Geospatial Commission: Call For Evidence Response Questionnaire

Please submit your completed questionnaire to:

geospatialcommission@cabinetoffice.gov.uk.

Clearly title your email *'Call for evidence response'*.

About you and your organisation

Name	Professor Russell Wynn
Organisation	National Oceanography Centre
Job title	Associate Director - Government, International and Public Engagement
Address	European Way, Southampton
E-mail	rbw1@noc.ac.uk
Telephone	023 8059 6553

Please select which of the following best describes you as a respondent:

Respondent	**Please mark with a X**
Academic	
Business representative / trade body	
Central government	
Charity or social enterprise	
Individual	
Legal representative	
Local government	
Large business (over 250 staff)	
Medium business (50 to 250)	
Small business (10 to 49)	
Micro business (up to 9)	
Other - please state	**Non departmental Government organisation**

Call for evidence - three key themes

We have identified three high-level themes that could help our approach to setting a strategy which are as follows:

1. **Supporting innovation in the geospatial sector**, exploring how to secure cutting edge skills, the right access to data, and opportunities from emerging technologies for the geospatial sector itself
2. **Enhancing the UK's geospatial assets,** looking at how best to align interests, avoid duplication, and instill best practice across the whole public sector
3. **Driving investment and productivity in geospatial applications**, asking in which wider sectors the most value lies from better exploitation and use of geospatial data, in the UK and internationally

Introduction: Marine data management in the UK

The National Oceanography Centre (NOC) is the UK's centre of excellence for oceanographic sciences, with a remit to provide marine national capability and leadership for big ocean science at a global scale. NOC welcomes this initative to develop a National Geospatial Strategy.

NOC hosts the Marine Environmental Data and Information Network (MEDIN), which is a partnership of UK organisations committed to improving access to UK marine data and sponsored by 14 organisations, including the Natural Environment Research Council (NERC) and the UK Hydrographic Office (UKHO). MEDIN will submit a separate response to this call.

MEDIN effectively delivers marine data through a *network* of accredited Data Archive Centres (DACs). The British Oceanographic Data Centre (BODC) is the UK's designated DAC for water column oceanography, and is also hosted at NOC. Although UKHO is the designated DAC for UK bathymetry data, BODC hosts the General Bathymetric Chart of the Oceans (GEBCO) and is the Global Data Cetre for Seabed 2030, which is an initiative to map all of the world's oceans by 2030.

Within the UK, NOC is involved in an initiative with the Maritime and Coastguard Agency (MCA) and industry partners to develop and apply new Marine Autonomous Systems such as Unmanned Surface Vehicles for high-resolution seabed mapping. This forms part of a funding bid under Wave 3 of the Industrial Strategy Challenge Fund, and is being strongly supported by the Department of Transport. Previous attempts to initiate a UK seabed mapping programme have acknowledged the requirement to access the large volumes of seabed data held by industry in areas such as the North Sea.

The above examples all highlight the complexity of the marine data landscape in the UK, and the key role played by NOC in the archiving and dissemination of marine data, including global bathymetry. ***We therefore strongly urge the Geospatial Commission to ensure that NOC is a key partner in this initiative, working closely alongside UKHO (and complementing their domestic focus as a***

Partner Body) by providing access to global bathymetry and UK and global oceanographic data.

Questions

Q1. Is our view of the geospatial data types accurate? If not, what should be included or excluded from this?

Yes, although we suggest that **in the marine environment the impact of temporal change on geospatial data (including bathymetry) should also be considered**. For example, the MCA regularly commission bathymetric "resurveys" in key areas as part of the UK Civil Hydrography Programme in order to measure changes in seafloor bathymetry that may impact navigational safety, e.g. mobile sandbanks, channel infills.

NOC has world-leading expertise in global ocean and coastal modelling, and the measurement of global sea level, hosting the Permanent Service for Mean Sea Level (PSMSL). Changes in global, regional and local sea level will have a major impact on UK shoreline shape and character in the coming decades, influencing geospatial data from this dynamic environment.

