOC	Hydrographic Surveyor and data processor/ maritime cartogrpher
Hugh O'Sullivan	Waterford Institute of Technology	Marine Environmental Scientist
Hugh Parker	Fugro	Product Owner, Uncrewed Surface Vehicle
Hyun-Chul Han	Korea Institute of Geoscience and Mineral Resources	Research scientist
I Gede Mahendra Wijaya	PT Hatfield Indonesia	Marine Environmental Specialist
Ian Charlette	Ian Charlette Consulting	Director
Ian Moncrieff	Port of London Authority	Board Non-Executive Director

Ibon Galparsoro	AZTI	Principal Investigator
Ines Boujmil	National Institute of Marine Sciences and Technologies (INSTM) Salambo	Fisheries and Environmental Engineer
Ines Boujmil	National Institute of Marine Sciences and Technologies (INSTM Carthage)	Fisheries and Environmental Engineer
Ines Boujmil	National Institute of Marine Sciences and Technologies (INSTM Carthage)	Fisheries and Environmental Engineer
Inge Smith	Freelance	Marine environmental scientist
ISMAIL Yunisa Yakubu	Geotrek Integrated Services	Director of Projects
J.Austin	ASN	Marine Engineer
Jade Delevaux	The Natural Capital Project	Life Science Researcher
James Carey	UK Hydrographic Office	Head of Operational Delivery (Content)
James Hudak	n/a	Specimen Processor
James Miller	NOAA	Physical Scientist
James Nicholls	Mann Isle Geoscience Ltd	Director - marine geophysicist
Jane R Chimungeni-Brassington	Australian Fisheries Management Authority	Senior Policy Officer
Jasmine Tribe	City to Sea	Campaign Manager
Jason Quinn	CM Geomatics	Geophyicist
Javier	European Association of Professional Marine Environmental Observers	Marine Environmental Observer
Javier ESCARTIN	CNRS	Senior Scientist
Jaya Roperez	University of New Hampshire	Graduate Research Assistant
Jean Laporte	ARGANS Ltd.	Managing Director
Jennie Kevis-Stirling	James Fisher Marine Services	Survey & UXO Manager
Jennifer Jencks	NOAA/IHO DCDB	IHO DCDB Director
Jennii Swaisland	Plymouth University	Student
Jenny Black	GNS Science	Senior Data Technician
jervis robinson	Fiji Hydrographic Office	Senior Hydrographic Surveyor

Jesper Sano Hoejdal	HydroCharting ApS	Manager
Jess Hillman	GNS Science	Marine geologist
Jo	Australian Seaweed Institute	CEO
Jodie Smith	Geoscience Australia	Marine Geoscientist
John Boyd	GMIT	Coordinator
John Buckingham	BMT	Chief Mechanical Engineer
John Farrell	US Arctic Research Commission	Executive Director
john lloyd	Strathearn Lloyd Ltd	Research Director
John Lowell	National Geospatial-Intelligence Agency, DoD, USA	Sr GEOINT Authority, Maritime
John Maschke	Australasian Hydrographic Society	Chair AHS SW Pacific Region
John Nyemah Natt Jr.	Muh-reen international	Chief executive officer/ coastal and ocean engineer
john waita	state department of mining	deputy director
Jon Hawes	Cefas	Mapping and GIS Coordinator-Marine Protected Areas Programme
Jonathan Ball	Land Information New Zealand	Product Owner
Joonas Virtasalo	Geological Survey of Finland	Senior Scientist
José Luis Casamor	Universitat de Barcelona	Associate Professor
JOSEL MOSTAJO	DEPARTMENT OF FOREIGN AFFAIRS PHILIPPINES	DIPLOMAT
Joyce E. Miller	University of Hawaii	Directory of Seafloor Data (retired)
Juan Gonzalez	Universidad Católica de la Santísima Concepción	Postdoctoral Researcher
Justin Manley	Just Innovation Inc	President
Jyotika Virmani	Schmidt Ocean Institute	Executive Director
Kakha Nadiradze	AFRD Georgia	
Kam Austine	EGS Survey Pty Ltd	Business Development and Technical Manager
kasey Cantwell	NOAA OER	physical scientist

Kate Knight	Good Water Master Naturalist	Citizen Scientist/Educator
Kate Rose	Northern Gulf Institute/Mississippi State University	Senior Research Associate
Katie Kirk	NOAA / UNH	Oceanographer / PhD Student
Kelsey Archer Barnhill	University of Edinburgh	PhD Student
Kevin Black	Danish Hydrographic Office	Nautical Cartographer
Kevin Mackay	NIWA	Programme Leader
Kevin Smith	Discovery Marine Ltd	Business Manager
Khalid	Dawaeim Advanced Business Ltd	Consultant of the Sea Sector Department
Kim	OneOcean	Area Sales Manager
Kirsty Ferris	Next Geosolutions	Project Support Manager
Kizito Wekesa Wakwabubi	Survey of Kenya	Hydrographic Surveyor
Koen Vanstaen	Flemish Hydrography	Director
Lance	Environmental Consulting	Air Quality Specialist
Lance Manuel	The University of Texas at Austin	Professor
Laura Hanley	Centre for Environment Fisheries and Aquaculture Science, CEFAS	Senior Data Manager
Laura Watson	wecs	mmo
Leonard Pool	SIDUS Solutions, LLC	Director
Lisa Levin	University of California, Deep Ocean Observing Strategy	Professor
Liz Taylor	DOER Marine Operations	President
Lizzie Lane	unemployed	unemployed
Louise Tizzard	Wessex Archaeology	Geoservices Director
Luciano Azevedo	Ocean Floor Geophysics	AUV Operator
Lucy	Liverpool John Moore's University	Student
Magnus Wallhagen	Swedish Maritime Administration, Swedish Hydrographic Office	Head of Production, Swedish Hydrographic Office
Manuel Arias	ARGANS Ltd.	Ocean Physical Modelling Programme Manager

Marcelo Sperle	PGGM - Programa de Geologia e Geofísica Marinha	Coordinator
Margaret (Peg) M Brady	NOAA Fisheries	Ecosystems & Habitat Science coordinator
Margaret Dolan	Geological Survey of Norway	Research scientist
Maria Baker	University of Southampton	Senior Research Fellow
Mariana Gomes	None	Shift Leader Navigator - Seismic
Mark Zimmermann	NOAA	Research Fishery Biologist
Marta Pratellesi	Italian Hydrographic institute	
Martin Jakobsson	Stockholm University	Professor
Martin Jones	ARGANS Ltd	Coastal Programme Manager, Head of Institutional Affairs
Martin Stemp	RS Aqua Ltd	Managing Director
MARTIN VAN DER KNAAP	FAO	Fishery and Aquaculture Officer
Martina	Limpiando el mundo	Project director
Mary-Lynn Dickson	Geological Survey of Canada, Natural Resources Canada	Director, Canada's Extended Continental Shelf (UNCLOS) Program
MARZIA ROVERE	NATIONAL RESEARCH COUNCIL OF ITALY	PhD
mattia romagnani	navionics	Team Leader
MD RONY GOLDER	Khulna University	Research Student
Megan Greenaway	NOAA Office of Coast Survey	Technical Advisor
Meme Lobecker	NOAA	Physical Scientist
Michael Gillooly	Marine Institute	Director - Ocean Climate and Information Services
Michael Powell	StratumFive Ltd	Strategy Director
Michele BAREZZANI	Alcatel Submarine Networks	Marine Expert
Miguel Silveira	MadeinSea lda	General manager

Miles Dunkin	Ministry of Business, Innovation and Employment	Manager Geoscience Information
Mithun Kalarickal Muraleedharan	Student	Student
Mohamed Elsaied	University of Matrouh	Post-Doc. Researcher
Muhammad Aththaar Nazim	Marine Affairs and Fisheries Agency	Planning Analyst
MUHAMMAD SYAHIR BIN AZHAR	JOHOR PORT BERHAD	MARINE EXECUTIVE
Murat	Myself	Student
MYRTO PROVATA	Ecoquest environemtnal Consulting	Scientific manager
Nan-Chin Chu	Ifremer	International Officer
Natalia Smith	Maritime NZ	GIS Analyst
Nataliya Turko	Geological Institute of the Russian Academy of Sciences	Senior Reseacherm
Nathan Dellevar	N/A	Student
Neil Tinmouth	SEA-KIT	Chief Operations Officer
Nelson Kuna	CSIRO Oceans & Atmosphere	Hydrographic & Marine Geophysical Surveyor
Neville Barrtt	University of Tasmania, Institute for Marine and Antarctic Studies	Senior academic
Nic Bax	CSIRO, Australia	Co-Chair Global Ocean Observing System Biology&Ecosystems
Nick Richardson	Marine Ecologist	Marine Ecologist
Nico Fassbender	Nekton	Research Assistant
Nicole du Plessis	South African Environmental Observation Network	Science Officer
Nikki Caputo	Wingspan Media	Owner/Producer
Nilton Sanchez Espinoza	Oceanographic and Antarctic Institute, Navy of Ecuador	Head of the Antarctic Projection Directorate
Nilton Sanchez Espinoza	Oceanographic and Antarctic Institute, Navy of Ecuador	Head of the Antarctic Projection Directorate
Norm Campbell	CSIRO	Honorary Fellow

Nouria Ouibrahim	LinkedInAfrica	Managing Director
OKE DWIYANA P	INDONESIA HYDRO-OCEANOGRAPHIC CENTRE	HEAD OF CHARTING DIVISION
OKE DWIYANA P	INDONESIA HYDRO-OCEANOGRAPHIC CENTRE	HEAD OF CHARTING DIVISION
Oke Dwiyana P	Indonesia Hydro-Oceanographic Centre	Head of Charting Division
Ole Benjamin Hestvik	Olex AS	Managing director
Ollie	Specialist Marine Consultants	Offshore Marine Coordinator
Paddy Lambe	CFT and ERM	Regional diving officer / env consultant
Paige Roberts	One Earth Future, Secure Fisheries program	Research Associate
Pat Iampietro	CSU, Monterey Bay	Geospatial Technology Officer
Patrick Lyne	Manada, Irish Whale and Dolphin Group, Marine Mammal Research Association	Marine Scientist/Acoustician
Paul Byham	Babcock Marine Training Ltd	Multibeam Training Specialist
Paul Sieberhagen	Moana New Zealand	Business Anlayst
Paul Turner	DOC/NOAA/NOS	Physical Scientist
Pedro Fernández	Bio Ocean Solutions- Universidad Politécnica de Madrid	Professor Dr.
Peer Fietzek	Kongsberg Maritime	Business Development Manager Ocean Science
pete	na	bdd
Peter Crane	www.PlanetPositive.Ventures	Founder
Peter Harris	GRID-Arendal	Managing Director
Peter Macy	Blue Ocean Gear	Chief Business Officer
Peter Ward		Underwater Acoustics Consultant
Peter Wittwer	University of Geneva	Professor
Pradeep Singh	Institute for Advanced Sustainability Studies	Research Associate
Prasadh Gunasinghe	Kotelawala Defence University	Lecturer

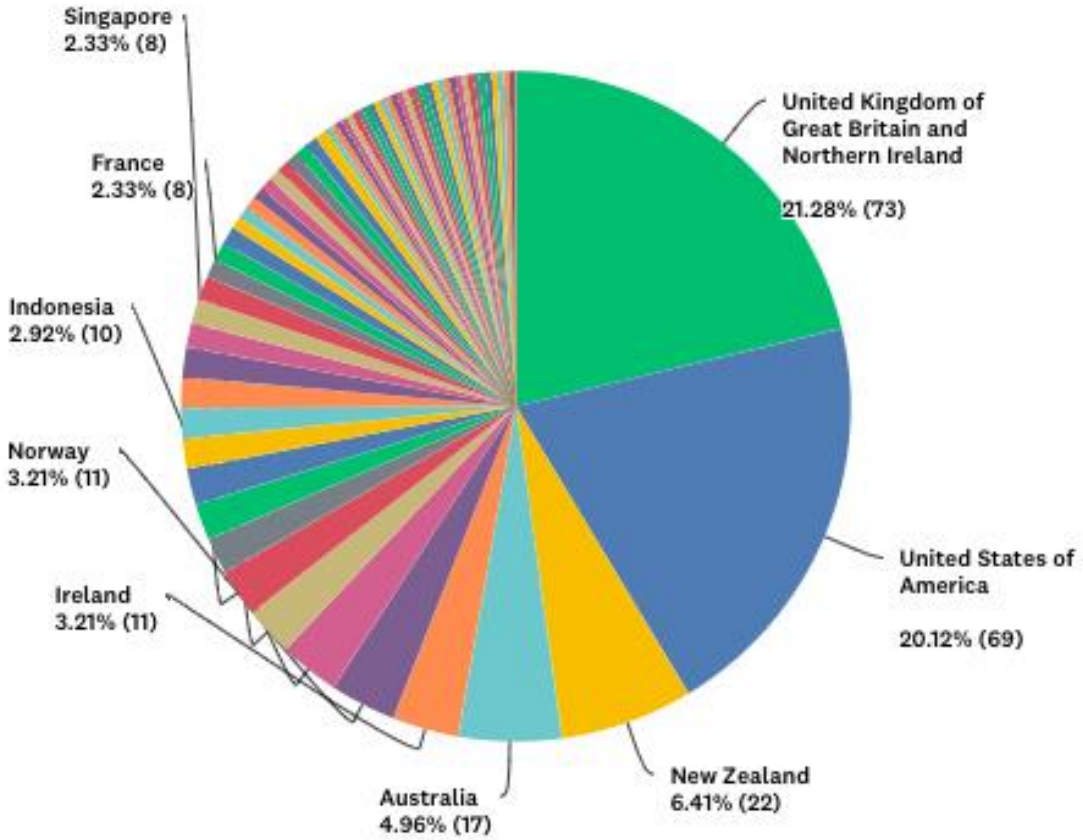
Rafael Catany	ARGANS	Project Manager
Rafael Ponce	Esri Inc.	Global Maritime Sr. Consultant
Randy Gillespie	Windover Group	Senior Consultant
Rebecca Kavanagh	Orkney Islands Council	Marine Environmental Planner
Renyou	UK Hydrographic Office	Product Support Engineer
Renzo Omar Menacho Garcia	Directorate of Hydrography of Perú - Polar Vessel Carrasco	Officer
Ricardo Molares	Ocean and Maritime Consultor	Maritime and ocean science consultor
Richard Mills	Kongsberg Maritime AS	Vice President Marine Robotics Sales
Riki Mules	MPI	Senior GIS Analyst
Rita Oliveira	Shift Thinkers	Partner CEO
Rita Sá	Associação Natureza Portugal - WWF Portugal	Head of the Oceans and Fisheries Programme
Robert Croft	UK Hydrographic Office	Defence Development and Standards
Robert Ferris	Feritech Global Ltd	CEO
Robert Lindley	Foodworks Co Ltd	Senior Partner Fisheries
Rochelle Wigley	UNH	Project Director Nippon Foundation / GEBCO projects
Roger Birchall	Mr	Senior Geophysicist
Ruel Concepcion	Consultant	Consultant
Sally Cox	Discovery Marine Limted	Director
Sally Stewart-Moore	Centre for Environmental Data and Recording	Marine Data Officer
Sally Watson	NIWA	Marine Geophysicist
Sally Wattam	Mercator Media Ltd	Consultant
Sam Strutton	MarineSpace Ltd	Marine Consultant
Samantha Andrews	Memorial University	PhD Researcher
Samir BACHOUCHE	National Research Center and Development of Fisheries and Aquaculture (CNRDPA)	Researcher and director of aquatic ecosystem research division

Samuel	Mombasa County government	Environmentalist
Samuel Deleu	Flemish Hydrography	Team & Project Manager
Samuel Mitchell	Machinists Union Local 1998	Past President & Trustee
Sandie Wilson	Portland Port UK	Environment and Planning Manager
Santiago Urdaneta	Geomares	CEO
Sarah	Applied Ocean Sciences	Technologist
Sarah L Smith	Rutgers University	Postdoctoral Research Associate
Sarah Tubbs	Marine Conservation Cambodia	Head of Marine Mammal Science
Satish Ramachandran	AROBOT	Co Founder
Saxon Jones	Modus Ltd	AUV Supervisor
Schmitt Thierry	SHOM	Adjunct head of the Bathymetry department
Seeboruth Sattiabaruth	GEBCO ALUMNI	Hydrographic Surveyor
Shane Geange	Department of Conservation	Science Advisor
Sigit Heru Prasetya	PT Hatfield Indonesia	Marine and Fisheries Specialist
Simon Ironside	FIG Commission 4 Hydrography	Chair FIG WG 4.3 Mapping the Plastic
Simon Pittman	Seascape Analytics Ltd	Director
Sioeli Tonga	Pacific Community (SPC)	Lead Solution Architect
Siviwe Mabija	Advisian	Senior Marine Engineer
Stephen Middleton	Retired	Geoscientist
Stiofan Creaven	Freelance Environmental Scientist	Environmental Scientist
Stu Wainwright	Captain Chaos Marine Services	Owner
Stuart Edwards	CSIRO - Marine National Facility	Geophysical Survey & Mapping - Team Leader
Sunjay	Geophysicist, IGCP UNESCO PROJECTS	Geophysicist

Susan Israel	Climate Creatives	Founder & President
Sylvia	Free lance	Technical Advisor
Taina Wilson	MPI	Senior Policy Advisor
Tapani Vuori	Maui Ocean Center	General Manager
TheOceanEconomy	TheOceanEconomy	Admin
Thomas Roure	ECA GROUP	Business Manager
Thorleifur Agustsson	Rorum ehf.	Research Director
Tim Litvin	Optonautics Inc	Founder
Tomer Ketter	UNH/CCOM/Seabed 2030	Data Analyst
Tonny	Kongsberg Maritime	Sales Director
Toufik alansar	Ifish project -Fao indonesia	Policy expert
Toundji Olivier Amoussou	Nazi Boni University	Associate Scientist
Trevor Alcorn	Geological Survey Ireland	GIS Specialist
Tyson Brooks		
Vaipo MATAORA	Infrastructure Cook Islands	Director National Hydrographic & Geoscience
Valerie de Liedekerke	WWF	Baltic Ecoregion Programme Manager
Vasudev Mahale	CSIR-National Institute of Oceanography, Goa, INDIA	Scientist
Vegard Aksnes	SINTEF Ocean	Research Manager
Vincent Lecours	University of Florida	Assistant Professor
Walter R Roest	Ifremer	senior scientist
Wyssam Bashawri	Blue Economy KSA	FOUNDER
Yi Lin	UKHO	Sales Support
Yiannis Konnaris	Interfusion Services Ltd	Project Manager
Yosup Park	KIOST	Senior Research Specialist
Yulia Zarayskaya	Geological Institute of Russian Academy of Science	researcher
Zdenka Willis	Veraison Consulting LLC	Chief Executive Officer

	NLWKN - Forschungsstelle Küste	Research Assistant

Q5: In which country do you mainly work?



