Geospatial Commission

Call for Evidence responses: Geospatial Opportunities across the Economy

Introduction

In December 2020, the Geospatial Commission published a Call for Evidence that asked 13 questions about the geospatial ecosystem. This document contains responses to the Call for Evidence where respondents indicated that their answers can be made publicly available. We received 133 responses, which have been broken down by organisation group across the document, the details of which are in the table below:

Total responses	133
Responses that can be published	100
Private companies	41
Non-government organisations and industry associations	14
of which didn't relate to the survey questions	1
Academic institutions	3
Geo6 partners	5
Public bodies	17
Individual responses	20
Confidential responses	27
of which didn't relate to the survey questions	2
Responses excluded on request or for suitability reasons	6

The responses have been formatted around the organisation type to improve accessibility of the document. Written answers are provided first, followed by quantitative data and responses provided in a non-standard format.

We are grateful for the high quality and number of responses we received from a broad range of stakeholders.

The questions we asked are listed below:

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Q4. How integral is location data to your or your organisation's activities?
Select one from the following list:

- Core to what we do
- Part of what we do
- We do not make use of location data

Q5. Which section(s) of the data value chain does your organisation operate in?
For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do":

- Data capture and creation
- Data transformation, processing and systems
- Data analysis and visualisation
- Application of data

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

- Findability of data
- Accessibility of data
- Interoperability of data
- Reusability of data
- Lack of awareness and/or difficulty communicating about location data
- Funding
- Privacy laws and/or ethical considerations for the use of location data
- Geospatial skills (e.g. surveying, GIS)
- Wider data skills (e.g. data science
- Other

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?
Please rate the importance of any additional blockers: (high / medium / low)

- Findability of data
- Accessibility of data
- Interoperability of data
- Reusability of data
- Privacy laws and/or ethical considerations for the use of location data
- Geospatial skills (e.g. surveying, GIS)

- Lack of awareness and/or difficulty communicating about location data
- Funding
- Wider data skills (e.g. data science
- Other (please specify)

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

- Artificial intelligence/Machine learning
- Automation and robotics
- Geo-Building Information Modelling (BIM)
- Digital twins
- Visualisation and immersive tech (AR/ VR/ MR)
- Internet of Things
- Satellite and airborne remote sensing (including earth observation)
- Cloud computing
- Crowd-source data
- Miniaturisation of new sensors
- Quantum computing
- Edge computing
- Other (please specify)

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years?
Please rate the importance of the following: (high / medium / low)

- Artificial intelligence/Machine learning
- Automation and robotics
- Geo-Building Information Modelling (BIM)
- Digital twins
- Visualisation and immersive tech (AR/ VR/ MR)
- Internet of Things
- Satellite and airborne remote sensing (including earth observation)
- Cloud computing
- Crowd-source data
- Miniaturisation of new sensors
- Quantum computing
- Edge computing
- Other (please specify)

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

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Written response to questions

Private Companies

1Spatial Group Limited

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

1Spatial think that a combination of political, economic, social and technology changes have had a huge impact on the use of location data. The UK's exit from the European Union has resulted in changing government policies, as is the retained EU Law (Revocation and Reform) Bill. These political changes have resulted in government needing to use more location data to help inform, shape, and monitor new policies. Post COVID-19 impacts are demanding new/changing policies, resulting in the need for more location data to be used, for example understanding where vulnerable people live. The UK's continued lower productivity and focus on efficiency has driven the need to use data and location data more. Organisations need to achieve more/smarter outcomes with less resources. Use of location data is helping drive efficiencies across our economy. Social changes that have had a big impact on the use of location data include changing customer buying behaviours and expectations, leading with digital and data. Technology changes that have had a big impact on the use of location data include the advancement of data science and analytics, working towards using location data for analysis as well as visualisation. Location data is increasingly being used for predictive analysis. Specific technologies include machine learning and artificial intelligence.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

1Spatial think that a combination of political, economic, social and technology changes will continue to have a huge impact on the use of location data in the next 5 years. By 2025 location data will be embedded in so many more decisions, interactions, and processes. Location data will be processed and delivered in real time. Flexible location data stores will enable integrated, ready-to-use location data. Location data operating model will treat location data like a product. Location data-ecosystem memberships will be the norm.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

1Spatial agree that the geospatial market is not a single sector but is best described as an 'ecosystem' due to the diversity of products and services that enable or utilise location data across multiple industries, sectors, and markets. These characteristics reflect the trends the 1Spatial are seeing in the market. Location data will be processed and delivered in real time – this is driving new data capture and creation capabilities. Flexible location data stores will enable integrated, ready-to-use location data - this is driving new data transformation, processing, and storage capabilities. Location data operating models, treating location data like a product – driving data analysis, visualisation, and application of data. 1Spatial would add location data verification and location data validation as a characteristic, alongside data transformation and processing. 1Spatial would also add centralised, federated, and distributed integration architectures. We are seeing the emergence of new architecture patterns, for example driven by digital twins. We suggest referring to data foundations as well as data infrastructure.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

1Spatial would like to answer this question the other way around. How can the UK public sector / the Geospatial Commission support location data for innovative applications of technologies. 1Spatial suggest that the UK public sector / the Geospatial Commission needs to invest more in supporting the sustainability and evolution of UK public sector data infrastructures/foundations. Many public sector organisations have digital, data and technology (DDaT) functions but too often programmes are led by technology or digital and not data. 1Spatial would like to see more interventions and investment in our data infrastructures. Innovative applications of location data can then leverage these data infrastructures/data foundations.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

1Spatial think that location data and technology is being and will continue to be transformational across all sectors of the economy. This will have a significant economic, social and/or environmental impact. Specific examples, relate to the need to improve sharing of better location data for decision-making across local, regional, and national data delivery teams. The Covid-19 pandemic highlighted the technical and non-technical challenges bringing together location data and sharing location data across organisations. Location data and technology can be transformational for Agriculture, Construction and Infrastructure, Logistics and Supply Chains, Cities, Public Safety and Security, Autonomous Driving, Land Administration and Energy Transition. Location data and technology can be transformational for building back better, growth, levelling up, the green revolution, natural capital and ecosystem assessment, infrastructure performance, achieving net zero and our climate change mandate.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

1Spatial strives to drive better awareness of the value of geospatial data. We could all do this by embracing the UK geospatial strategy and ensuring that the strategy is at the core of the UK geospatial ecosystem. We could celebrate successes pertaining to the strategy. The recent 'Geospatial Knowledge Infrastructure Readiness Index and Value Proposition for World Economy, Society, and Environment', summarises the UK's strengths and opportunities. How can we leverage our strengths and focus on areas for improvement, for example, Geospatial Mandates in Sectoral Policies, Geospatial Collaborations, Industry Capacity and Industry Networks.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The National Underground Asset Register (NUAR) is an excellent example of effective collaboration to deliver geospatial applications. This example relates to 1Spatial's response to question 11.- the need to improve sharing of better location data for decision-making across local, regional, and national cross sectoral teams. Collaboration is fundamental to delivering NUAR and any other multi-organisational application of geospatial. Collaboration is needed across multiple stakeholders. Effective collaborations need to align stakeholders on a clear vision of the application of geospatial. A blueprint should define the applications of geospatial, the order for building geospatial applications to maximize value and reusability, the way their capabilities will evolve, and their ownership and governance structures. Without all this, we've seen organisations build disparate single-use geospatial applications with limited engagement by the business and no way to attribute value from use cases back to the geospatial application.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

East of England

Q17. What is the name of your organisation?

1Spatial

Q18. What is your role within the organisation?

Business Development Manager

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Geospatial Software and Services

Airbus Intelligence

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

A combination of consumer behaviour, and technological advances. Within this timeframe location data has now become a necessity for many businesses, rather than a novel innovative niche. Technological advances have driven a huge increase in the availability and accessibility of location data. Moreover consumer willingness to adopt locational data continues. Focusing specifically on the public sector there is considered to be a relatively low level of geospatial use, especially Earth Observation, across Government and that the potential isn't being reaped. Maturity has accelerated fastest in organisations that have actively invested in embedding day-to-day use of these data across disparate policy areas.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

In this timeframe Earth observation will evolve into ultra-high resolution imaging, with intra-day revisits. Therefore, there will be multiple opportunities per day to capture satellite images, with image resolution typical of aerial systems. For example, From 2023, Airbus Pleiades Neo will offer twice daily revisit with enhanced images up to 15 cm resolution. This will facilitate a new raft of monitoring applications. Looking across the broad range of capabilities that EO capabilities can bring, there is a clear role for them to play in emerging policy areas such as Net Zero and greenhouse gas inventorying. The quality of geospatial datasets is such that they are more and more applicable to support policy. What is lacking is the willingness and drive to make this happen.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I agree with the characterisation of the ecosystem.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Utilise UK sovereign very high resolution EO capabilities to bolster the national spatial data infrastructure and build capacity for future missions. Point 46 of the recently published House of Commons Science and Technology Committee UK space strategy and UK satellite infrastructure report discusses the UKs lack of 1 sovereign satellite EO capability. However, the Airbus contribution into this report2 has already highlighted that Airbus Intelligence UK provide EO services of Vision-1, the UK's first sovereign <1M resolution optical imaging satellite, and NovaSAR. Besides the MOD, this data is not widely used by the UK public sector or the Geospatial commission. There is an opportunity for these missions to contribute considerable high resolution EO data into the public sector to drive the UK economy in areas to include:

- Enrich the national spatial data infrastructure with up-to-date EO imagery available across the public sector,
- Drive the uptake of EO and innovative applications across the public sector,
- Build capacity and skills in the downstream UK space sector to support the delivery of future sovereign satellite EO capabilities.
- Consider how geospatial solutions could be considered in the export market. For example, supporting nature-based solutions for sustainable management.

Maintain a UK archive of Copernicus data to guarantee high-bandwidth access for the UK. Point 50 of the same report, also discusses the UKs position with regards to Copernicus and sentinel data access. Airbus' has previously maintained a Long Term Archive (LTA) of Sentinel data under Copernicus. The UK Sentinel LTA contract has now lapsed with the standstill on Copernicus contracts. Maintenance funding for the UK Sentinel LTA could guarantee high-bandwidth access across the UK and secure a long term archive.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The financial sector, including mortgage lenders and insurers are beginning to investigate the value of EO data especially in the context of climate change. In particular, EO is now being seen as a source of data to identify and track new developments, assess the extent and suitability of renewable energy installations, and identify fine scale changes that may impact portfolio risk. Geospatial is a solution to identifying the impact of climate change under future scenarios of, for example, rising sea levels.
The rail sector is now adopting EO technology to improve the safety and efficiency of the railways. For example, project LUCI is demonstrating the effectiveness of 3 satellite derived land use and land use change to proactively identify potentially hazardous land use. It is thought that EO will deliver a rail specific land use inventory, and changes ahead of other data sources such as national mapping data or on foot surveys.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Airbus Intelligence delivers very high resolution EO data and analytics to support a range of different application areas. These include, defence and security, forestry, agriculture, and urban planning. In particular, very high resolution images have the power to capture and illustrate complex patterns of life and the status of the built and natural environment. In turn, this data can be used to raise awareness around key topics such as climate change and supply chain integrity.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Airbus routinely collaborates with geospatial analytics and valued service providers to deliver EO based geospatial solutions. For example, in project LUCI (referenced in R11) Airbus is collaborating with a Canadian analytics company Ecopia to deliver the rail focused land use information. Specifically, Ecopia is providing advanced AI building and road detection based on Airbus EO imagery. The Ecopia analytics are a complementary layer to the Airbus imagery and analytics.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Airbus Intelligence (part of Airbus Defence and Space Limited)

Q18. What is your role within the organisation?

Solutions Consultant

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Information and communication

Built AI

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Covid-impacted hybrid and remote work patterns and the changing nature of retail/the hight st

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

New services showing consumers and stakeholders the (properly anonymised and aggregated) benefits of location data

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The historical data owners such as councils, govt departments, which may not have the data in digitised form

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Bringing consortia together to build data trusts/data sharing platforms and getting private companies to help with digitisation of historic data

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Location data and AI technology can help bring transparency to commercial property and business activity, with AI inference key in mining and exploiting sparse data

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Our product gathers data from many sources, apply AI inference, and create unique market trends/views that were not possible before

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Market rent, property availability data, and location data on suppliers/clients are key to many small, medium and large businesses, but not openly accessible at the moment. It would take key stakeholders, e.g. LandRegistry making it a legal requirement to register all commercial leases (not just >7 years), and other AI data companies to make this happen.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Built AI

Q18. What is your role within the organisation?

Co-founder and CTO/CSO

Q19. How many people work for your organisation?
10 - 49

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

Business Navigators Ltd

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Ongoing improvements in technology.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

I feel it will be three things. Working towards Climate Change using better Data. Demand -Led need for business to better use geospatial data. Continuous improvement from Public & Private Sector Organisations.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Suggest 'right to left thinking' is needed. Application being led by Value Added Outcomes. Data Analysis to support decision making. Improving technologies, AI, Quantum Computing to improve processing. Back to how best to capture and create the data needed for the Value Adding Outcomes.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Infrastructure Asset Data via NUAR is helpful. However, Future Planning Data is needed UK Wide. Similar to what is being developed by the SIS.DataMapWales Programme, being led by Welsh Government. Also, the Infrastructure Mapping Application (IMA) in London.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Energy & Utilities. Flood Defence. Tackling Climate Change. Supporting Vulnerable People. Reducing Fuel Poverty.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Business Navigators Ltd we already are doing working with Wales & West Utilities and Welsh Government Data Map Wales; in Wales.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Business Navigators Ltd - Planning, Delivering and Maintaining Existing and Future Infrastructure in Wales.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No
Reason:
Happy for this to be shared

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South West

Q17. What is the name of your organisation?

Business Navigators Ltd

Q18. What is your role within the organisation?

Director

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Energy & Utilities

CartoDB Inc.

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The volume of data has grown tremendously over the past 5 years, collected from a variety of new sources including GPS, SDK's, Social Media and more. But technological advancements to manage this data, to provide more detailed analysis, including AI, and the ability to easily share these insights has had the biggest impact.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

With the volume of data now available and much of this in cloud storage, the biggest impact will come from solutions which can access, analyse and share this data at source, so running natively in the cloud without the need to copy data, so working on a single source of truth in a fast and scalable environment. The timesaving and accessibility will be extremely impactful.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

This covers the key elements but the ecosystem does not always fit into silos, for example new data can be created as a result of analysis and the combination of data sets; or disseminating data through dashboards into the hands of experts and decision makers allows new and greater applications of data.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

provide more awareness forums for suppliers of new data sets and solutions

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

There are so many potential uses and benefits across all sectors. From smartphones to connected cars, location data is changing the way we live and the way we run businesses. Everything happens somewhere, but visualising data to see where things are isn't the same as understanding why they happen there. Modern Location Intelligence platforms and Spatial Data Science workflows enable organisations to use spatial data and analysis at scale, and put the information in front of decision makers to optimise business processes and predict future outcomes. This might be to reduce costs, improve services, make efficiencies, improve environmental impacts, direct strategic planning or policy.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

There are 2 key aspects to consider here. Firstly, the Carto platform itself allows easy access and dissemination of data and analysis, through dedicated tools for non-technical users, data scientists and developers, so exposing geospatial to a greater number of users. Partnering closely with the leading cloud Data Warehouse providers to extend geospatial capabilities in these environments. Secondly, Carto can contribute through existing marketing and thought leadership activities which includes: webinars about new technical advancements or data sets, often with partners/clients; providing regular social media/blog announcements; releasing eBooks (eg Becoming a Spatial Data Scientist); presentations at industry events; dedicated workshops and awareness activities for clients (with members from Data Partnerships, Product Development, Data Science teams). Carto is also a member of OGC and an active contributor to OpenSource, to help improve future geospatial solutions.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Carto have thousands of customers and integration partners from all over the world. All use different elements of the platform to deliver a focussed solution, using a combination of their own data and often 3rd party data sets. Carto provides a Data Observatory where we have partnered with many specialist data providers as well as many open source data sets, to enable simple access and licensing to over 12,000 data sets (currently). Some data sets are unique to Carto, some have favourable pricing terms, but all data is delivered directly into a users' Carto account, saving significant time with investigating sources and the ETL process. The Carto platform has been developed to take advantage of modern cloud computing and so we collaborate closely at a technical level with the primary Data Warehouse providers.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Other (please specify):
Carto is registered in the USA with offices in Spain and remote workers (currently) in various parts of the UK but centralised around London shared office space.

Q17. What is the name of your organisation?

Registered as CartoDB Inc. but known as Carto

Q18. What is your role within the organisation?

Business Development Manager

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
IT Solutions provider, working in all industries specified above (except the last 2)

Costain

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Drone tech, cloud capabilities, open data initiatives, AI use cases, API/developer resources, mobile/tablet compatibility

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

AI, VR/AR, Digital Twin, enhanced coding skills, cloud based analytics

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Might add data integration- combining data from multiple sources to create a new, enhanced dataset.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

NUAR, work with OS for wider/better data sharing, increased drone data sharing, support system integration around digital twin and data interoperability

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Drone data for biodiversity management, weather data and logistics, traffic and AI/ML, live data feeds and digital twin. UK wide impact, better environmental and social impact, economic in £ mil.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

advocate for improved geospatial data management and use on our projects, share knowledge and lessons learnt, best practise, support initiatives like NUAR, align with GC's vision and guidance and promote via internal and external events

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

OS, Land Registry, ESRI, AutoDesk, Microsoft, MET office, Environment Agency, Natural England, BGS, HERE, Waze, Google

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Costain

Q18. What is your role within the organisation?

Group Head of GIS

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:
Construction

CWMPAS

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Open data and the ability to layer different data sets that have a correlation. The growth of IOT and the ability to monitor data patterns of almost anything.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The care sector, having access to hyper local data to develop a varied approach to care solutions across urban and rural settings.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

If it is to be an ecosystem, it should include the users and the skill needed to live within the ecosystem. There is a whole range of operational competence needed to grow this, it should be shoehorned into every national education curriculum asap.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Work with the Third sector (charitable sector) to drive grass root innovation, demonstrate this tech to front-line workers to encourage innovation to emerge from practice and service delivery.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Health sector - huge potential for exploiting more tech. Wellbeing, monitoring our living environment, air and water quality. Tourism trisect enhancing visitor experiences. Crime and Policing supporting the conviction of criminals and making our communities safer living spaces.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Showcasing, advocating, demonstrating, raising awareness, inspiring others, making it sexy. It's a very unknown area of work.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Partnership working with data centres, developing working relationships between data boffins and those that can make good use of the data in their working roles (e.g. health professionals). Getting operational and analysts in the same room. working with Large Tech companies, Big Pharma etc Schools and universities offering decent apprenticeship opportunities that cover the multiple roles in this field.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No
Reason:
I'd like to get involved in this if possible and be a (non technical) advocate for Wales

Q15. Who are you responding on behalf of?

Other (please specify):
A Social Value Cooperative delivering support and digital advocacy in Wales

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Wales

Q17. What is the name of your organisation?

CWMPAS

Q18. What is your role within the organisation?

Digital Programme Lead

Q19. How many people work for your organisation?
50 - 249

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

Cyient

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Connectivity: the pace of technological development in connectivity (particularly the advent of 5G) and new mobility Last Mile Connectivity (Delivery and Ridesharing: increase demand for online shopping/food ordering. Cloud/AI: advances in cloud computing, AI, machine learning and deep learning techniques. Pandemic/Cost of living: economic and political pressure results in the need for data-driven analytics for better, more targeted spending. Space & Satellites: increase commercial availability, accessibility, and the use of satellite dataset. Net Zero: climate changes put pressure on government/local authorities to increase focus on sustainability. Privacy and Security: Increased focus and attention on location harvesting and sharing (I.e. Google court case) Open Data/standards: Availability of more accurate open data (such as OpenStreetMap) and open data standards.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Economic and Political factors will continue to impact all aspects of industry and society (war in Ukraine, Recession, Inflation and the continued fallout of the Pandemic). Net Zero: climate change crisis and the need for identifying climate-related risks (financial risks to the banking sector etc) and the need for digital twin of our planet which would allow us measure and manage our impact. ESG, particularly sustainability: sustainability concerns, the rise of mega cities, increasing traffic and the birth of the software-defined vehicles. Autonomous Mobility and Development: Verification & Validation (V&V) of autonomous cars would require both simulation and millions of miles of on-road testing. Space & Satellites: increase commercial availability, accessibility, and the use of satellite dataset. Metaverse/Industrial Metaverse: Increase demand/interest in AR-VR-based virtual training/remote assistance to reduce cost, ensure worker safety and keep factories operational through lockdowns. Data Governance, Security and Privacy: the need of increase level of confidence in data/analytics so government, local authorities and financial markets can trust. Intelligent Transport: demand for intelligent transport solution/product especially in goods delivery sector– the needs for quicker, more efficient, and more environmentally friendly transport. Supply Chain Optimisation: leverage of intelligent systems, big data and analytics for scenario planning, demand prediction and addressal of issues along the supply chain. Edge Computing & Analytics: the needs for real-time data/insights (edge computing). Miniaturisation of sensors coupled with lowering of cost (for hardware such as Lidar, radar and cameras that capture high resolution imagery).

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Looks good

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Geospatial Commission to identify and support targeted initiatives to solve specific challenges (like with NUAR), such as: Digital Roads (drive for agreement between major road stakeholders as to what a digital road could be: DFT, National Highways, Transport for Scotland etc). Connected Vehicle systems (harvesting live sensor data from vehicles for automated map changes/event tracking) Future Farming/ELMS: Support DEFRA with their ELMS programme (good use cases for current and future satellite technology such as hyperspectral and thermal)

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Autonomous Mobility: starting with V&V and moving into HD Maps, self-healing maps and optimised road/infrastructure management. Done properly, a good mobility ecosystem will drive economic growth but also support levelling up/social mobility. Last Mile Delivery/Connectivity: Geospatial data is crucial for efficient delivery routing, but can also be leveraged to create more efficient and sustainable delivery models (I.e. more central hubs for collection, better forecasting of future needs such as with medication or healthcare). Smart(er) cities, roads and infrastructure Economic impact: having access to the relevant data/insights would allow Local Authorities better plan their budget (money allocation) Social Impact: less congestion, better public transport, reduced air pollution would result in less stress, more happy and healthy community Environmental impact: Reduce cardon footprint by making travel more efficient ESG: Earth observation has the potential to drive much greater improvements in our understanding of the impact we’re having on earth and how we can mitigate these.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Through workshop and collaboration with Government and Public sector on specific challenges. Most importantly, we need to all provide better articulation of the outcomes of what geospatial data enables (I.e. instead of focusing on the technology, we focus on what it does). As much as we want to talk about Geospatial (or maps), most benefits are downstream from the technology itself (I.e. google Maps is not about the map, it’s about getting me to the nearest coffee shop or landmark). Better connections with other private organisations, especially those in the “big tech” sector who are often driving much of the innovation with regards to geospatial, but are rarely included in conversation (I.e. Metaverse, autonomous vehicles/platforms, smart phones, cloud etc)

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We think NUAR has been a good example of where the Geospatial commission has succeeded. But we would also look to initiatives such as OpenStreetMap (and the fact that it's now being edited by some of the largest tech companies in the world) and technology such as What3Words.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South West

Q17. What is the name of your organisation?

Cyient

Q18. What is your role within the organisation?

Head of Location Based Solutions

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Information and communication

Databricks

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advancements such as wider industry adoption of deep learning for image segmentation purposes (eg. using satellite imagery to detect building shapes, roof pitch, changes in the layout, a new shed, conservatory). On the other hand, emergence of big data platforms (e.g. apache spark) on the cloud has made processing of very large location data possible without the need for super computers. Lastly, tech companies like Google, Uber, Microsoft, Carto, Databricks have been adopting grid index systems as a standard for data outline, on the government side the same has been pioneered by Ordnance Survey with British National Grid - this approach can further increase the volumes of location data that we can process efficiently.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Appropriate use of AI/ML, solid data standards that are produced together with the industry, evolution of organisations like OGC to take an angle appropriate towards big data and AI/ML ready data, cloud adoption.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Data should be perceived as a product in a circular data economy. Data capture can be simply an ingestion from another system that has already processed the raw location data. Deffiniton of geospatial data marketplace would be of big value in this domain since it can feed broadly into the geospatial ecosystem. The chart does not communicate such aspects of geospatial data. The nature of the data is also not captured. Is the data being ingested as streaming data, batch data, are there real time processing requirements in place, what is the volume of the data. We need to have data drive designs in place. This feels rather infrastructure led or software led - this approach imposes various limitations, if the data grows systems stops being adequate, if the data evolves system stops being adequate. Data driven approaches account for data evolution.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Cloud technologies can help ingest very large volumes of imagery data such as satellite imagery. In such scenarion we could remap the whole territory of UK identifying peatlands, deforestation areas, areas where solar and wind power have been well adopted. These technologies can bring the level of processing that was in the past reserved for super computers and not fit for wider use. Now we can bring such technologies to all government departments and use them as a catalyst for innovation.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

One of the very interesting use cases for geospatial data is ESG and Sustainability in general. Location data has very big implications in proper analysis of sustainability of an organisation and its supply chain. Further the new technologies can help improve the envioronment through identification of peatlands, deforestation areas or adoption of solar and wind energy across the UK. On the other hand, geospartial data can be used for maritime use cases like prevention of illegal exchange of goods outside of the port or identification of human traficing. There are many use cases where geospatila data can help the government improve the regulatory and policy-making activities.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Databricks has already been working with the likes of Ordnance Survey and DEFRA over the last few years, one of the examples of innovative work that would increase the awareness of the value of geospatial data was a joint publication between Databricks and Ordnance Survey on the efficient resolution of UPRNs and Building Shapes in OS Mastermap [Link excluded from publication]. Likewise, we have been promoting usage of grid index systems such as H3 and British National Grid as a way to both increase efficiency and interoperability of geospatial data. Going forward we believe we can help you rethink the way data is exchanged using solution like Delta Sharing [Link excluded from publication] that can completely replace the need for Rest APIs and is designed in a data driven approach.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We work with both UK, Australian, US Federal and EU government on many geospatial use cases, spanning from maritime data analysis, agricultural analysis, AI/ML applications, big data analytics, etc. Given that we are a cloud data platform we have as customers over 6000 ortanisations world wide both in public and private sectors across all industries and we help these organisations with all of their data needs, governance, scalability, data products, data sharing, AI/ML, analytics and geospatial.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Databricks

Q18. What is your role within the organisation?

Senior Solutions Architect - Public Sector Pre-sales Technical Lead

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Information and communication

Energy Networks Association

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Market conditions: • Government mandates have resulted in rapidly accelerating innovation using location based data to achieve objectives such as net zero by 2050. Moving to a more sustainable future: • Unlocking the value of location data has become considered as an instrumental enabler in the UK's future flexibility market. Innovation & technological advancements: • Intelligent mapping of energy infrastructure such as mapping EV charge points and low carbon technologies • Significant advancements in drone technology / Aerial imagery and GPS data have enabled the accurate mapping of infrastructure.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

2010-2020 • Geolocation technology became the foundation for all location-positioning services and applications. The ability to identify an object's geographic location in real-time benefitted several industries that have come to depend on this data. • During this time period there has been a significant increase in the adoption of location based data by businesses to help inform decision making processes. • Effective application of location data has been a major contributor to the transition of a more digital future. • Within the UK energy sector, unlocking geolocation data has allowed pilot projects such as the NESM being possible [DDSG] and the development of government initiatives such as NUAR [Geospatial Commission]. Next 5 years - changes and trends • The next 5-10 years will mark a decade of transformation and mass innovation using location data • This will lead to increased opportunities for all industries to exploit location data, to either create a competitive advantage or make better informed business decisions. • Investment in infrastructure = Physical Infrastructure + Data Infrastructure • The volume of data available will continue to increase as new and emerging technologies like smartphones and IOT connected devices grow exponentially. Changes and trends include: • Increasing real-time availability of data e.g. Smart cities / smart energy systems • Rise of Artificial Intelligence/ Reality e.g. AR is currently one of the most prevalent geolocation trends, and APIs are redefining AR. AR portrays a real-world environment through a digital augmentation app. • Explosion of use cases e.g. significant increase in the adoption of location based data by businesses to help inform decision making processes. • Open Data e.g. increase in the availability and use of location intelligence information by the public at large

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

• Figure 1 is a standard data ecosystem traditionally adopted by businesses. • Is there an opportunity to evolve the traditional model and embed open data following the adoption of the data triage playbook across energy networks in the UK. • Similar initiative adopted in the offshore survey industry with the Crown Estate's Open Data programme. An initiative to map the UK seabed and make data freely available after a certain timeframe. Data can be viewed and used under specific terms and conditions. • Making data open will have to undergo a process to systematically identify issues, i.e. a data triage process to categorise the following criteria (Privacy, Security, Commercial, Negative Consumer Impact or Legislation and Regulator Barriers). Ultimately datasets will need to be identified and assessed before techniques can be used to mitigate any issues.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

• Primarily focus on investment and funding including investment in education, apprenticeships and development opportunities. • Focus on initiatives promoting greater awareness. • Give recognition to organisations actively embedding / promoting geolocation data as a key enabler for digital transformation. • Support new digitally enabled markets and business models • Support senior leaders to create awareness of innovative applications of location data with these technologies to ensure senior leadership are engaged and willing to champion the message from the top down. No such thing as an organisation being ‘digitally mature’ but it rather being a continued path of ‘maturing’ because of continuing external developments, innovation and disruption.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

• Primarily focus on investment and funding including investment in education, apprenticeships and development opportunities. • Focus on initiatives promoting greater awareness. • Give recognition to organisations actively embedding / promoting geolocation data as a key enabler for digital transformation. • Support new digitally enabled markets and business models • Support senior leaders to create awareness of innovative applications of location data with these technologies to ensure senior leadership are engaged and willing to champion the message from the top down. No such thing as an organisation being ‘digitally mature’ but it rather being a continued path of ‘maturing’ because of continuing external developments, innovation and disruption.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

• Support government initiatives focused on creating greater awareness • Embed / promote geolocation data as a key enabler for digital transformation • Creating new digitally enabled markets and business models • Geospatial data is linked closely to digitalisation and some major barriers to creating a digital ecosystem are not only technical but organisational, cultural and behavioural. This is currently lacking and needs to be steered by senior leadership across industry. • Senior leaders aren’t always sufficiently data fluent therefore its crucial to ensure senior leadership are engaged and willing to champion the message from the top down. Potentially need cross industry involvement and agreement. No such thing as an organisation being ‘digitally mature’ but it rather being a continued path of ‘maturing’ because of continuing external developments, innovation and disruption.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

National Energy Systems Map • Many Net Zero projects are intrinsically linked to geolocation data. • 2018 saw the release of the Energy Data Taskforce report, which was sponsored by BEIS / Ofgem / Innovate UK. • This initiated the importance of Data and Digitalisation to achieving net zero . • Based off the findings of the report Taskforce developed five recommendations for Government, Ofgem, and Innovate UK. • The NESM pilot project was born off the 5th recommendation o Recommendation 5: Visibility of Infrastructure and Assets – A unified Digital System Map of the Energy System should be established to increase visibility of the Energy System infrastructure and assets, enable optimisation of investment and inform the creation of new markets. • Delivery of the NESM was achieved by a collaborative effort from the UKs DNOs. • Raised the importance of data sharing and collaboration to achieving the report's recommendations • Also highlighted the issue of sharing data and associated security risks/threats.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Other (please specify):
UK Distribution Network Operators [DNOs]

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Energy Networks Association

Q18. What is your role within the organisation?