NOC will be happy to support the Geospatial Commission through provision of expertise and advice relating to these observed and predicted temporal changes.

Q2. In addition to current government policy, what are the areas of geospatial skills where the commission could best focus, to help ensure the necessary capability within the UK for the future?

NOC encourages the Commission to explore development of **intitiatives and training opportunities for assimilation and interpretation of data across the interface between land and sea**; the coastal zone is of particular strategic importance to the UK and developing geospatial expertise that is able to cross from the marine to terrestrial environment is key to understanding and managing this zone.

Q3. What are the geospatial skills needs and gaps in your organisations, how can these be most effectively addressed, and how can careers in the sector be best promoted?

Not answered.

Q4. Are there any publicly or privately-held geospatial datasets that are currently challenging to access or use or of insufficient quality, but which you or your organisation would find valuable if these issues could be resolved?

Please explain why this would be of value, and how access/quality could be improved?

There are currently large volumes of high-quality seabed and oceanographic data from UK waters that are held by industry (e.g. oil and gas, offshore renewables) that lack regulatory requirement for subsequent public access, even when commercial sensitivity is no longer applicable. Developing mechanisms to unlock and disseminate these industry data through the MEDIN network of DACs would be a good starting point for the Geospatial Commission.

As mentioned in Q1, **improved coastal bathymetry coverage, including quality and repetition of data collection should be a priority.** As well as rocky shores, UK coastlines are made up of mobile sediment that changes with the currents and waves. These sediments form channels, banks and other features that change the coastal bathymetry and morphology over time. Better resolved coastal bathymetry and morphology data sets, would lead to the improvement of modelling for coastal defence and management. Regular and frequent mapping of the changing coast poses a great challenge for data collection and integration, which would require improvement in autonomous technology.

Q5: Do you anticipate that any changes will be needed to both address data and the wider ecosystem, to support emerging technologies? Please provide evidence of value to support any proposed changes.

See Q7 regarding Marine Autonomous Systems.

There is also a need to develop automated systems for effective and efficient data collection and delivery, and the metadata needs to be embeded within the data stream. **There needs to be investment in managing the data from the first point of collection to the end storage and use – from beginning to end**. There is also a need to develop existing systems and geospatial databases so that they are incorporated into wider information systems. Systems need to be flexible and agile and able to respond to developing applications and requirements.

Q6: How should the commission be looking to develop the UK's capability in Earth observation data, both technologically and to support an effective market?

A potential risk that is already impacting NOC is that marine remote sensing is heavily dependent upon recruitment of EU and non-EU scientists to gain the specialism to interpret data - the NOC team comprises mainly international colleagues. Remote sensing is a specialist field that draws on expertise from a small international community.

It is also unfortunate that the dedicated MSc Remote Sensing course at NOC has ended due to a shortage of funding. Our hosting partner, the University of Southampton does, however, incorporate some training but this is only at undergraduate level.

In terms of investment, historically, marine Earth observation has fallen between the National Centre for Earth Observation (NCEO) and the NOC in terms of funding, with the consequence that obtaining funding for basic marine Earth observation (not applications) has been poorly funded.

Q7. Which new technologies should the commission focus on to provide new opportunities to process and exploit geospatial data for economic growth?

NOC is a world-leader in the development and deployment of Marine Autonomous Systems (MAS), having received £30M of UK Government investment in MAS in the current decade, including a £3M Marine Robotics Innovation Centre and the new Oceanids development programme, which forms part of the Industrial Strategy Challenge Fund.

MAS platforms (e.g. Unmanned Surface Vehicles and Autonomous Underwater Vehicles), their onboard sensors (e.g. multibeam bathymetry, biogeochemical) and softwares (e.g. automated command-and-control) provide opportunities to collect high-resolution seabed mapping data at reduced cost (and in some cases higher spatial resolution) compared to manned vessels - MAS will undoubtedly play a significant role in the Seabed 2030 initiative.