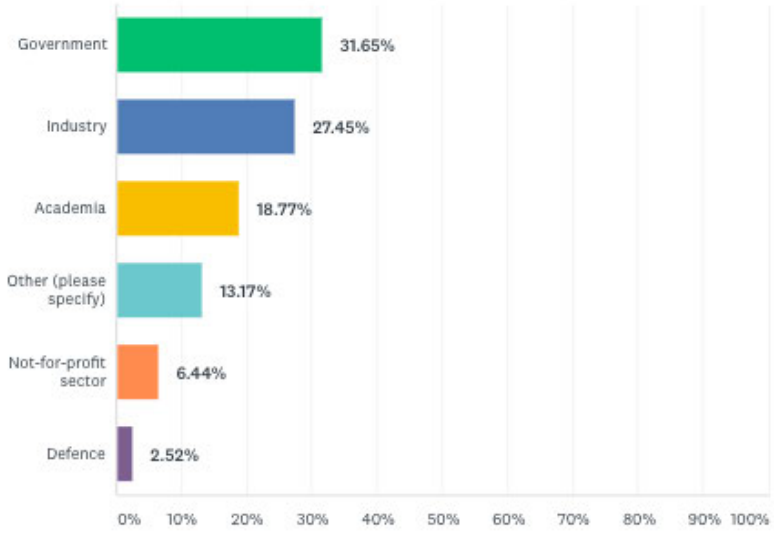
Country	Responses	%
United Kingdom of Great Britain and Northern Ireland	73	21.28%
United States of America	69	20.12%
New Zealand	22	6.41%
Australia	17	4.96%
Ireland	11	3.21%
Norway	11	3.21%
Indonesia	10	2.92%
France	8	2.33%
Singapore	8	2.33%
Germany	6	1.75%

India	6	1.75%
Italy	6	1.75%
Canada	5	1.46%
Kenya	5	1.46%
Portugal	5	1.46%
Spain	5	1.46%
Brazil	4	1.17%
Nigeria	4	1.17%
Tunisia	4	1.17%
Colombia	3	0.87%
Malaysia	3	0.87%
Sweden	3	0.87%
Belgium	2	0.58%
Denmark	2	0.58%
Ecuador	2	0.58%
Fiji	2	0.58%
Greece	2	0.58%
Peru	2	0.58%
Republic of Korea	2	0.58%
Russian Federation	2	0.58%
Seychelles	2	0.58%
South Africa	2	0.58%
United Arab Emirates	2	0.58%
Algeria	1	0.29%
Argentina	1	0.29%
Bangladesh	1	0.29%
Benin	1	0.29%
Cambodia	1	0.29%
Chile	1	0.29%
Côte D'Ivoire	1	0.29%
Cyprus	1	0.29%

Egypt	1	0.29%
Ethiopia	1	0.29%
Finland	1	0.29%
Guatemala	1	0.29%
Iceland	1	0.29%
Israel	1	0.29%
Kiribati	1	0.29%
Kuwait	1	0.29%
Kyrgyzstan	1	0.29%
Liberia	1	0.29%
Malta	1	0.29%
Mauritius	1	0.29%
Monaco	1	0.29%
Morocco	1	0.29%
Mozambique	1	0.29%
Netherlands	1	0.29%
Philippines	1	0.29%
Saudi Arabia	1	0.29%
Senegal	1	0.29%
Somalia	1	0.29%
Sri Lanka	1	0.29%
Sudan	1	0.29%
Switzerland	1	0.29%
Thailand	1	0.29%
Turkey	1	0.29%

Q6 What sector do you represent or work in?

Answered: 357 Skipped: 9



ANSWER CHOICES		RESPONSES	
Government		31.65%	113
Industry		27.45%	98
Academia		18.77%	67
Other (please specify)	Responses	13.17%	47
Not-for-profit sector		6.44%	23
Defence		2.52%	9
TOTAL			357

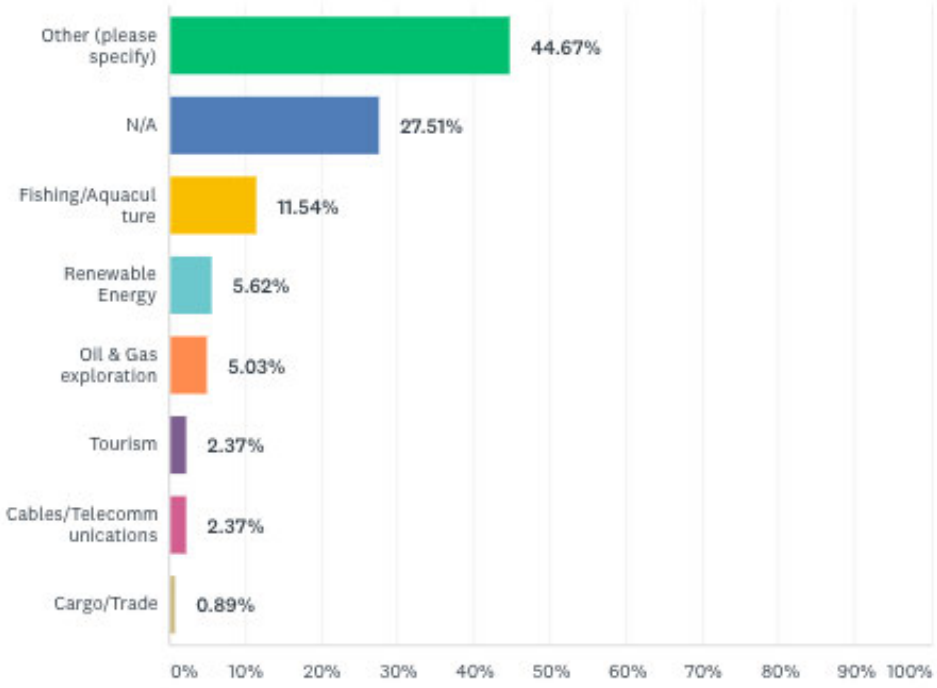
<u>'Other':</u>

- All of the above
- All the above
- Applied research for environmental decision science
- Consultant
- Consulting and Growth of Blue Economy in Morocco and West Coast Africa
- Consulting Firm
- Crown Research Institute
- Currently unemployed
- Development
- Enviro
- Environmental Consultancy
- Environmental Consultancy-Self Employed
- Environmental Consulting
- Government Company
- Hospitality
- Hydrography

- I am an independent consultant currently working for Multilateral Development Banks
- IGCP UNESCO PROJECTS
- IGO
- Independent
- Independent consultant
- Industry and Government (projects)
- Industry and Statutory Harbour Authority
- Inter-Governmental
- International development
- Korean aid project to provide OTEC power.
- Marine Consultancy
- Maritime Solutions
- Marketing Branding
- Non-departmental Public Body
- Nonprofit, philanthropy, Tribal and NGO
- Offshore seismic, polar, shipping & ports
- Old Mariner
- Philanthropy
- Private sector
- Private sector
- Private sector cooperates with the governmental Authorities
- Public research institute
- Recreational Boaters
- Research
- Research and development
- Retired from Industry
- Sports/recreation and industry
- Trust Port ie: Commercial Operating with Statutory Responsibilities
- UN
- Venture capital

Q7 If you are within the maritime industry, which specific area/sector do you represent?

Answered: 338 Skipped: 28



‘Other’:

- All based on ocean science
- All of the above
- All the above
- Archaeology
- Autonomous vehicles
- Blue Economy
- Charting
- Charting and hydrography
- Coastal management
- Coastal Management
- Coastal Management
- Commercial Marine
- Commercial Port and Statutory Harbour Authority
- Conservation
- Conservation and restoration ecology. Academic research
- Construction
- Consultancy
- Consultancy - all of the above sectors are clients
- Consulting
- Consulting
- Coral reef ecosystem management
- Deep sea exploration and mining
- Defence

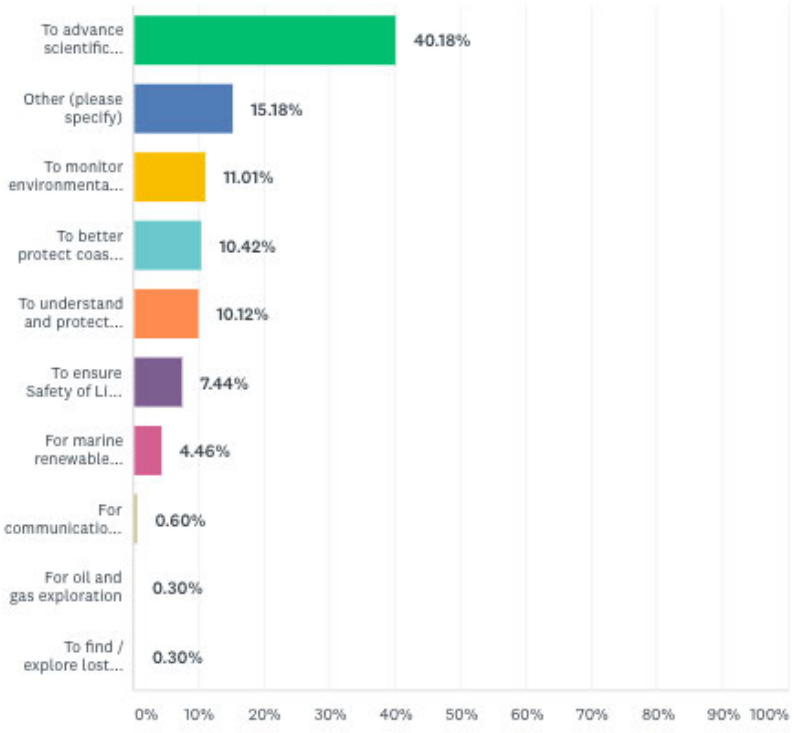
- Defence
- Drone services such as photogrammetry, lidar, inspections and bathymetry
- Environment and Space-based technologies
- Environmental Consultancy
- Environmental Consultancy, Ship Repair
- EO satellites & SDB charting
- Exploration and Conservation
- Federal Employee in the Department of Defense
- General exploration
- Geophysical / Geotechnical Survey
- GEOSPATIAL / HYDROGRAPHIC SURVEY
- Global ocean mapping for various industries
- Govt
- Helping ensure safe navigation
- Hydrographic and Antarctic Affairs
- Hydrographic and Cartographic
- Hydrographic and oceanography
- Hydrographic Office
- Hydrographic Office
- Hydrographic Survey
- Hydrographic Survey
- Hydrographic survey and seabed mapping
- Hydrographic Surveying
- Hydrographic Surveying
- Hydrographic surveys
- Hydrographic Surveys
- Hydrography
- Hydrography
- Hydrography
- Hydrography
- Hydrography
- Hydrography
- Hydrography and Navigation
- Hydrography/Hydrospatial
- Hydrography/nautical charting
- I have 45 years experience in the maritime sector, former Ship's Captain, Operations Manager in various Shipping Companies in cargo and passengers trade. Former Advisor to the Minister of the Equipment, Transport and Logistic of Morocco. Last November 2019 I was the International Coordinator to gather 20 African Countries to attend a Blue Economy Forum in Morocco. Actually I work in implementing recommendations of this Forum to encourage the development of the Blue Economy.
- I represent hydrographic and spatial professionals working in the rivers, estuarine and coastal areas and also those working on the seas and oceans. Our organisation is focussed on raising professional standards and contributing to the elimination of plastic waste from river systems/waterways before they reach the oceans
- Infrastructure
- Interested party

- Manufacturer
- Manufacturer of multibeam echosounders
- Mapping
- Mapping
- Marine Debris
- Marine ecology
- Marine Environmental Management/Monitoring/Protection
- Marine Fisheries Related Industries
- Marine Geology
- Marine Georesources
- Marine geospatial
- Marine Management Organisation
- Marine Planning, Environmental Policy
- Marine Remote Sensing/Earth Observation Research
- Marine Robotics
- Marine RTDI
- Marine Science
- Marine Science
- Marine Science & Research
- Marine Science Technology & Aquaculture
- Marine Survey
- Marine survey and charting
- Maritime Administration and Safety
- Maritime Authority
- Maritime Cartography
- Maritime data broadly
- Maritime management and operation, environmental and sustainable development and engineering
- Mining
- Multiple
- National Mapping Agency
- Nautical Charting
- Nautical charting
- Nautical data management, navigation
- Navigation
- Navigation
- Navigation
- Navigation and compliance
- Navigation and Maritime Commerce
- Navigation Product and Service
- Nonprofit & NGO, philanthropy mainly
- Not oil and gas. I thought we're supposed to be decarbonising?
- Ocean acoustics
- Ocean Mapping
- Ocean mapping
- Ocean Mapping IBCM GEBCO 1980ff

- Ocean Observing and Science
- Ocean tech and robotics
- Oceanographic Research
- Oil/gas/renewables/cables surveys (species and habitats)
- Port
- Port Authority responsible for Port of London and 96 miles of Tidal Thames
- Production line of nautical charts
- Production of nautical charts
- Regulation
- Regulator - all Maritime sectors.
- Research
- Research
- Research
- research
- Research for supporting maritime activities management (i.e. fishing and aquaculture, renewable energy and environmental monitoring)
- Research/Government
- Resource management
- Safety of Navigation, Hydrography, Ports, Marine Spatial Planning
- Scientific consultancy
- Scientific Market (Governmental, institutions)
- Scientific research
- Scientific research (fisheries)
- Scientific research / conservation
- Seabed Mapping
- Seabed minerals
- Ship design
- Software & electronics
- Software services to the above industries
- SOLAS
- Sports/recreation
- Subsea technology
- Surf zone mapping
- Survey (commercial offshore energy, Scientific, academia & defence)
- Survey / Inspection of Windfarms, Cables/Telecomms, O&G
- Survey and charting
- Survey and monitoring
- Survey, charting and geospatial software solutions
- Technology
- Tracking and data optimisation
- Ultra deep mining
- USV
- USV building
- We monitor all Maritime sectors
- Work in oil, renewables, cables and conservation

Q8 What do you consider the main benefit of mapping the world's oceans to be?