Head of Data & Digitalisation

Q19. How many people work for your organisation?

10 - 49

Q20. What best describes the industry that you or your organisation is involved in:

Electricity, gas, steam and air conditioning

EOLAS Insight Ltd

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Advancements in location-based services and consumer targeted services.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Internet of things and the networking of remote and mobile assets.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I think that is a good representation.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Creation of geospatial communities, something lacking in Scotland. Better funding support for geospatial startups, as happens within the space sector.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

It is my strong belief that the geospatial sector is ripe for disruption. Traditional GIS methodologies will be replaced by automation, and Geospatial jobs replaced by software engineering and data science roles.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Engage with the community more. Engage with our target market (environment tech) and ensure they understand the geo elements.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We have collaborated with NatureScot to develop a remote sensing and AI based deer detection service. This is being expanded to elephants in Mozambique with in-country partners.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Scotland

Q17. What is the name of your organisation?

EOLAS Insight Ltd

Q18. What is your role within the organisation?

Managing Director

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Agriculture, forestry and fishing

Esri UK Ltd

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The most significant factors in the in the increased value delivered by location data to society have been from advances in capability and reduction in cost of the underlying technologies, infrastructure and data. These have combined to make location data more accessible and useable across society than ever before. These are (in no particular order) Mobile The growing use of mobile, location-aware devices as a primary means of interacting with data and services, both in the consumer world and within business. Drones The explosion in availability and capability of drones for image capture and surveillance. Commodity Cloud The increasing accessibility of cloud storage and processing technology enabling the storage, maintenance and analysis of large, complex datasets. Satellite based positioning for consumer use The provision of positioning capabilities across every country that can be consumed by consumer mobile devices

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Climate Change Adapting to and mitigating climate change is the biggest challenge that the planet faces. Many aspects of the drive to net zero require use of location data in new ways, and this will mean demand for data, technology and expertise is going to grow. A good example of this can be seen in the range of apps that now exist to help drivers plan routes for electric vehicles/ These consider information on charging points, current demand etc. There are expected to be ~10 million EVs on UK roads by 2030, compared with ~1 million today. Key to understanding, mitigating, and reducing climate change will be the use of location information to link disparate sets of data from different organisations in a cohesive manner. Convergence of data science and GIS (Geographic Information System) In the public and private sectors organisations are increasingly investing in data science and business intelligence teams. Traditionally these teams have lacked geospatial skills and the tooling they made use of fell short in this area. As awareness of geospatial techniques grows, location data becomes more accessible, and the tooling improves we will see growth in meaningful analysis and intelligence using location data. Provision of location data for analysis instead of just display Data providers are increasingly looking to provide location-enabled features in a variety of database structures that enables analysis of these features rather than just their display or presentation. The Ordnance Survey National Geographic Database is probably the most important example in the UK. Satellite internet coverage for remote land and marine use There will be an increasing number of satellite constellations coming on stream that provide internet access at a low-cost for areas of the earth where land-based access is not possible. This opens up new opportunities for exploring, managing and monitoring these areas. Improvements in battery storage technology and charging Mobile location -aware devices require power. Improvements in the methods of storage and charging these devices will stimulate their use in a broader range of applications where reliability is critical particularly in remote areas.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

As well as data capture, hosting, analysis and applications in the value chain, there should be an added facet of the value chain around engagement. That is, sharing and collaboration through spatial data.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Many of these technologies are being used to supply greater insight by processing raw location data. Making these insights open and accessible encourages innovation. Key data providers, such as Ordnance Survey, may be hindering innovative applications of location data because of the need to demonstrate commercial returns. Other countries, such as the Netherlands, have successfully made their core location data open (free-to-use) for both public and private companies. The UK Public Sector and Geospatial Commission should investigate funding options to provide key location data in a genuinely open (free-to-use) way for organizations in the private sector in a similar fashion to the Public Sector Geospatial Agreement. This might take the form of separate agreements for organisations that are managing critical national infrastructure, for groups of organisations that are examining ways to achieve net-zero internally and through their supply chain and for charities provide critical services such as the RNLI

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Driving increased awareness of location data across the economy is crucial if we are to realise the full range of applications and insights that it can offer. Awareness is important from a number of different perspectives, for example: • Senior leaders and decision-makers can build their understanding of the potential applications of location data in their sectors; • Many data scientists would benefit from greater understanding of spatial analysis and how this can be applied to bring datasets and systems together; • Industry standards bodies may need to consider the role of geospatial data to support interoperability in relevant systems and processes; and • Different communities can work more closely together, such as digital, geospatial and space. High impact would be achieved with billions of pounds of ROI.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Esri UK are always exploring ways to promote the value of geospatial. One approach has been Esri UK’s development of education outreach programmes to drive the awareness of the value of geospatial in schools and universities. Our ambition is that young people will emerge from education with an understanding of geospatial, that they will take to the workplace and the wider economy. For example, all schools have been invited to subscribe to Esri’s global SaaS (Software as a Service), ArcGIS Online at zero cost, to teach with and about GIS as mandated in the national curriculum. 40% of UK secondary schools have taken up a free account. Esri UK work with initial teacher training providers and teachers in schools to give them the skills and confidence to use GIS technology, whatever their prior background.

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

They can bring into their classroom real life case studies, and deploy the same technologies used by geospatial professionals to ask and answer questions about the world. Alongside this face-to-face approach, the Teach With GIS and Careers With GIS hubs provide teachers, students and parents with a wealth of material to explore the value of the geospatial sector and the rewarding and enriching careers within it. These hubs provide a one-to-many line of communication and have received more than 124,000 views. Investing in these resources that are easily adopted by teachers into their curriculum is important for raising wider awareness and developing appropriate skills that allow young people to access geospatial employment opportunities more straightforwardly. Into the future, deeper engagement with the primary school sector and other educational establishments outside of mainstream secondaries are in their preliminary stages, to ensure equality of access. The GeoMentors program has been launched to better connect schools with geospatial professionals, who will talk about their careers and industry experience specifically. The opportunity for students to develop and deploy their own geospatial solutions to global problems is also welcomed. For example, the recently launched Nature Park initiative will allow students to tackle the climate crisis, and other localised projects like Design Future London allow them to use Esri geospatial technologies meaningfully and skilfully before they have even left the classroom. Esri UK's ambition is for all undergraduates to gain experience with and understanding of geospatial tools and information during their degrees as relevant to their subject area specialisms.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

One examples is The Supply Chain Data Partnership (November 2022) The Supply Chain Data Partnership will seek to provide a location dataset for global supply chains such as palm oil, soy and wood-based packaging applications to increase resilience to climate change. The ambition is to launch a financially sustainable Location Register which provides a trusted location platform to conduct due diligence on commodity assets to identify, prevent or mitigate risk. This will assist with reducing emissions, biodiversity loss and environmental impact of supply chains, reduce unsustainable agricultural practices and land degradation through more effective monitoring and smart procurement contracts. Founding members are OS (Ordnance Survey), Unilever, Esri UK, Deloitte and Planet Labs PBC, and the initial stage will see the delivery of a proof of concept to demonstrate the feasibility of creating a global register for the location of assets. The concept is also supported by Trase.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No
Reason:
We would like option to review any use of our responses

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Esri UK Ltd

Q18. What is your role within the organisation?
Head of Government Practice

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

FISH Digital Forensics

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

With out doubt the biggest impact has come from technological advancements, specifically in the quality and affordability of sensors and Cloud service

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The ability to combine contextual data with imagery to make use of AI within Cloud services

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

This ecosystem looks good but out of date. The latest view in 2022 is to have it all merged and connected in a distributed chain

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Disrupting criminal activity in Law Enforcement

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The Police and the Justice system struggle in adapting new technologies. The whole fabric of society is based on Law and Order. Everything else is a 'nice to have'

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Use our exceptional technologies to capture useful data in other markets to Law Enforcement

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Managing serious health and safety issues in the construction industry, border control,...

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

FISH Digital Forensics

Q18. What is your role within the organisation?

CEO

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Law Enforcement

Fugro

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Digitalisation clients starting to understand what geodata can do for their businesses. Drones have advanced the discussions on autonomous acquisition services

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The commercialisation of large scale uncrewed aircraft and vessels, digital twins, client digitalisation, increased cloud processing and use of AI for advanced analytical information

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

No additional suggestions this covers geodata journey very well

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

For power utilities, we offer Fugro ROAMES®, a solution which includes a high accuracy 3D network model of our clients' conductors and poles, or digital twin. The network model is physics-based, which allows for the application of other inputs such as weather, network load, conductor material which can be used to simulate the conductor sag and swing under different conditions. Along with a full-scale 3D network digital twin we also model the environment surrounding the assets – which is used to inform on critical clearances, vegetation intrusions, and the spatial accuracy of our clients' GIS schematic. By providing these analytics our utility clients have been able to implement digital inspection programs

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

helping to reduce their carbon footprint, inspection cycles, and OPEX costs.Fugro’s uncrewed surface vessel (USV), Blue Essence, incorporates industry-leading expertise to form the next generation of uncrewed vessels for inspection, construction support, hydrographic and geophysical surveys. Blue Essence’s modular design means that it can be used for a wide range of industry tasks within the energy sector and others. It’s a solution for both nearshore and over the horizon operations.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Digital inspection services replacing traditional foot patrols in the power and gas sector has seen a reduction in carbon, improved predictive vegetation management, reduced inspection cycles so safer networks and up to 40% savings in OPEX costs. Fugro's site characterisation services has been able to speed up the design and construction process of numerous offshore renewable projects by de-risking the sites prior to construction.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Fugro is the world’s leading Geo-data specialist and we have a ‘triple A’ approach to offer integrated data Acquisition, Analysis, and Advice. Geospatial solutions are therefore a natural fit for Fugro and we have invested in acquiring and innovating new technologies in this space for both our marine and land clients.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Fugro's uncrewed surface vessels have been designed in the Netherlands, we have remote operations centres in Aberdeen UK, Houston, USA and Perth Australia which are used to control these vessels on their projects throughout the world. As a company Fugro operates in 65 countries and has more than 100 offices worldwide. These offices collaborate on a daily basis and also engage local suppliers in these countries as part of our projects.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

East Midlands

Q17. What is the name of your organisation?
Fugro

Q18. What is your role within the organisation?
Commercial Excellence Manager

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

Geollect

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The availability of developed Geospatial Information Systems (GIS) for technically skilled individuals has been key to the exploitation of geospatial information across government and industry. Advances in the democratisation of GIS designed to enable non-expert users to gain advantage from these data is now beginning to see exploitation of fused geospatial information across a much wider range of sectors and use cases. The use of common standards for geospatial data exchange further enhances the ability to leverage the power of geospatial data. These standards may be Open Geospatial Consortium approved but also include proprietary formats used in SaaS such as Esri's offerings. The number of small to medium sized enterprises basing their business model on exploiting geospatial information has shown considerable growth during this period, driving competition and innovation across many sectors. Disruptive events such as the COVID-19 Pandemic and global supply chain shortfalls has highlighted global fragility and many sectors are looking to utilise geospatially enabled information to better mitigate and understand risk.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The trend for web enabled geospatial portals that visualise information in easy to use and access formats is likely to continue over the next 5 years, with more sophisticated use cases driving innovative tooling and interconnectivity. In the longer-term governments will most likely look to make all publicly funded geospatially enable data more easily accessible, searchable, and available to support economic and social policy. The exponential increase in the number of remote sensed platforms in earth orbit should seed innovation and new ways to exploit the data that these platforms can collect. To support critical issues of energy availability, pricing and supply and to better understand the impacts and required mitigations of climate change; leveraging complex geospatial data in easy to access and exploitable delivery methodologies will become more critical for business and government. The increasing computational power of edge computing and portable technology such as mobile phones and IoT enabled devices will drive the in-situ collection of geospatial information and the exploitation and fusion of these data with other sources for the widest range of use cases.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Within the data transformation, processing, systems section – Data interoperability enablers such as ownership, ability to access, search and exploit should be mapped with particular focus on ease of access, this includes the transformation of non-traditional geospatially referenced data into geospatially enabled formats. Within Application of data section, the ability to exploit geospatial data for digital twinning, modelling and testing should be highlighted in conjunction with the ability to utilise geospatial information to counter and better understand risk, threat and effect for business and government.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The Geospatial commission should ensure that public geospatial information is easily accessible, searchable, and exploitable by cataloguing and support the serving of government owned data through geospatial portals and access points. Ensuring that government provisions these data in easily accessible and exploitable formats is essential to rapidly gaining value, not just for visualisation in standalone application but enabling full data access. The cost of accessing UK government funded data from specialist geospatial centres such as the UKHO or Met Office is often financially prohibitive and leads to UK businesses looking to other nations agencies or private industry, where possible UK industry should be financially incentivised to use UK government derived data. Innovation funding for low TRL geospatial projects is key to enabling new products and application of data from small to medium sized enterprises, government innovation funds such as DASA should actively seek to enable themed calls for geospatial technology when appropriate.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Location data will be transformational for many sectors as the prevalence of edge sensing and remote sensing becomes financially viable and more accessible. Such sectors include transportation of goods and people including the associated risk management, renewable energy development, health and defence and security. It is highly likely that most sectors that are heavily exposed to environmental change such as agriculture, fisheries and energy will be some of the first to maximise the insights that new remote sensed platforms can enable. In defence and security, commercial use cases will drive the application of Radio Frequency remote sensed data application and improved EO/IR collect capabilities. Critically geospatial technologies are already developing new ways to monitor, mitigate and understand cyber and information operations effect on real world behaviours. There will be conflict and value gained from the use of personal data collected from mobile applications based on phones and personal IoT enabled devices, this was clearly evident during the COVID-19 pandemic and lessons learned from the delivery of private and publicly funded applications will drive new and innovative ways to collect data from health devices, that are trackable to monitor future public health concerns or emergencies. For the maritime domain, the use of geolocated information on Critical National Infrastructure, maritime activity and risk / threat will enable new ways to protect and plan energy and telecommunications connectivity alongside essential shipping related behaviours, once again this will be enabled by the exponential increase in spaced based sensors.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Geollect are industry leaders in the operationalisation of geospatial information across multiple domains, with particular expertise in the maritime. By enabling new and innovative methodologies for exploiting these data we are able to educate and inform our customer base on the value of geospatial data to gain, tactical, operational and strategic insight. Geollect also engage with thinktanks, public organisations and registered charities such as RUSI to provision geospatial capability to better enable their understanding of conflict and international events, this in turn enables vision of geospatial data exploitation to a wider audience. We engage with academia to source talent and to inform of the professional demand for geospatially pertinent data scientists, developers, and GIS operators. If the Geospatial Commission were to sponsor or enable networking events and industry and public sector forums Geollect would be keen to engage.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

a. In Defence beyond our work for the Royal Navy, Geollect have built and delivered software solutions to Permanent Joint Headquarters, Defence Intelligence, Border Force, CII, and RUSI. b. Geollect have built and deliver a range of software solutions in the following commercial industries: i. Maritime insurance ii. Maritime security iii. Shipping & cruise lines iv. Critical infrastructure c. Geollect currently delivers maritime intelligence software solutions to five P&I Clubs, and Geonius is utilised by a further four Clubs. The solutions developed and maintained by Geollect support 1,000s of users in situational awareness and operational improvements. This includes winning the Safety4Sea Technology Award alongside North P&I. d. Geollect build and deliver intelligence platforms, which have augmented the operational capability of the Carnival Cruise global intelligence team by providing near real-time vessel information and contextualising intelligence, weather, media, and granular operational reference information.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South West

Q17. What is the name of your organisation?

Geollect

Q18. What is your role within the organisation?

Head of Innovation

Q19. How many people work for your organisation?

10 - 49

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Intelligence, maritime trade, expert witness, professional geospatial services, technical advisory and development, geospatial SaaS and DaaS, defence and security

GMV

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Location data is now widely available and accessible to all. People are informed and aware of the benefits of location data (tracking pets, fitness trackers, delivery monitors, transport timetables, uber journeys). Location based apps are commonplace, including location based gaming. Data is now often time stamped and geotagged. Location data (satellite, aerial, drone imagery) is more affordable and readily available to support business operations. The timeliness of the data has improved and is approaching real-time availability which is being used to provide valuable insights into events happening all over the world. Location data is now commonplace within media/news. While location data has always been used by the media, location data is now regularly used to support analyses covering security, climate change, biodiversity, fires, floods, volcanoes, industrial incidents, disasters, conflict zones.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

GMV anticipates the emergence of drone technology, including ground, air and sea, will generate vast amounts of location data to support real-time and continuous mapping of cities, regions, infrastructures, hazards, emergencies, planning, quantities/volumetric data. Drone based mapping sensor technologies will also evolve from hyperspectral and thermal to include radar and RF. The new platforms and sensor technologies will enable new geospatial products to be developed to support new applications. Other technological developments such as Internet of Things (IOT) sensors and autonomous systems and robotics will consume geospatial data but also generate datasets which will in turn feed new applications. Over the next 5 years there are plans to launch dedicated satellite constellations to monitor and measure specific features of interest. These constellations are being proposed and financed driven by business needs for better geospatial data to support commercial activities as well as to offering a tool for global governments to monitor their compliance with international obligations. GMV can see an expanded use of geospatial data in science and policy fields where it is not yet widely used; eg, social sciences/policies, financial management, risk management, law enforcement, humanitarian work and others including NGOs, Insurance companies, Green Funds, News and Media corporations. At the same as new constellations emerge, the growing business dependency for geospatial data at the right time and location will drive new needs for new players to invest in their own satellite/constellations to ensure their business has continuous access to the critical data required to support their operations. We expect businesses involved in transportation, utilities, security, mining/minerals and exploration will need to develop their own platforms and systems capable of generating the geospatial datasets they need to run their operations. The bigger the success, the bigger the opportunity. Success will generate more references and case studies demonstrating the advantages and the need for using geospatial data. GMV expects expanded use of location data in due-diligence process. For example, ESG or commodities' trading are recent examples of legislations that require the use of location data. More developments are expected in related areas. With the vast amounts of data being created, there will be a need to develop new and improved integration techniques for combining geospatial data and systems to deliver improved monitoring, situational awareness and decision-making. To achieve this, there will be a need for better, easier and affordable access to intense computing resources and to deploy advanced AI techniques to extract insights and patterns that turn geospatial data into information and intelligence. All of this opportunity will bring with it a need for concerted effort to regulate the use of the data (especially when combined together with other datasets and with AI algorithms). AI will detect new patterns within the data which may impact on security or on privacy and may require specific regulation to ensure no misuse or abuse.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Instead of “Data Analysis and Visualization”, GMV would recommend that it is re-phrased to “Data visualization, analysis and interpretation” which will better reflect the actual procedure used within geospatial data.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

GMV considers that innovation is best driven by opportunity and challenges. In that respect, the Geospatial Commission could work with the public sector to identify “sector challenges” on regular basis and raise small scale competitions to address these challenges. This would require an active intervention. In contrast, a more passive approach could also be considered where the Geospatial Commission provides free datasets (of specific areas) to allow application developers to address the same challenges. Clearly, a mix of both may yield the best results. Through this type of collaboration between the Geospatial Commission and public sector entities new relationships will be formed as successful innovations emerge to address the challenges. These relationships may extend to provide the opportunity for Geospatial commission experts to work with public sector offices/agencies to ensure geospatial needs are captured and shared, requirements are harmonized and best practice emerges. There is also a need to create a major new focal point for the UK Geospatial Community. One possibility could be to consider a National Geospatial conference to share (i) case studies and successes (ii) innovations (iii) developments in regulation/standardization (iv) emerging government policy involving geospatial information. This would help to strengthen the sector, facilitate collaborations, foster new innovations and maintain the UKs pole position in geospatial data.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

(1) Healthcare – expansion of fitness trackers for remote/autonomous pre/post operative care (linked to insurances and surgery waiting lists) (2) Security – monitoring (people, possessions, property,

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

environment) (3) User pays principle – road user charging, priority lane charging, flexible parking charges, (4) Emergency services (E112, eCall, Intelligent Speed Adaptation etc…) (5) UK policies as UK moves away from EU policies (soil quality, air quality, agriculture, forestry, fisheries, biodiversity/protected, habitats, land-use, ESG due diligences, carbon markets) (6) Local govt/civic/council duties – innovative services to monitor local highways, high streets, planning permissions, property boundaries, fencing, damage/vandalism, potholes, street lighting, refuse collections, flooding/drainage, pathways, vegetation ingress, intelligent traffic coordination (?) (7) Robot deliveries – navigation/guidance/control/routes/accessibility restrictions (8) Drone deliveries – navigation/guidance/control/routes/accessibility restrictions/collection and drop off zones (9) Urban air mobility – navigation/guidance/control/routes/accessibility restrictions/collection and drop off zones

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

GMV can raise awareness. GMV can develop the underlying technology to improve the quality of the data itself. GMV can demonstrate benefits of our solutions to stakeholders. GMV can develop applications answering to the specific needs of the challenge.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Collaboration is key when developing innovative applications to address new market needs. In the area of geospatial data services, GMV has successfully collaborated with financial institutions, insurance/re-insurance, telephone operators, media outlets, World Bank, energy operators, utility companies, governments, national mapping agencies, Think Tanks, Social scientists, Federations and NGOs. GMV is also an active collaborator within projects and commercial contracts. The following examples illustrate the breadth of our collaborations. ESA European Space Agency (ESA) – GMV works with ESA to develop applications that utilize space based positioning, communications and geospatial data. These applications are prototyped through the collaboration with ESA and future users. Our prototype applications are taken to a point of pre-operational services and validated with future users in real world settings. The prototypes are then further developed before being released to the market.– UK Space Agency (UKSA) – GMV works with UKSA via ESA and national innovation programmes. GMV develops novel technologies to enhance the collection, processing and analysis of geospatial data within major space based missions. GMV also works with the French Space Agency to develop data processors for extracting critical information from geospatial data to support carbon monitoring. InnovateUK – GMV works with UK researchers, industry and Catapults in developing new systems and services that utilize geospatial and location data.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
East Midlands

Q17. What is the name of your organisation?
GMV

Q18. What is your role within the organisation?
CEO

Q19. How many people work for your organisation?
50 - 249

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

ICEYE

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advancements

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Technological advancements

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Looks complete

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Reach out to new space satellite companies to find out about their ground breaking new technology applications and how they can help UK Gov nationally to save money and become world leading. This would encourage growth in the UK.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Iceye has a world class flood prediction and analysis tool giving real time access to flood events globally, extent and depth. This would save the Uk millions per year in flood prevention schemes and in disaster response management to a level of accuracy never achieved before.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

ICEYE are very active on social media and attend numerous events and conferences around the world promoting and discussing the key issues around SAR data and development of our natural catastrophe services.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We would like to work with the Cabinet Office, Environment Agency and Defra to develop our solution to meet the needs of the UK better at a national and local level

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

ICEYE

Q18. What is your role within the organisation?

Senior Manager, Government Solutions

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Earth Observation Satellite company manufacturing satellites, providing data and developing world leading natural catastrophe solutions for Government and Insurance

IDOX

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The adoption of public cloud services has enabled the rapid deployment of geospatial data and the direct use of cloud optimised geospatial datasets from providers such as AWS. These platforms enable developers to produce and deploy applications and services without having to manage complex infrastructures.

The offering of "Geospatial as a Service" whereby software, data, analytics and platforms are provisioned as on demand and subscription services has reduced the complexities associated with the deployment of enterprise GIS.

The growth in the availability of satellite imagery and earth observation data at increasingly high resolutions, at greater temporal frequencies and in application ready forms is driving innovative services and applications.

A greater understanding of the importance of geospatial data being applied to local to global challenges e.g. disaster response, climate change, COVID pandemic has raised the levels of awareness and understanding across government, business and the public.

The proliferation of web mapping and embedded web maps in a wide range of online services for B2B and B2C markets has influenced expectations as has the ongoing, almost de facto use of Google Maps.

The maturity and adoption of open source geospatial technologies has driven the application and usage of geospatial data at a cost effective level.

The growth in the availability of definitive open geospatial data from a wide range of public sector bodies has enabled value added applications and innovative services to be produced by the market e.g. in the PropTech space.

The continued mass adoption and use of mobile phones with location aware capabilities and integrated web mapping that provides access to a suite of points of interest data and spatial analytics e.g. where's my nearest, how do I get to.

The increasing proliferation of collaborative, user-generated (business & consumer) GIS data and richer content information that can verified for quality and linked to further intelligence applications.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The increasing convergence between CAD, BIM and GIS within the world of digital engineering, smart cities and smart infrastructure will transform the efficiency and effectiveness of the design, construction, operation and maintenance of assets across a wide range of construction and infrastructure use cases.

The mainstream application and use of AI within geospatial data infrastructures to extract and create derived data products as well as to generate new spatial intelligence.

The continued growth in georeferenced big data being generated by more, and more sophisticated sensors operating in real/near real-time will provide more dynamic and temporal spatial intelligence.

With the focus on economic, environmental and social resilience e.g. energy security, food security, environmental sustainability, geospatial data and technology will be increasingly applied to delivering value, informing decisions to solve such challenges.

The progression of self driving vehicles will continue to drive innovation in location-based sensors as well as generate opportunities for vehicles to collect geospatial data.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The increasing use of visualisations and immersive experiences e.g. 3D, Virtual Reality and Augmented Reality will be more widely used to enhance the user experience in a range of applications and services e.g. public/community engagement and consultation.

User expectations will continue to put pressure on the public sector to adapt and adopt processes that are more self-service and joined up across agencies with location providing a common thread.

The ongoing rapid pace of digital and technology change will put pressure on government and other institutions to modernise legislation, policy, processes and procedures eg, digital planning, digital environmental impact assessment.

The increasing proliferation of collaborative, user-generated (business & consumer) GIS data and richer content information that can verified for quality and linked to further intelligence applications.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Data integration is also a key part of the geospatial value chain. Geospatial data is an increasing component of many different business workflows and other business system environments - many of the challenges and opportunities rest within the ability to easily and seamlessly integrate geospatial data and services within a wider information architecture and ecosystem.

Brokerage of data is also a key aspect - organisations and suppliers that can aggregate and distribute definitive data to the market are key to making it easy to discover, view and service data demands in an efficient and cost effective manner. Currently, there are countless examples of similar end user organisations duplicating the effort to find, process and provision geospatial data in the same application ready formats across many parts of local, regional and national government as well as across the private sector.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

By undertaking targeted, sectoral specific market research e.g. Architecture, Engineering and Construction to identify the gaps and opportunities to apply geospatial data and technologies to key use cases and workflows.

By funding pilots/proof of concepts to address specific challenges in relation to the application and use of public sector geospatial data by the commercial sector e.g. Proptech, Construction and Infrastructure.

By working directly with Innovation UK, KTN, Geovation etc. to stimulate ideas and proposals for innovative, geospatially enabled products and services to solve real world problems across key market sectors.

By directly funding and supporting the work of the Association for Geographic Information as the professional membership body for the UK geospatial community in order to develop and expand the UK geospatial industry cluster and target specific interventions of value to the industry community.

By driving closer co-operation and collaboration action between sectors e.g. geospatial, data science, space, AI etc.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

One of the biggest opportunities lies in the digital engineering sphere. Almost all construction and infrastructure projects rely heavily on geospatial data and technology through every phase of the asset lifecycle - planning, design, construction, operation and decommission - with the lifecycle often spanning decades. The need for a common geospatial data environment that is interoperable, standards-based and easily integrated with the common project and business systems throughout all stages of the lifecycle, that can integrate CAD, BIM and GIS, that is dynamic and responsive to change would transform the existing business processes, reduce data duplication, create efficiencies, improve public engagement/consultation and introduce innovation such as immersive visualisation etc.

A related example would be with Environmental Impact Assessments. Almost all infrastructure projects require an EIA to be undertaken. The current processes are manually intensive, document driven, rely on multiple different software technologies and GIS solutions with significant data duplication. Adopting a Digital EIA approach would revolutionise the processes involved, the use/reuse of geospatial data, stakeholder engagement (by providing information in a clear and user friendly manner) and provide interactive, self service collaboration.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We could provide a suite of targeted case studies covering the application of geospatial data and technology across local government, utilities, land and property, construction and infrastructure.

We could contribute to thought leadership events, blogs, journals and networks to illustrate the fundamental importance of geospatial to solving key business challenges in the above core industries.

We could participate in any advisory boards - blending our breadth of cross industry experience with our geospatial domain expertise.

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We could drive and/or participate in pilot/POC projects designed to showcase the potential for geospatial within the PlanTech and PropTech markets.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We have numerous examples of both public sector and commercial engagement across our product set. We have listed some of the examples below, and would be happy to present these in more detail.

Uniform: [Link excluded from publication]
Idox Cloud: [Link excluded from publication]
Aligned Assets: [Link excluded from publication]
thinkWhere: Our collaborative project with Eurogeographics [Link excluded from publication] has delivered a geoportal to provision a suite of topographic and cadastral open datasets to the market [Link excluded from publication]. This work has radically transformed the visibility, access and use of definitive, aggregated public sector geospatial data by a wide range of public, private and academic users.
ExeGesIS: [Link excluded from publication]
LandHawk: [Link excluded from publication]

See the following link for a full list of our case studies: [Link excluded from publication]

In addition to the above, we are working with DLUHC as part of their ongoing project to modernise the public sector planning services.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

The majority of our staff (80%+) are based in the UK, with an offshore development centre in Pune (approx. 10%) and the remaining 10% spread across France and US.

In the UK we are mostly "work from home" throughout the UK, but have offices throughout the UK as listed on our websit

Q17. What is the name of your organisation?

Idox PLC

Q18. What is your role within the organisation?

Head of Geospatial

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication.

Inakalum UK Ltd.