The ability for MAS to undertake long-term observations in all weather conditions allows great potential for measuring temporal change. And as well as generating geospatial data, these systems will require geospatial data for safe and efficient operation (see Q18). They are also able to transmit data in real-time via satellite, which is driving new data management tools within BODC to enable through-flow of these data to end users such as UK Met Office and Royal Navy.

Other technologies with varying levels of autonomy include fixed platforms (e.g. shore-based radar and the ARGOS beach camera system), passive drifters and satellites. Integration of these autonomous platform data, with other data sources, would lead to a seamless transition from land to sea when considering problems like flooding, sediment transport and coastal defence, or intertidal fisheries management.

The Commission is strongly encouraged to engage with the NOC to 1) understand

the full potential of MAS to collect and exploit marine geospatial data, 2) identify opportunities for MAS data integration with model and satellite data in order to develop a holistic 4D view of the ocean (see also Q8 below), and 3) explore mechanisms for seamless integration of data collected by autonomous platforms across land and sea.

Q8. How can geospatial data and applications be used to support enhanced roll-out of future technologies?

Integration of satellite and model data with real-time data collected by autonomous and drifting platforms is a key research area for NOC and its partners, and is being applied in new projects in UK waters (e.g. MASSMO – Marine Autonomous Systems in Support of Marine Observations), and overseas as part of the Global Challenges Research Fund and the UK ODA agenda (e.g. SOLSTICE – Sustainable Oceans, Livelihoods and food Security Through Increased Capacity in Ecosystem research, focussed on the Western Indian Ocean). In addition to capturing information about the ocean, data captured can feed back information on how the technology is performing in the field, which in turn can be used to enhance vehicular performance. **Geospatial data layers (and model outpurs) can play a key role in targeting features of interest to the end user**, that are then surveyed in detail with high-resolution *in situ* observations.

Q9: What are the options for how public sector organisations could continue to invest in maintaining and enhancing our geospatial data assets?

A fundamental requirement of centres like the British Oceanographic Data Centre (BODC) is to put data at the heart of research operations.

Some data centres also develop products. The Natural Environment Research Council gave BODC a clear remit to provide open data but not information products, and we believe that this has proved beneficial.

Data centres like the BODC have a role to provide the data and information to underpin the recommendations determined by the Intergovernmental Panel on Climate Change (IPCC).

Contributing data that has societal benefit is a key requirement of public sector organisations. The underlying value of this data is not necessarily reflected in its commercial value.

Q10: What areas of the underpinning geospatial infrastructure such as positioning technologies, including GPS and indoor positioning systems, and geodetic networks and frameworks to support them, should we be prioritising

the development of, in order to support the emerging requirements for geospatial data?

It should be noted that many *in situ* observational platforms, including MAS and Argo floats, rely on the Iridium satellite network for data transfer. Radio and underwater communications are spatially limited and often challenging in the marine environment, so **investing in increased access to satellite networks and reducing cost / increasing resilience would provide a major benefit**.

Q11: What role should the private sector have in both the development and maintenance of the underpinning infrastructure and enhancing the UK's geospatial data assets?

See Q4.

Also, on the instrumentation side, **there is a need to develop and build in standards for marine data that are interoperable**. We would like to be able to work with commercial companies, to be assured that when their sensors start to send us data, that we know what it is. There needs to be knowledge exchange about standards.

Q12. Do you face challenges when working with geospatial data from across the public sector? If so, what are they and how could value be better released? Are there any technical remedies or standards that could be adopted to improve the interoperability of geospatial data? Please provide supporting evidence of what these remedies could help to accomplish.

As mentioned in the Introduction and questions above, the marine data landscape in the UK is complex, and so **ensuring that all existing marine data can be obtained and assimilated will be a key initial challenge for the Geospatial Commission**.