Answered: 336 Skipped: 30



ANSWER CHOICES		RESPONSES	
To advance scientific understanding of seabed characteristics		40.18%	135
Other (please specify)	Responses	15.18%	51
To monitor environmental changes over time		11.01%	37
To better protect coastal habitats		10.42%	35
To understand and protect national economic interests		10.12%	34
To ensure Safety of Life at Sea		7.44%	25
For marine renewable purposes		4.46%	15
For communication cable purposes		0.60%	2
For oil and gas exploration		0.30%	1
To find / explore lost man-made assets		0.30%	1
TOTAL			336

<u>'Other':</u>

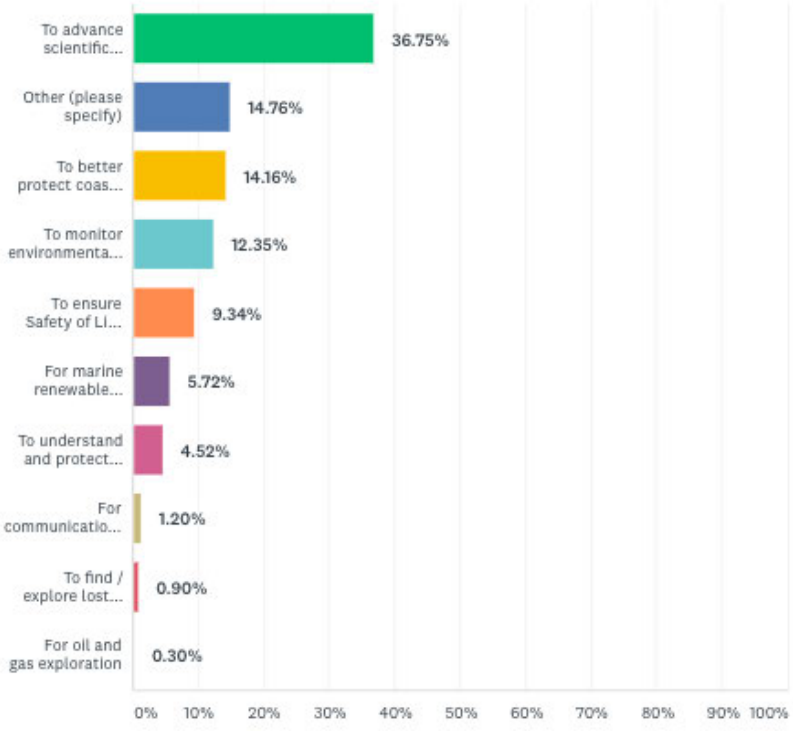
- All of the above
- All of the above
- All of the above
- All of the above
- All of the above except oil & gas exploration
- All of the above plus the understanding and global stewardship of the maritime environment from sub-seabed to LEO
- All of the following are major benefits to reasons why we need to

- All of them, To better understand the Global Earth System
- All the above
- All the above might be applied. Coastal mapping is crucial to better understand and sustainably exploit the ocean resources.
- Blue world economy
- Conservation planning (stewardship), especially for the deep ocean
- For establishing the foundation or reference frame to all other ocean's datasets, to understand our blue planet better.
- For most of the points indicated above
- For regulating climate as oceans covers 70 percent of mother earth's surface where it transports heat from the equator to the poles, regulating our climate and weather patterns. Transportation and cargo/trade. Recreational activities and facilities. The air we breathe: The ocean produces over half of the world's oxygen and absorbs 50 times more carbon dioxide than our atmosphere. Medicine: Many medicinal products come from the ocean, including ingredients that help fight cancer, athritis, Alzheimer's disease, and heart disease. Food: The ocean provides more than just seafood; ingredients from the sea are found in surprising foods such as peanut butter and soymilk.
- Global shared-resource security
- How is oil and gas exploration to the benefit of the world's oceans? why is their data secret and yours for free?
- In my opinion seafloor mapping has diverse benefits and it is difficult to constrain it just to one. I think that the main one is the produciton of knowledge that can be used for many purposes, but I think that it the main one is to get knowledge for an informed management of maritime activities, including conservation
- In my opinion, it is a mixture of "to advance scientific understanding of seabed characteristics" and "to better protect coastal habitats" as the protection can benefit from the scientific understanding (and maybe vice versa)
- It is a combination of all of the above as the data has many purposes
- It is impossible to suggest a "main" benefit as so many are mutually inclusive. Climate Change and the consequences to the coastal domain, habitats, industry, infrastructure and the very existence of human settlement requires detailed data to underpin models and provide knowledge, insight and mitigation.
- It would only be beneficial for certain of the above e.g for renewable marine resources of it does not use seismic sounding which is very detrimental to ALL marine life. And in effect to the environment at large - as a consequence of damaging ALL marine life
- Management and protection of the oceans and coastal environments.
- Ocean science (modelling)
- Overall to enable the safe, sustainable and efficient extraction of resources from the ocean and coastal areas, be they energy, mineral or food.
- Several of the points above; scientific understanding of seabed habitats and the water column above is required to monitor environmental change over time, and to enable all other applications mentioned above
- Sustainable development
- The main benefit of mapping the world's oceans is to ensure safe and sustainable development of each of the industry sectors (i.e. economic interests, navigation, coastal habitat, etc)
- The ocean bathymetric data has been widely used in running Models related to Atmospheric (Wind) and Ocean (Currents and Eddies) circulation. Thus mapping the world's ocean will improve the prediction capabilities of such models.

- There are several within this list that I consider equally important. Understanding/protecting a national economic interest, advancing scientific understanding, ensuring safety of life at sea
- There is no single "most Important' reason, but instead numerous complimentary reasons. This is important as this approach will ensure collaboration. Of high importance to Governments is national sovereignty, security, sustainability and future economies. Science plays into all areas.
- There is not one main benefit, but several of the above. Marine renewable purposes, advance scientific of the seabed characteristics and to monitor environmental changes over time. There are many more reasons to chart the worlds oceans as there is so little that we know about our oceans and the sea floor.
- This is not a single issue value proposition. There are multiple great reasons to map the oceans.
- To better manage the oceans so that all of the above benefits may occur in an way that provides the best benefits to society.
- To better protect coastal habitats and physically portray how this is important economically to those who do not prioritise the marine environment
- To better understand natural marine processes (science) AND improve protection of natural benthic habitats and of the entire ocean (EEZ+ECS+The Area, i.e. not only national interest)
- To exploit nature in order to feed the population
- To further understand the offshore environment, confirming current models, and to be able to use as a baseline for future monitoring, exploration etc.
- To identify new opportunities and resources.
- To improve sustainable management of human activities in the entire ocean.
- To meet the Sustainable Development Goals
- To obtain a complete picture of the seabed to enable future international and national decisions on the ocean to be based on a comprehensive dataset and a full understand of the ocean environment.
- To protect habitats (coastal and deepwater), to monitor environmental changes, to advance scientific understanding, for renewables and communications.
- To provide a coherent framework, and starting point, to underpin most of the ideas and items mentioned above, and if pressed the main one: to understand and protect wider humanity's interest in the marine environment to promote safer, green, economic growth in the blue economy.....
- To provide the fundamental data needed to unlock the full spectrum of what is on our planet.
- To support sustainable development and management of the global marine resource
- To sustain the natural world for the benefit of people and nature
- To understand/model coastal processes and hazards
- Understand the seabed for sustainable economic development and protection of ocean and coastal habitats
- We use data, in all its forms, to support understanding of the earth, regardless of the user intent for the information.

Q9 Why are you particularly interested in mapping the ocean floor?

Answered: 332 Skipped: 34



ANSWER CHOICES		RESPONSES	
To advance scientific understanding of seabed characteristics		36.75%	122
Other (please specify)	Responses	14.76%	49
To better protect coastal habitats		14.16%	47
To monitor environmental changes over time		12.35%	41
To ensure Safety of Life at Sea		9.34%	31
For marine renewable purposes		5.72%	19
To understand and protect national economic interests		4.52%	15
For communication cable purposes		1.20%	4
To find / explore lost man-made assets		0.90%	3
For oil and gas exploration		0.30%	1
TOTAL			332

<u>'Other':</u>

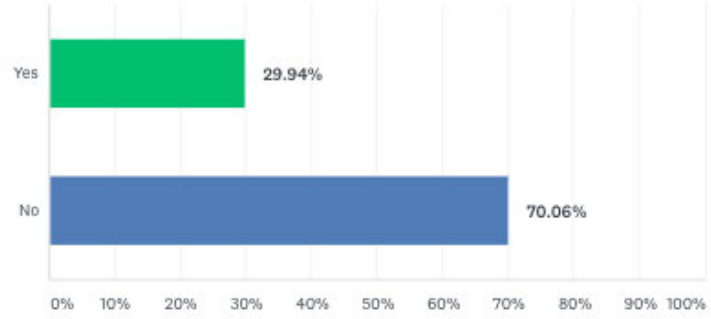
- Acoustics is the only way to derive 3D maps of marine habitats rapidly over large areas. The importance is captured in several points above; scientific understanding of seabed habitats and the water column above it is required to monitor environmental change over time, and to enable all other applications mentioned above
- Again my interest spans several of these groups
- All of the above
- All of them, plus in my case, my personal motivation: being part of the effort to chart the last bit of undiscovered areas on our world
- All the above

- As above
- As states above in Q.8.
- Because I believe in the GEBCO Project ideals.
- Better decision making for many of the above
- Better understand the deep sea
- Combination of choices: understanding the role of seabed characteristics in oceanographic drivers of coastal habitat and ecosystem health
- Conservation planning
- For identify the features under sea
- For sustainable development of the world's ocean
- General good of mankind and the global environment we all share
- Greater understanding will lead to sustainable use cases and littoral preservation.
- I am a surveyor and geospatial specialist so support client desires. However, for myself I am interested in protection of the environment, sustainability and future economy.
- I believe it is necessary to ensure we fully understand the oceans (not just the sea floor but all aspects of the ocean) in order to develop our interests (oil and gas, fisheries, tourism, construction, etc) in a safe and sustainable and responsible way.
- Identification of suitable areas for the promotion of new activities in a certain region (e.g. renewable energy, aquaculture) For management of existing activities (mainly fisheries; both, artisanal and industrial fisheries). For protecting and conservation of benthic habitats
- It's my passion and career
- Management and protection of ocean and coastal environments
- Mapping the seafloor helps us to work out things like where different types of fish live, where we might find resources, such as rare metals and fossil fuels, and whether there is a risk of underwater landslides happening that might cause a tsunami. Maps of the seafloor are also useful tools for answering a wide range of other scientific questions, such as finding out where certain types of fish like to live, how new volcanoes can form at the bottom of the ocean, and where we might find natural resources, such as oil and gas.
- Mixture of oil and gas, renewable energy and telecom and power cables
- Most of the above
- Ocean modelling
- Prediction of occurrence of fishery resources
- Public data set will create transparency that will allow us as a local & global community to set coordinated and cohesive ocean policy so that the last remaining fairly intact frontier will benefit future generations before it is too late.
- Recreational fishing
- See previous answer
- Some of above: understand and protect economic interests (not necessarily national); understand coastal habitats; understand the scope (i.e not detailed mapping) of marine renewables (and O&G); to perhaps setup better framework for environmental changes over time.
- Support the broadest understanding of the seafloor to support all maritime endeavors. Maximizing the value of effort collecting data, creating products and services is our key goal.
- The future depends on the seas and oceans (economically, scientifically....)
- To advance scientific understanding of seabed characteristics; To monitor environmental changes over time; To better protect coastal habitats
- To better protect coastal habitats and physically portray how this is important economically to those who do not prioritise the marine environment

- To better understand ocean acidification and climate change which are driven by releasing CO2 into the atmosphere from burning the oil and gas.
- To build on that scientific understanding to better understand the the tactical ocean environment for operational advantage
- To ensure Safety of Life at Sea and support Integrated Coastal Zone Management
- To ensure the effective ecosystem-based climate change adaptation and mitigation at national to global scales
- To explore what is yet to be discovered in the depths of our ocean.
- To find out for the first time ever, what our planet really looks like
- To identify habitats and species worth protecting, to identify what is sensitive and what is changing over time (physical, chemical and biological processes).
- To identify new opportunities and resources.
- To make this data the foundation of a "Hydrospatial Information System".
- To monitor marine pollution, particularly waste
- To support sustainable development and management of the global marine resource
- To sustain the natural world for the benefit of people and nature
- To understand/model coastal processes and hazards
- Use of data in cartographic products
- Would have clicked to better protect coastal habitats, but it is also about better protecting deep sea habitats.

Q10 Have you ever estimated the environmental, social and economic value of mapping the seabed of greatest interest to you?

Answered: 334 Skipped: 32



ANSWER CHOICES	RESPONSES	
Yes	29.94%	100
No	70.06%	234
TOTAL		334

Comments (91)

‘Comments’:

- "Estimated", as in assessed the value of a healthy ocean for human well-being.
- A Risk-based Methodology of Assessing the Adequacy of Charting Products in the Arctic Region: Identifying the Survey Priorities of the Future https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=2e0f077b8a0147149c8229c9204332d7 An analysis of % mapped of the U.S. EEZ https://www.tandfonline.com/doi/abs/10.1080/01490419.2019.1705449
- Absolutely. For example in Senegal the coastal erosion causes a lot of damage every year. And situation goes worst and worst. We are pretty sure that the solution won't come from the government only. It has to be inclusive so that the populations themselves would get involved.
- ABYSSA is a private company devoted to explore the deep sea and consequently protect marine habitat to ensure sustainable development resources
- Accurate seabed mapping will allow identification of areas that will be of primary biological interest and most in need of protection.
- Always interested everything about the oceans.
- As a national mapping office (for geology) the relevance of this activity is obvious as well as statutory.
- As a Portuguese citizen, mapping the seabed is strategic for a country as Portugal. It can increase our role in the economy issues, as environmental and social opportunity. Big territory will be important for us.
- As I said before, the future of new generations will rely on knowing our seafloor (from monitoring environmental changes to all things we will discover in our oceans.
- As I work in the field it is of importance to me and future possibilities.
- As the marine ecology and fisheries background in professional environmental consulting firm, there are limited information's for updated seabed condition in several area, especially in my country, Indonesia. As we know, fisheries activities are having a high influence from sea parameters, such as up-welling & down-welling process for offshore large pelagic fish (tuna,

mackerel, etc). This process is depending on bathymetry and seabed condition in certain area/region.

- Baseline maps of the seabed around Scotland would help us to better spatially plan the use of our seas by giving a more detailed understanding of the biotopes present thus allowing a clearer determination of potential impacts of developments in different areas.
- Better access to date, more coherent analysis potential and more scope for holistic approach to planning
- Better choice of submarine cable routes with benefit on cable raw material use and durability. Possibility to associate climate/seismic sensors to submarine cable systems with better seabed cartography.
- Better costal engineering related open data for better planning - capability of deriving dense bathymetry through satellite imagery (SDB) - developing the feeling that the sea is the responsibility of the whole world
- But we have estimated the benefit of vast ocean farming leases which will need seabed mapping to inform locations
- Cefas (as part of the MEDIN) are working alongside the OECD and GOOS to run a cross organisational study. See link via:https://www.cefas.co.uk/data-and-publications/cefas-data-hub-feedback/
- Coastal sea-bed mapping for interannual to ensure portuary safety and maintain tourism assets around the coast.
- Coral reef fisheries
- Due to work on oil and gas projects
- Environmental assets = an inventory of seafloor geomorphic features (habitats) that have biodiversity and conservation value; Social assets = scientific knowledge of the origin of oceans, plate tectonics and hence geohazards (tsunami risk, etc.), data for search and rescue (eg Malaysian airline MH370) and ocean habitats; Economic assets = fisheries, ship safety (submarine navigation) and better data to assess possible seafloor mining.
- Estimated the contribution of seabed data in basin-scale marine species-distribution models.
- For a better understanding of seabed characteristics and monitoring environmental changes.
- Former member of Atlantic Seabed Mapping International Working Group
- Have spent many hours mapping the seabed as the initial stage in mapping biodiversity. Started with single beam, now use multi-beam. Consistent and calibrated backscatter data remains a major issue for all systems and one that is easily resolved for single beam systems
- Hi-res map give us sound understand for earth system
- I am now retired. When working I was originally at a University conducting ocean surveys to understand tectonic evolution of the ocean basins. I then started a company that specialized in surveys to plan and oversee mapping for installation of submarine cables and pipelines. We developed an ongoing system to help design and monitor cable systems .
- I consider mapping the seabed directly impacting "Blue Economy" activities: in other words, sustainable development according to the UN Sustainable Development Goals. And although the majority of these activities happen in coastal waters and shipping lanes, the impacts of knowing what's at the bottom and how difficult would be to get there, has an impact on everything that happens on the surface and in the water column. That's difficult to quantify accurately but based on some studies, globally the Blue Economy has an asset base of $24 trillion worldwide, from which around $2.5 trillion a year is generated by fishing, aquaculture, shipping and tourism; if we also think of deep sea mining, submarine cabling, etc. the benefits of knowing what's down there way surpass the costs and efforts of surveying it.
- I have been involved in mapping the seabed of the Indian EEZ region for above benefits. In addition to this I am partially involved in EIA studies for the mining of PMN site in Indian Ocean region hence understand the economic value of seabed mapping.