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Covid certainly had an enormous impact on how we do business and restriction of movement during lockdowns drove the need for innovative solutions in both the public and private sector. The emphasis from central government on migrating to online services has had a huge impact in the public sector, a prime example being the excellent work done by HM Land Registry on the Local Land Charges project, which was a great example of central and local government cooperating to deliver a large scale geospatial solution.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

In many instances, geospatial data has been harvested from existing data sources over the past 5 years and many of these data sources are incomplete and outdated. Over the next 5 years, I expect to see substantial investment from central and local government in building rich geospatial datasets from scratch, with the realisation that the best analytical tools in the world cannot work with poor data. As better data becomes available, advances in machine learning and artificial intelligence will bring a new wave of innovative solutions to old challenges, such as planning, traffic management, town and city centre development.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

This is a reasonable characterisation of the ecosystem.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

SMEs are constantly developing innovative geospatial solutions. Once a prototype is developed and tested at the SME's expense, it becomes very expensive for an SME to test a solution at scale. The public sector and the Geospatial Commission can help SMEs take solutions from prototype and trial stage in smaller areas to pilots in larger areas, by both funding pilots and helping to find pilot participants in the public sector.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Inakalum has developed a prototype solution that uses machine learning to predict citizens' ratings of a range of services in their area such as healthcare, education, hospitality, retail, public services & amenities, parking, etc. This is done by by first building a geospatial database of all the services in the area and then surveying a sample number of citizens and feeding these sample results and the underlying geospatial infrastructural data into a machine learning module that predicts ratings of other areas based on the infrastructure in that area. We can also use algorithms to predict the number and location of public services that need to be added to an area to improve its rating. For example, if an area rates 2.3 out of 5 for litter bins, we an predict the number and location of litter bins to be added to bring this rating to 3.5. This solution will provide Local Authorities with an accurate means of measuring the quality of services it delivers to its residents, businesses and visitors. It will also highlight areas of poor performance and offer solutions to improve predicted ratings. This innovative use of machine learning in a geospatial data application has never been done before and is truly ground-breaking. In order for it to become a reality, Inakalum needs two or more UK cities to participate in a pilot project, preferable in diverse geographical areas, and the trial results will determine how accurately geospatial data and machine learning can: a) predict citizens' ratings and service improvements within a city; and b) how accurately a machine learning module trained with data from one city can be used to predict citizens' ratings and service improvements in another city, using only the geospatial data in the first city to train the machine learning models. The Geospatial Commission could provide support for this pilot project by way of funding the pilot, and engaging with Local Authorities to find suitable candidate cities to participate in the pilot. On successful completion of the pilot, Local Authorities throughout the UK and beyond will have a viable, scalable solution that will provide accurate predicted citizens' ratings and service improvements based solely on geospatial infrastructural data. Ultimately, AI/ML could do a lot of the planning for Local Authorities in how they improve their services and amenities in the community and the addition of a Citizens' Engagement platform could involve citizens in prioritising improvement works necessitated by budget constraints.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Inakalum has spent 5 years developing a solution for building geospatial datasets from scratch. Our solution is unique in that it uses locally recruited agents to walk the streets and gather data as they walk. While seeming counter-intuitive to use people to gather data in this age of technology, the solution is surprisingly efficient and produces richer data than other solutions which rely on drive-by technology or satellite imagery. As our agents stand in front of every street asset and public place they log, they capture a high-resolution image of every datapoint, and these images lend themselves to using machine learning to add meta data to datapoints. For example, in Newcastle upon Tyne city centre (3.1 km2), there are over 1000 street lamp columns and Inakalum's machine learning module analysed the images of all street lamp columns, in just 88 seconds, to identify the columns which have additional apparatus attached. This particular use-case is invaluable to Local Authorities and Mobile Network Operators when trying to find suitable street lamp columns for deploying 5G small cell equipment. Following Inakalum's trial in Newcastle in March 2022, Newcastle City Council bought access to the geospatial data gathered

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

during the trial. Inakalum will be working closely with Newcastle CC over the coming months to build use-cases for this geospatial data and we will be happy to share our use-cases and learnings with the Geospatial Commission, which they may make available to other Local Authorities to drive awareness of the value of geospatial data.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

With reference to the answer to Q11 above, a pilot to further develop and test a machine learning module to predict citizens' ratings of services and amenities in their area, based on the underlying geospatial infrastructural data, would involve collaboration between an SME (to deploy the solution and run the pilot), the Geospatial Commission (funding), and Local Authorities (pilot participant cities).

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Inakalum UK Ltd.

Q18. What is your role within the organisation?

CEO

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Geospatial data gathering and analytics

Locatum Limited

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Evolution of low drain long-life super-reliable IoT devices has enabled massive expansion of the data economy; social media, wearables, mobiles and the gullibility of the public that services are free has facilitated a surveillance state in which tracking and monitoring of everything is ever closer and almost universally accepted; implementation of GDPR on websites is an ubiquitous PITA where the lowest common response (accept) is taken as an implicit signal that data harvesting is fine; quite effective spam filtering coupled to over-whelming omni-channel comms has created an environment for personalisation that is entirely dependent on giving up location data; human augmentation and extended reality (inc AR/VR) is a reality for Gen-Z already; Moore's law hasn't been able to keep up with the compute needed for crypto or the metaverse otherwise they would probably be more prominent; 4G data capacity has limited ability of network devices to transfer as much data as they could theoretically capture (see 5G/6G in Q2); disinformation and MSM have created a binary social environment in which "if you're not with us you're against us" making for example any challenge to HD data capture be it by vehicles, CCTV or body-cams marking the arbiter as an enemy of the state; open data has proven to be somewhat of a false saviour - yes there are large volumes of static data being published but broadly fail to apply Q-FAIR principles

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

hyper-automation coupled to new compute models (distributed cloud, new processing models, advanced ML etc), practical blockchain and AI driven security could go either way - enabling the current state or enabling row back against datafication of the human experience; 5G/6G and the genuine ubiquitous connectivity that this enables coupled to effective/efficient terrestrial and space based solar power will enable massive expansion of the surveilled earth at both planetary and human scale; large scale political and industrial hand-wringing about climate change will see lots more modelling of it but little action; the over-whelming volumes of data will relegate data from the consciousness and see the continued rise of insights, personalised/filtered by invisible AI to fit your (or someone else's) information/action need; location data from the wisdom of the crowds will stifle the individual, constrain risk-taking, damage innovation capacity and slow (r)evolution

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

examples need to be far more extensive and illustrative; e.g. include EO, IoT, CCTV in data capture and creation; by doing this it will become apparent that these elements are increasingly integrated into service flows and tool sets that blur/merge these components such that this separation will likely be seen to be legacy quite soon

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

real time services e.g. site safety through integration of multiple 4k camera and sensor web feeds from people and plant into Digital Twins via 5G networks to trigger risk proximity alerts or interventions; this model will also play out in the public realm, in logistics, in supply chain, in commodities, in shipping - the enablers are UC, NB-IoT, new compute, a changing of the leadership guard (to a generation that thinks this stuff should just work like their apps do and will then make it so)

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

see Q10 response - the consequence will be an ever more granular and transactional interaction between citizen, industry and government which will slow our response to climate change

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

stop talking about geospatial, it scares the horses

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

thousands of organisations depend on "geospatial" data yet would never think to mention it - Formula 1 teams, logistics and delivery businesses, asset managers, reinsurers and on and on; they are able to do so because they collaborate with others to de-specialise geospatial and focus on the value in solving real time demands for insight whether about engine performance, continually changing travelling sales problems or risk; we need to start telling better stories to different audiences where value, benefits, impact, RoI and profit are the punchlines

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?
A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
South East

Q17. What is the name of your organisation?
Locatum Limited

Q18. What is your role within the organisation?
Principal Consultant

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

Loquis

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

GPS connected devices - like smartphones, connected cars, smart watches - have open the doors: almost anyone has got a gps device in his pocket, this is the first condition. Then location based applications or features started to rise, enabling new services and better usability.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Connected cars, smart watches, wearables, smart glasses will bring it forward but the impact will come from new location based apps: a new array of apps will be developed to leverage on users location and augment the real life experience of anybody

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Talking about application of data, I would not limit the scope to "real world problems" but to "real world opportunities", how location data can improve and augment real world.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Location Based Open Data is key for nurturing the innovation in this space. On this matter any info, data, text, visual, content owned by public institutions should be made available as open data ("public by default").

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Anywhere but tourism, travel, culture, mobility, smart cities will be significantly impacred on a scale that we can't imagine right now. Thanks to this location data / application people will experience an augmented reality of their real world, they will get closer to real places, pay more attention to real cases, the will be much more entertained and care more about the places they live or visit: it's the realverse vs the metaverse, do you care?

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We are deeply involved since 2018 in this challenge, Loquis is the digital platform where any places tells its stories. With Loquis anybody will get access to any human experience of the real world, it's a time machine for preserving and sharing anything that is relevant and related to real places.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Loquis is an open platform, where anyone can listen to the stories of the real world. It's free for users and for creators, institutions and private companies, touristic boureaus, towns, transports, food and win districts, any of these organizations can collaborate to create a shared value and give voice to the real world.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Other (please specify):
Italy with a team based in London

Q17. What is the name of your organisation?

Loquis is the commercia name, [Link excluded from publication], Georadio Srl

Q18. What is your role within the organisation?

CEO

Q19. How many people work for your organisation?
10 - 49

Q20. What best describes the industry that you or your organisation is involved in:
Arts, entertainment and recreation

Manchester Geomatics

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The availability of large scale open data lodged in massively scalable cloud based environments.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The expansion of skills to use cloud based platforms internationally.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

It fails to mention the nature of the geospatial information infrastructure required to support the ecosystem. The concept of “core reference data” is missing.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

By providing publicly available exemplars. Digital Planning is running 20 years late, we need to know what the impediments have been.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The handling of land availability data such as Brown Field registers and Strategic Housing Land Availability Assessments is extraordinarily poor and technically primitive.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

By sharing my experience in the field over the last 50 years. In particular discussing the nature of and the need for spatial data infrastructure.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The London Olympics highlighted the value of a shared data environment. The separation of HMLR anode OS into separate organisations is irrational and a major impediment to a coherent national approach to geospatial data.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Other (please specify):
I am a Borough Councillor serving for the last16 years on A Development Management Committee,: A Visiting Professor of Geographic Data Science at Liverpool University and owner / consultant at Manchester Geomatics.

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

North West

Q17. What is the name of your organisation?

Manchester Geomatics

Q18. What is your role within the organisation?

Owner / Consultant

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

One.network

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advancements (especially widespread application of machine learning) and data availability (in the highways sector which is my area the explosion of sensor derived data and imagery from connected vehicles and IOT devices) have conspired to raise expectations about the possibilities of geospatial data among my client base (public and utilites sectors).

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

In the highways space, the biggest policy priorities are carbon, congestion, air quality and citizen engagement. All 4 drive demand for better use of lcation data.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

-

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

There should be a focus on funding sustaibale business models for innovators. My company (one.network) funds its own R&D through a successful SaaS business model selling business critical solutions into the local authority and utility sectors. We many instances of unsustainable and potentially wasteful funding granted through Innovate and similar bodies whcih often lead to one-off projects that

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

frequently fail to deliver promised break throughs. Chanelling funding to end users of solutions such as LAs delivers better outcomes in terms of more sustainable market solutions.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

-

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We work with 98% of highway authorities across England & Wales. We actively evangelise about the power of spatial data to our customers, and would welcome support from GC in these endeavours.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We have developed a solution that enable utility companies to communicate the precise location and timing of road and lane closures to highway authorities, and then provide real-time updates to the public via all major sat-navs. We developed this in the UK in collaboration with 20 highway authorities, a similar number of utilities, Google and TomTom, and have successfully exported the solution to the United States. It is current in deployment across the state of Florida.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

one.network

Q18. What is your role within the organisation?
CEO

Q19. How many people work for your organisation?
50 - 249

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

Optimal Cities Ltd

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Remote working due to the pandemic.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The emergence of the Metaverse infrastructure and on-demand localised services

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I would add Decision Intelligence as a next step after application of data. The ability to advise the end user about complex matters using data, while removing the need for the end user to be a domain expert (e.g. An Urban Planner identifying areas with Public Health risks without needing to understand how multispectral satellites and bioinformatic modelling works)

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Facilitating private-public dialogue to make authorities aware of innovative solutions that they can pilot or test. At the moment most of the possible interactions with authorities is part of bidding process which excludes new companies with no previous contracts, even if the team has cumulative tens to hundreds years experience.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Geospatial companions to advise regarding urban planning and policy matters by using GeoAI, satellites and human domain expertise. E.g. [Link excluded from publication] is using a combination of AI+Satellites+Planning Expertise to identify issues and opportunities for urban planning, development, monitoring and management from analysis and consultation to plan made.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Geospatial is core to our services, product and capabilities, so by default we are promoting the value of geospatial as value to our core competencies.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Working with ESA Space Solutions to create a planetary digital urban planning tool, part of the Digital Connected Globe initiative: [Link excluded from publication] - engaging with over 100 specialists in the UK and beyond to identify system requirements, scoring methods, factors and interactive tools.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Optimal Cities Ltd

Q18. What is your role within the organisation?

CTO

Q19. How many people work for your organisation?

10 - 49

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Urban Planning and Public Health

Oracle Corporation UK

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

1. Increased Automation This is needed as the amount of geospatial data is growing fast, especially with 3D data acquisition through LiDAR or Photogrammetry becoming faster, easier, and less expensive, and now 4D (Temporal) data. e.g. feature / attribute extraction - holes in the road, building, building heat loss ---- what is underground to avoid cutting pipes and broadband wires and more importantly fibre which is non magnetic. 2. Better natural resource management agriculture, forestry, climate change 3. Real-time applications Increasing computing power, edge computing, better algorithms, and ML support in-field equipment will allow for developing real-time and near real-time geospatial AI/ML applications. 4. More data for AI/ML LIDAR and temporal produce more data which can be used for better predicting events like flooding or traffic re-routing. 5. Better accessibility of AI/ML Apps ML integrated with GIS. Data Scientists are not necessarily geospatial tools specialists, and vice versa. Hence the need for tooling like Oracle Spatial Studio and Oracle Analytics Cloud that makes Geospatial / AI-ML easy for not only Data Scientists but for Geospatial experts as well.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Data processing algorithms, AI/ML advancements (3&4 from Q1)

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Emphasis on data storage from “Data transformation, processing and systems” – data storage (and processing) is critical when the system generates vast amounts of data which sometimes needs to be stored/archived before it can be processed.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

I we can replicate the use of GeoSpatial and AI/ML as mentioned (GPAS – rapid COVID variant detection, NBIO – Smart forests) it could dramatically improve the speed of analysis and prediction. There is a wide are of use cases this could apply to including defence, Police, Intelligence agencies, agriculture, transport and logistics, local and central government

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

NBIO Nascent Biotech Inc - Link to video on Norwegian Forrests [Link excluded from publication]. Building digital solutions to promote sustainable management of the world's forests using GeoSpatial analysis. This can be replicated for farming in general using spatial with AI/ML. PUBLIC SECTOR Governing entities can analyze national or local datasets for digital battlefield and surveillance, contact tracing, crime mapping, predictive policing, and emergency services. Countries and cities gain efficiency by managing large and complex land registry and mapping, agricultural, 3D city modeling and planning, hydrographic map production, and meteorological data. TELCO & UTILITIES Companies increase competitiveness by efficiently analyzing outages and effectively planning field services. Help in mobile network planning, utilities facilities management to optimize cell tower placement, maintenance workflows, and reduce costs. TRANSPORT & LOGISTICS Improve operational efficiency by processing large volumes of complex heterogenous spatial data for maintaining railway assets, airport assets, air traffic, long-haul trucking, and parcel delivery. ENGINEERING AND CONSTRUCTION Companies can combine GIS and CAD systems for building information modeling (BIM) and facilities management, connecting workflows, eliminating data silos, and providing location context. RETAIL Enhance customer experience with targeted marketing, site planning, indoor customer flow with location intelligence. FINANCIAL SERVICES Discover risk zones and other patterns based on customer location data analysis and customize offers based on this intelligence. HEALTH Improve planning care while tracking disease outbreak patterns, epicenters, exposures, and environmental impact based on location.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

• Providing support to lighthouse projects. • Continuing to educate our customers about the value of location-based data through marketing activities from online seminars to educational videos to conferences and other events, or through in-person customer briefings, and training

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The fast spread of the highly infectious Delta variant underscores the need for faster identification of COVID-19 mutations. Uniting governments and medical communities in this challenge, the University of Oxford and Oracle's Global Pathogen Analysis System (GPAS) is now being used by organisations on nearly every continent. Institutions using the platform include: the University of Montreal Hospital Centre Research Centre, the Institute of Public Health Research of Chile, the Oxford University Clinical Research Unit in Vietnam, the Institute of Clinical Pathology and Medical Research – New South Wales Pathology, and Oxford Nanopore Technologies. GPAS is also now part of the Public Health England New Variant Assessment Platform [Link excluded from publication]

Q14. Would you like your response to be confidential? If yes, please give your reason:
No

Q15. Who are you responding on behalf of?
A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
South East

Q17. What is the name of your organisation?
Oracle Corporation UK

Q18. What is your role within the organisation?
Sales Consultant

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

Orbit group

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

An unprecedented amount of big data collection and analysis, technological advancements in handheld devices (computing power, 5G), and rapid internet developments (sensors, connectivity, cloud storage) have created huge potential across multiple industries.
Location data is crucial for better understanding consumers' behaviour for the marketing and advertising sectors, while business intelligence can make much more informed decisions as a result of spatial distribution algorithms.
In addition, increased environmental awareness around net zero greenhouse gas emissions by 2050 and UN climate change conferences have boosted suitability studies for renewable energy installations where location data plays a key role.
Consumer behaviour has become much more self-service focused with GIS as a service growing in demand. This is mirrored outside of GIS with other location data and technologies such as airborne devices.
The shift towards remote/agile working has increased the requirement for web-based enterprise solutions and cloud services.
Advancements in data availability as well as collection and storage improvements have played a big part in advancements in the areas of Enterprise/Cloud services and Big Data/Point Cloud Capabilities. This has also meant that there has been increased interoperability with other sectors leading to the growth of BIM.
An example of specific impacts at our organisation was the release of HMLR's polygon datasets displaying property ownership extents, particularly the Commercial & Corporate Ownership (CCOD) and Overseas Companies Ownership (OCOD) datasets. Following release of this data, Orbit has been able to turnaround customer queries quicker, through faster land and property ownership resolutions. It has also enabled Orbit to better manage its property portfolio by identifying opportunities for stock swaps with neighbouring organisations.
Another example is the recent move to an open government licence for core identifiers such as Unique Property Reference Numbers (UPRNs). By having the capability to obtain the nationally recognised property identifier, it is hoped this will greatly contribute towards better address data accuracy and fewer address-based issues.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

We anticipate external factors such as environmental issues and climate change having a huge impact on data requirements and on consumer behaviour. The increase in remote working will also likely increase cloud-based services and remote services such as satellite and airborne technologies, along with visualisation, immersive tech, mobile technology and connectivity. In terms of technological advancements, we are seeing 3D modelling continuing to grow as well as AI and Big Data. In addition, drone technology is becoming more advanced and more accessible, as well as improved spatial machine learning algorithms that will identify spatial patterns in data faster and more accurately. Access to data and increased open data availability (such as easily obtainable data previously only released via FOI requests) will also have a big impact. Adopted standards in data within and across organisations (such as set out in Europe's INSPIRE directive) should also come to the fore.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The proposed ecosystem is a fair generalisation of the 'geospatial journey'. Notable exceptions we feel is missing from the characterisation would include where data is acquired or procured from third parties. Not all data is captured or created and as this is an integral part of the ecosystem at our organisation, we feel

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

third party data acquisition should also be considered within the characterisation. Furthermore, we would include dissemination of data as this has to be a big consideration given licensing requirements as well as the disparity between public and private sectors in terms of data availability and access. Finally, we feel data standards should be incorporated at some point within the value chain.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The UK public sector / Geospatial Commission could support innovative applications by creating a national framework for these technologies to exist. A standards agency or other body responsible for a programme of delivery and/or method of enforcement could be responsible for pressing priorities such as data completeness, standards and formatting. Means-tested funding could be offered to organisations who wish to access platforms/software and Improved machine learning algorithms that focus on identifying areas of suitability for renewable energy projects e.g. expanding the EV charger infrastructure, solar panel, heat pumps and wind turbine installation etc. Funding smart city applications that will use location data to identify residents' behaviour, anticipate traffic congestion, enhance customer experience for public and private services (automatic ticketing, restaurant suggestions based on location etc). Incentives to invest in drone technology that can be used for a wide range of services (surveying fields/crops and woodland, mapping infrastructure, for health services by carrying medicine to remote areas or to people with limited mobility) and Internal innovation around biodiversity and moving towards net-zero carbon. The GC could promote the understanding of these technologies and the uptake by trialling/expanding usage within the public sector. Progress the public sector over to a more innovative approach such as cloud-based data storage where not already doing so.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Geospatial technology could play a big part in improving environmental conditions within the housing sector, from measuring biodiversity of grounds/estates, to understanding energy performance of properties.

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Ensuring that all location data adheres to data standards would aid interoperability. Location data and technology could be transformational in public and private sectors via a national network of smart assets. e.g. an openly available national street lighting database, with all lights all fitted with miniature sensors and connected via the IoT, to immediately inform owners of the exact location of faulty assets or bulbs which need replacing. Similar uses of these technologies could inform when specific litter bins were full and needed emptying, or of obstructed fire doors in a block of flats. The 'void' time of assets would be decreased by more efficient fault reporting and intelligent management, positively impacting on economic, social, and environmental factors. Other specific examples:
• Energy: Increased usage of renewable energy requires suitability studies for their installation. Location Data is crucial in determining these best locations while overlaying with any possible constraints
• Marketing: Understanding consumer routing behaviour can lead to tailored advertising – High impact with possible GDPR complications
• Health Sector: Identify and manage disease hotspots – High impact
• Tourism: Applications of Augmented reality and location data (e.g. use your mobile screen to access information on nearby buildings/monuments – low impact
• Retail: Large supermarkets use location and census data to better understand their customers and identify new sites for stores.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We already engage in sector specific networking via the LinkedIn group 'Gi4Housing'. We have had data suppliers sponsor events where the sector comes together to highlight successes and meet up. A model where there are no GIS vendor specific affiliation attracts a wider audience. A similar model could be rolled out more widely across additional sectors. Being more established than most in the housing sector in terms of geospatial, the organisation could do more in communicating best practice. Promoting our work through internal and external social media. Follow best practice examples and joining communities with mutual interests, customer engagement and seminars on the benefits of using technology and location data to identify services and amenities near them. Perhaps a more widely recognised geospatial communication resource across organisations should be promoted. The value that betters awareness of geospatial often tends to get lost within organisations due to 'Business As Usual' and business related priorities.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We have recently collaborated with the Warwickshire Wildlife Trust (WWT) on a project to improve the biodiversity within our estates. By providing third party verification of our internal Grounds Maintenance GIS data, and cross referencing it with Wildlife Trust habitat data, we now have a model where we can identify suitable areas of land to improve and to which specific habitat would be best suited for specific areas. Being involved in 'Nutrient Neutrality' is another example of a collaboration between a housing provider, planning consultants and local authorities to improve water quality. Local authorities and the public sector in general could be more consistent in the data and formats in which they are sharing information. More specifically in the housing sector, providers could share more detailed data than they are currently required to. More wider collaborations include Boots retail stores and Skylift UAV manufacturers in delivering medicine to the Isle of Wight. Also, project LEO; where Oxfordshire and renewable energy consultancies work together to support the UK's transition to a zero-carbon policy ([Link excluded from publication])

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?
A private organisation

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
London

Q17. What is the name of your organisation?
Orbit Group

Q18. What is your role within the organisation?
GIS team

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Real estate activities

Orbital Insight

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

GDPR,Privacy policies, explosion of data- there is a need for clean , sanitized, anonymised data that can be evaluated for trends and predictive analytics

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Providers developing the technology to analyse and deliver the data is an easy to use reliable verifiable format

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

this is a good baseline description of the ecosystem , need to expand to the use cases and map to specific organisational business strategy

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

allowing the use of geolocation data that meets the regulatory requirements and defining standards that will help organisations meet the regulatory requirements

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Climate change, supply chain, Sustainability, location intelligence and Asset intelligence

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Promoting the geospatial analytic platform we have developed to be the gold standard

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Manufacturing, energy, financial , armed forces and intelligence agencies

Q14. Would you like your response to be confidential? If yes, please give your reason:

No
Reason:
Happy to discuss what Orbital Insight can contribute to this call for evidence

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Orbital Insight

Q18. What is your role within the organisation?

Head of EMEA

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
It states you can select more than one, but more than one choice is not accepted- we are involved in Defense, energy, manufacturing, construction, professional , technical and scientific activities, finance and insurance

Placecube

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

1) Data volumes collected from mobile devices have continued to increase alongside a proliferation of mobile applications. 2) Increasing volumes of sensor data, in particular environmental data, are providing much more granular insights into how places are being used and their conditions.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

1) If local authorities are to genuinely fulfil their placemaking remit a genuinely democratic, privacy respecting, well maintained approach to location data will be needed. For example, UPRNs are very useful in matching households across different datasets to get a single view of a household. Despite UPRNs being Government standard, they are not currently employed in all central government and NHS datasets. Whilst UPRNs are open and it is possible to look up the longitude and latitude of each UPRN, we understand that licensing does not permitted inclusion of a UPRN alongside a physical address in an open dataset if the address and UPRN have both been obtained from Ordnance Survey licensed data. This makes it very hard to add UPRNs to open datasets. 2) New governance models such as data trusts might enable a more community-powered approach to the exploitation of location data. 3) Ongoing changes to statistical and political areas by ONS (made for the 2021 census) and the Boundary Commission will make comparisons of data over time difficult - particularly where Government departments publish statistics for areas which have been superseded (e.g. 2011 Lower Level Super Output Areas). The LGA's LG Inform and LG Inform Plus services do a pretty good job converting metrics for old areas to new ones where that is possible.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

1) (Ecosystem model currently contains Data capture and creation Data transformation, processing and systems Data analysis and visualisation Application) 2) Stewarding and governance of data and data ethics is likely to become increasingly important, not sure where those activities fit in the current picture (transformation, processing and systems? Seems quite broad a category)

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Not part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Understanding footfall patterns, air quality, traffic safety etc in urban environments using more ubiquitous sensing technologies, and using the resulting shared datasets to train AI models that predict the effects of new developments seems like a key tool in promoting sustainable economic growth and liveable cities.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Net Zero presents a significant opportunity through providing communities in a place with data, and tools to compare metrics across the place and in comparison to other areas. This will allow communities to innovate and implement associated Net Zero activities..

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

By promoting the geospatial results in our LG Inform platform

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Our data products are a collaboration between open data sources such as ONS and internal local authority data

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Other (please specify):
spread across the UK

Q17. What is the name of your organisation?

Placecube

Q18. What is your role within the organisation?

Director

Q19. How many people work for your organisation?

10 - 49

Q20. What best describes the industry that you or your organisation is involved in:

Information and communication

Ricardo

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Mobile phone GPS access - this has unlocked a whole other way to make vehicles "smart" without adding any additional hardware into the vehicle. There is also a shift to people being sensitised to their location based privacy, leaving location data on all the time is more the norm.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

We have seen a bit uptake in the use of open source data platforms and this enables the connection of data and insight across industries. This is where you get the opportunity, and are able to overcome the challenges of access/handling the data provided by each sector.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

There is a bit at the end that is missing which is all about the "so what"... Application of data needs to be "driving actionable insights". That way the geospatial value chain is always leading to a purpose - e.g. to improve air quality, or to safeguard operations etc.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Improving the TRL of the technologies available. Ability to adopt innovative ideas is sometimes met with push back or skepticism from public sector - breaking down that mindset, barrier between public/private sector.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Targeting how a vehicle operates to improve air quality for a local area can save lives due to air pollution.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

White papers, conferences, leveraging current engagements with local authorities where we support them with plans to improve air quality to then deploy solutions to action this.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Monitoring air quality (performed by or on behalf of a council), Creating dynamic low emission zones dependent on weather/AQ/congestion etc. (consultancy develop a AI/ML tool to automate this), enforcement of the solution for vehicles (council through tax or incentives), deploying and using the solution (vehicle owner/operator), compliance monitoring (consultancy/third party provider), compliance enforcement fines (council)

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Ricardo

Q18. What is your role within the organisation?

Digital Strategy Lead

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Engineering decarbonisation of transport systems - from advisory to design and development to deployment and monitoring

Satellite Applications Catapult

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Ways in which people consume data i.e., appification and the abundance of digital devices; increased availability of data e.g., low cost IoT, abundance of Earth observation; increased awareness of the role of data in driving business intelligence; increased availability of open data and tools; increased overlap with data science domain meaning less dependancy on specialist location data skills.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

(1) Increased investment in innovation processes that support the commercialistion of geospatial data and technologies, explore new routes to market and educate geospatial entrepreneurs on key enabling skills such as business planning and product marketing. (2) Intervention activites that enable the market for adoption of geospatial data and technologies including education programmes. (3) Decresed cost and increased precision, accuracy and latency of Earth observation and other remote sensing technologies. (4) Sensing technology built into everything such that it allows a real time feedback loop for digitial twinning. (5) Emergence of high altitude platforms for real time, persistent observations. (6) Cross and multidisciplinary working to enable application.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The characterisation presented provides an oversimplified view of the ecosystem and does not well represent the different value adding components of the value chain that presents both complexity and competition making its external perception confusing.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Investm in innovation that goes beyond science and technology development i.e., commecialisation and market enablement.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Green finance; corporate ESG; infrastructure operations - including their systemic relationship with the wider environment; land use and management - including food production.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Driving awareness is at the core of our remit at the Catapult.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

It is essential to work closely with the sector that you are designing solutions for to ensure (a) it is user led (b) you create champions of change to srive awareness and adoption; creating multidisciplinary teams from across different sectros is essesntial - challenges are often inherently not as simple as being solved by a geosaptial data or technology, collaboration ensures a holistic approach and meaningful application. The Catapult is an effective collaborator due to its independent, not for profit status and powerful convening power.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Satellite Applications Catapult

Q18. What is your role within the organisation?

Head of Geospatial Intelligence

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Research and innovation organisation working across multiple sectors.