There also needs to be a standard applied to metadata, to ensure all provides and users are speaking the same language. For example, if a data point describes a feature as 'rain' and another data point describes another feature as 'sleet', the technology that needs to read this, must be able to interpret 'sleet' as a sub set of 'rain'.

Vocabularies are used to describe the data - there must be clarity in description and interpretation. There should be standards in both vocabularies and interoperability. BODC is an acknowledged leader in the marine community in terms of developing vocabulary services, and would be happy to support the Geospatial Commission in this aspect.

Q13. How can the Geospatial Commission act as a more effective customer for geospatial data on behalf of the public sector?

As mentioned in the Introduction, although NOC is not one of the initial Partner Bodies of the Commission, our role as the UK centre of excellence for oceangraphic sciences, and as the hosting institution of MEDIN, BODC, and the Seabed 2030 Global Data Centre, **should see us playing a key role in providing marine geospatial data and scientific expertise to the Commission**. We would be happy to discuss this in more detail.

Q14. Are there any additional geospatial datasets, from the other partner bodies or other sources, that the public sector would derive significant benefit from having access to, that might have novel and valuable use cases? What would that access look like?

As per Q4, **it would be beneficial to be able to access commercially-collected bathymetric data** that have been gathered for commercial surveys for use within derived products. e.g. seafloor bathymetry at high resolution. Although we appreciate that this type of data may include commercially sensitive information, if a version could be produced at a lower resolution, e.g. 200 m, this would provide societal benefit in terms of navigation.

Q15: How can we best ensure effective local authority coordination and sharing of best practise, using location data to better deliver public services?

Not answered

Q16: As a result of this analysis, we are prioritising the exploration of possible initiatives in the high-value categories identified:

- **property and land**
- **infrastructure and construction**
- **mobility**
- **natural resources**
- **sales and marketing**

What are the existing or potential geospatial applications which could be scaled-up or developed in order to capture economic value? (We would particularly welcome responses from industry and other bodies engaged in these sectors.)

We recommend that the five themes of Private Sector Use Cases should be expanded to reflect marine, for example:

Property and land – marine data can be used to enhance security of coastal communities in terms of preparation for storm surge and flooding events.

Infrastructure – as mentioned in Q1, marine data can help scientists predict flooding and storm surge events that may compromise infrastructure. In addition, the British Ocean Sediment Core Research Facility (hosted by the NOC) collects data about deep-sea sediments. These data can be used, for example, to provide predictions about the likelihood of submarine landslides, which may lead to tsunamis. Information from deep-sea floor sediments may be used for mapping and surveys, oil and gas exploration, national resource assessment, pollution studies, laying submarine cables and the siting of seafloor structures.

Mobility – data that is derived from monitoring ocean circulation can be used to enable shipping routes to operate with maximum efficiency, saving fuel and time, for example.

All five themes could be enhanced by showing the need for and applications of marine data sets. For example, marine geospatial data can be used to help the UK manage the protection of its coastline and infrastructure (e.g. Thames Barrier), the identification of Marine Protected Areas, and development of sea floor maps to enable society to better manage precious seabed resources. Marine geospatial data underpin environmental impact assessments for marine renewable energy installations and their energy resource assessment.

Q17: Are there any other areas that we should look at as a priority?

NOC again encourages the Commission to ensure that the Strategy reflects the critical role of marine data in delivering societal benefits **both for the UK and the wider global community**.

Q18: What are the main potential private and public sector innovations that will rely on the use of geospatial data to rollout, and are there corresponding regulatory challenges?

The rapidly increasing number of Marine Autonomous Systems in UK seas will require a variety of geospatial data to operate safely and to meet regulatory requirements. In 2016, the UK Marine Industries Alliance (MIA) launched an industry Code of Conduct in respect of surface Maritime Autonomous Systems, however, this is a voluntary code, and new regulations around navigational safety will undoubtedly require real-time access to high-quality geospatial data, e.g. bathymetry.