- I have drafted a number of papers and submissions to GEBCO meetings and I have been involved in the Seabed 2030 project from its conception.
- I have in particular reviewed the value of mapping the polar regions for better understanding of the changing cryosphere in a warming climate. For example, the impact from influx of warmer water towards outlet glaciers is key to understand in order to assess future sea-level rise, and the bathymetry is key to know where the warmer water can reach marine glaciers.
- I have studied it and worked on projects that contributed to such aims
- I think is a must for environmental issues and for better understanding of the oceans to map the whole sea floor. As a part of the industry I consider very important to reach this knowledge for the implementation of appropriate regulations worldwide.
- I use self-collected seafloor & watercolumn data (hydroacoustic, sedimentological, hydro-/morphodynamic) to set up different predictive models within the framework of a sustainable ecological management of sediments.
- I was UK National Hydrographer and then CEO of UKHO and the interested in all marine data sets in national and international waters
- I've been 100% involved in this since June 1962. Perhaps the oldest active member of GEBCO, was Vice Chairman of IBCM, the only IBC that completed six complete datasets; Bathymetry, Plio-Quaternary Sediments, Magnetics, Gravity, Seismicity, and Bottom Sediments. Am actively involved in Seabed 2030 since before the founding meeting. Have two students who attended the UNH-CCOM program, and involved in Shell Ocean X-Prize.
- I've been involved with a number of projects looking at the seabed for various reasons and then looking at how little is known about the areas in question. No reasonable case for extractive activities can be made given how little we really know at this point. It's not keeping us from extracting but it is causing damage to the environment that we have yet to assess or understand
- If I understand the question, I have often feared for the damage being done to the seabed, and the opportunities of using deep ocean topography for things like farming.
- If you mean "quantified" the value, in terms of money, or other metrics, then "no," but I think there is GREAT value in mapping the seabed, for many of the reasons listed in the prior two questions.
- In my opinion, seabed mapping is very important for the safety of navigation and economic development of a country. The presence of a good sea map can actually minimize the occurrence of sea accidents while improving the economic condition of a country. Bathymetry data is very important to be used for access to ports, goods distribution channels, protection of the marine environment, mitigation of natural disasters, defense, climate prediction and for the sustainability of human life in a future that will come as a natural resource.
- Inestimable in a monetarist sense. This question goes to the heart of a multiplicity of knowledge systems and values. The question can be essentially reframed to: what is the cost of not doing this?
- It enabled me to monitor impact of pollution on the ocean and it's resources
- It will give you more information about the earth
- It’s the topic of our company
- It’s very important to have background how seabed affects in the maritime and marine renewable resources, sea level rise, climate change and coral reef bleaching. Although, face big problems in coastal cities and the deep ocean sea floor.
- Limited involvement in seagrass mapping and blue carbon valuation in Small Island Developing States
- Mapping Seabed bring more environmental and economic value than the social value... as the mapping oceans definitely brings huge safe heaven for the marine and energy based industries also importantly the environmental preservation of oceans for the future sustainability is very

important Keeping the same oceans what been left for the current generation need to be social responsible for the future generations to understand more about the oceans

- Mapping the sea bed will enable us to know what lies beneath the sea bed in the form of natural resources which can be of economic benefit to our country.
- My work for the past 20 years has been involved with mapping the seabed for commercial purposes - i can see clearly the benefits of coherent, consistent and complete seabed mapping to both national and industry economic interests as well as the tangible improvements to our environmental understanding, and the subsequent impact on social benefits (certainty of power supply etc)
- No but we have benefitted from having detailed seabed data
- No details can be provided
- Not in detail, but broadly in regards to my MPA research
- Not officially estimated but note that approx 95 percent of world trade is carried by sea, approx 98 per cent of all telecommunications by undersea cables and the majority of the world population lives within 10km of sea.
- Not sure what this question means
- On a great variety of subjects, starting with Government maritime charting responsibilities and extended to the almost complete range of practical applications.
- On behalf of the Life Bahar for Natura 2000 project, I joined GEOMARA in order to carry out surveys in 5 zones covering 130,000 hectares in Malta. I worked on Multibeam Echo Sounder and CARIS to create a seafloor mapping for the characterization of marine protected areas.
- Only a small fraction of the deep seabed has been explored, leaving our scientific understanding of most of the ocean's benthic ecosystems largely in the dark. Nevertheless human activities impact these ecosystems in the absence of good science. The more we know, the better we can protect and know what to protect in the deep ocean.
- Our project involves early warning systems of HABs for Aquaculture, understanding the bathymetry of coastal waters around Ireland and Wales allows us to better understand the role of ocean physics in HABs.
- PERU HAS PARTICIPATED IN PROYECTO GEF-PNUD HACIA UN MANEJO CON ENFOQUE ECOSISTÉMICO DEL GRAN ECOSISTEMA MARINO DE LA CORRIENTE DE HUMBOLDT Informe Final Valoración Económica Total (VET) de los bienes y servicios ecosistémicos del Gran Ecosistema Marino de la Corriente de Humboldt (GEMCH). 2015
- Prediction tuna resources
- Previously worked for Government and estimated seabed values for conservation, marine planning, and sectoral planning.
- Report generated in support of INFOMAR programme for Ireland
- Seabed engineering route and infrastructure location
- Simply because the ocean's give life to us. Without it earth would die. Economic consequences should be a secondary consideration
- Submarine dynamic, natural hazards, submarine resources
- The answer to this question would cover all the points indicated in the question number 9.
- The aspect of safe navigation and possibilities of sustainable exploitation
- The Blue Economy is an essential element of many nations in the world. Scientific understanding of the characteristics of the seabed in all parts of the ocean would enhance the sustainable way that we work, play, transit, develop and preserve the ocean environment.
- The Cook Islands seabed is rich in mineral resources (Magnese nodules) and probably the most abundant in the world and other minerals found in our seabed as previous marine reports have justify that. If the Cook Islands in future in a better position to mine such resources and careful considerations of the environment impacts and the implications cause by the mining activities.

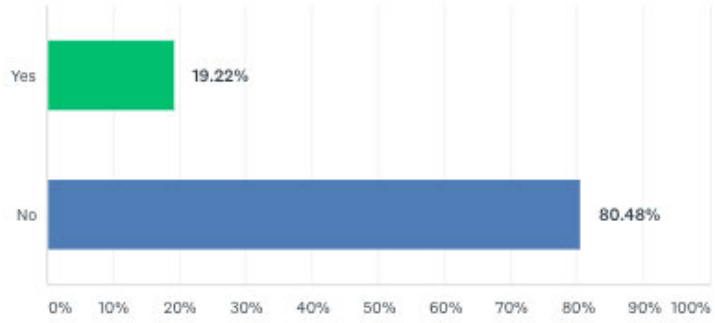
By mapping the entire seabed will give us confidence in making decisive decisions on mining activities and protect areas of interest.

- The GDP of the countries with connection to open seas are much higher than other countries with no coast. For example once a subsea cable is connected a country to another part of the globe an incredible increase in GDP and economy of the country is observed.
- The mapping of the seabed is necessary for safe of the navigation, installing cables, exploration of resources, knowledges of the relief of the bottom
- The question isn't very clear, but I think you are asking if I think the environmental, social, and economic value of mapping the seabed is important? If that's the question, then it is of importance. All our ocean activities, including the estimates on the blue economy and related jobs are based on very very limited data and understanding of what is out there. If we have a high resolution map, we'll know what is of ecological importance and imagine how much larger those numbers will be for society and for the future economy.
- The seabed is the best resource at this time, not yet widely used, the technology can be used to utilize the seabed resources for humanity, including conservation
- The States bordering the Baltic Sea have agreed upon a hydrographic survey plan within the Helsinki Commission (HELCOM). The main goal for the Helsinki Commission is to save the vulnerable waters of the Baltic Sea.
- The world economy is mostly ocean depending. Oceans control the climate and the human feeding.
- Thought about it and realised it's value - but very guilty of not promoting it's value loudly enough .....
- Through my master thesis
- To better protect what is in our oceans we must know what is there.
- To better understand what has to be done to adapt and mitigate the climate change, ocean acidification and degradation of a perfectly good planet caused by releasing CO2 into its atmosphere.
- To sustainable and equitable manage resources and livelihood of the people
- We are a marine survey company
- We contributed to the latest Marine Plan for N.I. which valued marine fisheries, aquaculture and tourism at >£1billion for Northern Ireland (not including renewables or other forms of offshore industry). See: https://www.daera-ni.gov.uk/sites/default/files/consultations/daera/Marine%20Plan%20for%20NI%20final%2016%2004%2018.PDF
- We do this at a high level as part of offshore wind assessments.
- WE have led the Mapping Ocean Wealth Program in Australia for the TNC. Whilst the work focused on seagrass, saltmarsh and mangroves we are now applying to coastal habitats derived from seabed mapping products
- We have reviewed studies of the multiplier/leverage factor in who benefits from every $1 spent on data acquisition. Shipping, coastal resilience, aquaculture, tourism, medicine
- We work on Ocean Risk tools so it goes with the territory
- While no $ numbers have been generated for NZ and the Pacific Islands, the environmental, social and cultural (don't forget cultural specially in the Pacific Ocean) benefits of seabed mapping have been demonstrated qualitatively in a number of scientific publications and reports.
- While planning surveys I have researched the economic benefit of save navigation into a harbor as well as the potential cost of a maritime accident. The cost is to the environment as well as the local economy.
- Work in Norwegian fjords (reefs). Work in the English Channel (reefs, again). Work in the Mediterranean (deep water habitats). Work in the Falklands (deep water habitats).

- Yes, a study from 2017 to estimate the potential of Blue Economy in Algéria including the seabed economic value

Q11 Are you aware of any third-party models for estimating the environmental, social and economic value of mapping the seabed?

Answered: 333 Skipped: 33



ANSWER CHOICES	RESPONSES	
Yes	19.22%	64
No	80.48%	268
TOTAL		333

Comments (62)

‘Comments’:

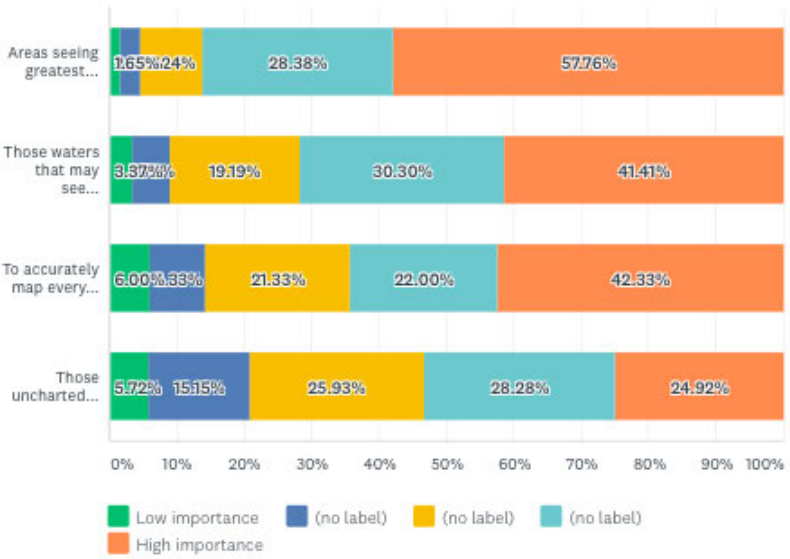
- At the moment few areas of the seabed (around 20%) has been mapped mainly for scientific and industry purposes. Even though the lack of resolution sattelite models has been developed so far in this way.
- Bathymorphological and metocean
- Better planning of littoral monitoring through machine learning,deep learning and AI OF TIME SERIES BATHY DATA IN THE COSTAL AREAS .
- By involving either other govt organisation or private sectors
- BY JOINT PROJECT WITH ANY OTHER GOVT ORGANISATION OR PRIVATE SECTORS
- By use modelling software and use secondary data
- Center for Coastal and Ocean Mapping Director Larry Mayer estimations
- Colombian Maritime authority
- Crowd-sourced bathymetry
- European Commission Blue Growth
- FISHEYE or something similar (don’t recall from the top of my head)
- GEBCO Seabed 2030, AusSeabed
- Gee, many marine pilots and harbor masters have acquired and shared these data.
- General awareness only
- I believe that benthic ecosystems and marine species are highly vulnerable. This issue highlights the need for the development of Blue innovative technologies which are ecological friendly and autonomous/semiautonomous, enabling a non-damaging/noisy mapping approach. This will definitely contribute to the environmental value of seafloor mapping and aligns well with the Blue Circular Economy approach.
- I think every country are doing it with the same model (UN)
- I think every estimation would be underestimated

- I think marine spatial planning is the best process for that
- I understand the UN has undertaken some work in this area but am not aware of specifics
- I would need to dig up details (typical consultant, I know....)
- I would start with the IHO basic Publication M-2
- I'm aware of various models that have been created and used by scientists, either in New Zealand or abroad.
- IHO, Gebco
- In house ORIG0
- Indigenous knowledge systems
- INFOMAR (Ireland) programme's value assessment
- Informar
- InVEST toolbox
- Ireland Pacific
- joint project with any other governmental organisation, or with any private company
- Marine institute in Ireland has done a number of social economic reports on this.
- MEDIN Cost Benefit Analysis, LINZ study on the marine environment. Various Blue Economy studies
- More experts, more reference studies for seabed exploration
- No but worth discussing with Dorset Coast Forum and Dorset Wildlife Trust in connection with past C-Scope project
- No details can be provided
- NOAA eNOW - https://www.coast.noaa.gov/enowexplorer/#/
- Not current since retirement 10 years ago.
- Not really
- Not strictly speaking, apart from specific scientific projects and investigations
- Not the seabed specifically and in isolation, but Marine Ecosystem Services Project and initiatives by ISA, etc.
- Ocean Accounting initiative by UNESCAP https://www.oceanaccounts.org
- PERUVIAN GOVERNMENT COMISION MULTISECTORIAL DE LA ACCION DEL ESTADO EN EL AMBITO MARITIMO - COMAEM EN LA ZONA ECONOMICA EXCLUSIVA Y LA ZONA MARINO COSTERA
- Really don't understand the question.
- See Oregon State Univ CEOAS efforts on Marine Resources & GIS
- Seen several studies but have not studied them in detail
- Senegal was one of the largest fish producers a few years ago. Our economy is mainly based on seafood. Unfortunately, the overexploitation of resources has ended up impoverishing artisanal fishing. In addition to the coastal erosion, many families have become poorer. This is why many young people are tempted by illegal immigration. So economic models based on the physiology and nature of the seabed have many examples like this one. And our commitment is to reverse this trend. We must re-establish our relationship with our environment and in particular with the sea. Then the seabed!
- Several but none of which I can remember now. Several regional seabed mapping initiatives for the UK marine aggregates industry.
- System of Environmental-Economic Accounting (SEEA)
- The Nigerian Institution of Oceanography and Marine Research has developed a model to periodically monitor the oceans to check hydrocarbon pollution and plastic pollution but I am not sure of model used.

- The oil and gas industry have many such models. These are hidden in the estimates of the amounts of Carbon in known and potential reserves of oil and gas, most of which are under the ocean floors. Integrating these values into existing models such as those run by the IPCC produces outputs that are alarming outputs to most people. Not apparently for the oil and gas machine.
- The Swedish Government Strategy for Blue Growth https://www.regeringen.se/regeringens-politik/maritim-strategi/ The EU Commission Strategy for Blue Growth https://ec.europa.eu/maritimeaffairs/content/blue-growth-%E2%80%93-shaping-next-five-years-together_en
- There are many softwares available in the market as well companies work on the environmental social and economic of the ocean mapping as measuring the oceans aren't easy task , companies such as Fugro, Ocean Infinity, Eiva, Caris all have dedicated IHO framework which are available to solve these challenges. We have spent years of time developing systems which can be deployed to map oceans and we recently won the United Nations Reboot The Oceans Challenges for Mapping Oceans
- Third party models - as in, proprietary models? Not that I can think of. Only Government funded models spring to mind.
- Unfortunately, mining companies in partnerships with academic institutions with limited regard on impact of mining
- Various NOAA reports and models
    - Via a WWF 2017 Report that estimated the Blue Economy worth
- We've primarily worked with ESRI on this
- Well, I have seen articles in journals, e.g. Danovaro, R., Aguzzi, J., Fanelli, E., Billett, D., Gjerde, K., Jamieson, A., Ramirez-Llodra, E., Smith, C.R., Snelgrove, P.V.R., Thomsen, L., Dover, C.L.V., 2017. An ecosystem-based deep-ocean strategy. Science 355, 452–454. https://doi.org/10.1126/science.aah7178
- Well, I've seen really rough estimates of the oil and gas reserves, and I've heard environmental groups talk about valuing "ecosystem services." There have been some papers in Science and Nature, but I can't recall specifics.
- Wildlife Trusts in UK
- Yes, inhouse tools
- Yes, the Ifremer's EEZ mapping for French overseas territories

Q12 80% of the world's oceans are currently uncharted; how highly do you rate the following priorities?

Answered: 305 Skipped: 61



	LOW IMPORTANCE	(NO LABEL)	(NO LABEL)	(NO LABEL)	HIGH IMPORTANCE	TOTAL	WEIGHTED AVERAGE
Areas seeing greatest climatic change or in those waters with scant oceanographic data	1.65% 5	2.97% 9	9.24% 28	28.38% 86	57.76% 175	303	4.47
Those waters that may see greatest socio-economic growth	3.37% 10	5.72% 17	19.19% 57	30.30% 90	41.41% 123	297	4.18
To accurately map every nation's Exclusive Economic Zone (EEZ) first	6.00% 18	8.33% 25	21.33% 64	22.00% 66	42.33% 127	300	4.11
Those uncharted waters opening in the Arctic and Antarctic regions	5.72% 17	15.15% 45	25.93% 77	28.28% 84	24.92% 74	297	3.97

Comments (56)

'Comments':

- ABNJ as common heritage of mankind so all nations will have an interest
- Another priority is to convince telecom cable owners to share the existing survey data covering all the existing cable routes worldwide: a considerable amount of very precise data.