Search Acumen

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

I believe Covid and the market conditions definitely played a large part in the adoption of location data and the use of technology in general.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

As consumers rely more heavily on technology and data to power their daily lives, this will naturally spill over to location data. Instant gratification and answers, via smart devices, is the norm for the majority of what we do, so eventually more manual property/location based processes will be automated.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Is it worth noting how spatial data can link together with other datasets that might not naturally be deemed spatial.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Make Local Authority CON29 data & Local Land Charges data available, so that these searches can be produced instantly. In turn this will speed up the property transactions, reduce fall throughs and allow consumers to make educated decisions when purchasing properties.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Make Local Authority CON29 data & Local Land Charges data available, so that these searches can be produced instantly. In turn this will speed up the property transactions, reduce fall throughs and allow consumers to make educated decisions when purchasing properties. Other professionals could also utilise this data such as tree surgeons accessing TPO data.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We already use spatial data & technology as our key driver in our messaging to our clients and the LegalTech & PropTech world

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

If we could access all the Local Authority CON29 data & Local Land Charges data, we could deliver instant real-time searches. These could then be relied upon by the consumer, the lawyer, the lender, the surveyor and anyone else involved in property transactions. A live digital twin of every property in the UK would be an incredibly powerful service. It could be the keeper of all utility usage data, central heating service records, the list of useful spatial data that could be associated to a property is vast.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Search Acumen

Q18. What is your role within the organisation?

Strategic Products Manager

Q19. How many people work for your organisation?
50 - 249

Q20. What best describes the industry that you or your organisation is involved in:
Real estate activities

Skanska UK Infrastructure

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The biggest change has the been the internet and access to the captured data that has location data assigned to it. The accuracy of the data captured be it in location or content needs to be undertaken by a professional.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

On the negative side, those in the gold rush for data are gathering poor data and sharing this data that does not support the real location of the data. On the positive i believe that geo-located photos will build a visual world well beyond the capabilities of Google street view. I think that a combination of photoloation, GPS, and phone location will aid the accuracy of public gathered data.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Is the word of "Consequential" and professional in the correct place? Good data requires professionals to gather accurate data so a professional can make decisions on professionally captured data. The Data capture and creation requirements seems to describe the manufacture of equipment and not the collection of the data.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The PSGA should be have the contact named rather than just the organisation. Large private organisation should have limited access to the PSGA when support the public sector.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The ONS should provide more geospatial statics in geospatial formats. The ONS should display their data in maps on their own web site.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We are not funded to deliver what could be useful to the national dataset and there is no requirement of what is useful beyond what only currently know.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

At Skanska we operate a GEO triangle with BIM/GIS/ Engineering Surveying working together to Capture, Process,visualise and reuse the data together. Major Infrastructure clients ought to have a head of geospatial that understand the national value over the local value.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Skanska UK Infrastructure

Q18. What is your role within the organisation?
Head of Engineering Surveying

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Construction

Streetwave Ltd

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advancements are then creating opportunities for new products/services that then change consumer behaviour

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Developments in technologies that will rely on the mobile or IoT networks

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

They seem logical

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Providing more grant funding, tax incentives and procurement opportunities for these companies

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The UK public sector can commission independent mobile coverage and quality surveys across the country. Mobile performance at every house/business can be visualised on a GIS and made freely available to stakeholders across the UK who depend on mobile networks in some capacity. These include: Ofcom (for regulation purposes), network operators (to identify not-spots to cover), local authorities (to procure the best networks for their employees/machinery), business and consumers (to identify the best mobile networks where they work/live), the Home Office (to fully understand the quality of the ESN before its switch-on), and electric vehicle public charging stations (to identify where new sites can rely on the mobile network to process consumers payments [not spot areas where payments can't be made could leave drivers unable to charge]). As a result, Ofcom would have independent datasets to regulate the mobile operators (they currently rely on coverage data provided by the operators), councils, individuals and businesses would save money by procuring the networks which best connect them in their geographies and infrastructure builders would be able to make more informed decisions on the geographical positioning regarding where they should roll out new sites.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

At Streetwave we measure the quality of the mobile networks across every house/business in the areas we map. We do this by attaching our data collection equipment to partnered logistical vehicles (eg bin trucks) to develop an accurate and independent mobile coverage data set across the whole of a county that refreshes regularly. This data is collected in the cloud before being visualised on our GIS. This generates economic, social and H&S value to stakeholders across society (see previous questions for details of who and why).

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We have already begun collaboration to create these data sets using the logistical vehicles of various councils on a POC level including Monmouthshire and Cardiff. If the UK government were to support our data collection efforts on a national level (either through funding or connections), it would quickly scale up the benefits we could deliver to relevant stakeholders across society.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No
Reason:
If you feel this ties into the work you are undertaking, I would love to have a call to discuss the work Streetwave does and explain the results of our last 2 years of market research in the area in more detail. My email is george.gibson@streetwave.co

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Wales

Q17. What is the name of your organisation?

Streetwave Ltd

Q18. What is your role within the organisation?

Co-founder and Head of Operations

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:

Information and communication

Streetwise Maps

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Truly open data rather than pseudo open data. Governement bodies finally understanding the value to the economy from opening up data.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Much more data being released as open data

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

seems ok

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

By publishing what is core data is available now and how frequently it will be updated and also what new data will be coming along to allow for planning.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Linking of Title Plan numbers with INPIRE IDs to allow many industries to reference and make use of their own existing property related data ie utilities, insurance and broadband.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We would be happy to get involved in conferences and group discussions representing SME in geospatial solutions

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Working with local authorities to improve EV charging networks

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Streetwise Maps

Q18. What is your role within the organisation?

Managing Director

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Construction

Sun Spiral Innovation

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Consumer behaviour will always be the biggest underlying driver. The technology is just the enabler.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Consumer demand for more closely integrated location-based services.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

No, it's a market. A large, complex one, but still a market. Please don't invent new words for it. Ecosystem is not very useful.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Decent funding opportunities for start ups. Long-term, well-supported accelerators. Easy access to data collected using public money.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Again, wrong question. I don't know, because I need to start with the specific problem, not the technology.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

By showing how it solves real-world problems, rather than focusing on the tech.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Sorry, no examples. I'm not quite sure what you're asking here.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

East of England

Q17. What is the name of your organisation?

Sun Spiral Innovation

Q18. What is your role within the organisation?

Founder

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Process consultants

Telint

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The most important consideration for me is security. This problem has clearly grown massively in the last 5 years and it could have a major impact on the use of location data – which could be manipulated or even destroyed. By all known metrics the number of threat vectors is increasing at an alarming rate. Statistics shared recently in the APPG for Digital Identity noted (December 2022) that ID fraud cases have increased 34% on the same period for 2021 and are up 23% on pre-pandemic levels. With such important data being captured we have to find ways to ensure that who we think is using the system are indeed the people using it. Of particular concern is "legal identity documentation, fraudulently obtained." We also have to make the location data less easy for malicious actors to obtain "en masse" than we have in the last 5 years, and have ad hoc checking beyond 2FA as an integral part of how we move forward in the next 5 years.

Standards and technology, too are of fundamental importance. The direction of travel is "open everything," and this, combined with a rapid growth of "gigabit capable" fibre and radio networks has resulted in "network densification" – and a need to have the best possible location data for both above and below ground assets. As the UK Frequency Allocation Table has been (and continues to be) heavily congested and technology makes possible the commercial use of higher frequencies whilst governments remain keen to see more fibre deployed (hence the Building Digital UK Programme), the need for accurate location data will continue to grow – but not at any price. Someone will have to pay. The economic climate in the next 5 years is likely to be quite different from the past 5, and with the death of cheap money and a general tightening of belts across the economy this will all feed through to an increased reluctance to pay.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Some key trends I anticipate having the biggest impact over the next 5 years are:

1 An acceleration towards using telecommunications networks ("TNs") by other utility networks because any buried infrastructure capable of attracting the epithet "smart" must have a return path – and that requires a telecommunications network ("TN"). From smart electricity and water meters to smart EV charging to level 4/5 autonomous vehicle use to the use of empty gas or other pre-existing infrastructure capable of being re-used to the need to "push" more data out to the edge of networks – all will require continual changes to the TN's themselves that in turn would benefit from improved location data.

2 Consolidation in the number of altnets competing with BT/Openreach as the "cheap money" era has ended so capital will become harder to obtain. This, combined with existing Access to Telecommunications Infrastructure ("ATI") legislation also serves to increase the interest in utilising an enhanced underground asset register… but not at any cost.

3 There is already a complex and telecoms specific underground and above ground asset register that captures far more sector specific data than just about the asset but even makes possible the purchase of "live capacity" using the register – it exists in the UK, whilst a similar product has also been used in Sweden for nearly 9 years. Because in the telecoms domain there are multiple buried infrastructures that compete with each other, multiple different "flavours of capacity," and because the networks themselves evolve at speed (some key changes include 2G and 3G and Copper switch off), NUAR was never designed and nor does it need the functionality that a "BroadbandHUB" type of solution can offer.

4 It is therefore already inevitable that if TN's to have a API into NUAR… a kind if "NUAR +" more value to all parties would result. There exists no market failure that would justify a duplication of solutions that already exist, even assuming that NUAR had such a capability anyway, which it does not. The logical thing is to encourage such a collaboration, to the benefit of both communities. Indeed, TN platforms may well already have useful data on abandoned underground assets that NUAR does not. They had need of such information immediately the telecommunications market was liberalised in 1894, and indeed the

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

original Mercury Network launched in the 1980's in London was initially based on unused underground assets of the defunct London Hydroelectric Power Company.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

There already exists a telecoms platform ecosystem, and as mentioned earlier, I see the logical development to be to develop a "NUAR+" that would help both communities to help each other more quickly and effectively by sharing their data

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Supporting innovation and emerging technologies

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?

Other (please specify)

To a degree all the above are blockers to varying degrees but most high has been an historic failure to understand the "wild west" that comes with a deregulated telecoms market. Telecoms may once have been a utility – but today it differs considerably from others nfor one very simple reason. They are based around one set of buried infrastructure that can have different owners. Telecoms has competing multiple sets of infrastructures and different owners.

There is simply no way that the State could replicate the scale of investment in infrastructure that the telecoms operators are making. Collectively this is believed to be of the order of £18billion by up to 130 competitors and perhaps £16billion by BT/Openreach depending on which press releases one reads). Margins are depressed and costs (especially of capital) have jumped. Consolidation is likely, sector specific regulation endemic, and recently this was capped by very necessary new laws concerning the removal of equipment – nationally – that had already been purchased from what are now deemed "High Risk Vendors."

If we want to get location data more widely used across the economy then using it to actually improve the reach of Gigabit capable TNs would recognise that one of the reasons why it is not more widely used is because the Gigabit capable networks required to optimise that value have yet to be deployed fully. If having that TN ubiquity is really so important then NUAR can be seen not as a threat but as a way to help all parties achieve this key goal. We already have a government Barrier Busting Taskforce, Building

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?

Digital UK to subsidise build outs in remoter areas, the Digital Connectivity Infrastructure Accelerator to encourage the wider use of above ground public assets for cellular telephony.
The expectation is likely to be from the sector that this should be a free or at least a no more expensive service than what they already have to pay that could be used to achieve the government's goal of Gigabit connectivity faster. That is a not unreasonable starting point in my view. More intelligently by working on NUAR+ it becomes possible to demonstrate the value of NUAR itself to what remains a sceptical sector that has not rushed to engage to date.

Emerging technologies and market trends
Advances in technology are creating new market trends and opening up opportunities for the use of location data. The ubiquity of the Internet of Things and sensors are creating new datasets with location attributes and enabling real time insights, including data from wearable and smart technology, connected vehicles and satellites. Cloud service providers are enabling this data to be stored more cheaply and processed more effectively. Simpler user interfaces are making it easier to interact with applications fuelled by location data, generating insights that are easier to engage with. Artificial intelligence and machine learning are behind many of these applications, making data processing more efficient by allowing the automation of complex processes, enabling new insights.
Together, these technologies are enabling an increasing number of organisations to collect, store, share and use location data, thereby fuelling a wave of innovation and market growth.

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The single biggest help would be to address the issue identified on question 9.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Wholesale Asset Reuse making possible cheaper access to infrastructure in line with a sector specific statutory duty that already exists. An example of such a platform would be "AssetHUB" which is one of the telecoms platforms currently operational under the Digital Connectivity Accelerator Programme from DCMS.
The benefit is the ability to lift GVA right across the whole economy and particularly in more depressed rural areas.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We already do via the UKTDTF and via trying to encourage the spread of the NUAR vision

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

I would be keen to support International cooperation in this space – and have assisted DES and UKTI abroad before. As this is a public response I will not discuss any detail here…beyond letting it be known that I would be wiling to assist.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Other (please specify)
As a member of the NUAR strategy group

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Q18. What is your role within the organisation?

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:

Information and communication

Tensing

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

gdpr, cloud hosted databases, reduced cost of storing and collecting data, accessibility of open data portals.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

wider adoption of open data, accessibility to use location data within more mainstream software packages, broadening skillsets in spatial analytics

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

there needs to be more emphasis on ETL - extract, translate, load tasks. These are everywhere and critical when working with geospatial data in its multitude of formats.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

ensure data standards and open data portals, only domain experts know what to do with the data. We need support to ensure data is available to be able to apply it.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

ESG - both business and govt, open data for asset management - refer to WWF articles [Link excluded from publication]

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We can help to ensure spatial data can be integrated with other data in a flexible way, using no-code/low code solutions, making it more accessible to a wider range of people

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

I work for Tensing, we can help with geospatial ETL using tools like safe softwares FME.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Tensing

Q18. What is your role within the organisation?

Business Director

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

Teragence

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advancements in terms of data processing, data visualisation and tools

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Technological advancements in terms of data processing, data visualisation and tools

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

No

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

TBC

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

TBC

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We have found that the biggest breakthroughs have come when we enageged with other parties from ana analytics angle and brough in the "geospatial" aspect as a an additional data dimension, rather than coming form a pure "geospatial" angle

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

TBC

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Teragence

Q18. What is your role within the organisation?

CEO

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

TravelAi Ltd

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

the pandemic and contact tracing, creating long time series mobility profiles

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

user centric applications with direct benefits, new more accurate and less power hungry smartphone GPS chipsets

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Fair set of characterisations, but does the above allow for operators who work across all the silos?

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

UK company TravelAi worked with National Highways to develop and launch a automatic digital travel diary app (imagine the national travel survey, but automated and able to capture 52 weeks of revealed preference multimodal transit instead of just 1wk of stated preference user data). Already been shortlisted by Danish government but despite being InnovateUK and SBRI backed not able to find the people in UK public sector to use our MyWays service (and cheaper than forms, roadside surveys etc) [Link excluded from publication]

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

[Link excluded from publication] - scale, anyone with a smartphone, includes travel by tram, train, tube, bus, car, bike, plane and foot without any user input.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

by having partners in local and national govt using the very services and IP TravelAi Ltd has developed in the UK.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

TravelAI has worked with National Highways to build and dveelop the MyWays Automatic Digital travel Diary app. In 2021 their CarbonDiem app for automatically carbon footprinting a persons transport lifestyle was invited to the COP26 showcase. The IP is part of a new spinout addressing EV range anxiety and the prioritisation of new EV charging infrastructure. They have successfully partnered with Cardiff University, Glagow University and the Big Urban Data Centre (UBDC) in establishing their automatic mode detection against traditional survey based manual entry web or paper methods.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

TravelAi Ltd

Q18. What is your role within the organisation?

CEO co-foudner

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

Turley

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Collaboration between built environment organisations. Increasing sharing of geospatial data on built environment projects – for example masterplannning projects for the public sector which require spatial data and attributes to be shared amongst professional teams and developers / contractors.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

We envisage greater central hosting of project data for built environment projects. We also anticipate more tools to enable integration of data (e.g. Arc GIS / ESRI BIM integration). From a cultural perspective we anticipate greater virtual collaboration, which will provide greater opportunity for data sharing and hosting. We are anticipating growth of platform and software agnostic standards and protocols over the next 5 years. We know that DLUHC is driving the digital local plan agenda and this will be implemented in the next 5 years. This will encourage a shift from analogue to digital approaches to capturing geospatial data and devising policy. We also note that the Government is committed to widening participation and diversity and inclusion in the planning system. Location data can provide greater insights into different demographics and user groups within the planning system.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The conceptualisation of the ecosystem appears comprehensive however the broad categorisation of the Application of Data makes it somewhat difficult to understand whether built environment applications have been fully considered. From a practice perspective we would expect to see Land Use Planning and Optimisation as a category.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

N/A

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Location data can improve longer term / strategic policy making for land use planning and also improve the quality of decision making on planning applications. It can do this by providing decision makers with better quality data on the environmental and social and economic impacts of proposed development. Location data will also help planners to better relate proposed development to enabling infrastructure capacity and underpin the business case for future investment in infrastructure. Remote sensing will enable better categorisation of land and assessment of its development potential and sustainability (for example, crop rotation and quality of land).

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Informing our clients of the value of spatial data by providing data we capture in a format which they can incorporate into their systems and/or by using a cloud model structure for co-working, including client end. Not just limited to sub-consultants.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

In the built environment sector, collaboration between local authority planners and architects and private sector consultants (planners, masterplanners, engineers, etc) is possible via digital platforms using geospatial data as a common reference point.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Other (please specify):
Manchester, UK wide and ROI

Q17. What is the name of your organisation?
Turley

Q18. What is your role within the organisation?
Senior Director, Director and Senior GIS Consultant (three people completed the survey collaboratively)

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

Univrses AB

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Use of consumer devices

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Arrival of connected and autonomous vehicles

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

This makes sense

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Providing clear guidance as to which problems SMEs should focus on solving. Support that guidance with targeted Calls for Proposals, funding and access to Needs Owners such that clear understanding of why solutions are required and be understood.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Road management. Understanding how road assets are evolving, their current state of health and where investment should be prioritised can have a major impact. Significant financial savings can be realised by targeting investment in roads and related assets in a data driven way. In addition, gains in safety, operational effectiveness etc. can be realised.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Through seminars giving insights into how Univrses has had an impact in countries outside of the UK

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Univrses and City of Stockholm. Deploying Univrses geospatial solutions in the Nordics has help various cities, including Stockholm, to realise major savings in management roads and related assets. Inspection costs have reduced by more than 50% and annual investment in road infrastructure is expected to decrease as roads are better managed, thereby extending their useful lifespan.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A private company

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Other (please specify):
Stockholm, Sweden

Q17. What is the name of your organisation?

Univrses AB

Q18. What is your role within the organisation?

CEO

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Computer vision and AI for autonomous vehicles and smarter cities

Non-government organisations and Industry Associations

Connected Places Catapult

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Increasing volumes of data have made it possible to develop and then improve services, increasing demand, and to develop new innovations, in a developing virtuous circle. The increase in number and diversity of application areas means that geospatial is becoming less bounded as a sector, and is becoming a set of tools available across sectors.

Improvements in technology and uptake of applications have increased the availability of some categories of data in particular, notably mobility data from location tracking on smartphones. Major users like transport planners have been able to gain new insights and develop new services. Sectors and organisations that previously made relatively little use of location data now can. Developers of consumer services are able to use location applications without deep investment in technology or skills, broadening utility. Geospatial is becoming more accessible to non-expert users, with image analyst tools offered through mainstream GIS software. This is positive on the whole but it does mean there are new users of data who may not fully understand the nuances of spatial data.

A growing range of internet of things applications across many industry sectors use location data to improve insights, efficiency, management of infrastructure, safety and security. Built environment sectors are increasingly taking up data technologies.
Location data very often holds potential benefits for multiple interests and stakeholders, and in recent years we have seen some models developing for sharing data for mutual benefits.

Digital twins are one developing area. The Connected Places Catapult hosts the Digital Twin (DT) Hub is the home of the connected digital twin community, and we see string evidence for the potential of digital twin technologies, and UK strengths in related innovation.
We also support CReDo, the National Digital Twin programme's Climate Resilience Demonstrator, the pilot project for the National Digital Twin programme. CReDo is exploring the impact of flooding on energy, water and telecoms networks. It demonstrates how those who own and operate them can use secure, resilient, information sharing across sector boundaries to mitigate the effect of flooding on network performance and service delivery.

CPC has also supported the creation of the IM Data Hub, where mobility data were available to all SME and Universities to develop skills in the use of real world datasets. Specifically CPC was pivotal in establishing the value of mobile network data to derive travel patterns for passengers and goods in both urban and rural areas.
The use of highly granular mobile network data to identify demand for new mobility services led to the development of new aggregation, namely trip-chains, which enable the development of activity and agent-based models to build large synthetic populations and model travel behaviour at large scale (regional level). The programme of work funded by the Department for Transport (DeMAND, AsSeTS for Rural Mobility and Rural Innovation for Sustainable Environments (RISE) for Decarbonising Last Mile Road Freight) used geospatial analysis and artificial intelligence to visualise complex insights deriving from agent-based models.
Other location dataset used to de-risk the introduction of on-demand shared mobility are the GNSS data, which were used to monitor and assess the performance of the mobility service during the Horizon 2020 Galileo for Mobility. The growing availability of high-resolution satellite/aerial imagery and tools to easily analyse this means that we can fill in gaps in data and carry out analysis that previously would have remained a gap in knowledge. An example of this is the ServCity project in which Deep Learning tools have been used to detect road markings for guiding Autonomous Vehicles.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

We expect continued innovation as data technologies including artificial intelligence are combined with location applications in new ways, growing the range and impact of potential uses across sectors. We already see demand from major infrastructure installations (stations, ports, airports, stadiums, shopping centres, town centre developments) and transport providers. It is likely that uptake will increase among other owners and operators of estates and installations, including across the public sector, where that proves financially sustainable.

We expect more development in location-enabled environmental monitoring services. We expect innovation in managing resilience, water supply and flooding, heat and other weather events, and climate change adaptation. Addressing these challenges will generally involve working with location-related data from multiple systems with multiple interests. CReDo, the National Digital Twin programme's Climate Resilience Demonstrator, works with water, energy and telecoms services. Successful operation involves managing legal, economic and social questions about how to share risks and benefits.

There is growing demand to use location data for reaching net zero targets, but tools and models will need to be developed, in particular in building energy retrofit. Location applications can contribute by monitoring the built environment, assessing current inefficiencies, prioritising works, fitting solutions to property types, and assessing impacts. As requirements for reporting emissions grow, we expect to see more location data applications emerging to track, measure and report emissions. We expect more innovation in use of location to optimise use of resources, for instance rollout of electricity charging, and localised energy grids.

We expect to see more use of location-enabled applications in local economic development and decision-making. Services for these purposes will need to show transparency and accountability, if location data is to be used successfully to support local economic decisions. Where local public bodies have increasingly detailed data about local places, we also expect increasing demand to make more of that data available to citizens and local businesses, to gain insights and to innovate in ways that public bodies may not.

CPC has contributed to the DfT Future of Transport: Rural Strategy by establishing the added value of highly disaggregated mobile network data aggregated at trip-chain level in rural areas with different population densities. This led to the adaptation of business models for new mobility services (such as Demand Responsive Transport, active travel ore delivery drones) and the provision of personalised mobility based on current travel habits and real population needs. Roll-out of Autonomous Vehicles will create demand for high resolution, frequently updated 3D models with attribution.

We expect more demand for transparency and accountability across areas of location data application. For example, as above the data can help improve business efficiency in supply chains and operations, but there is already concern about increased pressure on and monitoring of employees. We expect increasing demand for privacy-enhancing innovations, as more granular data about people's movements is generated and potential risks to privacy increase. As a result of the roll out of new technologies, such as 5G, mobile network data could be used to identify single users and short trips (less than 2 miles). Proximity data, generated by Bluetooth sensors in mobile phones, which could be pivotal to study active travel and designing places of tomorrow. Resolving new challenges as they develop will be important to building public confidence that location data technologies are being developed equitably for everyone's benefit.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

This characterisation accurately sets out the high-level categories of actions to generate and use data. These are good examples but the great number of applications in use and emerging mean they cannot be representative. It may be helpful to fill out the developing picture of how these areas operate specifically in geospatial applications, with many more diverse illustrative examples, to improve understanding of the expanding range of potential applications.

It may be helpful to expand the "Application of data section" to recognise more of the headline requirements for successful delivery. It could also be helpful to include in the characterisation the

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

different timescales in the use of data, from near real-time uses in monitoring some infrastructure, to insights gained from data across much longer timescales. In practice, these processes generally work concurrently, and across multiple timescales, so there is often more circular iteration and feedback than a linear sequence suggests.

There is overlap between data analysis and visualisation, and application of data. Data analysis and visualisation are both applications of data – perhaps the difference in application of data is that a final product is being ingested in some way to create a service. The steps in the ecosystem read like a workflow, but data analysis and visualisation can be an end point itself. There may not necessarily be a further application of data.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Supporting innovation and emerging technologies

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?

Other (please specify)

In our own projects and across the sectors we work in and represent, all of these blockers can occur somewhere and to some degree, so generalising effectively is a challenge. In some applications, which work with data generated by smartphones, privacy is a key issue. In others, for instance involving collaboration between organisations, interoperability and managing competing interests and organisational policies are potential blockers. In the public sector, and place-based projects involving public sector partners, funding, skills, awareness and compliance with legal responsibilities are key.

Organisations developing geospatial initiatives need to consider the relevant of these potential blockers and understand where they may or may not become critical for a specific project or application.

It will be important for the UK to retain clarity in application of data protection and other relevant legislation, which may be challenging as technology innovations make it possible to generate and use yet more data about people in places.
For projects with local authorities in particular, resourcing for data management responsibilities is a recurrent blocker. Leveraging geospatial data depends on data quality standards that take time to maintain, and unfortunately data management is usually low on the list of organisational priorities. Additionally, local authority data is often held on platforms that are not well-documented, or outside of, which reduces its accessibility.
Encouragement and support should be provided to organisations that could (or should) be sharing their data, in a responsible way.

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?

Other (please specify)

All of these can be a blocker in specific situations. The public sector will often be a key actor to deliver maximal application of location data for public benefits, and skills, funding and awareness of potential benefits are likely to be issues in achieving that. Using data about places can involve the interests of many people and organisations. It will be important to develop a broader understanding of what the public interest is, and how to respect it, in the use of data about places, in particular by public bodies. There may be an argument for guidance for local public bodies in representing the public interest in relation to use of data in and about local places, so they act confidently as users of that data and as local representatives of citizens in data interactions with businesses and other organisations.

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years?

Other (please specify)

All of these technologies have potential roles in realising the value of geospatial data in different environments and for different purposes. In practice, most of these technologies will be used in some form of combination. Supporting UK location data capability and delivery will involve ensuring that skills and standards continue to support integration and connection of technologies, as well as development and deployment.

Government initiatives to advance the most impactful enabling technologies (in particular AI/ML), which could be applied to many purposes, should specifically and strongly support the application of the technologies to geospatial, to make best use of the UK's strengths in geospatial technologies.

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Location data applications can potentially be used to realising many public benefits locally in UK places, including through improving transport, housing and planning, targeted support to economic growth, better environmental health conditions, reduced emissions and climate adaptation. These all involve multiple interests and actors, and local public sector organisations as significant and often lead actors.

Many local UK public bodies have impressive records of digital innovation, but it is inevitably a challenge for most of them to monitor emerging developments and know what innovations can help them deliver their responsibilities. Many are not well aware of the potential that geospatial technologies have for improving their operations and delivery for citizens. To gain the potential from innovation, organisations across the public sector (and in particular the local public sector) should be supported in developing and procuring geospatial innovations, including with development of skills and dissemination of proven models.

It may be helpful to develop guidance with public sector organisations (including central government departments) to increase understanding of potential benefits and help build skills and capability to deliver those benefits. For helping those who work directly with geospatial data – perhaps resources or a repository of data which works nicely with particular technologies. For example, guidance for using satellite/aerial imagery with AI/ML tools.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

There are already many benefits to be seen from application of location data to improving operational efficiency, supply chain performance and resilience, and planning and management of infrastructure and transport. It seems likely that in the medium term, the greatest potential benefits may be in levelling up the use of these applications across companies, sectors and all regions of the UK. More use of geospatial insights and applications could be very valuable in designing and delivering specific local solutions for local social, geographical and economic challenges.
In terms of developing demand, climate change mitigation, adaptation and resilience will see growing demand across the private and public sectors for new solutions, and geospatial applications could have very many valuable applications.

In relation to the example above of Autonomous Vehicles, location data and tools could help speed up the roll-out process by supporting the creation of high-definition maps. At the Catapult we are currently proposing a project to explore the build of CAV-quality maps using aerial imagery.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

The Catapult has a record of increasing awareness of use of geospatial in our sectors. We look forward to continuing and expanding our role in supporting geospatial innovations and diffusion of them. The Catapult hosts two relevant major programmes, the Digital Twin Hub, and CReDo, the National Digital Twin programme's Climate Resilience Demonstrator. These programmes are major strands of the UK's exploratory collaborative action on Digital Twins, and they provide insights that will inform the development of national Cyber-Physical Infrastructure, and this consultation. They are both developing evidence bases and models for geospatial data collaboration.

The GIS team at the Catapult have worked on several notable geospatial projects in recent years and have presented in various forms, formally and informally to many organisations. Such projects include ServCity, where we have demonstrated the power of geospatial in understanding CAV scalability; Energy Systems Map of Transport, where we demonstrated the utility of bringing together multiple datasets to understand energy demand by transport; and CAELUS, where we demonstrated how geospatial can be used to plan for drones.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The Catapult hosts two relevant major programmes, the Digital Twin Hub, and CReDo, the National Digital Twin programme's Climate Resilience Demonstrator. These programmes are major strands of the UK's exploratory collaborative action on Digital Twins, and they provide insights that will inform the development of national Cyber-Physical Infrastructure, and this consultation. They are both developing evidence bases and models for geospatial data collaboration.

Cross-organisational and cross-sectoral collaboration is likely to be key for realising benefits from geospatial, in terms of better management of places, including for reducing carbon emissions and improving resilience to climate effects. Our experience is that this kind of collaboration is new to many organisations, is often challenging for them, and takes time and successive iterations. It will continue to be vital to support demonstrators to trial and disseminate what works in terms of how mutual benefits can best be realised.