Hot off the press – linked to the above, in October 2018 it was announced that the

Maritime and Coastguard Agency (MCA) and the Department of Transport (DfT), in collaboration with the NOC, sucessfully secured £1M in a bid to position the UK as a world leader in the autonomous and smart shipping industry. The funding, awarded by the UK Government's Department for Business, Energy and Industrial Strategy's (BEIS) 'Regulators Pioneer Fund', will be used to pioneer new ways of regulating and supporting the autonomous and smart shipping industries to help them deliver innovative new technologies to the traditional maritime sector.

The global autonomous shipping industry is predicted to grow into a $136 billion behemoth by 2030, with UK businesses already playing a key role. The funding will see the creation of a Maritime Autonomy Regulation Lab (physically based at the NOC), where regulators from the MCA and DfT can work with academia and support industry to promote on-water testing and flagship projects and help the UK grow its presence in the global marketplace.

Q19: How best can we make the UK's presence in the international geospatial world more visible?

The Seabed 2030 programme is a high-profile international collaborative project, which will build on the NOC's contribution and commitment to the efforts of the General Bathymetic Chart of the Oceans (GEBCO) - under the auspices of the International Hydrographic Organization and the Intergovernmental Oceanographic Commission - to provide the most authoritative, publicly-available bathymetry data sets for the world's oceans. **It is vital that the Geospatial Commission acknowledges and supports NOC's leading role in the Seabed 2030 initiative**, as it has potential to underpin multiple UK maritime interests, particularly in the Global Britain agenda.

NOC-BODC has been a member of a number of EU initiatives so it is important to maintain our presence within those programmes e.g. the Argo global array of temperature/salinity profiling floats. Some programes have developed into long-term infrastructure in their own right. For example the EU's EMODnet Programme has developed into a leading European endeavour to capture an array of environmental information, including bathymetry, seabed habitats, marine geology, biology, chemistry and physical paramenters along with capturing human activities in the marine encvironment. The sole purpose of the EMODnet Programme is to capture existing data and ensure that they are made available to the public and industry alike.

Another example of a key European programme is the European Multidisciplinary Seafloor and water column Observatory (EMSO). The key contribution of the UK to the EMSO effort has been to collect data from the Porcupine Abyssal Plain sustained ocean observatory, and this has been coordinated by NOC. The EC granted legal status to EMSO, which has been helpful in maintaining the longevity of the programme. If the UK is no longer involved in these programmes, our ability to influence and benefit from these programmes will decrease.

As mentioned in Q12, the UK can enhance its global visibility by building upon its capability in the innovation in vocabularies and interoperability. BODC is an acknowledged leader in the marine community in terms of developing vocabulary services.

Q20: Where should the UK be looking for points of comparison overseas? Who are the other international exemplars? What best practice is being modelled overseas that we can learn from?

We recommend that the UK notes the following points of comparison:

The Australian Marine Data Network

The US' NOAA National Centres For Environmental Information

Germany's Pangea Data Publisher for Earth & Environmental Science

The EU's EMODnet and SeaDataNet

The IOC-UNESCO's IODE

Thank you for your time in completing your response to our call for evidence.

Any questions, please get in touch with the Geospatial Commission via geospatialcommission@cabinetoffice.gov.uk

Contributors to the National Oceanography Centre response:

Prof Russell B Wynn,
Associate Director - Government, International and Public Engagement
Chief Scientist - Marine Autonomous and Robotic Systems

Dr Graham Allen
Head of the British Oceanographic Data Centre

Dr Paul Bell
Associate Head of Ocean Technology and Engineering

Alan Evans
Head, International and Strategic Partnership Office

Dr Dougal Lichtman
Marine Physics and Ocean Climate Group

Dr Helen Snaith
British Oceanographic Data Centre

In case of query, please email, in the first instance:

Jackie Pearson
International and Strategic Partnerships Office

jfpea@noc.ac.uk
The National Oceanography Centre