- Arctic nations should show leadership and spearhead an international decade of seabed mapping in the Arctic Ocean as a contribution to Seabed 2030 and the UN Decade of Ocean Research for Sustainable Development (2021-2030).
- Areas being intensively bottom-trawled, which is an activity causing incalculable damage to the resilience of the oceans.
- Areas likely to support high biodiversity - canyons, seamounts, ridges - indeed any areas likely to contain slopes of >10degrees.
- Areas of greater bio/geoscientific interest currently with scant hydrographic, geophysical and oceanographic data.
- Areas of the high seas already known to have unique geological features such as hydrothermal vents or seamounts.
- Areas that are data-poor, especially sub-Saharan Africa. Areas of importance to small-scale fisheries and livelihood support in coastal communities.
- Areas that have the most amount of activity or effort
- Areas where seamounts are present or chemosyntethic communities (usually focus on mapping fishing grounds)
- Areas which are topographically complex and which host high levels of biodiversity such as chains or clusters of seamounts.
- Areas which have interesting features that might affect ocean currents and the climate. The southern ocean and Antarctica.
- Areas with coastal habitats like seagrasses and corals in their shallow seabed which can offer valuable ecosystem services (e.g. carbon sequestration, protection from coastal erosion, nursery and feeding grounds for marine organisms, etc.)
- Areas with high potential for impact from economic development, habitat vulnerability and restorative / adaptation opportunities
- Carbon Capture and Storage, Deep Sea Mining , Geothermal and Marine Archaeology
- Coastal areas and islands and ensure it becomes and enabler and asset bottom up business opportunities to the many and not just the few
- Deep sea extensive mapping using AUV might be one of the solution
- Deep water areas (mining, oil & gas, life with no photosynthesis) and subduction zones (earthquakes and tsunamis, tectonic plates movement) would be important to survey and understand better.
- Develop an accurate map in acoustic backscatter properties of the seabed
- Developed countries should assist in mapping the continental shelves of developing countries to provide them the data needed for wise marine spatial planning and choices on use of seabed resources.
- For coastal management purposes i would prioritize shallow areas, as these are more important for a variety of reasons (eg productivity, influence on coastal processes and hazards etc)
- Hitherto non existant industries in the ocean space to be identified and people with knowledge of it (like me) put into an e-mail list. (e.g. aquaculture in offshore wind farms where a lot of marins space is used up by one ocean activity, producing more fish by seeding the oceans)
- I am focussed primarily on environmental protection rather than encouraging exploitation
- I don't know what you mean by map. Neither I suspect do you. At any rate lets start with resolution. At low resolution, say the level of Ptolemys map of the British Isles most of it is mapped. At the level of google street view, is that the most important thing to do at this point? I suggest prioritising those areas most vulnerable to the climate change effects. Maybe do those to Google Street view level. Now I understand that won't make industry, aka oil and gas happy but we have to decarbonise. Period. Hard choices have to be made about what to

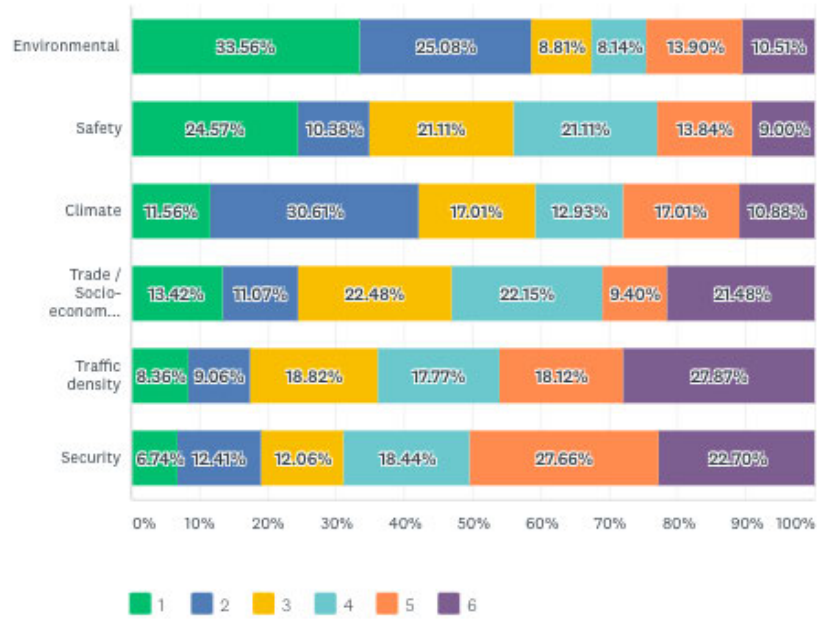
map. Removing oil and gas from the decision of where to map would go some way towards making that easier.

- I get concerned about too much attention being spent on the Arctic. Although marine safety is important and accidents would be especially environmentally damaging I would prefer to see minimal exploitation of sensitive Arctic resources.
- In dense and shallow shipping lanes outside territorial waters it is very important to map
- Language, language - in the Gulf of Aden, the (claimed) EEZ's of Yemen and Somalia overlap significantly, the area is adequately charted for the purposes of transiting from A to B and has been for the best part of 200 years (ok maybe not digitally, but you can still sail from A to B); mariners have used it for trade 4500 years - yet the economic benefits to the two nation's (Y & S) are not well understood by the nation's themselves and have been exploited by other nations....
- Mapping seamounts
- Marine archeology
- Mineral resources of deep sea
- Nations should be responsible for their own EEZ. Focus on international waters.
- Nearshore and coral reef ecosystems need bathymetry to help us manage those areas better
- Not sure without giving further thought
- Odd question, the ocean is completely charted. However, measured depth data is lacking broadly. The current maritime data governance results in inefficient use of the data that does exist, specifically due to data awareness, access and reuse restrictions.
- Prioritise mapping to areas that are likely to support habitats and species that are vulnerable to human activity
- Prospective marine protected areas in national jurisdictions or the high seas known or likely to sustain high ecological diversity or resilience to stressors on the marine ecosystem. (baseline mapping will help reveal features of these places and provide insight into where and how to better protect global marine ecosystems). (high importance) Potential seabed mining areas also need to be mapped and explored in detail BEFORE allowing mining activities. There is no remotely responsible way to permit mining in the deep sea without assessing the existing ecosystems intact there and fairly assessing the impacts of potential resource extraction. (high importance)
- Representative areas of all oceans
- SailDrone, Ocean Industry, Larry's barge. Ge all HOs to release their offshore soundings. Support Low Earth Orbit altimetric satellites.
- Scientific reports suggest that the productivity and biodiversity of the ocean will change with the combined pressures of climate change and human uses of ocean spaces. Wityhout 3D maps of habitat and the abundance and type of life we have no way to estimate changes and losses in ecosystem services we depend on. This includes the living resources on the bottom (not just bathymetry collected by Seabed 2030) and life in the water column
- Shelf waters subject to human pressures where spatial management is required (e.g. MPAs, Fisheries), and seabed geomorphology is important for understanding drivers of productivity
- The Area in general needs a focus of Seabed 2030 as the EEZ+ECS should be the responsibility of each state (not diminishing the importance of them being mapped)
- The first two should be of highest importance to each country - imagine not knowing what your above sea landmass looks like? The second one is also important for those who have the ability to operate outside the EEZ but are contributing to socio-economic growth. The third and fourth should be the priority of global efforts - beyond the scope of any one country. All are equally important.
- The greatest socio-economic growth would be to survey waters shallower than 200 m, near the coastline.

- Those area which may need protection due to unregulated undersea mining & other man-made activities which may damage the sea-bed ecosystem.
- Those areas that provide critical ecosystem services that support living marine resources.
- Those areas that represent an host spot of biodiversity
- Those close to the largest amounts of waste - gyres, estuaries
- Those island nations and developing coastal states that are most prone to effects of climate change and sea level rise are also often those with less wealth to mitigate. Long term planning backed by scientific evidence and linked to development banks investment should be considered a priority.
- To assure livelihood of the poor people and sustainably manage their resources
- To protect the ocean against industrial interests
- To uncharted waters opening in the Atlantic ocean
- Understanding our planet (scientifically)
- Very shallow uncharted waters < 25 metres and intertidal zones where most human activities are concentrated
- We don't need more greedy companies and corporations destroying the rest of the planet. So no, don't search for economic value please!!!
- We need to focus not on the "easy gets" but where we as humans are having the greatest impact. These are typically shelf waters <100m
- You do not provide a legend for the weighting in question 13 so I have assumed 1 being the most important and 6 the least important

Q13 Which factors should be given greater weighting within a geospatial prioritisation modelling tool?

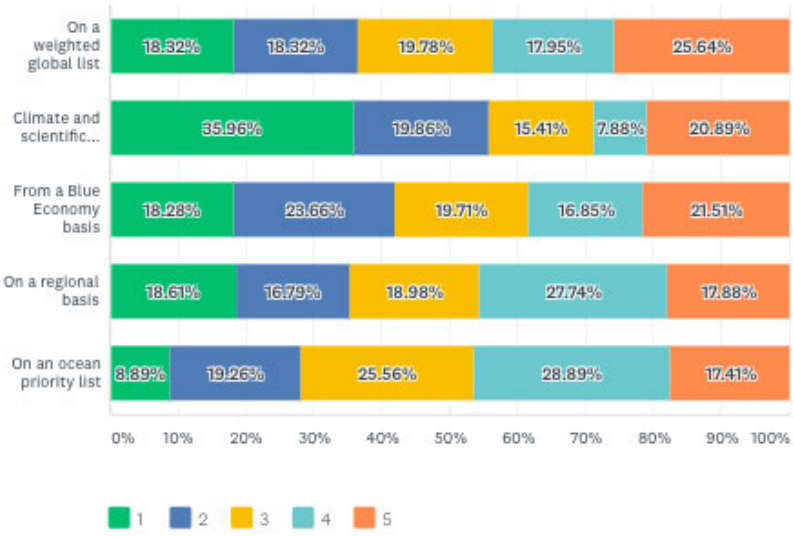
Answered: 311 Skipped: 55



	1	2	3	4	5	6	TOTAL	SCORE
Environmental	33.56% 99	25.08% 74	8.81% 26	8.14% 24	13.90% 41	10.51% 31	295	4.25
Safety	24.57% 71	10.38% 30	21.11% 61	21.11% 61	13.84% 40	9.00% 26	289	3.84
Climate	11.56% 34	30.61% 90	17.01% 50	12.93% 38	17.01% 50	10.88% 32	294	3.74
Trade / Socio-economic (Blue Economy)	13.42% 40	11.07% 33	22.48% 67	22.15% 66	9.40% 28	21.48% 64	298	3.33
Traffic density	8.36% 24	9.06% 26	18.82% 54	17.77% 51	18.12% 52	27.87% 80	287	2.88
Security	6.74% 19	12.41% 35	12.06% 34	18.44% 52	27.66% 78	22.70% 64	282	2.84

Q14 How should we prioritise marine geospatial surveys?

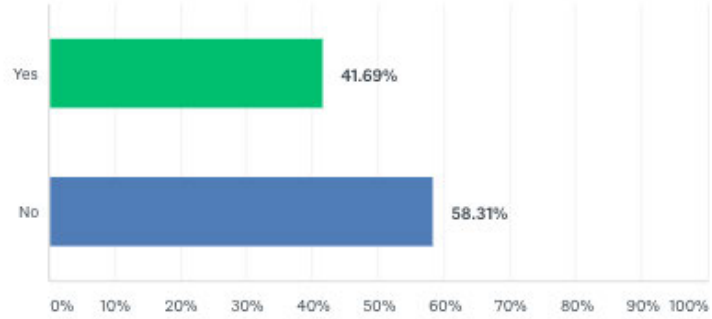
Answered: 302 Skipped: 64



	1	2	3	4	5	TOTAL	SCORE
On a weighted global list	18.32% 50	18.32% 50	19.78% 54	17.95% 49	25.64% 70	273	2.86
Climate and scientific priority	35.96% 105	19.86% 58	15.41% 45	7.88% 23	20.89% 61	292	3.42
From a Blue Economy basis	18.28% 51	23.66% 66	19.71% 55	16.85% 47	21.51% 60	279	3.00
On a regional basis	18.61% 51	16.79% 46	18.98% 52	27.74% 76	17.88% 49	274	2.91
On an ocean priority list	8.89% 24	19.26% 52	25.56% 69	28.89% 78	17.41% 47	270	2.73

Q15 Are there any particular areas of the seabed that you are currently trying to get mapped?

Answered: 307 Skipped: 59



ANSWER CHOICES	RESPONSES	
Yes	41.69%	128
No	58.31%	179
TOTAL		307

Q16 If you answered 'yes'...

Please share details of your area of interest	Why do you want to map this part of the seabed?	Have you applied for funding / resource to map this part of the seabed?	Have you articulated the environmental, social or economic value of mapping this area of the seabed? If yes, please give details / links.
Alaska, USA, EEZ	Fisheries management	Yes.	No.
All "unmapped" areas within our EEZ	To determine if there are dangers to navigation and for coastal management	Yes	Yes
All oceans everywhere	I believe in the goals and aspirations of Seabed2030, it is now 2020 and we need to collect data on a global scale to achieve the desired coverage by 2030.	We have both donated data collected during transits and also been paid to collect data specifically to support Seabed2030	N/A
All shallow clear water areas that are suitable for satellite derived bathymetric reconnaisance	o enhance knowledge and aid mitigation against climate change effects but also to increase developing national blue economies in a sustainable and climate friendly manner	No, however we have been ESA funded to develop sophisicated methods of deriving bathymetry from free to access ESA Sentinel Satellites	
Antarctic	Research	Yes	No
Antarctica y Arctic	To ensure safety of life at sea and monitor environmental changes over time	No, we are not allowed to apply funding. We conduct opportunity surveys in the Antarctica giving support	yes, all would be advantages. More and more tourists visit the Antarctica. It is highly necessary to update the nautical charts to avoid accidents in this remote wilderness. Furthermore, it would be key to know the seafloor, depths and

		scientific projects from other state authorities	oceanographic variables in the water column in the Antarctica for environmental issues.
Any unmapped area	It should be mapped	No	No
Aquacultures Biodiversity Conservation	Yes	Not yet	https://www.was.org/meetings/ShowAbstract.aspx?Id=33642
Arabian Gulf	Habitat mapping	No	No
Arctic	least mapped ocean	No, I'm not in a mapping organization, but we advocate for such	yes, in USARC's goals report publication at www.arctic.gov, specifically here: https://www.arctic.gov/reports_goals.html and in congressional testimony, also on USARC's news archives
Arctic	PhD Thesis 1970 - Alpha-Mendeleev Ridges	No	Part of IBCAO, now doing northern Indian Ocean via LDEO
Arctic	Cable installation	Not yet	
Arctic and Antarctic waters	security, environmental changes...	No	No
areas less than 200 m depth	for safety and socio economic reason	Not yet	No
Areas likely to support deep-sea coral habitat	To inform resource management decisions	We have program funds and are slowly contributing to mapping US deepwater areas of interest	We create reports to congress describing our activities, for example: https://deepseacoraldata.noaa.gov/library/2018-dsc-report-to-congress/
Areas of W coast of N America EEZ not yet mapped	worked on mapping the CA SW for many years but job is not finished	Not since CSMP	

Areas under use by humans - such as aquaculture	environmental impact is of high importance to ensure sustainable use of resources	Yes	https://www.researchgate.net/profile/Thorleifur_Agustsson
AREAS WITH HIGH TRAFFICS AND CONTAIN MANY OBSTRUCTION/HAZARD TO NAVIGATION	FOR SAFETY REASON	NO/FROM OUR ROUTINE BUDGET ONLY	YES
Areas with unreliable sounding data	to improve chart quality	never/from routine budget	No/never
At present mapping very shallow coral and seagrass areas (habitat and bathymetry)	Significant ecosystem services and threats of losses/changes with major socio-economic impacts	Yes	Yes. The Marine Biodiversity Observation Network is engaged in articulating these values for shallow and deep seabed regions
Australia's EEC and prioritised areas within	Regenerative seaweed farming	No	No but we have mapped the value of the industry
Australia/NZ EEZ	To enhance understanding of national resource	No	http://www.ausseabed.gov.au/home
Australian EEZ	Part of the HydroScheme Program of the Australian Gov	No	http://www.hydro.gov.au/NHP/hipp.htm
Australian shelf and upper slope	Underpin MPA and other spatial management of habitats and understand distribution of productivity	Yes	Yes, in multiple ways. Particularly via the NESP Marine Biodiversity Hub, and via AusSeaBed
Bahamian banks	To further understand the role of seafloor features in oceanography	No	no, but several fisheries that depend on specific larval transport are of high importance to the Bahamian government

	and larval dispersal of marine organisms		
Baltic Sea			
Banks Peninsula	It is essential and there is an opportunity to do so	Not me personally	Not this area specifically but have done so for other geographic areas within NZ
Barents sea	Poorly mapped to modern standards highly used region of Arctic	N/A	No
Bay of Biscay (SE Atlantic ocean)	To produce background information for supporting informed management of maritime activities, including conservation and protection	Yes	No
Braxilian continenttal margin	It is one of the PGGM's goals	Yes	Yes. We have partners from the govern agencies and oil and gas industry
Canada's EEZ and proposed outer limits under UNCLOS	Less than 10% of Canada's vast offshore is mapped to modern standards	Natural Resources Canada and Fisheries and Oceans Canada are developing Canada's Coastal and Ocean Mapping Strategy as a future funded program	In progress
Carnegie Ridge, Cocos Ridge, near Galapagos Island's EEZ	for UNCLOS purposes	No	No
Carnegie Ridge, Cocos Ridge, near Galapagos Island's EEZ	for UNCLOS purposes	No	No