Q14. Would you like your response to be confidential? If yes, please give your reason:
No

Q15. Who are you responding on behalf of?
A non-government organisation

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
London

Q17. What is the name of your organisation?
Connected Places Catapult

Q18. What is your role within the organisation?
Strategist

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

GeoPlace LLP (1)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

COVID response has highlighted the importance and critical need for accurate and well-maintained location data. For example pharmacy data and the sharing of vulnerable people data between NHS and local authorities was made more difficult at the outset with the data coming from central government not being included with UPRNs. Other examples used for COVID response include household level location data for analysis, planning and prioritisation of service delivery based on identified / analysed need(s) and the ability to widely share this across multiple actors easily. More recently recognising fuel poverty at the household level from both utility provider and public sector viewpoints helps understand how to get help to the most needy. Innovation with location data in the platform provider, system integrator and consumer application sectors will enable public and private sector efficiency to counteract cost increases. Specifically in the property sector this will stimulate economic growth e,g, home buying and selling. The availability of consumer facing applications that integrate geospatial data as part of the user experience, without the user really needing to understand how it underpins their use case(s). Consumers want and expect the GoogleMaps experience in other business and government interactions, i.e. free at the point of use, easy to understand and a sense that the data they are looking at is reliable, trustworthy and relevant to their needs. Our transport sector is also going through a transformation with the strive for Net Zero and Electric Vehicles, the development of Technology and the automation of Vehicles and the desire to use our transport infrastructure differently through walking and cycling and with the general aim to make our streets nicer place to be. This transport revolution alongside the increased awareness of the importance of the climate crisis are creating ever more demand for quality location data.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

(1) ESG / environmental corporate social responsibility: traceability and sustainability of goods, supply chains and the ethical / green credentials behind them will drive more analytical use cases where accurate geospatial data is needed. (2) AI: automation in logistics and navigation will demand more robust, highly accurate and legally sound geospatial data, e.g. autonomous vehicles not only need detailed data to navigate but also data that manages real world / legal representations (3) Augmented Reality / VR: merging and overlaying of the observed world with georeferenced contextual data (4) Economic climate and government policy the public sector is a large owner, producer and consumer of geospatial data. A lot of this data is inaccessible for machine:machine processing and of varying quality. Government policy could be more effective to invest in effective wholesale digitisation and transformation programmes to unlock greater efficiencies and value to UK plc. Further efficiencies needed in the public sector as public sector spending is reduced. Location data can be used to underpin service transformation, and policy design and monitoring.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Geospatial data must be part of a wider national data infrastructure. There have been some attempts at this, albeit at smaller sector based levels but no clear mandatory (and centrally driven) national data infrastructure exists across the UK. It is unclear how the GC works with the National Infrastructure Commission’s data infrastructure - Digital & Data - NIC . There is a role for the GC in being clear about the standards required in a Geospatial Information Data Strategy and taking forward the aims published Unlocking the power of location:The UK’s geospatial strategy . The strategy would benefit from being owned and driven by the GC - the UPRN/USRN mandate is a good example of this. For example on of the Geo6 members, VOA, have picked it up but not others in this group HMLR for example. Some form of policing of adoption / non-adoption would be hugely beneficial and convey to public sector organisations that this is important and there are ramifications for ignoring it. The GC could be more visible in driving

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

the standards across core systems of government. This approach would then support government priorities such as: Economic Growth: particularly around speeding up the home buying and selling process, the wider proptech market, transportation and highways management, lending, banking, insurance etc. Public sector efficiencies: with public sector spending reductions, location data can be used to underpin service transformation, and policy design and monitoring. The current ecosystem is largely based on snapshot data / epochs which can lead to inefficiencies and out of date data being used to underpin critical data applications.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Care should be taken to avoid specific focus on innovative geospatial technologies in this domain. Greater emphasis should be placed on the geospatial data, the standards and interoperability of these as a high-quality reference framework on which to build great products and services upon. A National Geospatial Data Strategy needs to do more than promote standards - it needs to drive the adoption of standards by working the parts of the economy that will deliver the biggest impact. For example, working with the Protech sector and government organisations interacting with this sector (LR/VOA and local authorities) to embed these standards. If GC can assist developing and realising business cases and investment at HMLR and VOA to adopt UPRNs as part of their end to end operational data management activities and workflows for example rather than simply publishing activities this would provide greater opportunity for market and technology innovation as well as internal efficiencies.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Quantifying the scale is difficult without further analysis and study but the following are examples where innovation and better adoption / use of geospatial can be transformative: Management of real-world assets (more precise locations, better attribution) important for improving asset maintenance schedules and data sharing. Better validation/verification services around property to support fraud and identity authentication use cases, eg - - "we use the UPRN to help link a person, with a certified identity, to a property". ESG, in particular managing climate change. highways management and transportation.

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Wholesale benefits to the conveyancing process. For example opportunities in Conveyancing and Landlord registration provides some quantitative evidence, such as ubiquitous use of the UPRN, along with appropriate access to the data may lead to an overall reduction of 10% of annual house sales falling through which is equivalent to 34,100 transactions a year: Each transaction that does not complete costs the consumer on average £2,160 – that is £73,656,000 to consumers. The average stamp duty per transaction is £8,230 – that is £280,643,000 for The Treasury.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Reuse and application of the GeoPlace model to collect more / other types of data from local authorities and other public sector bodies for reuse within the wider public sector / commercial markets

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The Joint Venture GeoPlace model provides an excellent example of public sector partners working collaboratively to support the geospatial industry.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Other (please specify):
Public sector owned LLP organisation representing local authorities

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

GeoPlace LLP

Q18. What is your role within the organisation?

Director

Q19. How many people work for your organisation?
50 - 249

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

Geoplace LLP (2)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

• Increase of awareness of the innovative use of location data by consumers that is driving information service providers to deliver insights rather than just data.
• Technologies, such as Earth Observation, drones and AI extraction of features, are having a major impact on the data acquisition processes.
• Business processes connected to what in the US are called "systems of record", which rely on canonical datasets to complete regulatory and other checks particularly with respect to online transactions, referred to as Know Your Customer (KYC).

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The contribution of location data to the economy and society can be enhanced through access to authoritative and dynamically updated information about people, businesses, and land and property in the UK, including location, address, ownership, use and value in Fundamental Reference Data (single canonical sources such as the Unique Property Reference Number [UPRN]). This is essential to support transformational government and allow citizens and businesses to efficiently access public services at all levels. Spatial Finance – the availability of highly granular geospatial data, such as addresses and 4D topography from satellite and LIDAR surveys will increasingly be used to meet ESG requirements in decision-making on loans, insurance and investment portfolio management.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The location data domain needs to form new partnerships with the Earth Observation ecosystem to harness and exploit the new capabilities emerging from the Earth Observation sector. This is where the action and money are emerging.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

• Improve understanding of the KYC market and the role that official, canonical sources can play in meeting their needs.
• Encourage catapults to design specific data-centric innovation projects with geospatial embedded from the start.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

To meet one of the key needs identified in earlier questions, GeoPlace has commissioned independent research focused on the potential for unlocking value through transformational change by integration of government land and property databases. The complete executive summary is being included to provide detail of a "blueprint" for advancing this concept.

A BLUEPRINT FOR DISCUSSION
.
Executive Summary What is the Vision?
A digital society needs the consistent, joined up evidence base to underpin all societal, economic and environmental decisions around land and property. The British Property Federation asserts that the real estate sector directly employs more than 1.2 million people and contributes over £100bn to the UK's economy (GDP) each year – about 7% of the total. The UK public sector is the largest landowner and tenant with real estate assets (including land) of approximately of £406 billion1 , much of which is key to service delivery. This contribution to the economy and society can be enhanced through access to authoritative and dynamically updated information about people, businesses, and land and property in the UK, including location, address, ownership, use and value in Fundamental Reference Data (single canonical sources such as the Unique Property Reference Number [UPRN]). This is essential to support transformational government and allow citizens and businesses to efficiently access public services at all levels.

Why are Fundamental Reference Data Essential?
This referencing infrastructure is fundamental to the economy, and supports key government policies in the following areas, for example:
• Strengthens resilience of our buildings through targeted retrofitting, reduces our dependence on energy, and mitigates the impact of climate change;
• Supports better evidence to shape government policies around the wellbeing and resilience of people and places, and mitigates the social and economic inequalities they are facing;
• Enhances disaster management by improving evacuation processes;
• Supports data readiness in preparation for response to future crises, such as pandemics;
• Harnesses data to identify and support vulnerable people more effectively;
• Enhances fraud detection through validation by cross-referencing data across government departments;
• Makes doing business with Government easier by extending "Tell us once" concept into real estate;
• Guides the planning system in creating sustainable development and delivering against the SDGs;
• Prevents future legacy IT [Digital, Data and Technology (DDaT)];
• Establishes more efficient portfolio management and asset maintenance;
• It is estimated2 that the widespread use of the Fundamental Reference Data would lead to an overall reduction of 10% of annual house sales (34,100 transactions) falling through. Currently the cost to the consumer is £74 million and £280 million to the Treasury through lost stamp duty.

Digital, data and technology (DDaT) underpin everything the government does and provides vital services for millions of citizens every day. The public sector is estimated to spend £46 billion on digital in 2021/23 . Fundamental Reference Data will help to ensure that some of this spend is more effective for the users and will act as an exemplar in designing products and services in new ways.

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Have Fundamental Reference Data been successfully implemented in other countries?

Denmark, The Netherlands, Lithuania and New Zealand are exemplars of how access to public Fundamental Reference Data is making an important contribution towards modernising the public sector and its interactions with the public and businesses, delivering significant and quantifiable benefits. In Denmark their Basic Data program was completed in 2019 at a cost of UK£71 million and a report to the Danish Parliamentary Finance Committee in April 2021 has reviewed progress against the business case. It concluded that pay back was achieved in three years and annual benefits are currently UK£100 million (25% to public sector and 75% to private sector).

Why hasn't an integrated referencing infrastructure of Fundamental Reference Data happened in the UK?

Lack of joined up thinking around this basic, referencing infrastructure and a long term failure to comprehend the big picture has constrained the UK economy. Previous initiatives addressing parts of the blueprint have not reached the statute book or their use mandated. However, current work on these initiatives means that we need not be at a "standing start". Now is the right time. Progress on developing Fundamental Reference Data fits well with the 'roadmap for digital and data' and 'data readiness' agendas.

What have been the consequences of not having a reference infrastructure?

Specific high profile impacts include: not being able to quickly evaluate the scale of the building cladding problem, highlighted by the Grenfell Tower disaster in West London; the significant cost of implementing the track and trace solution in response to COVID19; and private sector organisations are creating alternatives to government data products, rather than being able to focus on adding greater value to the economy through new, innovative products and services.

What are the current problems with the referencing infrastructure situation?

A complex landscape of custodians and inconsistencies in data and processes based on specific business needs have led to collaboration being crucially missing. The responsibility for managing the Fundamental Reference Data and their data components in GB4 is spread across a wide range of stakeholders and geographies and much needed standardisation and collaboration is crucially missing, leading to a patchwork of standards and currency of products and services.

Why is now a good time for change?

Policy, market and technology drivers are converging to make this an opportune time for change. The Fundamental Reference Data proposal is aligned and supportive of the recently released UK and Scotland Data Strategies by supporting businesses and organisations to innovate, create value and drive new economic growth; the Geospatial Commission's Location Strategy released in 2020 advocates the principles underlying the Fundamental Reference Data approach; and the Fundamental Reference Data are a fundamental part of the 'data readiness' program following the impact of COVID-19 to ensure commercial re-use processes are effective and a higher level of preparedness and resilience to future disruptions.

What are the key risks?

The major risks with the highest probability include: the perception that the delivery of the current data custodian services are reasonably efficient and there is no need to change the status quo; the current data are fully embedded into complex business processes and ICT solutions of the custodian organisations and the private sector and would be too disruptive to change; and many private sector organisations are dependent on the government's data chaos for their livelihoods and may lobby against change.

What has to happen to create the Fundamental Reference Data?

Strong governance arrangements and studies into the technical and financial feasibility of the Fundamental Reference Data proposal should be established. These include:

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Strategic Actions

• Think tanks, political advisors need to be briefed to improve awareness of potential benefits to government, business and citizens.
• The CEOs of the current Fundamental Reference Data custodian organisations need to be fully briefed and initially agree that this is an initiative worth investigating and pursuing. A summit in the spring of 2023 with the authorities in The Netherlands, Lithuania and Denmark would support this decision-making process.
• The creation of the full set of Fundamental Reference Data is a substantial programme of work and needs to be prioritised and broken down into manageable size components that are incrementally delivered, as was achieved in The Netherlands, for example. • If the technical and financial investigations outlined below are positive then a Fundamental Reference Data awareness campaign would be initiated, and a Fundamental Reference Data proposal submitted to the UK government for approval and funding.

Technical Actions

The technical and financial feasibilities of the proposal would be investigated, including:
• A technical concept testing workshop would be arranged with participants from all the Fundamental Reference Data stakeholders to agree a technical feasibility study. The workshop should be facilitated by an independent organisation.
• A technical team would then identify the technical options for achieving the Fundamental Reference Data and recommend a way forward with associated costs, timelines and risks. • A Proof-of-Concept project would be implemented on a limited scale to test the technical feasibility of the proposed solution.
• An economic team would conduct a socio-economic impact assessment to create a business case for the investment.
• A further team would review the options for implementing and managing the solution.

Awareness of geospatial in other sectors

Driving increased awareness of location data across the economy is crucial if we are to realise the full range of applications and insights that it can offer. Awareness is important from a number of different perspectives, for example:
• Senior leaders and decision-makers can build their understanding of the potential applications of location data in their sectors;
• Many data scientists would benefit from greater understanding of spatial analysis and how this can be applied to bring datasets and systems together;
• Industry standards bodies may need to consider the role of geospatial data to support interoperability in relevant systems and processes; and
• Different communities can work more closely together, such as digital, geospatial and space.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

An engagement strategy for the adoption and use of Fundamental Reference Data.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Seeking to make secondments from the UK private sector to bring market knowledge into organisations at an operational level. Actively leveraging geospatial skills within the UK (not just in the public sector) into the FCO Overseas Development Aid programme, particularly in the domains of spatial finance.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Geoplace LLP

Q18. What is your role within the organisation?

GeoPlace is a limited liability partnership owned equally by Local Government Association (LGA) and OS. Responsible for collating, managing and maintaining the primary UK authoritative geospatial address and street data.

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Information and communication

Northfield Community Partnership

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Covid-19

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Whether or not the PAF dataset is open

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I would add the Pre-data capture and creation phase where organisations learn how important the ecosystem is and decide to become part of it, and I would add 'and non-professionals' to the last box, after the word prefessionals

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Not part of what we do
Data analysis and visualisation	Not part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Not sure

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

PAF open could help all sectors - hard to anticipate the impact yet

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Through our new project Digital NNS (Neighbourhood Network Schemes)

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The databases and organisations mentioned in this post [Link excluded from publication]

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A non-government organisation

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

West Midlands

Q17. What is the name of your organisation?

Northfield Community Partnership

Q18. What is your role within the organisation?

Community Lead, Digital NNS

Q19. How many people work for your organisation?

10 - 49

Q20. What best describes the industry that you or your organisation is involved in:
Human health and social work activities

Open Geospatial Consortium (OGC)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advancements in the areas of Application Programming Interface (API) standards. The OGC published the OGC API – Features standard in 2019. Since then, this standard has been implemented by government agencies (e.g. British Geological Survey, National Land Survey Finland, and US Geological Survey), companies (e.g. Esri, Microsoft, Ordnance Survey), and academia to serve vector feature data. Additional OGC API Standards have since been developed and published to support other aspects of the geospatial ecosystem. For example, the OGC API – Environmental Data Retrieval standard was published in 2020 and has been implemented by government agencies (e.g. US National Weather Service, UK Met Office, Meteorological Service of Canada), private companies (e.g. IBL Software Engineering), and academia (e.g. Wuhan University). Another example is the OGC API – Processes standard which was published in 2021 and has been implemented by companies (e.g. Hexagon) and intergovernmental agencies (e.g. European Space Agency). Ordnance Survey has launched a new product series called OS NGD API which implements multiple OGC API Standards, including OGC API - Features and OGC API - Tiles.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

We are seeing increasing interest in the role of geospatial standards in Digital Twins technology that creates a virtual representation of a real-world physical system that serves as the digital counterpart of the real-world physical system for practical purposes. Current research into Digital Twins is developing solutions for the urban, natural, air, and ocean environments. OGC is involved in the European Commission's ILIAD - Digital Twins of the Ocean Project. The commonality between these targeted solutions is the need for a persistent and constantly maintained 'network' of data feeding into decision support systems where data-based decisions directly influence interventions in the real world and where the impact of these decisions can be monitored and measured in the virtual world. The potential role of geospatial standards as the means through which Digital Twins technology gets integrated into the Metaverse has also been discussed as a possible area for future development. Note that in both Digital Twins technology and the Metaverse, delivery of geospatial data into those environments is primarily seen as a role for OGC APIs. Communities of interest in Urban Digital Twins and the geospatial dimension of the Metaverse are currently forming within the OGC.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The 'Application of data' appears to focus on the application of geospatial data in professional services to address real world problems. It should be noted that geospatial data is also increasingly used in the Gaming industry and in entertainment platforms, as well as in the Metaverse. OGC has established an Interoperable Simulation and Gaming Domain Working Group which includes companies operating in Defence Training (e.g. Thales, CAE) and others that operate in the gaming industry (e.g. Epic Games).

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The Geospatial Commission could sponsor innovation initiatives within the OGC Collaborative Solutions and Innovation (COSI) programme. Ideally such sponsorship would be through a partner organisation such as Ordnance Survey (OS) because of the number and scale of the initiatives. COSI is an innovative, collaborative, and hands-on development and rapid prototyping program that leverages the potential of more than 500 OGC members to collaboratively find solutions to spatiotemporal information challenges. OGC members bring their challenges to COSI. These challenges are extremely diverse. They can be specific technical problems, such as developing a new API or data model, or more complex challenges, such as developing a new architecture, exploring new standards, or profiling them for specific use cases. Challenges brought into COSI are refined and mapped to a set of requirements, use cases, and implementation scenarios, and ultimately addressed in different types of initiatives. For most initiatives, OGC members act as sponsors. Mediated by OGC Staff, synergy effects are used to address individual problems as holistically as possible. For this purpose, sponsor funds are pooled and then distributed to OGC members who participate in the solution development within an initiative. References: Active Initiatives in OGC COSI, [Link excluded from publication]

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Development of a Reference Architecture that describes how to implement OGC Standards to meet the needs of different domains could be transformational across several sectors. To highlight this, consider that each of the following examples implements core or foundation concepts from the OGC Standards Baseline: (1) Agriculture, Forestry & Fishing: OGC Standards are being used to support smart-farming in the EU-funded DEMETER project [Link excluded from publication]; (2) Mining & Quarrying: The OGC's Geography Markup Language (GML) and Well Known Text (WKT) Standards are used in the representation of Coordinate Reference Systems which are published by the International Association of Oil & Gas Producers (IOGP) in the EPSG register. [Link excluded from publication]; (3) Health: OGC IndoorGML Standard could support navigation to help manage movement in response to COVID. See [Link excluded from publication] ; Please also refer to this technical paper on Health SDI [Link excluded from publication] ; (4) Energy: Modeling of housing stock and energy efficiency as well as the integration of utility networks in MUDDI. [Link excluded from publication] Water, Sewerage & Waste: The OGC's WaterML standard is used by the US Geological Survey (USGS) for representing water bodies [Link excluded from publication]. (5) Construction: CityGML, MUDDI, and InfraGML are some of the examples of OGC Standards (approved and candidate) that have had an impact on the construction industry. MUDDI is being implemented by the UK National Underground Asset Register (NUAR). CityGML is being implemented by the Cabinet Office of Japan in the creation of a National Digital Twin. [Link excluded from publication]; (6) Transportation: The Aeronautical data quality implementing rule (mandated by EU Regulation 73/2010 and UK Statutory Instrument 2019 No. 459) requires information and data to be structured in accordance with international standards for geospatial information, including the use of the GML. [Link excluded from publication] (7) Defence: Please refer to UK Defence Standard 00-102. (8)

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Real Estate: The OGC CityGML Standard has been demonstrated to have the potential to support city planning and taxation. See [Link excluded from publication]

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

OGC Member Meetings are open to the general public. OGC Members receive free complimentary tickets, the number of which depends on the Membership level. These meetings offer an excellent opportunity for anyone interested in location data to engage with experts from across the Globe. Discussions during the meetings cover case studies, challenges, solutions, new technologies, opportunities for standardisation, success stories for standards, and several other topics. Some examples of activities and events through which OGC helped to raise awareness of the value of geospatial: (1) COVID-19 Response: Very early in the pandemic, OGC published a technical paper on Health Spatial Data Infrastructure [Link excluded from publication]. The paper provided a reference through which the geospatial community could discuss with various stakeholders how geospatial technologies support the response to COVID-19. Also early in the pandemic, OGC established a page on the OGC website to help the global community discover and access various resources related to COVID-19. The page has been very useful at raising awareness of different approaches through which organisations were responding to the pandemic to support their communities [Link excluded from publication]; (2) In the recent Location Powers outreach event on ESG investing (November 2022 in London) OGC promoted the value of geospatial data and technologies to experts in the ESG financing industry. [Link excluded from publication] APIdays LIVE Interface 2021 conference attended by API architects from different sectors, for example finance, healthcare, marketing, etc. [Link excluded from publication] Metaverse Summit [Link excluded from publication]

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

OGC Testbed-17: In 2021, OGC conducted the Testbed-17 innovation initiative. Among the organizations that provided Testbed-17 sponsorship were the following OGC members: Defence Science and Technology Laboratory (Dstl); European Space Agency (ESA); Natural Resources Canada (NRCan); US Federal Aviation Administration (FAA) System Wide Information Management (SWIM) Program; US National Aeronautics and Space Administration (NASA). In a collaborative effort, all Testbed participants, sponsors, and the OGC team worked together to increase Technology Readiness Levels (TRL) for geospatial IT solutions, including software architecture, interface design, information & data models, and related standards and specifications. Testbed participants followed a rapid prototyping approach to design, develop, and test solutions to sponsors' location-related problems. The testbed produced 16 engineering reports, all of which are freely available for the general public to download. OGC Vector Tiles Pilot: Between 2018 and 2019, OGC conducted the Vector Tiles Pilot. The pilot implemented prototype extensions of OGC Standards to support vector tile formats. The work from that innovation initiative went on to inform the development of the OGC API – Tiles standard within the OGC Standards Program. As of 2022-11-10, the OGC API – Tiles standard has been approved by the OGC Membership and is available for the general public to implement and use. More than 100 organisations participated in the Standards Working Group that is responsible for OGC API – Tiles, and more than 10 of those participated in the research activity conducted by the Vector Tiles Pilot. The OGC's Consensus Process enabled the organisations to work collaboratively and to develop a standard, from concept through to approval. References: OGC Testbed-17, [Link excluded from publication]; Vector Tiles Pilot Phase 1, [Link excluded from publication]; Vector Tiles Pilot Phase 2, [Link excluded from publication]

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A non-government organisation

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Other (please specify):
Arlington, Virginia, United States; London, United Kingdom; Brussels, Belgium. The Head office is in Arlington, Virginia.

Q17. What is the name of your organisation?

Open Geospatial Consortium (OGC)

Q18. What is your role within the organisation?

Director of Product Management for Standards

Q19. How many people work for your organisation?

10 - 49

Q20. What best describes the industry that you or your organisation is involved in:

Information and communication

OSGeo:UK

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

There has been an increase in use of open source tools and data across the board, with a number of major companies adopting open source technologies. Over the last 5 years there has been a significant uptake of home deliveries, for which address data are a key element.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Address data will still be key moving forward with the increase in home deliveries. Data access is also vital in terms of access to the internet in terms of both fixed line broadband and mobile broadband signal. Significant chunks of the population still do not have reliable access to broadband internet (some by limitations of the technology, some by choice) and this is an increasing issue for service access. The other aspect coming into play in the future is the issue of informed consent regarding use of data, with regards GDPR. Individuals data is key to many developments with geospatial data, with an individual's location (at any point of time) as well as their home address being considered personally identifiable data. The amount of data is growing really fast. In the past years, having a standardised metadata capturing tried to address some of the issues in regards to handling large volumes of the data. Going forward, there will be more needs to handle data versioning and change logs. Having access to historic data, can help with trends and pace of change.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The figure is a reasonable representation of the geospatial data environment. However I think there should be a greater focus on secondary data discovery and curation. For example, primary data collection is covered in Data capture and creation, but secondary data, which forms the bulk of data used in the geospatial industry only gets mentioned in passing in Data transformation, processing and systems. Additionally education is not mentioned at all in this overview. To ensure that the best benefit can be gained from this data, education needs to underpin all stages. This includes things like the geospatial apprenticeship being spearheaded by the RGS-IGB, as well as existing short course and university level training. However it also includes education for users of data - so non experts, who do not have a training in this field. They need to be aware of their geospatial data and what it can be used for.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Opening up of core government spatial datasets are key to this. Probably the data set that could have the biggest impact is address data. Much has been written on what could be achieved with open address data and we think opening this up could be transformative to the industry. Wider government support for open standards and supporting a wide variety of software would also have a great impact.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The address data issue could leverage billions of pounds of benefits. Supporting and developing ethical frameworks to address some of the issues surrounding GDPR and related issues could also prevent many of the potential issues around using individuals data. This would include the education elements mentioned above.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Having the resources to do more promotion of open tools and demonstrating use of full stack open source GIS tools.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The Open Source Geospatial Foundation (OSGeo) is a not-for-profit organization whose mission is to foster global adoption of open geospatial technology by being an inclusive software foundation devoted to an open philosophy and participatory community driven development. They deliver a range of collaborations globally, including supporting software development and promotion. They run an annual FOSS4G (Free and Open Source Software 4 Geospatial) conference each year spearheading this collaboration. We (OSGeo:UK) are the UK local chapter and support this work within a UK context. We also run FOSS4G:UK, a regular conference bringing together commercial, not for profit, academic, local and central government organisations to discuss open source geospatial. We also fund a range of open source projects, with £4k of funding awarded this year [Link excluded from publication]

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

An industry association

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Other (please specify):
UK wide (no specific base)

Q17. What is the name of your organisation?

OSGeo:UK

Q18. What is your role within the organisation?

Chair (Dr Nick Bearman)

Q19. How many people work for your organisation?

Not applicable

Q20. What best describes the industry that you or your organisation is involved in:

Professional, scientific and technical activities

Royal Geographical Society (with IBG)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

As the learned and professional body for geography we recognise that changes in technology have brought geospatial and geographical thinking into mainstream technological and consumer landscapes, across a wide variety of applications and sectors. This has largely been driven by enhanced capabilities to generate, collect and process data in real-time; new approaches to analysis, including AI and machine learning; and greater attention to visualisation and to understanding geographical context. Such changes have raised awareness of issues of privacy, differential access, and ethical issues of location data particularly with personal data; a person's current and past location does not appear to have obtained the same level of scrutiny as other aspects of personal data.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The value chain presented within the call for evidence describes data processes from capture or creation to application. Changes across this chain in sensor technologies, capture processes, processing and analytical capabilities will advance rapidly. Across the research and innovation communities, universities and industry will continue to push the boundaries of technology, data analysis and application of data. This will be underpinned by cohorts of specialists across the geospatial domain, expert in producing and consuming geospatial data intelligently, and interpreting it to unlock economic value and deliver social and environmental benefits. The development of these skills, both at foundational and advanced levels, needs to be embedded widely across the UK through all phases of education, training and professional development. Such skills development needs to focus on specialist skills (e.g. in AI, data science, sensor technologies etc), but equally in the skills of geographical interpretation to leverage greatest value from the data. More widely concerted efforts are needed to address issues of absorptive capacity to ensure there is uptake of the value of geospatial across sectors and organisations at all scales. Geography has and will continue to play a key role in the delivery of geospatial and broader geographical skills of interpretation, analysis and visualisation. These skills and competencies must continue to be cultivated, supported and developed across the education and career pipeline, embracing new technologies and approaches and the ubiquity (and multiple sources) of spatial and geographical information. These skills are needed not just by technical specialists but also (and critically) by decision-makers and consumers of geospatial data, analysis and insight. Within the value chain or ecosystem we recognise the importance of foundational and authoritative data. The stages outlined above are underpinned by this data, along with skills to understand and unlock the value.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The ecosystem, as described, does not reflect the need for research, professional skills, and professionalism, and this undermines the characterisation. For geospatial data, skills need to be developed not only for the creation, curation and assurance of geographic information, but also critically for contextualisation, analysis, interpretation and use of this information. This is where geography - and its spatial lens - has a particular role in unlocking the value of location data, especially when linking and drawing relationships from a range of disparate datasets across scales and contexts. The ubiquity of data makes it vital that citizens, scientists and policy makers are fluent with numbers and data in all its forms. There is a huge opportunity for those who are equipped and ready to take advantage of the data revolution that is already well underway.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Innovation is underpinned by skills, knowledge and behaviours. The UK public sector should provide leadership to ensure there is opportunity for the development of skills across society, through schools, universities and employment. This should include development of apprenticeships and technical education, as well as investment in existing routes through schools and universities. Furthermore, the development of innovative applications is often underpinned by primary and applied research. There should be sustainable mechanisms for funding and dissemination of this research to ensure that down-stream users can benefit and are aware of such benefits. There are many benefits to building data skills in the UK population, including helping citizens to participate more fully in the democratic process, enhancing research in universities and in the workplace, supporting the economy and taking advantage in particular of more ubiquitous data. A coordinated and continuous effort is needed to improve data skills across all phases of education and employment. Innovation and business awareness, as well as a myriad of transferable skills, underpin effective geospatial professionals and a forward-looking industry, and should be part of a rounded skills landscape. This focus on skills and supporting development will be key to reaching the potential economic, social and environmental benefits from location data. Geographical and other spatially-focused subject and professional bodies, membership bodies and associations across the world play a key role in demonstrating and raising awareness of the impacts and value of geographic information. We recognise the importance of foundational and authoritative data which underpins all the .e. all this is underpinned by foundational and authoritative data and skills to understand and unlock the value.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Geographical data and approaches play an important role in the journey to net zero, carbon reduction and mitigation of climate-related risks. Its value is already being demonstrated across sectors including agriculture and forestry, and business and finance, and there is huge potential for more. The current investment by the finance sector in spatial environmental analytics is clear evidence of this. Integrated data – in particular spatial data – can help solve complex problems, through the geographical dispersion of risk, and by improving our understanding of the environmental and social contexts of decision-making for, and investment in, data practices. The evaluation of public policy and intervention requires geospatial analysis to understand 'what works where' (and 'what does not work where'). Geography, and by extension the application of geographic data, is a valuable tool in impact-evaluation and understanding

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

why different responses to interventions are observed, whether they are social, economic or environmental.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Geographers are ideally placed to relate to many other fields of knowledge, including the increasingly complex relationship between location data/geospatial data approaches and techniques, big data analysis, and broader technological and digital advancement in the collection, use and storage of data. Organisations which can bring together the discipline, along with technological advancements, provide an important space for creative thinking and networking which leads to greater depth of understanding and efficacy of solutions. Geographical and other spatially-focused subject and professional bodies, membership bodies and associations across the world play a key role in raising awareness and demonstrating the impacts and value of geographic information, and recognising appropriate skills and expertise. These bodies have a role in professionalism, skills development, and fostering cross domain working and knowledge exchange.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

As a learned and professional body, the Royal Geographical Society (with IBG) supports and facilitates collaboration between and within sectors, and plays a role in convening educational, research, professional and representative organisations. The Society, and related relevant bodies, have an important role in developing the skills pipeline and the ongoing professionalism of those practicing geography and geospatial skills within the workplace. Accreditation of professionals recognises professional practice and a commitment to continual development and adherence to appropriate professional Codes of Practice. Every sector will benefit if data professionals are competent, professional, ethical and accountable. Royal Geographical Society - Professional Code of Conduct (rgs.org) Chartered professionals also make a commitment to the continual development of their geographical and other skills through annual CPD. The Society offers a range of events, activities and initiatives that foster the professional development and networks of geospatial professionals.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Other (please specify):
Learned and Professional Body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Royal Geographical Society (with IBG)

Q18. What is your role within the organisation?

Professional and Policy Manager

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Professional, scientific and technical activities

Royal Institution of Chartered Surveyors (RICS)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

an expectation that land and property information will be openly and transparently available to all, scrutiny due to new money laundering legislation, pressure on housing delivery, upward value in land prices caused almost primarily by taxation advantages and natural capital/offsetting use. We think the biggest changes of the next 5 years will be mainly consumer driven rather than technology led.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

the adoption and use of UPRN. the alignment of physical and economic geography (VOA and taxation data), and the development of land use frameworks.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

no, that is a good description of the geospatial ecosystem

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

the geospatial commission has achieved an enormous amount in its young life, we think it could act as a fulcrum for geospatial applications within the 'catapult' network, it already supports geovation hub but there is a lack of coherence in UK academia which perhaps the commission could help alleviate (along with other interested organisations).

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

planning (digital), provision of affordable housing, climate change mitigation, land use framework, critical mineral supply chains, renewable energy (land and sea).

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

RICS would be keen to help with any awareness raising initiatives, our consumer guides for example are part of our public benefit remit and reach a large audience through citizens advice bureau etc. we also support schools outreach (Class of your own, get kids into survey, geospatial.uk) and the advanced apprenticeship system.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

RICS collaborates with multiple bodies such as FIG [Link excluded from publication] (global geospatial), CLGE [Link excluded from publication] (EU geospatial) and CASLE [Link excluded from publication] (commonwealth geospatial), we also work closely with the UN and World Bank.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

An industry association

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Royal Institution of Chartered Surveyors (RICS)

Q18. What is your role within the organisation?

Head of Land & Resources (inc. geospatial surveying)

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Real estate activities

Sustainability First

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Sustainability First is an environment think-tank and charity. We have co-led (with another charity, the Centre for Sustainable Energy in Bristol), a major multi-partner project (2017-21) - the PIAG project - on 'Access to Smart Meter Data for a Public Interest Purpose'. There is a significant and unmet need for granular energy consumption data - including by location - to inform public policy. First Covid, and now the energy-price crisis demonstrate a pressing need for granular locational energy consumption data to support policy interventions - and without which government, regulators and policy makers are flying blind. In particular to have a clear understanding of the distributional impacts of such major changes in market conditions. [Link excluded from publication]_Snapshot_Report_2017-2021.pdf

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Achieving the UK 1.5 degree statutory target for net-zero will require granular energy consumption data by location - i.e for suitably anonymised / aggregated smart meter data to become available - to inform policy - including understanding distributional impacts and designing suitably targeted policy interventions.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

This eco-system characterisation does not seem to address an earlier stage - regarding *routes to access* 'public-interest' data-sources - and their subsequent collection (rules on privacy, consent etc) - including how far access to major data-sources with public-interest benefits may / may not be covered by legislation e.g the Statistics of Trade Act 1947, the Digital Economy Act 2017. E.g, on energy-consumption data (which is locational to the level of every household), government can collect this data under the Statistics of Trade Act. In practice government presently collects one *single* annual consumption figure for every household meter via energy retailers. That single annual consumption figure is wholly inadequate to the task of understanding granular patterns of energy consumption - but, inter al, informs the BEIS subnational energy consumption statistics. BEIS currently do *not* collect more granular energy consumption data (but investigating collection of accurate monthly energy smart-meter data) under their existing SoT Act powers. BEIS seems unlikely to use those powers to obtain more granular energy consumption data (eg half-hourly). At the same time the DEA 2017 cannot be a route for BEIS or ONS to require half-hourly energy consumption data from an organisation, because there are presently no arrangements in place for smart meter energy consumption data to be collected or brought together in a single 'hub'. For this reason smart meter energy data can only be collected as now by BEIS using their SoT Act powers - by requesting the data direct from energy retailers. To conclude 'Routes to Access Data for the Public Interest' should also be a consideration in this Data Eco-system

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Not part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

See our Sustainability First PIAG project on 'Access to Smart Meter Data for a Public Interest Purpose' - [Link excluded from publication]

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Sustainability First is an environment think-tank and charity. We have co-led (with another charity, the Centre for Sustainable Energy in Bristol), a major multi-partner project (2017-21) - the PIAG project - on 'Access to Smart Meter Data for a Public Interest Purpose'. There is a significant and unmet need for granular energy consumption data - including by location - to inform public policy. First Covid, and now the energy-price crisis demonstrate a pressing need for granular locational energy consumption data to support policy interventions - and without which government, regulators and policy makers are flying blind. In particular to have a clear understanding of the distributional impacts of such major changes in market conditions. [Link excluded from publication] Achieving the UK 1.5 degree statutory target for net-zero will require granular energy consumption data by location - i.e for suitably anonymised / aggregated smart meter data to become available - to inform policy - including understanding distributional impacts and designing suitably targeted policy interventions for net-zero.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

The Sustainability First and CSE (2017-21) on access to smart meter data for a public interest purpose has without question contributed to better awareness of the value of geo-spatial - including developing use-cases on approaches to government energy statistics, regulatory oversight, local energy planning and analytics for decarbonising heat - [Link excluded from publication]

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The PIAG project on access to smart meter data for a public interest purpose was a major multi-partner project with the 'right' parties were brought together over an extended period to consider the many issues

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

around access to a nationally representative smart meter half-hourly data-set. It considered privacy and consent issues, international comparisons, potential routes to the data in GB and detailed public policy use-cases - [Link excluded from publication]

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A non-government organisation

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Sustainability First - [Link excluded from publication]

Q18. What is your role within the organisation?

Associate

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:

Electricity, gas, steam and air conditioning

Tech UK

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Consumer demand
Consumer's demands have led to enhancements in locational data to ensure they receive services at the standard they expect. For example, last-mile delivery companies have been responding using more sophisticated geospatial data solutions to improve accuracy and allow for better tracking. A similar trend is observed in transportation, where passengers expect live time information on arrivals, departures, and service disruptions, as well as the availability of car parking spaces and now EV charge points. Demand-side organisations, such as transport authorities, have also been using data to learn about patterns of demand for public transport by examining information on aggregated user journeys.
Availability of consumer facing applications that integrate geospatial data as part of the user experience, without the user really needing to understand how it underpins their use case(s). For example, inclusion of maps and geospatial data into Platform solutions, and address data into consumer websites and government services. Finance and insurance companies such as Nationwide and Zoopla are now incorporating UPRNs into core business processes to provide a better, more reliable service to customers, and to reduce risk to their own decision-making.

Climate change and energy
The need to act on climate change has undoubtedly increased the demand for authentic and authoritative data that is better regulated to enable better-informed decisions. Geospatial data plays a key role in identifying and adapting to the ongoing challenge, from detection and monitoring, and providing trusted analytics to help shape adaptation, modelling, and the implementation of viable solutions. The role of geospatial data in responding to climate change has been recognised, with UK Government recently announcing £200 million of funding to invest in Earth observation and climate programmes to prioritises our space and net zero ambitions – keeping in mind that more than half of key climate data comes from space. techUK members have also highlighted the use of geospatial data to monitor energy use in buildings, including identifying assets and monitoring areas of high energy use. This is especially prevalent with the rising costs of energy that is expected to continue. techUK member GeoPlace, who have partnered with UK Government Department of Business, Energy and Industrial Strategy (BEIS) to interpret UPRNs to explore energy use, warm home discounts and helping vulnerable families in fuel poverty.

Adoption by Local Authorities
Local authorities have embraced geospatial solutions as they attempt to deliver on local net zero commitments. These tools form part of the wider 'smart city' technology stack which councils have been steadily investing in over the last five years. This is driven by demands from local stakeholders to improve public service delivery and the need to generate cost efficiencies using trusted analytics. In addition, the COVID-19 pandemic demanded the better use of geospatial data in the public sector (for example, through better routing of emergency services) to generate economic and social value. Going ahead, techUK members envision local authorities being a key driver of geospatial adoption in the UK.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

AI and Automation unlocking the value of location data

The growing volume and diversity of data is predicted to be an staggering 463 exabytes of data per day by 2025. Geospatial data is undoubtedly part of the wider explosion of data that presents new opportunities for industry and academic researchers: As more data is collected from a variety of sources, such as IoT sensors, satellites, and other imaging technologies, there will be larger and more comprehensive geospatial data sets, covering a wider range of geographic areas and providing more detailed information about the features and characteristics of these areas.
However, this expansion of location data has exacerbated challenges around access, interoperability, quality, transparency, and the ability to analyse data especially in realtime. Addressing these challenges will be crucial for Geospatial Data to become an integral part of the UK economy. techUK members

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

across the geospatial value chain highlighted how increased automation, AI and ML applications has been vital tool helping tackle part of this challenge.
It is worth noting that whilst AI and ML will continue to grow in importance for geospatial data, the UK needs to be able to have the compute infrastructure to support the increasingly complex analysis of these datasets by AI. For this reason, the Met office have already invested in the supercomputing infrastructure ExCALIBUR, a Compute infrastructure refers to cloud and edge which are crucial for collecting and sharing data, but also large-scale compute like HPC and quantum which will be needed for complex analysis across multiple geospatial and non-geospatial datasets project that will run until 2025. Whilst many geospatial-based industry use cases will not yet be reliant on HPC and large-scale compute, this demand will grow and the Geospatial Commission should work closely with the upcoming Future of Compute Review by UK Government to ensure the needs of the geospatial ecosystem can be met in the UK.

Open data
Access to Geospatial Data will be one of the key drivers of change in the next five years. This is especially true when integrating multiple data sources, that can offer more consistent, accurate, and useful information when compared with an individual data source.
However, research commissioned by the UK Government shows there are several barriers which stops data from being shared effectively across the economy. This includes, though not limited to, organisations lacking the resources or knowledge to share data, lack of existing incentives to share data and high cost associated with implementing data sharing practices. Furthermore, as more geospatial data is increasingly collected by multiple private sector organisations rather than a single public authority, this coordination issue becomes increasingly complex. techUK members highlighted that often, there is good data in different organisations being shared, but there needs to be consistency and promise that this data is accurate so end users have consistent, definitive, and authoritative geospatial data to make decisions.
The work undertaken by the Geospatial Commission, such as the National Underground Asset Register, the Public Sector Geospatial Agreement, Unique Property Reference Numbers (UPRN) and Unique Street Reference Numbers (USRN) and so much more, has opened access to crucial public sector data sets and enabled crucial innovation. The UK currently has some of the best geospatial data in the world and this work by the Geospatial Commission should be commended.
Housing Associations are using UPRNs as a ‘single source’ of truth for a property, linking together datasets such as Gas Safe, electricity certificates to ensure that a property is safe & secure for tenants. The PropTech industry is using UPRNs to streamline data integration, linking and matching to internal housing systems. For example, temperature sensors to work out risk rating for: mould, damp and fuel poverty risks without having to send surveyors round to all of their housing stock.
Furthermore, techUK welcomes the recommendation to apply FAIR and to develop a new Code of Practice to public sector geospatial data, following mission one of the data frameworks and ethics. This is a good resource to understand what the UK tech sector is thinking: Going ahead, the Geospatial Commission should continue to prioritise opening access to public sector data that is confirmed to be accurate, up to date, and following the FAIR principles set out in the NDS.
To encourage sharing of geospatial data outside of Government, techUK recommends that the Geospatial Commission should follow the principles set out in mission one of the NDS to encourage the market to responsibly share geospatial data whenever possible, by using incentives to maximise value for money data sharing in support of public good; and addressing data practices that distort competition and consumer outcomes. Some techUK members have been able to open select datasets, such as the sharing of accurate, aggregated and anonymised mobility data by BT with public authorities to aid the response to the pandemic, but more should be done within the geospatial ecosystem to unlock the value of geospatial data and raise awareness about data that is open and available.

Self-driving vehicles
Self-driving vehicles (or autonomous vehicles) are an exciting new use case that can revolutionise the way people and goods are transported in the UK. The market is estimated to be worth £40bn to the UK by 2035 according to the Connected Places Catapult.
These vehicles will rely on a combination of real-time mapping of their surroundings through sensors and LiDAR technology and pre-loaded 3D maps. Highly resilient and accurate positioning information will need to be determined in harsh situations where satellite signals are disrupted using novel antenna technologies which are being developed. This combination of approaches will enable the vehicles to make sense of their environment and route themselves for the safest and most efficient journeys.
As vehicles become more connected and can take ‘scans’ of their location, additional use cases will emerge which will enable data on things like congestion to be communicated to other vehicles to enable them to reroute and to transport authorities to factor this into traffic planning and road design.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Unmanned Air Vehicles
The growing use of unmanned aerial vehicles (UAVs) or drones in numerous applications is driving the need to integrate them safely into global airspace. UAV's will need accurate, reliable and high-integrity positioning data to ensure they can integrate with existing air traffic control (ATC) protocols, and unmanned traffic management (UTM). Ofcom has already consulted this year on the regulatory spectrum requirements to connect UAVs with satellite and cellular mobile technologies like 4/5G.
There is also significant potential for UAVs to become part of the wider geospatial stack as they can be deployed quickly into areas where satellites may not be overhead (e.g., conflict zones or natural disaster sites). UAVs can be easily directed toward different areas as the situational picture develops and combined with new approaches to high-quality image processing, can help produce maps quickly and reliably. By collecting and harnessing geospatial data, UAVs promise significant productivity gains in use cases as varied as agriculture, infrastructure inspection, real estate, and the optimisation of the logistics facilities like ports (as well as for the emergency services and rescue and rescue).

Electric Vehicles Infrastructure
The shift from internal combustion engine (ICE) vehicles to electric vehicles (EVs) is creating an urgent need to deploy a network of reliable and well-positioned charge point infrastructure nationwide.
Geospatial data will be critical for informing how this infrastructure is planned and deployed. Currently, the ability to model demand, understand site suitability, ensure a seamless consumer experience (e.g., if charge points are actually working) and track roll-out are blockers to faster deployment and therefore uptake of EVs.
Locational data will play a significant role in overcoming many of these challenges by enabling a clearer picture for operators, customers, and public bodies on the demand in given areas and information on the operation of assets deployed. Location data operating model will treat location data like a product. Location data-ecosystem memberships will be the norm.

Supporting innovation and emerging technologies

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?

Other (please specify)

There are several potential barriers to the application of location data. Whilst it may be useful to rank these in some cases, techUK members work in industries and sectors across the UK tech sector that experience different barriers. Rather than rank these, techUK members have highlighted key barriers from across the industry

Accuracy of data
The UK has a strong geospatial heritage, but until recently this data has been disparate across many different bodies, with very different methods of recording data. Often, especially with city planning, infrastructural and utility data, there are competing and often inaccurate datasets that make it difficult to accurately relay important information, such as the location of water pipes or fibre. techUK members emphasised that the reliability and assurance of data is a significant barrier, especially when they need to make important decisions based off inaccurate datasets.
To mitigate this, UK Government should proactively dedicate resources to confirm the reliability of public sector data, ensuring it is flagged when competing datasets from different governmental bodies relay different information. This Governmental data should be frequently updated and checked, and Government should seek to understand where AI or automation tools could be effective here. The Geospatial Commission should invest in infrastructure that enables public data to be frequently updated, creating a backbone for near-real time analytics. Going ahead, the UK ecosystem would also benefit from, where possible, standardising the reporting of data across public and private sector.

Interoperability of data
The value unlocked when combining multiple geospatial datasets, or with nongeospatial data, can be seen across environment, agriculture, regional and local planning, transport, energy, health, and more. The value of this interoperability can be seen delivering real value at a granular level, such as the Glasgow Operations Centre's integrated traffic and public safety management system that reportedly saved £20 million through combining public Space CCTV, security for the city council's museums and art galleries, traffic management and Police Intelligence.

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?

Indeed, studies undertaken this year by the Joint Research Centre (JRC), the European Commission's science and knowledge service, estimates that the impact of improved location interoperability ranges from EUR 272 billion to EUR 500 billion, depending on the proportion of location data in the public sector and also on the scenario considered.
With this in mind, the Geospatial Commission should promote interoperability across public sector datasets, continuing with the FAIR principles in the National Data Strategy.

Findability of data/ Lack of awareness and/or difficulty communicating about location data
Despite the UK's geospatial heritage, there is still a lack of awareness about the geospatial data assets available in the UK. The Geospatial Commission should prioritise raising awareness about the public and private datasets available and make these accessible as possible. To do so, the Geospatial Commission should look outwards, and partner with groups and associations that represent the industries and sectors that can be revolutionised by using this data. techUK would welcome working with the Geospatial Commission to raise awareness of the data available in the UK. The second aspect to the lack of awareness is the lack of skilled professionals available to derive value of geospatial data.

Skills
The Frontier Economics Report Demand for Geospatial Skills for the Geospatial Commission identifies the broad scope and reach of geospatial skills across the UK, resembling the different industries and sectors using geospatial.20 techUK members would welcome a continued push for geospatial skills in any update to the Geospatial Strategy to address many of the bottlenecks identified in this report and attract talent into a career in geospatial.
However, as we look ahead towards 203021 and the UK's ambition to become a science and technology superpower, there needs to be a focus on how geospatial analysis will be prioritised outside of the geospatial ecosystem alongside emerging technologies like AI. To truly unlock the value of geospatial data with AI, we need to open geospatial analysis for non-geospatial professionals, such as data scientists. techUK would welcome further analysis as to how to upskill data scientists to apply geospatial thinking, and how to get geospatial skills taught alongside data skills. techUK recommends further emphasis on the development of geospatial skills amongst the data science community, which will reflect the growing convergence of geospatial practices with AI. This will continue to align with Mission 3 of the current Geospatial Strategy to keep pace with technological advances.
Upskilling end users is critical for the UK's geospatial economy, aligning with Mission 3's recommendation to bring geospatial skills into the mainstream. It will be difficult for industries to identify and exploit the opportunities of geospatial if they are not equipped with the knowledge and expertise to do so. These could be through short online courses to master conversions, depending on industry need. The UK does have some examples of best practice in upskilling the UK workforce around emerging technologies that could be applied to geospatial. For example, the postgraduate conversion AI Masters courses have enabled graduates to undertake further study courses even if their undergraduate course is not directly related.22 This scheme has encouraged over 2,500 people to develop new digital skills or retrain to help find new employment in the UK's cutting-edge AI and data science sectors. The combined University of Bristol and NQCC courses are shorter courses aimed at professionals, researchers or leaders in business, government, academia or commercial organisations wanting to move into the field of quantum technologies and could be another route to bringing geospatial skills to the mainstream.
Other options include internships and apprenticeships to build connections between different parts of the geospatial ecosystem and industry to share knowledge. This could follow the example of the UK Space Agency who operate a placement programme called SPIN (Space Placements in Industry) which co-funds paid work placements across the sector. This cross-sharing of knowledge could be useful to help identify future use cases for geospatial

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Convergence of technologies will be key to the UK's geospatial future
There are several emerging technologies that have the potential to unlock the value of geospatial data and to rank the importance of these technologies negates the different and diverse ways each technology will be used across the value chain. These technologies will be used in a variety of ways, from collecting geospatial data, to analyse and validate this collection, or visualise findings from this data analysis.

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

As an example, the use of drones and other aerial vehicles for collecting high-resolution geospatial data is becoming increasingly common, and this technology is expected to continue to improve and become more widespread in the coming years. Drones will be critical for the collecting of geospatial data but depending on the use case they may also use geospatial data to navigate a specific route to – maybe one day – deliver medicine to vulnerable people. Their importance will vary depending on the use case and adoption in the UK.

Instead, techUK calls on the Geospatial Commission to think holistically about research, ecosystems and commercialisation of enabling technologies that will work alongside geospatial data. Any update to the Geospatial Strategy should consider how technologies will converge with geospatial data to enable innovation, drive forward the UK economy, and solve some of the grand challenges facing us in the years ahead, including in healthcare and climate change.

As an example of convergence, a digital twin mapping climate modelling may converge several of these technologies listed above, from IoT sensors, AI, cloud and edge computing, and immersive technologies. This cutting-edge innovation brings geospatial to the forefront and should be encouraged through the Geospatial Strategy.

techUK recommends that the Geospatial Commission actively develop routes for geospatial data to be explored alongside other emerging technologies to address missions to help grow the UK geospatial economy, potentially through Government agencies such as UKRI and Innovate UK. This has been achieved with other technologies, such as the UKRI commercialising quantum technologies challenge is forging connections between Government, the quantum industry and the wider UK tech sector. This challenge is investing £170m to develop new products and technologies based on advances in quantum science.25 This will showcase internationally that the UK is actively developing the geospatial data economy of the future, views geospatial as a crucial part of our science and innovation ecosystem and will raise confidence domestically in the UK's geospatial expertise.

Furthermore, even though a technology may still be emerging and not widely used in the geospatial sector within the next five years, the UK needs to look ahead and prepare for their use to remain a world leader. This is true for quantum sensing, which is expected to have revolutionary use cases for geospatial. The strategy should look ahead and create a sustainable path for geospatial innovation, which includes exploring technologies still in their infancy. Only looking in the next five years when assessing emerging technologies will stagnate growth.

Finally, any update to the UK's Geospatial Strategy should continue to be placed into the context of recent Government thinking around data and technology ecosystems, such as the National Data Strategy and the National AI Strategy. This will align with the current Mission 4 of the Geospatial Strategy and ensure that geospatial data is firmly part of the UK's ambition to be a science and technology superpower.

However, there may still be areas where the Geospatial Commission can help drive forward innovation by removing barriers and promoting adoption. With this in mind, techUK members highlighted key technologies that will be critical to the UK's geospatial economy, and where intervention by the Geospatial Commission to encourage the convergence with geospatial data could be key.

Digital Twins and 3D data

Geospatial data will be crucial for the creation and use of digital twins, as it provides the location-specific information that is needed to accurately represent physical objects and systems in a digital environment. Digital twins are typically created using a combination of data from sensors, imaging technologies, and other sources, and this data is used to create a virtual representation of a physical object or system. Geospatial data is a key component of this process, as it provides the spatial information that is needed to accurately locate and orient the digital twin in relation to the physical world.

Furthermore, digital twins can be used to visualize and analyse geospatial data in new and intuitive ways, providing organizations with new insights and enabling more effective decision-making. For example, a digital twin of a city could be used to visualise and analyse data on traffic patterns, population density, or environmental factors, allowing organizations to better understand the spatial dynamics of the city and identify potential areas for improvement.

This integral connection between geospatial data and digital twins is starting to be explored through "national" digital twins, such as the Denmark in 3D project. There is an opportunity for the UK to explore for the use of 3D geospatial data and the Geospatial Commission should explore dedicating resources to develop a plan around 3D geospatial data and the opportunities this may unlock.

AI and Machine Learning

The UK is the host of a highly sophisticated AI innovation industry, ranking third globally and first in Europe. This places the geospatial ecosystem in a good position to collaborate and experiment with the AI industry to push forward innovation in the UK.

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The use of AI-based solutions is rapidly advancing the data gathering and cleansing process for the geospatial ecosystem. It is also helping derive value from data more efficiently, accurately, and respond to issues more quickly. It also has the potential to open access to geospatial data by removing some complexities requiring GIS specific skills - though this may require a business to have data scientists well-equipped to work with geospatial data. For this reason, Meticulous Research reports that the use of AI-based GIS solutions by different industries is rapidly advancing the data gathering and assurance ensuring that the annual geospatial analytics market is expected $256 billion by 2028. 28 Undoubtedly, the Geospatial Commission should promote the development of geospatial-AI solutions in the UK to push forward innovation.
To unlock value from geospatial-based AI solutions, the Geospatial Commission needs to work with the larger geospatial ecosystem to tackle issues of data quality, accuracy, currency and consistency. Without acknowledging the variability that exists between data sets and the impact on any analysis, the effectiveness of AI could be seriously hindered. Furthermore, geospatial skills need to be progressed so professionals are able to work with AI models when needed. Finally, the Geospatial Commission should undertake analysis to establish whether the UK has the compute infrastructure to support the increasingly complex analysis from geospatial datasets. This includes cloud and edge infrastructure, access to high-performance compute, and potential routes to access quantum computing in the future.

5G, edge and connectivity for real-time data analytics
It is worth mentioning that many of the most advanced geospatial use cases around autonomous vehicles (AV's) and robotics will require higher speeds and lower latency offered by 5G and advanced connectivity. As acknowledged in trend five in the Geospatial Strategy, investing in connectivity infrastructure including edge, which enables data analytics close to the source of data collection, will allow data to be transferred more efficiently and cost-effectively. 4G networks are on a pathway to cover 95% of the UK landmass by 2025 and leading operator network coverage for 5G should match 4G by 2028. The Geospatial Commission should seek to include geospatial data in any Government initiatives pushing forward next-generation connectivity, so the needs of geospatial-based use cases like AV's are met. Real-time data analytics will be a crucial aspect of geospatial use cases going forward, and the UK needs to have the infrastructure to support this.

Responsible innovation
As location-based innovation becomes more prevalent with the explosion in data, is augmented by breakthroughs in artificial intelligence, and more accessible to a broader range of users through on-demand cloud computing, it will be increasingly important to ensure geospatial data is built on a robust framework of ethical and responsible innovation. Geospatial Data accounts for everything around us, meaning it can be manipulated to erode personal privacy if placed with other identifying datasets. Education and awareness on the repercussions of data collection, consumer consent and privacy is integral. Clear boundaries and guidelines in developing solutions will ensure the protection of people and consumers, whilst also building assurance with businesses developing novel geospatial solutions in the UK.
The existence of a well-established and respected digital ethics community in the UK places the country at an advantage when it comes to understanding and considering the ethical issues and questions that geospatial innovation could raise. This is an area where the UK could be seen as a global leader by underscoring the importance of responsible and ethical innovation through the Geospatial Commission. Alongside guidance and assurance, UK Government, industry and academia should partner to deliver training opportunities and education programmes on the societal and ethical considerations of geospatial data and ensure any strategy or approach to geospatial skills includes the development of business and socio-ethical skills.

Q17. What is the name of your organisation?

TechUK

The Centre for Seabed Mapping

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advancements have made it more possible and financially viable to map the seabed. Particularly in relation to the nearshore environment – this includes uncrewed platforms and drones. Provision of public-funded data under the Open Govt Licence and use of Data Archive Centres have increased the availability and accessibility of hydrographic and seabed mapping data. However, there is still a considerable data deficit across the UK marine estate. Improved consistency of data standards and metadata. Improved efforts over collaboration between organisations. Increased use and reliance on mobile apps and data.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

AI in processing and data visualisation (mapping) making useful data accessible for stakeholders
Increasing developments in technology e.g. Maritime Autonomous platforms to provide force multiplier efficiencies and benefits; software for data processing and visualisation; increased multi-agency collaborations to maximise available public funding; improved quality and accuracy of BIG datasets e.g. AIS
Availability of real time data in the marine domain is likely to increase, we will need to identify ways of using this information as we do for terrestrial users (e.g., live traffic updates).
Climate change: In order to fully understand what is happening at the coast, in light of sea level rise and increased frequency and intensity of storm events, it is imperative that we fully understand the nearshore bathymetry in order to understand impacts of wave hydrodynamics at the coast and how this will change. An understanding of the nearshore bathymetry will inform better management at the coast and enable greener solutions for logistics. The move to a net zero carbon society will have an increasing impact on how location data are collected, analysed and stored, especially for those data collected in the marine environment (which are typically collected using sensors and instruments deployed from ships). Marine environmental data (which is inherently a type of location data) will be used increasingly in real-time or near-real-time to inform operational systems across all sectors and I anticipate location data from the marine environment will increasingly be (re)used in digital twins of the oceans.
Standardised Application Programming Interface (API) to disseminate location data will have a big impact on the use of geospatial data, as it has the potential to simplify the process of accessing data from multiple sources.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

All above necessary and required. Centralised system where access is available is key. Consistency in approach also necessary. In addition – people and skills, knowledge exchange, collaboration and sharing of best practice, data validation and data assurance.
The characterisation of the data value ecosystem above takes into account the direct (revenues associated with the sale of data or information products) and indirect (e.g. gains in efficiency or productivity) economic benefits of location data associated with collecting, processing, visualising and applying those data. The societal benefits of location data is less well captured by the ecosystem above. For example the avoided costs associated with environmental mitigation that is informed by location data.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The Geospatial Commission should be more active, less passive. It could:

Support the development of automated marine sensors, to increase available marine data which can be used for transport, environmental monitoring and national security.

Facilitate, support and connect organisations to each other, to share information, lessons learned and identify mutual opportunities.

Champion to concept of data IS infrastructure.

Champion the need for infrastructure to support capturing and storing of geospatial data – forming standards and metadata requirements – would allow for greater innovation across the whole geospatial sector.

Government provision of a centralised 3D platform like google earth but with higher resolution data, covering the entire UK, where we can load our own layers/data for our stakeholder to access which is fast and can detail analysis.

Promote adoption of geospatial across the economy.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Geolocation data could have a significant impact on economic, social and environment by increasing awareness and allowing for better planning across all domains. It would improve the ability to understand, assess and control environmentally sensitive spaces, improve productivity and efficiency, port and voyage optimisation, improve transport.
Will significantly input and facilitate integrated coastal zone management. In light of climate change and impacts this will have at the coast, this will have significant impact across the sectors. Such data will be used to appropriately manage coastal communities and infrastructure and also identify how best natural habitats should be managed and where it will be possible to introduce nature-based solutions. This includes management of storm surges and coastal flooding, sea level rise, seafood security in a changing climate and predicting extreme events.
Data will also facilitate work related to “Blue Carbon”, particularly in the nearshore areas where up until recently minimum data has existed. The All Party Parliamentary Group on the Ocean have just delivered their initial report on blue carbon opportunities. Their first recommendation is to support better mapping of the seabed and its habitats.