Central Mediterranean Sea	It is the most data poor sector of the Mediterranean	Yes	http://www.academia.edu/12655153/Proposal_for_a_Malta_National_Seabed_Mapping_Programme
Coastal waters within 12 nm and less than 15m depth	Most relevant area for economic activities linked to degradation of the seafloor environment	Yes	Yes
Colombia Jurisdictional areas	This area is national interest	No... Colombia resources only	https://cecoldo.dimar.mil.co/web/ and https://www.dimar.mil.co/geoapps-de-expediciones-cientificas
Coral reefs ecosystems of the UK overseas territories	Conservation planning	No	Not yet
Dogger Bank	Cable installation	Yes	No
DORSAL DE NAZCA PROTECTED AREA	DISCOVER THE ECOSYSTEMS IN THE AREA	NOT YET	WE ARE IN PLANNING PROCESSING
East Antarctica	It is the least mapped area of Antarctica	Yes	Yes (application to CSIRO - Marine National Facility included a Benefits section)
Egyptian EEZ	Towards sustainable development of the world's ocean	Not yet	Not yet
Estuaries and shallow (<200m) waters around NZ	Aquaculture interests /Marine fishing / harvest interest	No	Yes , at various forums I am involved with
European waters	Global knowledge	Yes	This is mainly part of a European perspective
Great Lakes	Understand impacts from climate change on the largest freshwater ecosystem.	Some funding.	Yes, presentations and webinars focused on higher resolution mapping and the benefits it provides.

greenland	Increased use, opening navigational routes and national responsibility	unsure if DK have applied for funding	Unsure if DK have applied for funding, or defined the benefits
Guatemalan EEZ	Safety and marine protection	No	Yes, at national level
Gulf of Alaska, Eastern Bering Sa	Protect commercial fish populations	No	No
Hot spot of Biodiversity in the Mediterranean sea (cold water coral sites), and coastal areas affected by human impact and marine litter accumulation	Deep sea areas: to map the most relevant habitat and start monitoring programme; shallow water: to have a basis for habitat mapping and for good management and palnning of the human uses of the sae.	European programme (H2020) or LIFE programme, Iterreg MED programme	I have not much details
I have been involved with GIS and remote mapping of European waters for OSPAR based projects	Mapped for scientific and management purposes	The project was funded by the EU	
In the west africa Atlantic ocean	because my country Liberia needs an protective environment and lunch into marine renewable energy	No, I am trying to, but I don't have a source of funding.	Yes, in mapping this area, the country will have a coastal strategy to adapt in protecting coastal communities with their socio - economic activities, recreational areas etc, that are eroding. The sea level rise is approximately 0.77m and a high tidal of 4.5ft. Some coastal communities doesn't have a resistivity bluff/escarpment and some anthropogenic effects. Other feasibility are on a document prepared by me on a coastal structure building a year ago.

Increase production of SDB in shallow areas	We have access to the images and technology for efficient creation of SDB globally	Parts	No
Indian Ocean	Its not yet explored and have significant interest on Deep Sea Minerals,Ocean Climate and Environmental Monitoring,Complex Geology	No	https://ideas.unite.un.org/reboottheocean/Page/ViewIdea?ideaid=9154
Indian Ocean especially the Arabian Sea that exposes west coast of India	Arabian Sea seem to be heating up	No	No
Inshore fishing areas	To understand interactions of inshore fisheries with the seabed eenvironment	No	No
Installed windfarm areas without regular multibeam coverage	Lots of activities	Yes	No
Ionian sea	Hazards	No	No
Irish EEZ	National programme	Yes	Yes
Irish Sea offshore waters (off UK/Northern Ireland)	Very important to NI fishing industry	No	Not yet!
Italy's shelf areas	It is part of the national geological mapping project (CARG)	Funding is provided within the national geological mapping project	

Kenyan EEZ	Mineral resources. Ocean floor terrain	Not sure	Yes
Kenyan EEZ	To understand the seabed characteristics	No	No
Lakshadweep, Andaman Nicobar islands and Cochin	These are the major areas of interest by travellers, tourists, nature lovers, divers and a community that rely on its available resources to make living. Mapping these areas would help the government in starting new trade, business, tourism and natural conservation	No	No
Large marine ecosystem Indonesia Sea	this area becomes and provides natural resources for many communities in the coastal areas included in the LME	Not yet	http://www.fao.org/indonesia/news/detail-events/ru/c/1184212/
Locate unknown coral reef habitats	To protect rookeries	Not yet.	No
Long Island Sound (USA); Amundsen Sea continental shelf (Antarctica), East Antarctic contiental shelf (Antarctica)	habitat (Long Isalnd Sound), understanding history and vulberability of Antarctic Ice Sheets	Yes	Yes, by referring to CT and NYS state blue plans
Ma'alaea Bay, Hawaii, USA - Coral Reef Eco System Restoration	Coral Reef Eco System Restoration - Currently 7% coverage and declining	No	No

Mahia Peninsula	Environmental Interest	Yes - internal funding	No
Mapping the gaps	Explore the unknown and contribute to the fundamental baseline data needed to unlock more	No - we have philanthropic funding	No
Mediterranean Sea and especially Balearic Island	Protecction of Marine areas of importance as turistic assest	No	No
Mesoamerica next reefs & Pacific islands	To develop decision-making supprt tools to manage nearshore resources	Yes	Yes, coastal protection, clean water, fisheries, tourism
My organisation has numerous global surveys underway where bathymetry data is collected alongside environmental survey efforts (not standalone)	Dependant on project / region objective	Yes	No - there is potential to do so though or contribute to
Near shore areas within 50 miles of shoreline	Recreational fishing	No	No
North Greenland	Prediction of sea-level rise contribution from North Greenland ice sheet	Yes	Yes: https://polar.se/om-polarforskning/expeditioner/ryder-2019/
North Indian Ocean Region	For Scientific perpose and environmental benefits	Seeking	Yes, basically targeting towards the Carlsberg Ridge for hydrothermal vents as socio-economic value
North Natuna Sea (a part of South china Sea)	in the waters it is a very dense waters, many natural resources and	No	Not yet

	very important for economic development in the region		
North Sea	To accelerate offshore renewables	No	No
Northern Ireland Inshore & Offshore Region	For regional maritime monitoring and management	Yes, through my job, the Department of Agriculture Environment and Rural Affairs Marine and Fisheries Division employ me to gather marine species and habitat data collected through surveys they fund	https://www.daera-ni.gov.uk/sites/default/files/consultations/daera/Marine%20Plan%20for%20NI%20final%2016%2004%2018.PDF
NZ EEZ+ECS	National interest for economic and environmental benefits	not in the particular job but supporting initiatives to do so at parliament	Not in this job, mostly involved in discussion with key govt and stakeholders
Oceanic basins	Tectonic modelling	No	No
Oceanic tuna, oceanic squid in Indian ocean, I know the resource exists	To start a fishing company	No	
Off Somalia	This is a data-poor region with almost no information about spatial distribution of ocean resources. Mapping the seafloor would enable prioritizing management areas and understanding potential for future fisheries and resource use.	No	Yes. Secure Fisheries would use ocean floor mapping because it will: ● Vastly improve our understanding of bathymetry and ocean dynamics in areas that are difficult to study in situ due to inaccessibility or insecurity. ● Contribute to our understanding of the ecology of the study areas, especially in nearshore zones, enabling us to make appropriate policy recommendations based on new information,

			rather than relying on out of date research and uncertain estimates of ecosystem dynamics and health. Secure Fisheries is particularly interested in innovative solutions for satellite-derived bathymetry mapping using Somalia as a case study for the following reasons: • The lack of data is a major impediment to progress in the fisheries sector in Somalia. TCarta's contribution would immediately advance the state of research in Somali waters and allow for new, more accurate analyses. One Earth Future Foundation Ÿ 525 Zang Street Suite A Ÿ Broomfield, Colorado 80021 Ÿ USA • We would be able to incorporate bathymetry maps of Somali waters into our analyses of domestic and foreign fishing, especially areas of bottom trawling by foreign vessels, allowing us to improve the accuracy of our estimates of the amount of fishing taking place and its effects on benthic ecosystems. • Incorporating bathymetry data into our analyses would enable us to make specific recommendations for sustainable policies to the federal, regional, and local governments, with whom we have direct and productive relationships. • Combining updated bathymetry maps with other publicly available datasets, we can see where there are potential fishing grounds or useable shorelines. These are places where the international community or private investors can direct funds for development of the fishing sector, creating jobs

			and improving coastal livelihoods. • We would also use the bathymetry map as a component in an analysis of the potential for conflict over resources. For example, the new bathymetry map might reveal a good location for a large-scale port, but if that is the same place as an artisanal fishing landing site, conflict between developers and fishers could arise.
Offshore Alaska	Very limited coverage at present.	Yes.	Very valuable commercial fisheries. Loss of perennial sea ice raises risk of coastal inundation.
Pacific cost of Colombia	Oil and gas	No	No
Pacific Marine Protected Areas	Because of potential for manganese mining impacts	Am retired, but have volunteered my expertise for this mapping	Co-author of Pacific Remote Island chapter in Coral Reefs of the USA
Point Nemo	Man-made assets-- seabed characteristics	Not officially	
Red Sea Sudanese Coast	Scarcity of database	No	No
Seabed morphology and seabed substrate materials	It has not yet been mapped, there is a need to know how our seabed looks like and what is made of.	No	No
Seabed types and Geophisical properties	It's extremely important for Biodiversity sustainability	No	I worked on government projects but the dream is to be part of an expedition of this kind

Seepage, shelf and slope bedforms, slope channels, continental shelf	dynamic seafloor, source-to-sink sediment transfer, tsunami modeling	Yes	Only scientific, for economic only from the point of view of sand and gravel resources
Sene-Gambian continental shelf	Check sand movement	Not specifically	Related to climate change, sea-level rise and coastal erosion
Senegalese coast	coastal erosion and floods putting a lot people in constant danger every year (Corniches Est et Ouest de Dakar, Langue de Barbari à Saint Louis...)	No, we use our own resources. But we just want to have equipment such as under water drone, sonar and transducer...	The SODAGRI project. N°C_SODAGRI_008/2019
Seychelles EEZ	Segmented bathymetric survey, Hydrographic survey done in the 70's	No	As Seychelles is migrating to a blue economy, knowing what we have in our maritime space is of great economic, environmental and also social value to the assure the success of this migration.
Shallow water areas below 100m			
Shallow waters < 25 m	because 1/ they are poorly surveyed 2/ because they concentrate most human activities	Yes, mainly through R&D contracts	Ongoing process, not generalised and only assessed locally contracts permitting
Shallow waters, near coast	Safety at sea, more efficient shipping, move cargo from land transport to sea transport, protection of the enviroment, monitor climate change effects and protect cities and infrastructure, marine spatial planning	Yes, but not yet received.	No

South African EEZ	Better understanding of the deeper regions of the EEZ	No, relying on developing partnerships with maritime industries to gain access to their data	Still in process of finalising project description
South America subduction zone	Coastal Natural Hazards	No	No
Southern hemisphere	Under mapped	No	Generally through SCOR, DOSI
Southern hemisphere - largely unknown. And high-resolution mapping (AUVs)	Major areas of unchartered ocean, important for geo dynamics and climate	Yes	Yes - high-resolution mapping of hydrothermal vents for preservation purposes
Southern Ocean	Massive gaps	No	No
Southern ocean and Antarctica	For oceanography and climate	Yes	Yes.
Spurs on the north of the Manihiki Plateau	There are 2 to 3 critical foot of slope on these spurs east of the saddle that needs to be mapped and to provide realtime seismic data to justify the foot of slope and they are all critical points to strengthen the Cook Islands ECS submission at DOALOS subcommission.	No	Refer second question
Submarine Travel	Artic areas	No	No
Territorial waters	For safety of navigation and protection of marine ecosystem	No	No
The Gulf of Mexico	To see how much damage BP and its partners did to it.	I believe there already is data but its not available.	Does the environmental and ecological value of this area need further articulation. for what its

			worth : https://www.al.com/wire/2013/10/how_much_oil_did_bp_spill_in_d.html
The Nigeria Waters	i intend to carry out a holistic mapping of the Nigeria waters to contribute to the Geospatial seabed database	Not yet applied	No
The whole Mediterranean basin (0-30 m) and the East African shallow seabed (0-15 m) in Kenya, Tanzania, Madagascar, Mozambique	To gain understanding of the baseline distribution of coastal habitats (mainly seagrasses and corals), and to increase ecosystem-based adaptation to climate change and realization of related NDCs	I'm Project Manager in the Global Seagrass Watch project, a technological innovation project funded by DLR, which has already acquired 500.000e in funds for the next two years.	
Those areas that provide support to living marine resources	to better understand their role and value to ecosystems	No	No
Those that have been mapped, but aren't shown as mapped	Because old data, is not bad or unreliable data.	No	No
U.S. EEZ	Mapping our EEZ is NOAA's priority and charts are wildly outdated.	N/A	https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=2e0f077b8a0147149c8229c9204332d7 and https://www.tandfonline.com/doi/abs/10.1080/01490419.2019.1705449
UK waters	proof on concept of USV for ocean mapping capabilities	UTAS is the initial demonstration of capabilities	No

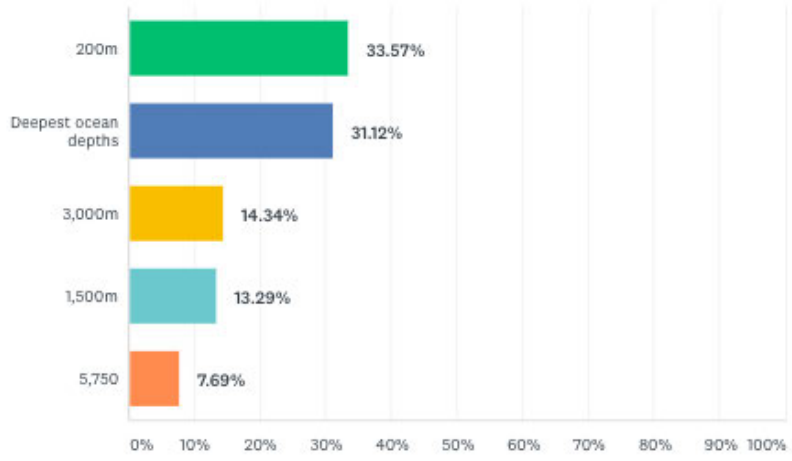
UK waters	Certain blue economy projects	Used known UKHO where possible	No
US EEZ	Protection, resources, safety of life	Yes	Yes
US EEZ	Directive from US governement. US EEZ is only ~45% mapped. Many of the unmapped areas contain seamounts which could support important deep-sea communities	Yes	see - https://www.whitehouse.gov/presidential-actions/memorandum-ocean-mapping-united-states-exclusive-economic-zone-shoreline-nearshore-alaska/
US EEZ greater than 200 m depth	NOAA agency priority	we receive federal funding allocated to ocean exploration	No
vsw, sz	It's where the people are	Yes	Yes
Waters near Mui Ke Ga in Vietnam	There will be an offshore windfarm project in Vietnam and the stakeholder specifically asks for that.	No	No
We are currently trying to more accurately map some of the inshore sea lochs and sounds around the Scottish coast.	To improve our regulatory functions.	No	Mapping these areas would improve the regulatory functions carried out by the likes of the Scottish Environment Protection Agency when it comes to Marine Pen Fish Farming. It would do so by improving the information fed into local and regional Marine Spatial Plans.
We are mapping the state of Victoria coastal waters	to understand habitat distribution and threats, understand sediment compartments	Yes, quite a few that fund our mapping	yes see papers https://scholar.google.com.au/citations?user=DFAsmU4AAAAJ&hl=en
We picked a hotspot model where jurisdiction are	Reduce potential for conflicts	Yes	In house ORIGo tools

overlapping and claims have been made earlier			
We recently commissioned high resolution nearshore mapping of the NSW (Australia) coast and are currently undertaking complementary multibeam mapping to 50m for priority areas eg off Harrington and sediment sampling.	To understand coastal processes and hazards including coastal erosion	We have been funded through NSW govt coastal reforms	https://www.environment.nsw.gov.au/research-and-publications/our-science-and-research/our-research/water/offshore-mapping, https://www.mdpi.com/2076-3263/9/3/141/htm, https://www.researchgate.net/publication/328878476_Seabed_Classification_Approach_for_the_SeaBed_NSW_Coastal_Seafloor_Mapping_Program_Proceedings_of_the_26th_International_Hydrographic_Conference_HYDRO18, https://link.springer.com/article/10.1007/s12237-020-00756-7
We've mapped some of the Seychelles outer islands slopes for our recent expedition in 2019. And we're planning to map seamounts around the Seychelles and Maldives in 2021.	Conservation priority areas to better understand what's down there, how to survey it and how to protect it!	Not personally no.	Not yet, we are working the data up and hopefully publish soon.
Welsh waters and Celtic Sea	Renewable Energy development	Yes	Yes, in the marine energy context
West coast of NZ North Island - from Taranaki to Auckland	Investigate large submarine landslides	In the process of applying for funding	High value with regard to understanding potential tsunami hazards
West Florida Shelf	Scientific understanding	Yes	Yes, subtidal oyster resources have great socio-economic and ecological benefits to the people of Florida.

West pacific	Climate change	Government	No
Western part of Banda Sea, Indonesia	To understand the morphology	No	No

Q18 To what depths do you require marine geospatial information?

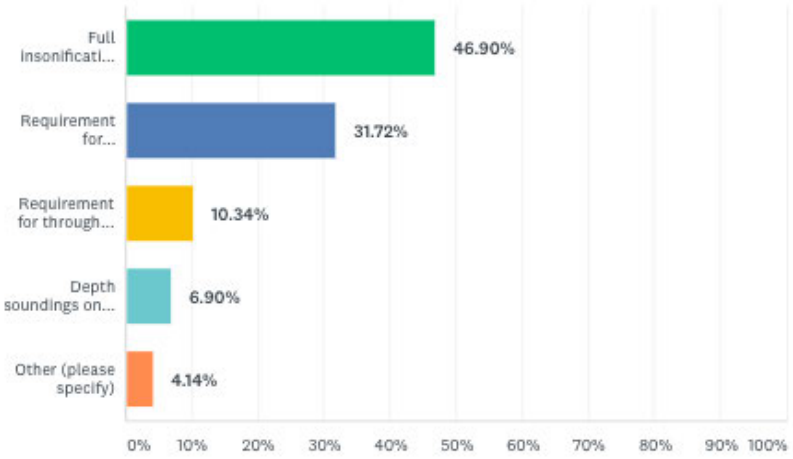
Answered: 286 Skipped: 80



ANSWER CHOICES	RESPONSES	
200m	33.57%	96
Deepest ocean depths	31.12%	89
3,000m	14.34%	41
1,500m	13.29%	38
5,750	7.69%	22
TOTAL		286

Q19 What level of detail and density of geospatial data is needed?

Answered: 290 Skipped: 76



ANSWER CHOICES		RESPONSES	
Full insonification and complete coverage of the seabed		46.90%	136
Requirement for identification and classification of seabed features		31.72%	92
Requirement for through water column oceanographic data		10.34%	30
Depth soundings only, no greater than 100m apart		6.90%	20
Other (please specify)	Responses	4.14%	12
TOTAL			290

‘Other’”

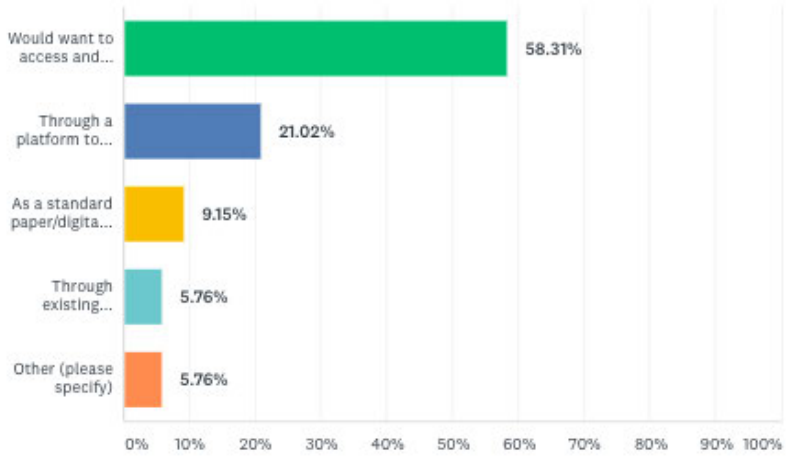
- 7/25/2020 2:08 AMAdd tags –View respondent's answers
- A sensible scaled system, so rather than 100 metre (cubes or square???) why not a scaled system - 500 metres (cubes NOT squares) 450 miles from the nearest land in the middle of the Indian Ocean to 10 metre (cubes) in the EEZ of Yemen and Somalia ....and an agreed Schema for description .....
- All the above in terms of primary production actually it is 20-800 m which is of the most importance for obvious reasons
- Currently I use ETOPO1 and STRM30. Something at least as fine in resolution as STRM30 would be desirable. Double or treble the resolution over large areas (basin-scale) would be even better
- Depends on the project requirements. For Safe Ship navigation, key pinch points require higher density, coastal surveys similar. In deep water density is less important unless there is a key factor under investigation
- Full insonification is not cost effective, but the other three points are useful dependant on where and what you are surveying.
- Ideally, Free Full remote sensing coverage at 10m High Resolution
- In Israel I find it hard to access multibeam from Arabian/Muslim areas. But my long-time connections with LDEO (my PhD) and UNH-CCOM (sabbatical 2003-2005) means I need other data - they will do the compilation using my digitized spot soundings and hydrographic contours.
- Satellite Derived Bathymetry generically relies on assessing depth based on the suns reflectance from the seabed through the water column to being received at the satellite multi spectral sensor. Tools derived by ARGANS also have the ability to rapidly assess areas that are suitable for SDB work by employing an optical reflectance form of a Secchi disk. In addition

our processors have a unique way to conflate multiple passes over a short time scale to greatly reduce random errors and provide a high degree of confidence.

- Seabed habitat features, texture, hardness and to the extent possible species / community composition
- The highest resolution based on depth and system capabilities. Collection of all sensor data for archiving, regardless of direct and immediate use.
- This answer varies with depth, marine traffic, environmental needs and such.
- When you collect the data please release it and let people interrogate it for themselves. Do not act as a benefactor when you are a beneficiary.

Q20 How would you want to use, or access marine geospatial data collected?

Answered: 295 Skipped: 71



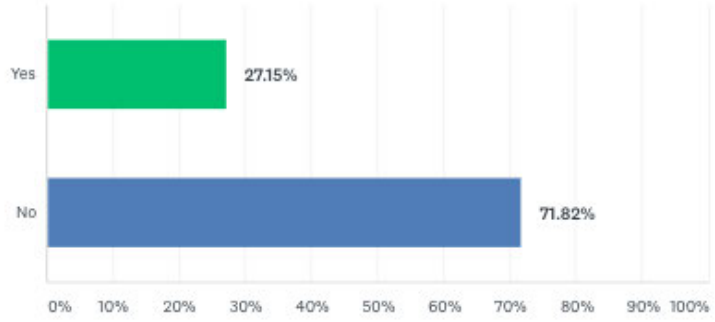
ANSWER CHOICES		RESPONSES	
Would want to access and download through a marine data portal		58.31%	172
Through a platform to create a tailored fused product for own needs		21.02%	62
As a standard paper/digital chart		9.15%	27
Through existing models/services and publications		5.76%	17
Other (please specify)	Responses	5.76%	17
TOTAL			295

‘Other’:

- All of the above
- All of the above, as well as a user interface such as a GIS story map
- API and web mapping including WMS and WMF
- APIs including OGC compliant web services
- As an Olex 3D model
- Data shall be utilized as well processed through standalone Hydrographic acquisition or cloud based acquisition and processing software
- Depending upon project
- Digital services, advanced through time. Less emphasis on portals and more on data management, data assurance and SDI is needed, with a focus on data archiving requirements.
- Free public marine data portal
- I want to see the GEBCO grid completed at 100-200m spacing. I started at GEBCO following the publication of the last paper chart set.
- ICZM database
- Online search which is very, very simple and no payment, no bureaucracy to search the data.
- Research and publications
- Through a cloud-based platform, from which data and metadata would be accessible.
- Web based interface and APIs
- Would want to access and download through a marine data portal that did not charge for the information ....in the common interest of humanity....

Q21 Do you have any existing or forthcoming data that you could contribute to the Seabed 2030 mission?

Answered: 291 Skipped: 75



ANSWER CHOICES	RESPONSES	
Yes	27.15%	79
No	71.82%	209
TOTAL		291

Comments (88)

'Comments':

- 40 years of mapping is captured in existing data bases.
- All Belgian data are open data
- All CSIRO data is made public and contributed to GEBCO via AusSeabed
- All data are property of client. I don't own rights to any data collected.
- All data I acquire will be public at the time of publication
- all of our data is available through https://maps.ngdc.noaa.gov/viewers/bathymetry/
- All our data products are already available from NCEI or other sources
- Answered yes as we have collected a lot of data but it is already being made available through Geoscience Australia.
- Aquabiodiversity Data
- As data is collected, we work with the collectors, and regional authorities to provide for open discoverability and accessibility.
- Bathymetric data can provide with the undersea feature naming proposals
- Bathymetry of previous hydrographic surveys in Fiji Waters
- Bathymetry produced by the Italian Hydrographic Institute of the Navy (which is the official mapping office and has a cooperation agreement with the Geological Survey of Italy) and surveys carried out for geological mapping activities.
- Central and Northern Atlantic along mid-ocean ridge and transform faults
- Contained within AusSeabed http://www.ausseabed.gov.au/home
- Current survey on Chatham Rise and Bounty Trough, recent surveys on southern Hikurangi Margin.
- Curves of features of IBCCA(GEBCO) projects
- Data are routinely archived with NCEI.
- Data available to public on NCEI website.
- Data of Guatemalan waters
- Developing an AUV for long-endurance bathymetry. Hope to contribute data in the next two years.

- EMOODnet metadata and DTM, which is already part of the Gebco compilation.
- Fugro donates data routinely throughout the year
- HIPP Bathy data and Cable route survey data around the glob
- https://www.researchgate.net/profile/Thorleifur_Agustsson
- I am not sure about the legalities, but the institute CSIR-NIO where I belong, possess PMN site region (demarcated to India by International Seabed Authority) in the Indian Ocean ~13degree South. However, I am informed that it is classified hence will have to discuss internationally. But please don't quote me on this.
- I applied for a project willing to collect data that I would share with Seabed2030 if the projetc is approved.
- I manage marine biotope point data from within the Northern Ireland Inshore & Offshore Area. Spatial layers for this data is held by my colleagues within the Department of Agriculture Environment and Rural Affairs Marine and Fisheries Division, see https://appsd.daera-ni.gov.uk/marinemapviewer/
- I plan in 2021 an International African Exhibition of Blue Economy in Morocco and thinking that it could be a good opportunity to promote seabeds mapping and to present to Governments,Public and Private Institutions,Participants,Sponsors,Visitors the importance of such Project, Technologies used and Advantages arising from.
- I work for NOAA's Office of Ocean Exploration and Research leading ocean mapping work. We have mapping missions planned each year. All data collected is QC'd and archived for public access via NCEI.
- If there is a repository for data we encourage data sharing from the clients we build subsea technology for.
- INFOMAR data is already publicly available
- Mahia Peninsula Wairoa Hard Cape Kidnappers/Clive Hard
- Mapping based on satellite-derived bathymetry our company is expert on. We do not produce data systematically, but we have means to produce high-res charting of coastal waters using optical data acquired from space assets, whenever water conditions are god enough. This has proven to be a useful tool for mapping coastal areas poorly mapped otherwise. It has the drawback that uncertainties are too large possibly for navigation, but definitively of use for scientific/environmental studies or as first guess for engineering companies operating in a given area.
- Maybe, indirectly, via the Office of Naval Research, of bathymetric data collected from US Navy submarines via the SCICEX program. See here: https://nsidc.org/scicex
- Multibeam and backscatter data, collecting Summer 2020, processing anticipated completion by 2021 near Bayfield Peninsula, Wisconsin.
- Multibeam surveys along and across Ecuadorian submarine rigdes
- Multiple MBES survey datasets in Australian continental waters. Produced by Uni of Tas or NESP Marine Biodiversity Hub partners and contributed to Seabed 2030 via AusSeaBed
- My colleague is taking care of this [redacted]
- My organisation make its data accessible by default where feasible through external portal http://data.cefas.co.uk/, and linked to other Portals such as MEDIN https://www.medin.org.uk/ and DEFRA Data Platform https://environment.data.gov.uk/
- My organization is already contributing
- Natural Resources Canada through the Geological Survey of Canada will continue to contribute to GEBCO and Seabed 2030 as data becomes available.. Part of the challenge in Canada is to identify data held by various levels of government, academia and industry and make these data available through a data portal. This will be one of the first steps in Canada's Coastal and Ocean Mapping Strategy.
- Newly collected data from the Amundsen Sea and from Long Island Sound. I am already working with Seabed 2030 and the data will be provided and integrated in the next couple years.

- Not currently
- Not right now, but we plan to get data sooner with our research vessel at national level
- Not sure as the data is very segmented and some might be lost.
- Not sure if it's relevant, but we have information on where we have observed deep-sea coral and sponge habitat here: https://www.ncei.noaa.gov/maps/deep-sea-corals/mapSites.htm
- Offshore Infrastructure, Vertical Offshore Reference Frame (VORF), Wrecks and Obstructions, Seabed Composition, etc. (But most of these data are only available for the UK waters.)
- OGS is a research Institute that have been acquiring bathymetric data with the R/V Ogs-Explora since 2003. We submitted OGS datasets to IBCAO, IBCSO & Emodnet. From 2019, OGS manage the Icebreaker Laura Bassi. I proposed a project to acquire data during all transits from NZ to Ross Sea. The idea is to navigate along well etabished route, in such a way we will obtain a good coverage along corridors (crossing interesting geological features). I'd like to coordinate the project with Chinese, Korean and French vessel. I'd like exchange information and to coordinate the project with Chinese, Korean and French research vessels during acquistion. I doubt the project will be approved because more then one researcher opponed the fact that is not "a proper research project" so doesn't deserve to be funded with PNRA funding (Italian Research Program For Antarctic Research)... it's a good idea but isn't research
- Olex data not already shared
- On the edge of launching a sea kayaking expedition from Mainland India to its Islands on the West Coast and East Coast. First leg planned from Goa to Kerala along the coast. Second leg is from Kerala to Lakshadweep islands. Third leg is from Tamil Nadu to Andaman Islands. Expecting to cover an accumulated distance of 2400 KM. Custom designed in Holland, constructed in Goa, the kayak is equipped with modern instruments such as navigation equipment, satellite and radio communication equipment, safety equipment, etc for the safety of three crew members. We have an Axiom 7" multi-function display of Raymarine that's powered by solar and battery pack. We have been considering whether to add a sonar sensor to it. But we are not sure if Raymarine sonar data can be used for SEABED application. If your team can determine if this is possible, then we can cooperate and share the data for SEABED cause.
- Our data is uploaded to https://portal.aodn.org.au and https://elevation.fsdf.org.au/
- OUR SURVEY DATA THAT ARE ALLOWED TO BE SHARED BY OUR HQ
- Perhaps
- PGGM is a research network integrating 27 institutions from north to south Brazil dealing with marine geology and geophysics since 1969.
- Possibly oil and gas survey data within the South African EEZ.
- PROYECTO GEF-PNUD HACIA UN MANEJO CON ENFOQUE ECOSISTÉMICO DEL GRAN ECOSISTEMA MARINO DE LA CORRIENTE DE HUMBOLDT Informe Final Estimación del Valor Económico Total (VET) de los Bienes y Servicios Ecosistémicos del Gran Ecosistema Marino de la Corriente de Humboldt (GEMCH)
- Revision of Aleutian Islands, Alaska, USA
- Satellite-derived bathymetry data at 10-m spatial resolution for the first 15 m of depth at the national scales of Kenya, Tanzania, Mozambique, and Madagascar (will have been completed by the end of July 2020)
- Seabed morphology classification that exist within my region and seabed substrate materilas
- See project website about satellite derived bathimetry: https://sdb.argans.co.uk
- Shallow areas. Tide Gauge. Sea level rise
- Since I work with Seabed, I already contribute all we have
- Singlebeam data from Kenya's RV Mtafiti
- Site survey bathy data for Tsunami warning buoys in the SW Pacific
- Some EM raw data
- Still under NDAs

- Suggest contacting Dorset Wildlife Trust as per earlier comment
- TBD how much, and if data can be released
- The existing GEBCO has my old grids for the Black Sea, Caspian Sea, and Lake Baikal. Since then I've provided grids for 10 largest East African Rift Lakes. Also my research hovercraft has been supplying bathymetry in the highest Arctic since 2008, and should soon be operating north of Greenland where work by icebreakers failed years ago.
- The research work conducted for ESA covered the littoral zones of four specific sites. This data is therefore ESAs to give, however I am sure that an approach to ESA would be received favorably and at the same time you could negotiate their support to Seabed 2030 through future Earth Observation Envelope Programme work employing SDB .
- The REV Ocean vessel will be collecting multibeam data to a maximum depth of 8000m on all transits and during missions. It will be launched in 2022. We are currently discussing an MOU with Seabed 2030.
- The Swedish Maritime Administration is co-ordinating the collection of bathymetry data in the Baltic Sea which is available at http://data.bshc.pro and https://portal.emodnet-bathymetry.eu/
- These pathways are already in place with NOAA Office of Coast Survey
- Upcoming research cruises offshore the Maltese Islands and Galapagos.
- UTAS
- We are continuously submitted Bathymetric data collected to Seabed 2030
- We could provide a demonstrator in a reasonably large zone to be agreed
- We have acquired a lot of survey data (MBES, SSS, SBP) on behalf of our clients sometimes over the same areas multiple times thereby demonstrating time-series changes. All was acquired subject to an MMO licence. If there was a national requirement on our clients to submit that data within a timeframe to a national database there would be a wealth of data immediately accessible at minor cost to the government/stakeholders. Currently this is not a requirement, so the collective benefit is not possible.
- We have images from coastal areas in the continental shelf in the Eastern Brazil Eco-region, South West Atlantic
- We have mapped some slopes around the Seychelles outer islands down to roughly 250m!
- We have shallow water survey data we collect
- We provide Bathymetry, water column and backscatter to LINZ and HIPP as well as regional surveys for local council. This data is already being supplied.
- WE STILL WAIT FOR A NATIONAL POLICY ON HYDROGRAPHIC DATA SHARING, AND CURRENTLY IN CONSULTATION WITH RELATED MINISTRY
- we use a Kongsberg 2040C. We provide our data through AusSeabed so think you get it anyway. If not I am happy to provide a direct path !
- We would like to map the surrounding waters of Langue de Barbarie in Saint Louis. So we could have a better understanding of the coast erosion and yearly floods. We just want to help
- You would need the permission of the Windfarm developers to get this data

Q22 Please list any other sources of information you think we should explore.