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The entire UK EEZ, especially inshore areas and areas of highest navigational risk. Areas with internationally/nationally important infrastructure on the seabed and connections to the coast and offshore installations, and national security risk. Generally underpin marine spatial planning, management of natural resources, carbon capture, waste management, geological and substrate mapping, habitat mapping, environmental conservation. Blue economy, expansion of maritime sector. Scale and impacts significant, variable depending on specific case studies.
Coastal flooding has the second highest risk impact category of civil emergencies in the UK, after pandemics and chemical, biological, radiological and nuclear attacks (National Risk Registry, 2022). Consequences of coastal flooding can include fatalities and casualties; widespread damage to property and infrastructure; disruption to essential services, particularly transport and energy; environmental damage and contamination. Location data are vital to defend the UK coastal infrastructure.
Coordination/access of marine and seabed data across sectors to support the energy transition, as well as ecosystem response.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Engaging more with the public and at geospatial events outside of our traditional marine remit, to drive a greater understanding of the way geospatial data is used.
Continuing our work to support the Centre for Seabed Mapping, which is bringing together organisations that collect data, to promote better planning, coordination and sharing of marine geospatial data.
Awareness can be raised through the Northern Ireland Coastal Forum and the establishment of a Northern Ireland Coastal Observatory.
The MCA is a central member of the UK Centre for Seabed Mapping, and previously Chair of the Pan-govt hydrographic data sharing MoU group, which evolved into a multi-agency survey planning group. We host the Civil Hydrography Annual Seminar, which is the primary fora for identifying collaborative survey and data sharing opportunities. The MCA are active in establishing new partnerships across public sector and strengthening existing collaborative relationships. As the largest commissioner of civil hydrography in the UK we are centrally placed to continue to actively drive improved survey collaborations, data quality, data availability and knowledge exchange.
Being a portal of interpreted geospatial coastal data that we have collected, providing levels of analysis appropriate for the stakeholder (public to Local Authority Risk Managers). We could also provide training to public sector workers and instructional videos for the public.
MEDIN currently works with the marine data community and has a key objective to raise awareness of marine geospatial data. They use a variety of fora to increase awareness of marine geospatial data. They would be very happy to share examples of the value of geospatial data from other sectors with our stakeholders. Along with the UK CSM, they would also welcome working with the Geospatial Commission to further raise awareness of the value of marine geospatial data and tools.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

UKHO participates in a vast amount of collaboration to deliver geospatial outcomes.
International collaboration via relationships with other Hydrographic Offices and regional Commissions.
Collaborative sandbox environments for development of new tools, this could be a way for government, industry and academia to collaborate.
The Centre for Seabed Mapping (CSM) promotes collaboration [Link excluded from publication]

Marine Environmental Data and Information Network (MEDIN) [Link excluded from publication]
MEDIN is a collaboration between organisations collecting, managing and using marine location data. As a network MEDIN is open to any organisation with an interest in marine location data. MEDIN collaborates with organisations from private and public sectors, as well as academia, charities, and members of the public. As an example of the geospatial applications that MEDIN delivers - MEDIN provides a single place to find UK marine location data – the MEDIN portal. This provides access to

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

marine data owned or managed by over 600 different organisations. MEDIN also provides a marine specific profile (the MEDIN standard) of the national standard for discovery metadata.
The European Marine Observation and Data Network (EMODnet) [Link excluded from publication].

The European Marine Observation and Data Network (EMODnet) is a network of organisations supported by the EU's integrated maritime policy. These organisations work together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products. EMODnet deliver a suite of thematic marine geospatial data products. MEDIN Data Archive Centres and other MEDIN partners are active members of EMODnet.
Open Geospatial Consortium (OGC) [Link excluded from publication] The OGC is a worldwide community committed to improving access to geospatial, or location information. They connect people, communities, and technology to solve global challenges and address everyday needs. The organization represents over 500 businesses, government agencies, research organizations, and universities united with a desire to make location information FAIR – Findable, Accessible, Interoperable, and Reusable.

Q14. Would you like your response to be confidential? If yes, please give your reason:

Q15. Who are you responding on behalf of?

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Q17. What is the name of your organisation?

Q18. What is your role within the organisation?

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:

The Marine Environmental Data and Information Network (MEDIN)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The use of marine environmental data has continued to increase over the past five years (the number of requests for data from the Marine Environmental Data and Information Network (MEDIN) network of Data Archive Centres* more than doubled over the past year alone). I think this is partially because of technological advancements, with developments to the systems disseminating location data making it easier for consumers to access data. I believe it is also due to the expansion of new marine industries which require location data at every stage of their operation. * MEDIN currently provides access to marine geospatial data via its network of specialist and accredited Data Archive Centres: UK Hydrographic Office (bathymetry data); British Oceanographic Data Centre (water column oceanography data); British Geological Survey (marine geology and geophysics data); Met Office (marine meteorological data); DASSH (marine species and habitats data); Marine Scotland; Cefas (fisheries data); Archaeology Data Service; Historic Environment Scotland; Royal Commission on the Ancient and Historic Monuments Wales (marine historic environment data).

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

I believe a shift to using a standardised Application Programming Interface (API) to disseminate location data will have a big impact on the use of geospatial data, as it has the potential to simplify the process of accessing data from multiple sources. The Marine Environmental Data and Information Network (MEDIN) has recently trialled a new API standard for Environmental Data Retrieval developed by the Open Geospatial Consortium (OGC). This standard is designed to be extremely flexible, hide the data storage details and be useful to non-expert users. Over the next five years, the move to a net zero carbon society will have an increasing impact on how location data are collected, analysed and stored, especially for those data collected in the marine environment (which are typically collected using sensors and instruments deployed from ships). Marine environmental data (which is inherently a type of location data) will be used increasingly in real-time or near-real-time to inform operational systems across all sectors and I anticipate location data from the marine environment will be increasingly be (re)used in digital twins of the oceans.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I believe the characterisation of the data value ecosystem above takes into account the direct (revenues associated with the sale of data or information products) and indirect (e.g. gains in efficiency or productivity) economic benefits of location data associated with collecting, processing, visualising and applying those data. I feel the societal benefits of location data is less well captured by the ecosystem above. For example the avoided costs associated with environmental mitigation that is informed by location data. The Marine Environmental Data and Information Network (MEDIN) recently collaborated with the Organisation for Economic Cooperation and Development (OECD) and the Global Ocean Observing System (GOOS) to explore value chains in public marine data. The full findings of this work is available in the published report and is extremely relevant to this question. Jolly, C., et al. (2021), "Value chains in public marine data: A UK case study", OECD Science, Technology and Industry Working Papers, No. 2021/11, OECD Publishing, Paris, [Link excluded from publication]. With regards to the direct and indirect economic benefits of the data transformation, processing and systems area, it is worth noting the independent cost benefit analysis of MEDIN carried out in 2019. This analysis found that the benefit to cost ratio of the tools and services to support findable, accessible, interoperable and reusable marine geospatial data that MEDIN provides is over 8:1.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The Geospatial Commission could support pilot projects to apply key technologies to new sectors, bringing together expertise from other sectors that have already widely adopted those technologies. This could then be followed by support to roll out successful projects more widely. The Geospatial Commission would have a key role in ensuring all relevant stakeholders are involved in the process.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Location data and technology are pivotal in defence and mitigation from environmental hazards such as: • storm surges and coastal flooding • sea level rise • seafood security in a changing climate • predicting extreme events To put the first of these into context, Coastal flooding has the second highest risk impact category of civil emergencies in the UK, after pandemics and chemical, biological, radiological and nuclear attacks (National Risk Registry, 2022). Consequences of coastal flooding can include fatalities and casualties; widespread damage to property and infrastructure; disruption to essential services, particularly transport and energy; environmental damage and contamination. Location data are vital to defend the UK coastal infrastructure.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

The Marine Environmental Data and Information Network (MEDIN) currently works with the marine data community and has a key objective to raise awareness of marine geospatial data. We use a variety of fora to increase awareness of marine geospatial data (e.g. social media, website, working groups, conferences, trade fairs, electronic newletter). We would be very happy to share examples of the value of geospatial data from other sectors with our stakeholders. We would also welcome working with the Geospatial Commission to further raise awareness of the value of marine geospatial data and tools.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Marine Environmental Data and Information Network (MEDIN) [Link excluded from publication]. MEDIN is a collaboration between organisations collecting, managing and using marine location data. As a network MEDIN is open to any organisation with an interest in marine location data. MEDIN collaborates with organisations from private and public sectors, as well as academia, charities, and members of the public. As an example of the geospatial applications that MEDIN delivers - MEDIN provides a single place to find UK marine location data – the MEDIN portal. This provides access to marine data owned or managed by over 600 different organisations. MEDIN also provides a marine specific profile (the MEDIN standard) of the national standard for discovery metadata. The European Marine Observation and Data Network (EMODnet) [Link excluded from publication] The European Marine Observation and Data Network (EMODnet) is a network of organisations supported by the EU's integrated maritime policy. These organisations work together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products. EMODnet deliver a suite of thematic marine geospatial data products. MEDIN Data Archive Centres and other MEDIN partners are active members of EMODnet. Open Geospatial Consortium (OGC) [Link excluded from publication] The OGC is a worldwide community committed to improving access to geospatial, or location information. They connect people, communities, and technology to solve global challenges and address everyday needs. The organization represents over 500 businesses, government agencies, research organizations, and universities united with a desire to make location information FAIR – Findable, Accessible, Interoperable, and Reusable.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Other (please specify):
The Marine Environmental Data and Information Network (MEDIN) is a network of over 50 organisations from across the UK public and private sectors, with an interest in marine geospatial data. Our 15 sponsors come from both the public and private sectors (Department for Environment, Food and Rural Affairs – Defra; National Oceanography Centre; Natural Environment Research Council; Scottish Government; Department for Business, Energy & Industrial Strategy; United Kingdom Hydrographic Office; Met Office; Natural Resources Wales; The Crown Estate; Joint Nature Conservation Committee; Maritime and Coastguard Agency; OceanWise; Agri-Food and Biosciences Institute - AFBI, Department of Agriculture, Environment and Rural Affairs – DAERA; Welsh Government).

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Scotland

Q17. What is the name of your organisation?

The Marine Environmental Data and Information Network (MEDIN)

Q18. What is your role within the organisation?

MEDIN Coordinator

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

The National Oceanography Centre

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advancements leading to improved data availability through the use of application programming interfaces (API), for the automatic transfer of data over the internet, has allowed automatic retrieval of archived and near-real time data that has been previously difficult to access. This has allowed the development of systems that can quickly turn data into information for use.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Better local energy generation and storage would help get more sensors and edge computing systems out to locations where monitoring is needed. Cheaper and more efficient data communications systems for remote sensor systems would allow better access to the data generated. Fully converting existing high-resolution environmental sensor networks to be accessible by application programming interfaces would make data more convenient to use.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

None

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

By connecting expertise in these new technologies to potential users.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Improving availability of tide, wave and flood predictions for public safety. This would reduce risk to the users of these systems in coastal and marine environments. Understanding environmental change (through observations etc.) is going to be increasingly fundamental to how we adapt to climate change.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

By better publicising how we collect, distribute, and use geospatial data for public benefit. Within the context of blue economy, coastal management and climate change adaption – we need to expand our engagement with public and private sector environmental data users to leverage scientific knowledge, in combination with technical advances in observing and computing technologies, to accelerate development and testing of innovative solutions. For example, given recent advances in modelling and observing capabilities, there is potential to develop integrated (land-sea) monitoring and modelling (predictive) systems for understanding impacts of changing hydrological cycle on the coastal environment and use the data to meet the needs of local councils, local businesses, and local communities. Could have direct economic impact (better prediction of extreme events, implications for net zero via e.g. more efficient operational planning, and framed effectively be used for community engagement and awareness.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Current project example ([Link excluded from publication]), NOC are developing a novel monitoring solution that exploits EO data, developed in partnership with coastal stakeholders (Channel Coastal Observatory, Environment Agency, Wales Coastal Monitoring Centre, and regional partners). National flood warning systems, run by the EA and SEPA, integrate data from multiple sources (topography, land type, weather, river water levels, tide, etc.) to produce risk maps for the public, planners, emergency responders and local authorities. Second example: Marine Environmental Data and Information Network (MEDIN) [Link excluded from publication]. MEDIN is a collaboration between organisations collecting, managing and using marine location data. As a network MEDIN is open to any organisation with an interest in marine location data. MEDIN collaborates with organisations from private and public sectors, as well as academia, charities, and members of the public. As an example of the geospatial applications that MEDIN delivers - MEDIN provides a single place to find UK marine location data – the MEDIN portal. This provides access to marine data owned or managed by over 600 different organisations. MEDIN also provides a marine specific profile (the MEDIN standard) of the national standard for discovery metadata.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A non-government organisation

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
South East

Q17. What is the name of your organisation?
The National Oceanography Centre

Q18. What is your role within the organisation?
Engagement and Partnerships Officer

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

Academic Institutions

Consumer Data Research Centre (University of Leeds)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Changes in data privacy have changed how data can be used. This means, for example, smart phone providers (e.g. Apple and Google) taking consumer data more seriously, with clearer options for the user on how to opt in or out of mobility tracking through apps. This has posed a challenge for long-term data collection: for example, apps may now only track users while that app is running and not continuously, giving only a very limited picture of their geospatial movements. Tracking also doesn't take place between/across apps, and providers have had to make it explicit exactly how consumer data can be used, making secondary data analysis more difficult to do. The implementation of GDPR just over 5 years ago, in March 2018, has undoubtedly transformed how data is collected, shared, and analysed. Many data sets have been around for a while, but how these data are interacted with is limited by increased data privacy, and the collection of new data will be limited by what is set out in the privacy policy.

More positively, the attitude towards data sharing and tracking was transformed during COVID-19 and UK national lockdowns. Data on mobility was integral to how the UK Government managed lockdown and tracked the efficacy of their lockdown policies. It was clear that rapid access to these data was beneficial to UK policymaking and the health and wellbeing of the nation.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

We foresee multiple factors that will impact the use of location data in the next five years. These include i) increased data privacy and more stringent data governance; ii) how location data is being used in commercial settings; iii) the infrastructure available to collect and share data; iv) and how consumers themselves make and share data. There is an increased awareness by data owners and stewards, as well as data producers (i.e. consumers), of how data is being used, collected, and tracked. This is partly a result of changes in privacy laws and GDPR, and also a shift in perspectives as a result of an increasingly more digital world. This will be further transformed should the UK decide to further reform their Data Protection and Digital Information Bill. There is potential for higher-reward data sharing as a result of this reform, with the fair use of data – especially for research purposes – making data sharing easier. However, such high reward data sharing necessarily involved higher-risk opportunities for data sharing. This means that while there may be less political regulation of data sharing, data owners may choose to be more conservative in how they share their data and with whom. Public opinion on such high-risk data sharing might contribute to increasing conservatism.

In terms of commercial applications of location data, we foresee a movement away from a UK address base provided publicly through Royal Mail, towards a more bespoke location and addresses tracking service provided for and by private delivery firms, such as Amazon Logistics and Evri. In order to improve delivery tracking and logistics by these companies, the current UK address base may no longer be fit for purpose. Changes in the infrastructure available to track and share data will change the types of data available for researchers.

Post-COVID, there has been a shift in how people choose to travel, moving away from public transport and towards private hire transport such as Uber. This means the data on how many people travel, who they are, and the travel they do is disappearing into the private sector, rather than held in a more accessible way. This limits the data to which researchers have access. Conversely, there are some improvements in data infrastructure that have increased data granularity and opportunity for collection. With an increased use and dependence on 5G, we will have a more accurate perspective on travel by individuals due to increased coverage, improving capture of footfall data in smaller locations (e.g. between individual shops in a shopping centre, rather than the shopping centre as a whole).

Beyond individual location data (captured by wearables and smart phones) improved sensors and greater emphasis on capturing real-time data also allows a more accurate reading of how people are moving. We

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

also have much more data on where public transport vehicles are, beyond GPS, and this more granular data will lead to better service provision in addition to providing more accurate location data. With the potential for the infrastructure-vehicle communication of data – for example buses interacting with traffic lights – there appears to be a movement away from people providing data (limited by privacy laws) and infrastructures providing data (not limited in the same way). Finally, an increased use of AI will also change how location data is being used, going beyond collection to prediction. For example, the data captured by an individual's smartphone can plot potential routes based on previous patterns: for example, Google Maps providing the quickest route to work at a specific time of day, based on the timing of previous movement. However, this relies on location data capture at an individual level when it is clear that there will be ongoing limitations to these data and how they are used.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The ecosystem presented here appears to align with the data processes in place at the ESRC-funded Consumer Data Research Centre. However, there are questions about how this ecosystem reflects ethics of data use, data governance, the provision of open data, and the individual skill sets required for each part of the ecosystem. For example, it is unclear in this diagram where the consideration of data ethics or governance should come: in data processing or in capture. Consenting individuals for the secondary use, or meta-use, of their data is considered best practice, but increasing conservatism in sharing data from the private sector, as well as an enhanced public understanding of data tracking and consent, means that consent for the secondary use of data might not always be possible. This could then make the processing of such data unethical. Similarly, making data open might not be possible at the capture stage, due to the necessity for anonymising or aggregating data. This is not accounted for in this model. Finally, what this suggested data ecosystem does not reflect is the different domain-specific expertise and knowledge required for each stage. It is unlikely that the people responsible for collecting data are also responsible for it transformation or visualisation. Likewise, the expertise and knowledge required for data stewards, particularly those in cloud computing, is substantially different to the knowledge required for other parts of the ecosystem. It would be difficult, for example, for a data collector or person responsible for data visualisation to have the same level of knowledge about data governance as the people responsible for how data is stored. Such failures to depict these types of knowledge is what leads to misunderstanding around what data science and the data workforce look like and, we believe, has the potential to discourage retention of staff in the data workforce who may not have been prepared for the level of data wrangling required on a day-to-day basis (because it isn't all about visualisation).

The need for technology solutions to address data protection requirements has been recognised in relation to health research (e.g. substantial investment through the ongoing NHS programme of secure data environments for health and social care data), with no equivalent initiative relating to geospatial and consumer data. Socio-legal challenges such as online harms and responsible AI are also more prominent than concerns about tracking or the security of location data.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The Geospatial Commission is well-placed to better facilitate sharing between organisations, especially where companies may not initially want to work together. This is particularly significant for us at the Consumer Data Research Centre, as much of the data we handle can be commercially sensitive and dissemination of our research findings limited by competition law. Brokering relationships between academic and commercial organisations would also be useful for innovation of methodologies and insights, as well as other components of research and development. The Commission could also be flexible and aspirational with funding, looking to provide resource for “blue sky” research or research that is high risk but high reward.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

There are obvious, projected impacts in sectors that rely most on location data. For example, this would include transport services and emergency services, and indicators of impacts in these domains would look like building capacity, changing behaviours, building preparedness and resilience, for example. However, adjacent to these impacts are how such impacts and improvements impact the lives of individuals. Having a greater understanding of transport and vehicle data, as well as data from improved sensors, could improve national and global awareness of drivers of air pollution and air quality. This could lead to changes in the transport system to improve this, which would in turn have benefits for individual and planetary health outcomes. Moreover, the use of location data during COVID demonstrated the transformational way in which health and wellbeing, as well as policy- and decision-making, can be transformed through the use of location and interaction data. Changes within infrastructure can impact business infrastructure (e.g. the provision of more public transport, increase investment), local and individual health (improved health outcomes, reduction of disease), and global health (minimisation of emissions, movement towards net zero), and therefore have a significant role to play in the transformation of person and planet.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

CDRC can demonstrate best practice in data governance and ethics, and in cross-sectoral data sharing. Our robust data infrastructure has played a pivotal role in our ability to build strong relationships with external stakeholders and to develop data sharing agreements with partners. We are also able to provide expertise in handling geospatial data, producing peer reviewed articles that uses geospatial data and demonstrates cutting edge methods.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

CDRC Leeds has built robust relationships with data owners Cuebiq and Wejo, and have made these datasets available for researchers through our data store. While these datasets have proven popular among researchers, mobile phone companies could do more to make data sharing accessible. Currently their data comes at a high price to researchers, and at a level of aggregation that limits the granularity of the data insights we provide. Outside of the data we analyse, we have also built data products, such as SPENSER (a synthetic population estimation and projection model), which provides a robust framework for testing a wide range of socio-demographic scenarios and their impact on population change. This can adapt to multiple users, scenarios, and research questions, allowing collaboration between researchers and across sectors. The adaptability of this model is built on its openness and agility to respond to multiple and diverse users. We believe in using open data wherever possible, and think there should be increased opportunities for cross-sector data sharing where those data were produced as a result of public funding. For example, public data could be more open or accessible where there is no security risk in its being shared.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Other (please specify):
A research centre within an academic institution. Our views may not be those of University of Leeds.

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Yorkshire and the Humber

Q17. What is the name of your organisation?

Consumer Data Research Centre (University of Leeds)

Q18. What is your role within the organisation?

Research and Impact Manager

Q19. How many people work for your organisation?

10 - 49

Q20. What best describes the industry that you or your organisation is involved in:

Professional, scientific and technical activities

The Alan Turing Institute, Urban Analytics Programme

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

We would like to highlight four trends: three technological ones, and a cultural one. Technologically, we have observed the following big shifts:
- The rise in availability of new forms of data (e.g,. [Link redacted for publication purposes]) from a variety of evolving sensors, including smartphones, GPS trackers, and other logging devices.
- New and disruptive applications of existing data (e.g., satellite imagery) thanks to new algorithms (e.g., deep learning) that unlock insights unavailable with previous technology.
- Detailed analyses scaled up to (supra-)national level thanks to the combination of the above with modern cheap (cloud) computing.

In addition to these technological developments, the other big trend to capitalise on is the cultural shift in the use of modern geo-location data for policy spurred by the pandemic (e.g., Google mobility trends). Harnessing this change and making it endure will take additional effort in convincing and showing the value of such an approach in “peace time”.
We expect this shift to continue, as highlighted in our response to question 2.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Technologically, we envision the changes described in response to Question 1 to mature, giving rise to, on the one hand, the creation of (official) data products from unstructured available data through AI, and the subsequent pervasive use of these new datasets in policy making and operations. At this point, it is important to note the crucial role that artificial intelligence and data science will have in realising the generation of these datasets. As we note in the response to Question 3 below, many of the new data feeds are highly unstructured and not ready for decision making. To bridge this gap, we need AI and data science that can automate and scale the process of adding structure and value to raw (new) data.
In addition to the above technological developments, we anticipate an increase in the adoption of digital and data technologies in the planning profession. The recent report by the Digital Task Force for Planning (https://digital4planning.com/a-digital-future-forplanning/) has created momentum and many of the technologies required are ripe for exploitation.
Both of the above will not happen automatically and will require work by geospatial advocates to pave the ground. If achieved however, the value they will deliver will be immense.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The characterisation is broadly appropriate for the ecosystem. One aspect that is not identified but which we suggest is important is the role data analysis (and modelling), in particular data science and AI, have not only in the analysis of data generated by other means (e.g., traditional data capture mechanisms) but also -and increasingly so- in the generation of data products that are analysis-ready. In particular here we are thinking of data products generated from highly unstructured data (e.g., satellite imagery) and processed with state-of-the-art modelling methods (e.g., deep learning) to generate structured datasets to be used in analysis subsequently (e.g., geographic features such as building footprints). Another good example here is the creation of geodemographic products and other profiling tools, which have generated substantial value in market analysis and related business sectors over thirty years and more (e.g. [link redacted for publication purposes]). Such systems have the potential to become substantially more refined through the addition of more disaggregate data, with additional focus on population behaviour and activities, and this will generate important new insights and opportunities for business and government. Recognising the role advanced modelling can have in the generation of data is the first step to fully realise the potential of modern, unstructured raw data sources.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

In our view, the Geospatial Commission can support innovative applications by brokering relationships between research & innovation organisations which are developing experimental data products, and providers of official data feeds. There is a high degree of innovation in the development of novel data products in organisations such as The Alan Turing Institute. Some of these generated datasets have the potential to shed light on parts of the economy, the environment, and society which traditionally have been very difficult (or impossible) to measure and track. There is a great opportunity for the Geospatial Commission in identifying these research and innovation projects and turning them into production-ready datasets that have the "stamp of approval" and distribution by official organisations like the Office of National Statistics. This approach would accelerate the transition from experimental to ready-to-use for some of these datasets, unlocking innovative applications of new location data.
Another role the Commission could play is as a convenor between organisations in government which require but do not currently possess (geospatial) data skills and training, and those which are in a position to facilitate them (e.g., the Royal Geographical Society or The Alan Turing Institute). For example, the Royal Geographical Society represents a national network of experts in the development and delivery of state of the art geospatial technologies; while The Alan Turing Institute also convenes a national network of experts at the intersection of urban analytics and other areas in close contact with geospatial technologies, and cutting edge data science and AI, delivering skills training through innovative models (e.g., Data Study Groups [Link redacted for publication purposes]). Both bodies could be leveraged to connect these sources of knowledge and skills to government departments, industry and NGOs..

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

We envision at least four areas where we anticipate location data and technology will be transformational:
1. Mobility: new forms of (location) data have the potential to propel sustainability, equity and efficiency in all forms of mobility. We need to build solid technological foundations that allow us to realise this area. But there is immense potential in terms of applications and impact in transforming how society moves around, reaching jobs, leisure, and nature; delivering goods and services, and keeping the economy functioning.
2. Land use: AI can transform the way we measure, understand, and plan land use across scales, from buildings to cities and into entire landscapes. Technologies like remote sensing combined with state-of-

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

the-art artificial intelligence can provide upto-date monitoring, which can in turn feed into better decision-making in a way that has never been possible within this realm. At the same time, artificial intelligence also provides an opportunity to fully realise the value of existing datasets in land use planning such as official planning applications, providing a representation in real time (a digital twin) of the main system currently in operation to administer how the land is allocated to alternative (and often competing) uses.
3. Prosperity: the rise of pervasive data can be leveraged to create healthy, sustainable, and prosperous cities as well as their populations. Areas like understanding demographics, fostering economic development, and promoting more liveable spaces will be transformed if we can obtain better ways of measuring not only them, but also how our interventions affect them.
4. Digital Twins: currently, digital twins still represents a nascent area where a large amount of research and innovation is taking place. Much of this is already generating systems that are production-ready and that can be deployed in the real world to influence their physical counterparts. If we can turn digital twins into a mature paradigm for the evaluation and implementation of urban policies, we envision radical improvements in our understanding and experimentation on policy design, generating significantly better management of cities and regions.

To contribute to reaching those outcomes, the Urban Analytics programme at The Alan Turing Institute has enshrined each of them into a mission (included below for completeness). In the coming years, the Turing is committed to work towards ensuring that the most can be made of the potential of location data and technology in these areas. Embedding data and data science in the very fabric of each of the areas above will have profound effects that will propagate across several scales, from the very individual (e.g., better mobility solutions for all) to the national (e.g., reaching net zero).

The four missions of the Urban Analytics group at Turing are:
- New forms of data propel sustainability, equity and efficiency in all forms of Urban Mobility
- AI is instrumental to the Land-Use Planning process for buildings, cities and Landscapes - Pervasive data are leveraged for healthy, sustainable, and prosperous cities and their populations
- Digital Twins are a mature paradigm for the evaluation and implementation of urban policies

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

The Alan Turing Institute is promoting innovation in the development and application of geospatial technologies (for example, in the areas described above in the response to Q11, and in the examples below at Q13). The particular focus of the Turing is on innovation through advanced data science and AI. The Turing seeks to catalyse novel research and the uptake of geographic data science and GeoAI throughout the HE sector through its role as a National Institute.
The Turing also works through channels such as the Geospatial Commission Skills Forum and the DT Hub of the Connected Places Catapult to promote awareness and uptake of geospatial technologies. There is considerable scope to build on these foundations – for example, in 2021 the Turing worked with members of the Geospatial Commission Skills Forum to identify partners for a series of six Data Study Groups which were coordinated and delivered simultaneously through the Turing. An activity of this kind could easily be turned into a national programme.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We would like to present the example of the Synthetic Population Catalyst (SPC) project, developed within The Alan Turing Institute in collaboration with government and industry partners. SPC provides technology to build synthetic populations that represent their real counterparts. These synthetic populations can be used in building simulations and scenarios relating to policy interventions.
SPC emerged through a surge in collaboration within the Turing Ecosystem of Digital Twins (EDT) programme in response to the COVID-19 pandemic, through the Rapid Assistance in Modelling the

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Pandemic (RAMP) initiative. This call brought together over 1800 individuals and teams from several British universities to develop new models or tools to inform the UK Government's response, and the public through data science-based approaches. This project brought together a range of capabilities such as the synthetic data generation (e.g. SPENSER), transportation and social interactions models (e.g. QUANT - [Link redacted for publication purposes]), visualisation of Big Data (e.g. Improbable, [Link redacted for publication purposes]), and public health and the environment (e.g. JCEEI). Together, the researchers combined datasets and methods to create a shared resource for creating a synthetic individuals of small study areas in England with associated socioeconomic, mobility, and health variables to model the spread of COVID-19. The Dynamic Microsimulation Model for Epidemics – DyME ([Link redacted for publication purposes]) was the cornerstone that delineated the next effort towards a national scale digital twin for Great Britain. A team of researchers took the initiative to transform the patchworked project into a unified, open-source, well documented, and easy to use tool called the Synthetic Population Catalyst (SPC). The researchers created a combined ground truth dataset, refactored it into the Rust programming language for performance, and transitioned to a format data output which reduced the computational time required for some data processing pipelines from 3 hours to 30 seconds. SPC is composed of a series of linked modelling modules, including some developed externally and validated internally before integration. The tool provides to researchers a set of pre-defined outcomes for 47 ceremonial counties in England; thus, users can explore, analyse and test what SPC provide without the tedious task of spending hours to recreate statistically significant samples of synthetic individuals to mimic the complexity of British society. The tool is also provided through an openly available and thoroughly documented website ([Link redacted for publication purposes]) for other users that might want to install and run the tool for customized areas. With this constantly evolving tool, users, more specifically researchers, can investigate the social economic structure that goes beyond the traditional social demographic perspective provided by the census and test different behavioural scenarios (so-called 'what-if' scenario modelling) with the help of multiple data dimensions at a national scale. This means that a tool initially created to model the spread of COVID-19 in a small study area can now be used as a digital twin to model environmental, health and sustainability problems. To provide an instance, SPC creates the synthetic individuals in a multi-temporal resolution for the Dynamic Model for the Environment - Climate, Heat and Health (DyMECHH) initiative, a project that explores how differentially affected the population is when facing climate change and the necessity to increase energy efficiency.