- 3Dofocean floor
- All data collcted by academic and commercial sources
- As per question 22 - also recommend contact with other MEDIN partners such as the UKHO https://www.gov.uk/government/organisations/uk-hydrographic-office, and OceanWise https://www.oceanwise.eu/; and other Defra organisations such as https://www.gov.uk/government/organisations/environment-agency
- Blueplanet
- BP, Shell, EXXON/Mobil ect
- Bring together private and governmental multibeam datasets.
- Cable route surveys
- can you post this in survey on coral list, there are a lot many stakeholders on that list.
- Collaborative request to Oceanographic Institutes from around the world
- Contact companies involved in industrial/commercial projects. There must surely be a wealth of data... This might take some persuasion. Or, may come at a cost. Reach out, people. Reach out.
- Crowd-Sourced Bathymetry - all private oil&gas companies + track sounding for transoceanic cables
- Data collected for nations by private or naval contractors.
- Deep ocean sea floor Bathymetric Classified the sea column
- Department of Defence (US), MOD (UK) must have lotsof data from their submarine operations.
- Egyptian navy force
- Ensure that contact is made with the Agri-Food and Biosciences Institute- Northern Ireland- who do seabed mapping (contact: matt.service@afbini.gov.uk)
- Existing data gathered by private industry that is not made widely available
- Existing multibeam and multisensory backscatter data archives
- Further focus on Africa
- https://appsd.daera-ni.gov.uk/marinemapviewer/
- https://argans.co.uk/proj-sdb.html
- https://openaltimetry.org/
- https://www.catlinseaviewsurvey.com/
- I am afraid we are pioneering this sort of application and are in the processng of identifying partners such as Japan RESTEC in a very open co-operation scheme involving but not being limited to the IHO and the European Space Agency.
- I believe some of the data being collected by crown entities should be open under commons licence. In order for this to occur their funding model may need to change as they are currently challenged with providing the NZ government with income so protect some of their data under IP arrangements so that it's value can be directly leveraged. This is a flawed model given Government funds part of their organisation anyway. Tax payers and business could be paying twice.
- I looked into acquiring a non-official single-beam echosounder XYZt dataset from field surveys by NOAA in Alaska, but I was told that dataset is no longer available.
- I think you have it covered! Some aspect of habitat data would help to inform MPA management
- ICESat2 results
- If it is not clear so then the use of satellite derived bathymetry in the shallow coastal zones of developing coastal and island states would add significant societal, economic and scientific value especially as they struggle to combat the effects of climate change and

subsequent sea level rise. It is in these areas that detailed knowledge for modelling is required but where expensive shipborne MBES is totally unaffordable. Additionally this SDB data aids the reconnaissance to where expensive MBES/LIDAR manned or remotely controlled capabilities might be deployed.

- IGCP UNESCO 640 PROJECT
- Indonesia geospatial, MMAF (Indonesia goverment)
- Industry data (e.g. Olex)
- Informar
- INSTITUTO DEL MAR DEL PERU DIRECCION DE HIDROGRAFIA Y NAVEGACION DE LA MARINA
- Italian Hydrographic Institute of the Navy (IIM) Institute of marine science (ISMAR) National Institute of Oceanography and Applied Geophysics (OGS)
- Japan national survey database
- Joint Nature Conservation Committee has maps of UK and Europena seabed
- Keep pressing for public release of surveys completed by private companies for the oil and gas sector. Surveys completed within EEZs where companies extract profit from a public domain resource should have mandatory public data sharing requirements.
- Kindly instigate the necessity of mapping oceans across University and Research organizations across India such as NIOT ,NIO and Other developing Countries who shall definitely involve as well increase opportunities
- MACHC member states
- Marine Georesources
- Marine geoscience research voyages/hydrographic surveys in East Antarctica (Chinese, Russian, Indian). This data is not publicly available.
- Marine Scotland Science and their work for mapping Scotland's marine waters.
- MPA
- N/A since I work with Seabed,
- National Ocean Service, Plastic Oceans, The Pew Charitable Trusts, and University of Texas Marine Science Institute Central Carribean Marine Institute
- NCEI multibeam and hydrographic data bases. Data is often very difficult to locate there unless one knows about specific data sets.
- NOAA 2020 Nationwide Spatial Prioritization Study
- Ocean current data in basis. The ebb rate na velocity.
- Oil & Gas industry, Bodies such as British Antarctic Survey, Fishing industry.
- Oil, gas and renewables companies hold significant amounts of data worldwide.
- OMVG studies from the 1980s
- Open source bathy datasets perhaps?
- ORIG0 enembles
- Pollution levels
- Private companies (oil industry, cable companies, etc) holding bathymetry data
- Reports of expeditions
- Satellite derived bathymetry
- Satellite Derived Bathymetry.
- Satellite imagery and crowdsourced bathymetry , and now , there is bENC products
- Seabed geology
- Seafloor sediment cores
- Seismic oil&gas vessels in transit could record bathy
- Surveys carried out by stakeholders of the Kenyan Hydrographic and Oceanographic committee.
- The coastline

- The colombian maritime authority and the colombian goverment have had and intense work surveying the caribbean for various purposes, and in the Colombian Antartic program important hidrographic surveys have been done in recent years
- The Oceans around Africa needs to be studied further to get more insights into the natural resources imbedded therein and to help check Ocean pollution that would destroy this resources. So, Africa needs more help in this regard in the form of capacity building and collaboration.
- There are 2,000 billionaires in the world, and 600 in the US. To complete Seabed 2030 by the end of 2030, some $335m is needed annually. Covid-19 may nix this, but have you approached billionaires? See my Hydro article.
- There seems to be a welter of unco-ordinated data sets esp. in the EU & USA which ought to be reviewed prior to starting thie endeavour.
- This is the reporting I'm involved in https://www.stats.govt.nz/topics/marine
- U.S. Navy bathymetric data available via Google Earth
- UKHO Marine Data Portal.
- Underwater habitats
- Utilization of this seabed data must be devoted to the sustainability of the development of the maritime development for peace and the good of humanity
- We have had good success working with commercial fishers to get both calibrated EK80 data and detailed habitat (expert) maps from their trackplotter data. Not all will be willing to share, but might be interesting working through a group like SeaBos to see what they as an industry could provide.
- What three words .....it is a great idea that, with a schema, might be scaleable to your needs
- Windfarm Developers
- www.optonautics.com
- www.pggmbrasil.org
- You should approach C4IR Ocean who are now hosting the Ocean Data Platform

Q23 Is there anything else you would like to add?

- Acknowledge this great contribution and efforts to The Nippon Foundation and GEBCO and give all my support to the working team.
- As the PGGM Coordinator I would like to stablish a partnership with the Seabed 2030 for surveys in the South Atlantic and Antartic oceans.
- Be great to please know how or what CEFAS data is contributing to the programme already or how it can? Please email my team via datamanager@cefas.co.uk to commence discussion further. Also interested in findings of this survey, press releases, opportunities, funding bids, outcomes/deliverables..... thanks
- Calibrate, calibrate, calibrate
- Can you include me in a mailing list of all future news from this project wherever in the world it is. Can you create an entrepreneurs and inventors network who would be future users of your data.
- Carry out research on the Africa waters as it is lacking in the areas of research... so much wealth here that are yet to be tapped.
- Consider plastic identification and removal as a portion of the research. The oceans can be cleaned while they are being mapped: contributes the economy while gathering data
- Crowd source bathymetry could play an important role in surveying the seabed.
- Do you have any Regional Defense initiatives that will benefit from this study?
- Facilitate access to high-resolution data from all contributors to 2030 maps. The chart is useless unless access to the high-res data is provided, and partners not willing to make data publicly available should be excluded from the effort -> use the model of MGDS with full access to data.
- Feel free to contact me directly to acquire data from Northern Ireland
- Good luck
- Good luck!
- Good luck!
- Govt are not provided enough information on the importance of seabed mapping so that inland issues are still taking precedence almost systematically. there need to be a more targeted 'lobbying' toward government bodies that could fund seabed mapping more specifically. I can help with that in NZ
- Great Initiative
- Hope that all nations will benefit from the Seabed 2030 mapping
- How will SEABED 2030 provide opportunities to help me continue to fund mapping knowledge gaps?
- I have volunteered on, participated in and/or led many US Law of the Sea cruises as well as Falkor cruises in the Pacific Marine Protected Areas. I would be interested in Seabed 2030 opportunities to participate in further data collection. I have 40 years of experience in multibeam surveys.
- I hope I can contribute
- I made this survey as an "ocean scientist" and not with my Seabed 2030 hat on
- I sincerely appreciate the opportunity given me to contribute to this survey
- I think this is a very good project and the data can be used for a variety of purposes. As mentioned I'm interested primarily in conservation and clean up and I'm sure the information coming from this project will be very useful. Thank you
- I think you need to be clear in setting targets and tracking progress. It isnt the % of the worlds seabed that is mapped that is important. We can quickly do that by mapping the deep ocean with very wide swathe widths. And stats need to be clearly differentiated into nearshore (50 m or less), cross shelf (50-200m), and deeper (slopes are usually narrow and steep, so readily fast to map, like abyssal depths). That breakdown makes a lot more sense and speaks truthfully.

- I would say you must get in touch with the Colombian maritime Authoriy and the Colombian navy, since during the last years the ocean surveys capabilities have increased and further agreements with central American and Caribbean countries can be set up.
- I would strongly support any action to fill in gaps in our knowledge of the global seafloor
- I'm skeptical about this project. Industry, oil and gas exploration, and security entities appear far too often in the answers as coevals with environment and climate change. Ecology is not mentioned at all. I would like more information about the governance and structure of GEBCO. [redacted]
- If this going towards Ocean Seabed mining, I am not a proponent.
- If we have the necessary equipment we can make a huge difference
- If you need more detail please call or check out sdb.argans.co.uk
- It was difficult to respond to some questions as the terms given weren't defined, i.e., what is the difference between security and safety?
- It's really important to ensure good engagement with the fisheries and aquaculture sector throughout this project, and ensure the future needs of a blue economy that are mindful of climate change impacts underpin the programme
- Keep up the good work. Look to satellite remote sensing sector for guidance re: cost/benefit, data management, etc.
- Keep us informed at ORIG0@pm.me
- Looking forward to having any form of collaboration between GEBCO and the UK Hydrographic Office. Feel free to get in touch.
- Many of these questions are very 'rigid' and I would have ticked 'all of the above' had it been available.
- Mapping the seabed is a critical activity that supports various activities including scientific applications. It's one of our national priorities. On the other hand, data are available with hydrographic service of the naval forces, which is under Ministry of defense.
- May your hands be blessed.
- New Zealand needs a marine survey strategy. Currently it is sectorial and affected by organisation animosity and patch-protection, resulting in sub-optimal outcomes both in terms of area surveyed and use of resources
- No - other than great project.
- One important point that I would like to raise, is to further emphasize the role of data providers. I think that data could be unlocked more easily if we put data providers at the center, if we give them a role more important than simply delivering dataset.
- Peer reviewed research publications appropriately referenced and indexed - geohazard and bathymorpological interpretation specifically of interest to me
- Please add calibrated backscatter - probably through single beam.
- Political situation ?
- Q13 and Q14 - what was the scale? 1 high or low ranking? I didn't answer those two questions because I didn't see where this was explained.
- Sea bed mapping typically uses multi-beam equipment and in deepwater this operates at 12 kHz. This has been implicated in a stranding event in 2008 in Madagascar, though it is hard to understand how this happened. Nevertheless some precautions should be applied when mapping biologically sensitive areas with cetaceans in deep water where this equipment is used. Personnel involved in cetacean protection and procedures need to understand how the swath width works also. It would be useful if acoustic studies were performed on this equipment to measure detectable energy outside the swath and non-target frequencies.
- Seabed2030 marks a unique opportunity to not only conduct bathymetric acoustic measurements, but also to simultaneously carry out acoustic ecosystem measurements within the water column by means of calibrated echosounder systems. Such "life in the ocean" data" is of high importance and it's acquisition does not add significant additional demands to the vessels collecting the seabed data.

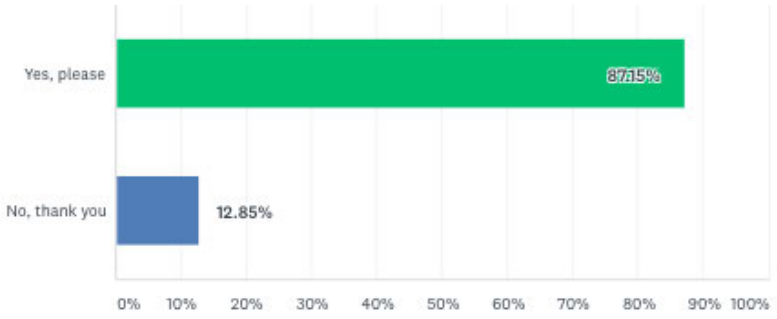
- See our product at basemaps.linz.govt.nz
- SEND TO ME YOUR NEWSLETTERS AND THE STATE OF THIS PROJECT
- Sludge oil spills
- Stay safe out there, people.
- Sub bottom profiling chirp signal processing for ocean floor mapping
- Thank you for helping to organize this global effort to map the seabed!
- Thank you for this exciting and important initiative. I look forward to contributing to Seabed 2030.
- Thanks, good luck
- The focus of most mapping seems to be with a bend towards potential extractive activities. We need a more holistic approach
- The need to create a centralized open platform where global-scale standardized bathymetry data will be collected and provided for not only assessing multi-scale water depth information, but also assisting multi-scale satellite-derived bathymetry modelling, estimations, and validation.
- There is an urgent need to develop capabilities to acquire seabed backscatter DATA and process it into a consistent/normalized quantitative product.
- There may be depth-related analytics that can be derived from physical, chemical, and biological oceanography, such as the variance of pelagic species distribution over time and space. Thus, I encourage looking beyond sonar-only methods to gain understanding of bathymetry.
- This should be a TOP priority for G-7 and G-20…
- To know more on how we can participate in the project as a country and a department who has the mandate to coordinate all activities for the development of the blue economy.
- Upwelling data, long term for same area. I know they exist but fail to trace them. Satellite data of temperature and chlorophyll data for past 35 years. Every satellite passage yielded temp/chlorophyll data to be used for fish movements and change of temperature fronts
- We also need to invest in the interpretation of the seabed data collected i.e. geospatial science such as marine spatial ecology / seascape ecology
- We are interested in the full blue ocean economy and are interested in how USVs can be used to collect not only ocean bathymetry but collect additional met ocean and environmental data to maximise project ROI
- We regard the GEBCO initiative as the only having the potential to understand, encourage and host an extension to the existing World Ocean coverage. We are aware than no funding can be expected to develop this far reaching project but could imagine a Google Earth-like Maritime application making coastal data available to the public.
- What's under the water fascinates me.
- Work these issues in the context of the Global Ocean Observing System and the Marine Biodiversity Observation Network, and promote use of best practices (and the Ocean Best Practices System) to enable interoperability and greater usability of observations
- Would also like the impacts of anthropogenic activities on the seabed and if possible water column.
- [redacted]

[redacted]

- Your response as soon as possible

Q24 Would you be interested in receiving the report that emanates from this survey?

Answered: 288 Skipped: 78



ANSWER CHOICES	RESPONSES	
Yes, please	87.15%	251
No, thank you	12.85%	37
TOTAL		288