Q17. What is the name of your organisation?

The Alan Turing Institute, Urban Analytics Programme

EDINA, University of Edinburgh

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The explosive growth and adoption of EO products as well as new UAV and IoT data streams are significant. These largely technological and policy innovations are manifesting in a confusing array of new (and/or) very similar products and services. From a consumers point of view the largest issue is appreciating the wealth and diversity of these new location data offerings and being able to sensibly discover,evaluate and use them.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

EO (especially via mini-sats/cubesats) and IoT and UAV/autonomous devices will continue play a major role in the next five years but we are also likely to see new forms of automated machine generated location data being generated - whether that is ML training data, ‘synthetic‘ data or actual ‘implicitly discovered’ location data as a result of AI and advanced ML algorithms.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The characterization is adequate and in some regards is quite a conventional logical linear workflow. This is useful for simplification and elucidation purposes but in practice will become increasingly difficult to differentiate in automated systems where feedback loops may skip or cross cut multiple categories. It has the advantage of being human intelligible. Future versions may need to be machine intelligible.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

An often neglected sector is Education. The Commission could facilitate a unified partner Licensing regime that provides access to all public (and potentially private sector) location data to academia for the sole purposes of research and teaching. The benefist of this would be many-fold but obviously are critical to fostering geo skills capabalities and in pushing forward innovation. Data are the bedrock for research yet current licensing arrangements (especially to newer but even for established commercially available data) are expensive for academia to access. As a consequence research can be hamstrung by complicated licensing and financial costs that militate against larger objectives - skills development and bleeding edge research innovation. The GC could (even across its own partner bodies) streamline access to data for academics by removing fees and restrictive licensing conditions. Models for doing this effectively already exist and have demonstrably benefited teaching and research endeavours. This is not a plea for unfettered no-cost access for academia but an argument in favour of a presumptive and by-default permissive framework that recognizes that education and research uses are fundamentally a societal good that has wider reaching benefits and should be more than just a means to maximise short term economic gain.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We already have a key educational remit - across all universities, colleges and 4600+ schools. We provide the key gateway for educators and researchers to discover, access and use geospatial data across multiple domains. As our answer to Q11 indicates, we have a ready mechanism for more broadly enabling access to geospatial data and services to a very broad church of application areas.Our existing users span the gamut from astronomy to zoology and all disciplines in between. Moreover we have school age audiences that currently have access to Ordnance Survey data. Access to other forms of geospatial data for purposes of learning are hampered mostly by licensing and access (cost) issues.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

digimap.edina.ac.uk digimapforschools.edina.ac.uk datanation.edina.ac.uk EDINA recently developed a Visitor Manager Mobile application for East Lothian Council funded via Edinburgh and South East Scotland City Region Deal funding. This innovation solution integrates live sensor data from beach car parks in East Lothian and presents it back to the user in an intuitive user interface to indicate car park occupancy. EDINA have developed a similar mobile application to assist students select which of the multi-location study spaces on campus may have more desk availability. Both these solutions integrate live and geospatial data to assist end-user decision making.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

An academic institution

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Scotland

Q17. What is the name of your organisation?
EDINA, University of Edinburgh

Q18. What is your role within the organisation?
Geospatial Services Manager

Q19. How many people work for your organisation?
10 - 49

Q20. What best describes the industry that you or your organisation is involved in:
Education

Geo6 Partners

British Geological Survey

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

• Growing need for more precise and accurate information from regulators, infrastructure managers and developers; as for example shown through the Covid crisis which demonstrated a heightened need for geospatial data in terms of how UK society and UK plc respond and adapt (resource allocation, planning services, etc) both immediately and longer term • General move towards more 'open' data, with acknowledgement that the value/impact of the data is in how it's applied, and the insight derived from that open geospatial data • Global community and increased virtual connectivity – an expectation from consumers and citizens of how geospatial data could and should be used to enhance their lives, and deliver better and more personalised services • This is balanced against growing awareness and concerns around data privacy, geospatial used properly can provide more accurate and personalised service/content, but without imposing upon individual's sense of privacy and control • The rapidly changing and growing use of technology, for example remote sensing and artificial intelligence to capture and interpret more and new/different geospatial data

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

• Global recession: people having less disposable income and squeeze on both public and private sector finances will mean a heightened requirement for geospatial data to drive change, alongside possible increase in nefarious criminal activity relating to the use of personal and geospatial data • Changes in government investment and focus in National energy and infrastructure programmes – for example climate change (the imperative for geospatial data to inform and build adaptation and resilience responses to climate change, for example around carbon storage, geohazards risk, green energy transition and water security) and critical minerals (including, for example, locating, accessing, clean extraction and usage of critical minerals to support for example the technology consumables sector • The recognition for the need for more cross-governmental and associated agencies joined-up thinking and collaboration to unpick the power of geospatial data and encourage innovation and insight • FAIR standardisation and evolution, dominating government and scientific data provision and growing understanding and awareness • Easier access to high-powered computing through growing readily availability of processing and accessing capabilities, both software and via cloud-based solutions – for example, easier availability to machine/deep-learning data analysis tools, web-served apps and geospatial opensource package codes

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

• Data 'storage' cannot be underestimated and is standalone pillar in its own right, its definition/use-case/purpose is different to that of 'hosting' – as such, less emphasis on owning infrastructure to deliver capabilities (data storage / data processing power) and more on accessing externally hosted services • The ecosystem should more strongly reference the linking-in to other datasets sitting elsewhere (inside or outside of that organisation) • A fifth column could be added, about monitoring the usage of data and assessing, quantifying and sharing the 'impact' of the utilisation of that geospatial data • Data ingestion from 3rd parties will inform the creation and transformation stages (i.e. not all organisations capture and create their own data) • Definitions of 'Visualisation' often confuses understanding the performance of the system (i.e, management information) with understanding the actual distribution and impact of the outputted geospatial data

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

• The GC is the ‘voice’ for geospatial data within and across UK Government – as such, the GC has an important role in extolling the virtues and ensuring all government departments (national, regional and local) and arms-length agencies are being made aware of the importance of geospatial data • The Geospatial Commission should be leading the debate regarding the standards/protocol on how geospatial data should be managed, used and shared – albeit the public sector should not step-in or ‘compete’ where UK plc is, or could, provide that geospatial data service • Creating the environment (and where appropriate the financial support) to encourage and enable data sharing and the sharing of ideas around geospatial data; for example, identifying and unblocking barriers around data accessibility and usability across multi-agencies and between the public and private sector • Helping public sector organisations reveal and articulate the ‘impact’ of geospatial data (either financially or softer, non-financially defined, benefits)

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

• Remote earth observation and monitoring services, e.g. Earthquakes, flooding – early warning systems, building-up database of incidences to help predict and mitigate future events • Using crowd-sourcing techniques, but with robust QA and capture technology, as a means of building-up geospatial databases through citizen science • Surveying technology for hard-to-reach geographic places and use-cases, such as critical minerals, deep-sea carbon storage • Digital twins, developing what-if scenarios for major infrastructure developments through integrating static baseline and real-time dynamic geospatial data into environmental modelling processes • National scale data acquisition, such as airborne geophysical survey • Coordination/access of marine and seabed data across sectors to support the energy transition, as well as ecosystem response

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

• Outbound communications material, demonstrating the value/impact through case-studies and providing examples where geospatial information (data and insight) has influenced policy decisions and infrastructure development • Working closer with academia research and early careerists to help them realise the importance and usefulness of geospatial data • Encouraging geospatial within school curriculum to raise awareness

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

• Using third party distribution channels to extend awareness and the reach/utilisation of data, alongside presenting opportunities for innovation with data sharing • Cross-agency collaboration in the the development and delivery of interoperable digital twins • The new UK Centre for Seabed Mapping coordinates acquisition of bathymetry data across the public sector, as well as serving as hub for seabed mapping applications.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

East Midlands

Q17. What is the name of your organisation?

British Geological Survey

Q18. What is your role within the organisation?

Head, digital data products within the BGS Informatics directorate

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Professional, scientific and technical activities

HMLR

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

HMLR believes the biggest trend is technological advancement that drives modifications to consumer behaviour and expectation

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

HMLR anticipates increased consumer and business demand for location data. We also anticipate increased expectations around the quality of geospatial information for the specific purpose of making better decisions about the utility of land and property. This will accommodate future trends such as; climate impact offset schemes (e.g. tree-planting); residential property for the elderly as over 65 population doubles by 2050; increased demand for inclusive and/or adapted workspace premises as the proportion of the workforce with a disability increases; increase in demand for land that can be used to secure UK energy and raw materials supply chains.
HMLR and our stakeholders are already seeing an increasing pace of technological change in the conveyancing market. As part of HMLR's roadmap to achieving a world-leading property market, we envisage improved access to data supporting up-front market information and an open ecosystem of digital services that support property transactions is becoming well developed, supported by our open data and service connections.
To support conveyancers' needs, HMLR has committed to exploring our priorities for data digitisation, such as the potential for online guaranteed index map searches and a means of drawing new title plans using shared base data. Our goal is to have a fully digital Land Register that is integrated within a fully digital conveyancing system.
HMLR is also working to exploit data science and other emerging technologies more fully. We believe these will become increasingly important to the future use of location data. We will explore the priorities for further digitisation of our title plans and documents, such as commercial leases, to make these available instantly. The latest data science and machine learning techniques will inform how HMLR optimises the cost, quality and speed of delivering this digital information. This will not only help improve the conveyancing process, but will create more accessible data that can be shared and used for a wide range of purposes across the property sector and beyond HMLR has committed in our Strategy 2022+ to make our data more accessible and easier to use. We intend to make our data more findable, accessible, interoperable and reusable by creating 'on demand' access to some of the datasets, adding additional attributes, increasing the frequency of updates and improving the metadata. We will also monitor emerging trends and needs in the market and publish more data where possible. Within our transformational programmes we will modernise our technology with particular focus on the infrastructure and processes needed to ingest, host (store), maintain and analyse data. More broadly, we envisage there being risks and costs associated with being reliant on ageing technology and infrastructure within government which might potentially hamper government's ability to better store and share data securely. In addition, there is a question around the ongoing storage of big geodata. The more that is created, the more government will need to store and protect. This needs government to collectively think about the infrastructure needed and potential impacts for energy use and net zero.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

HMLR does not have any comments in this section.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

HMLR believes that the Geospatial Commission / UK public sector could fund innovation and data improvement projects between the partner bodies. We also believe that there could be greater funding for programmes that support the technologies and approaches listed on thematics.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

As set out in HMLR's Strategy 2022+, HMLR believes that location data and technology could be transformational for the home buying and selling process, in particular by providing near real-time property information and enabling property to be bought and sold digitally. If all information that is useful to making a buying decision on land or property, including location data, were available up front in a consumer-focused way, decisions would be better informed and buying and selling property would be quicker, less uncertain and less stressful. To support conveyancers' needs, HMLR will explore their priorities for data digitisation, such as the potential for online guaranteed index map searches and a means of drawing new title plans using shared base data. Our goal is to have a fully digital Land Register that is integrated within a fully digital conveyancing system. We will also explore the priorities for further digitisation of our title plans and documents, such as commercial leases, to make these available instantly. HMLR's Local Land Charges programme will deliver an instant-access register with all information held geospatially. We estimate that open access to the Local Land Charges Register – once complete – could add around £3bn of value to the economy.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Maximising the value of the data HMLR holds is a key theme in our Strategy 2022+. We set out our role in making our data more accessible and easier to use, continuing to drive awareness of the value of this national asset. HMLR has carried out extensive work in analysing the economic value of the data and this has contributed to our Strategy 2022+. HMLR has shared the outputs of this work with the Geo6 partners

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

and believe that more could be done to share this work more widely across government. We are pleased to have been a case study in the Geospatial Commission report 'Measuring the economic social and environmental value of public sector location data', detailing how HMLR has quantified the value of our datasets to data consumers.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Geovation is an Ordnance Survey initiative in association with HMLR. Both organisations provide start-ups with grant funding, access to data and data expertise in addition to dedicated space to work at the Geovation hub. Geovation remains a testbed for HMLR data's utility and an incubator for the property info disrupters of the future.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

England and Wales

Q17. What is the name of your organisation?

HM Land Registry

Q18. What is your role within the organisation?

Parliamentary, Correspondence and Briefing Co-ordinator, Chief's Office

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Other service activities – Land Registration

Ordnance Survey

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The pandemic has particularly altered expectations on geospatial data. As the use of location data visualisation helped us understand the spread of Covid-19, it also opened eyes to the value of insights generated by linking information using real-world geographies. OS saw this first hand in our support across the UK government pandemic response, particularly as part of the Joint Biosecurity Centre's efforts to map the spread of the virus, coordinate the government response, and communicate that to the public.
The pandemic has also brought human and physical geographies closer together, often with an aggregation or anonymisation fuelled by necessity. In an effort to preserve and protect individual health records, the pull 'up' from the individual has met the push 'down' from aggregated geographies to a need for more granular geographic data somewhere around the household level. This is shown by the increasing adoption of unique identifiers across the public sector for the delivery of health and social services. After several years of arguing for the value of using Unique Property Reference Numbers (UPRNs) to link multiple data points to real-world features, this is now being rolled out as best practice across government.
There is an argument to suggest however, that these changes to behaviour and expectation were in motion long before the pandemic. The broad adoption of data science as a fundamental component of analysis has certainly accelerated and this challenges the existing GIS orthodoxy and its higher barrier-to-entry. While GIS remains a vital part of today's infrastructure, the broad adoption of location data as a discrete discipline may be eclipsed by more data science and visualisation-focused tools, such as PowerBI. How far that trend takes us is yet to be seen.
OS is evolving its offer to reflect how our users want to engage with our data, while also continuing to serve our more traditional geospatial users. Our back-end infrastructure is needing to change to make data more machine-to-machine readable, more accessible and attributable – all to support FAIR use, while also changing our architecture to prepare for more complex user interactions. The more complex 'future state' use cases, such as digital twins and autonomous vehicles, are still far away, but will require investment and technology proving now in order to prepare for broad adoption.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The trends we think will have a big impact on the future use of location data include:
Policy trends
• The shift to a net zero emissions economy will impact multiple sectors looking to design policy interventions, plan infrastructure or services more efficiently, deliver public services or manufacturing, or evaluate and monitor change. As highlighted by the UK Net Zero Strategy, the target areas include clean energy and nuclear power generation and their power transmission networks; the electrification of vehicles, supply chains, chargepoint infrastructure and understanding consumer preferences; building heating and energy efficiency; and nature stewardship. There is an implicit location data angle in all these areas, and significant innovation and research funding to fuel the transition.
• We anticipate an ongoing requirement for location data to be combined with other data sources, such as statistical, environmental, space-based, marine, terrestrial, or subsurface data. As set out in the UK response to UN consultation on Future Geospatial Information Ecosystem, this complexity means that it will be very difficult to have one 'solution' or one version of an ecosystem. The development of open geospatial data standards is a strong reminder of the need for interoperability to empower new use cases, and policy drivers for value creation from data and services across both public and private sectors.
• Ordnance Survey's trusted, authoritative location data has played a significant role in national security, defence and resilience for at least 230 years. As National Mapping Service to Great Britain, we anticipate OS data and capabilities to continue to support key security and defence use cases and activity, potentially through dual-use infrastructure or applications.
• Government devolution and decentralisation policies seem likely to continue over the next five years. City and region devolution deals, and devolved national government policies, are both driving needs to better understand communities with data, including location data, across a range of policy areas. There is also a risk that devolved nations could diverge in their geospatial data requirements from an England-wide or UK position in some policy areas, e.g., environmental standards or agricultural policy. As the

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

national mapping service for Great Britain, we at OS are alive to the potential need to support multiple sets of specifications for data capture, processing or publication. Consistency in the application of OS geospatial data across GB would be beneficial, enabling the linking of data held and developed at local levels to be scaled up to a higher spatial levels. Greater coordination by the Commission, working alongside the Geo6, could help realise value from interdependent location data and help achieve a range of policy outcomes.
Industry trends
• Technological capabilities are expanding at pace, but we believe it is important that we do not conflate the existing geospatial technology and markets with the wider application of location data across the economy.
• There have been sectoral advances due to geospatial data and technology applications: The third chapter of the Geospatial Knowledge Infrastructure Report (GKI) delivers a sectoral breakdown that highlights how geospatial supports further advances and the future outlook in these industries:
• Data capture methods are diversifying with the miniaturisation of sensors, UAVs and enhanced EO and RS techniques. Greater automation is being used in both the capture and processing of geospatial data; for example, the combination of rapid-revisit satellite imagery, with AI/ML for automatic feature extraction and base/HD mapping. The thresholds (expertise/cost/access) for entry into the ecosystem are lowering thanks to automation, aggregated data platforms (hosting/ingestion/management/security), Software as a Service and data analytics. The emergence of new entrants into the geospatial industry, especially specialised start-ups and tech multinationals, is also fostering a supportive environment.
• Growing demand for 'lower maturity' Digital Twins (3D precise, near real-time information or representations of places) is quickening other technology trends and developments, even though 'higher maturity' Digital Twins (e.g., of whole cities, regions, nations) remain a long way off. We note that the G7 / G20 governments increasingly require access to 3D, street-level data for digital representations of the real world to speed up workflows and monitor progress towards political goals. For example, the Canadian government recently committed CAN$8million to create a highprecision 3D map of Canada to support Net-Zero initiatives.
• Strategic partnerships within and across geospatial industry ecosystem bring about shared commercial opportunities as organisations leverage their strategic capabilities through collaborative activities. This indicates that while more geospatial market players emerge that make the geospatial industry more competitive, it is the collaboration between these actors that brings about solutions for the user challenges and for increasingly autonomous systems.
• Substantial investment has been made across various areas of geospatial, with capabilities that enable speed, accuracy and analytics in particular driving this confidence through the past decade. This investor confidence is detailed in a recent Geoawesomeness article that concludes that developments of sensors technology (EO, Lidar, SAR, etc.) and AI analysis solutions are considered significant factors in the growth of venture capital. The research also identifies how much funding countries have put into individual technologies showing that China and the USA are committing the most. There continues to be debate about whether the future customer need is for relative or absolute accuracy.
• There has been an increasing number of collaborations between business and academia that enable a symbiosis between research excellence and real-world applications. In the past three years, these collaborations have focused on the development of capabilities, commercial products or solutions, and climate change around the most promising trends in geospatial: Artificial Intelligence; Digital Twins; and Earth Observation.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Foundational geospatial datasets often function as part of a wider system of systems, underpinning the delivery of services to citizens and consumers. This can create challenges when trying to define the value of the data as it's often an enabler of those systems and outcomes, rather than an end-to-end solution. For example, our work through the Public Sector Geospatial Agreement is often focussed on the connectivity of people, places and things and requires us to link location data into broader systems in order to support a broad set of service-delivery, policy-formation and security & resilience outcomes. The "application of data" stage could reflect how this ecosystem fits within this system of systems and the expertise which the geospatial ecosystem needs to effectively facilitate delivery.

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

There is also a need to look at defining the ultimate value of the data for the benefit of individuals and organisations to enable positive outcomes. This in turn will reinforce the power of geospatial data to the public and decision makers alike, as happened during the pandemic.
The value chain does not differentiate between public/private sector value chain delivery and greater connectivity and interplay between the two could be utilised to help stimulate growth in the UK economy. As the growing shift from location data towards data science and visualisation tools continues to gain momentum, the silos between ecosystems will become increasingly harder to define. The need for trusted, authoritative, and maintained data through a clear set of agreed data standards will therefore become ever more important. This will support data interoperability and in turn develop clearer outcomes for each part of the ecosystem. We would therefore recommend that data governance, licensing, security, accountability should all be highlighted as examples under the "Data transformation, processing, systems" section.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Supporting innovation and emerging technologies

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years?

Other (please specify)

We remain cautious about taking too much of a technology-led perspective on geospatial innovation – we need to select technologies that help us meet particular economic, social and environmental outcomes, rather than the other way around. The level of maturity and the priority order of the technologies listed above would depend on your point of view and the outcomes sought. Some ‘lower maturity’ activity has considerable value further upstream which might enable wider innovation. For example, demand for the digitalisation of previously analogue data is increasing internationally, and in the UK, there is a push towards digitalising Traffic Regulation Orders. At a ‘higher maturity’ level, the UK is innovating with quantum technologies for quantum and surveying, and it could be that bringing geospatial information into the early stage of this work could bring a competitive advantage.

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years?

Other (please specify)

We are sceptical that the above is the correct method to assess impact, given the mix of enabling or ‘context-shaping’ technologies with future use cases. There are some, of course, likely to have a higher

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years?

impact in over the next five years, but without a clear link to building UK capabilities in specific use cases – such as Digital Twins or Carbon Capture & storage – investments in individual technologies – like Autonomous Systems or IoT – may leave the UK ecosystem unprepared. For some 'technologies' listed above, impact is likely to be greatest in the context of or combination with other 'technologies' (e.g., DT maturity enabled by IoT maturity/adoption realised through AI/ML enabled machine-to-machine data exchange, miniaturisation of new sensors, advancement of edge computing and 5G connectivity, DT applications realised through advancement of visualisation and immersive tech (AR/VR/MR); Automation and robotics enabled by AI/ML; Geo-BIM maturity somewhat in parallel to DT maturity). It is our view that AI/ML are likely to have the single biggest impact as they are a fundamental cross-cutting factor to so many other trends and developments in the geospatial sector and wider sectors of the economy, but these are already having a significant impact.

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Ordnance Survey is already supporting innovative applications of location data using the above technologies.
Lusaka Base Map Project, Zambia
OS worked with the International Growth Centre (IGC) and the Commonwealth Association of Architects (CAA) to create an automated basemap of informal settlements in Lusaka, Zambia. This was in response to the challenges associated with urban growth, the availability of accurate and up-to-date data for creating well-planned and managed cities, and for improving infrastructure at low cost. Using aerial imagery provided by the Zambia Survey Department in the Ministry of Lands and Natural Resources and artificial intelligence (AI), OS utilised AI to generate a new base map across 420km2 of Lusaka. Through Machine Learning, computers were taught what to look for, to label data and trace features such as buildings, roads and water in images using training data; this algorithm classified the various features and the technology then automatically created mapping quickly and accurately. This innovative technique offers an accurate and costeffective way to generate a detailed digital map that has a multitude of use cases, including the design and management of critical infrastructure services, land use and transport planning, land tenure, ownership and administration, and integration of future census data.
Preserving carbon in peatlands
OS are working to preserve carbon storage in peatland landscapes alongside Assimila, Space 4 Climate, Durham University, and the University of Leicester. Using a combination of geospatial data and space enabled technologies we can monitor, protect and preserve the largest natural land-based carbon store so that these peatlands can be used for carbon offsetting by continuing to take in carbon dioxide which will reduce levels of greenhouse gases in our atmosphere.
Monitoring Dubai's changing environment
OS collaborated with Deimos Space UK and the Mohammed Bin Rashid Space Centre (MBRSC) in Dubai to automate the production of geospatial information from satellite EO data using machine learning algorithms, to be used as an important source of information for measuring and monitoring how the environment is changing. Focussing on a number of challenges, such as improving the tracking of important vegetation growth and health, and on providing reliable data to ensure correct subsidy payments to farmers, the project created a prototype palm tree and mangrove feature for EO data using state-of-the-art deep learning techniques and developed an interoperable data model to easily share data with other government departments to inform decisions..

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The nine opportunity areas called out in the UK Geospatial Strategy in 2020 remain valid, with the transformational potential in the climate and environment, infrastructure assets and transport sector well-articulated.
The nature of the transformation sought could be a matter of both breadth and depth of the application of geospatial data and technology.
In terms of depth, there could be an opportunity space to enable transformation in Position Navigation Timing (PNT) systems in the UK. Almost every sector is dependent on critical communication infrastructure. In order to ensure the UK's resilience to growing global cyber threats from national and international actors, reduce its vulnerability to solar storms and space weather, and safeguard the realisation of autonomous systems - i.e., autonomous tractors, UAVs and CAVs - the UK requires robust access to resilient location and time services. Given the reliance of the geospatial community on robust GNSS, there is a role for the Geospatial Commission in the government PNT community and strategy.
Encouraging the breadth of awareness and usage of geospatial data could continue to be transformational in its own right. For example, the Scottish Government and Geospatial Commission's investment in Location Data Scotland is paying dividend in the rising profile of companies in the Scottish geospatial cluster and awareness by employers, accrediting bodies and training institutes of the skills those companies need to attract. Also in Scotland, is supporting conversations with AGI Scotland, looking at progressing 'spatial' thinking in education in Scotland. England, Wales and NI are not currently working on clustering and skills mapping at this pace, and that could present an opportunity. Ordnance Survey are supporting the Skills Mission of the UK Geospatial Strategy through supporting school (Year 10) work experience and providing teacher training in Digimaps for schools. With teacher training numbers in decline in geography, as they are across many subjects, and with teacher training currently under review, there may be an opportunity to engage with Ofsted and the Department of Education. To support wider skills and awareness in the general population, widening access to Digimaps for free to lower-performing schools in Scotland would help level up the support OS provides.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Ordnance Survey is already working closely with the Geospatial Commission as a Partner Body to support the broad themes of the UK Geospatial Strategy and to encourage wider use of geospatial across the economy.
Coupled with this, we engage millions of people across the UK every year through our physical and digital consumer products, helping more and more people get outside more often.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Ordnance Survey is already supporting innovative applications of location data using the above technologies.
Lusaka Base Map Project, Zambia
OS worked with the International Growth Centre (IGC) and the Commonwealth Association of Architects (CAA) to create an automated basemap of informal settlements in Lusaka, Zambia. This was in response to the challenges associated with urban growth, the availability of accurate and up-to-date data for creating well-planned and managed cities, and for improving infrastructure at low cost. Using aerial imagery provided by the Zambia Survey Department in the Ministry of Lands and Natural Resources and artificial intelligence (AI), OS utilised AI to generate a new base map across 420km2 of Lusaka. Through Machine Learning, computers were taught what to look for, to label data and trace features such as buildings, roads and water in images using training data; this algorithm classified the various features and the technology then automatically created mapping quickly and accurately. This innovative technique offers an accurate and costeffective way to generate a detailed digital map that has a multitude of use

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

cases, including the design and management of critical infrastructure services, land use and transport planning, land tenure, ownership and administration, and integration of future census data.
Preserving carbon in peatlands
OS are working to preserve carbon storage in peatland landscapes alongside Assimila, Space 4 Climate, Durham University, and the University of Leicester. Using a combination of geospatial data and space enabled technologies we can monitor, protect and preserve the largest natural land-based carbon store so that these peatlands can be used for carbon offsetting by continuing to take in carbon dioxide which will reduce levels of greenhouse gases in our atmosphere.
Monitoring Dubai's changing environment
OS collaborated with Deimos Space UK and the Mohammed Bin Rashid Space Centre (MBRSC) in Dubai to automate the production of geospatial information from satellite EO data using machine learning algorithms, to be used as an important source of information for measuring and monitoring how the environment is changing. Focussing on a number of challenges, such as improving the tracking of important vegetation growth and health, and on providing reliable data to ensure correct subsidy payments to farmers, the project created a prototype palm tree and mangrove feature for EO data using state-of-the-art deep learning techniques and developed an interoperable data model to easily share data with other government departments to inform decisions.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

England and Wales

Q17. What is the name of your organisation?

HM Land Registry

Q18. What is your role within the organisation?

Parliamentary, Correspondence and Briefing Co-ordinator, Chief's Office

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Other service activities – Land Registration

The Coal Authority

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

1. Increasing customer expectations, democratisation of data and the wide expectation that most data should be accessible and available to all ('frictionless' supply). This includes data previously considered to be niche and specialist; use of this data is no longer limited to those communities that created it. 2. Being constantly connected via mobile devices with more reliable 4G and 5G coverage has enabled more extensive and innovative use of location based services which is often linked with real time notifications. Specific examples include delivery tracking, transport planning and updates, and geofencing. 3. Technological advancements in how data and software are being managed and rolled out (SAAS, DAAS, etc) are lowering the financial and skills barrier to entry. Managing and maintaining software/applications and data warehouses on local servers is no longer necessary (although some may still choose to do this), with almost limitless amounts of data stored and accessed via cloud infrastructure. 4. Proliferation of data collection, whether this be by tracking our location/journeys, monitoring our online activities (social media, shopping habits) or captured by individuals (drone use).

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

1. Increased application of data science, artificial intelligence and machine learning; smarter, more accessible use of these technologies to gain insight from big data, data lakes and digital heaps. 2. Widespread use of digital twins as we start to see the downstream benefits. 3. Data ethics (specifically privacy). We expect there to be more focus on looking after your own data and a concern that people may lose confidence in how their data is managed and rescind permissions. This may result in a loss of wider benefits of having access to large bodies of data. 4. Continuing and increasing security challenges, including any geopolitcal direct/indirect impacts. 5. Big tech firms becoming bigger and holding increasing amounts of data and technologies – this is increasing levels of mistrust. 6. We have noticed a significant technology bounce following pandemic driven innovation and would expect to see further advances related to the big societal challenges such as energy security and climate change. 7. Autonomous vehicles, including routing, safety, underpinning legislation.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

We don't see the activities described here as discrete units. None of them happen in isolation and will cross over and depend on many other parts of the value chain. That said, they do describe most of the activities in the geospatial sector. The only potential missing activity is in the skills and professional development sector which would extend to training and consultancies.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

1. For satellite and airborne remote sensing, to continue supporting initiatives that reduce costs of data at point of use (central purchasing) but also importantly to look at embedding the data and technologies into organisations that lack the expertise. This could include ensuring the data is delivered via ‘out of the box’ ready web services reducing reliance on expensive/complex software, accelerating skills development, or supporting a knowledge sharing hub/activities. 2. Similarly for Artificial intelligence and Machine Learning there may be further value that could be driven by demonstrating the potential to non-specialists. At present these technologies feel out of reach by many organisations and so not considered. Demonstrating the art of the possible with signposting to enabling organisations and techniques could promote and accelerate their application.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

1. Wider use of earth observation data, but only if it is associated with pre-processed data, services and skills support to allow non-specialists to access and make use of it. 2. Energy security and supporting a functioning and sustainable energy mix (solar, wind, mine heat); identifying energy supply and demand is inherently a geospatial issue. 3. Autonomous vehicles; we believe this requires not just innovation around technologies and standards but adequate policies and legislation to protect both the technologists and the public.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We are already committed to maximising access and use of our geospatial data and have a specialised team that facilitates data sharing and providing support to users. In addition, the Coal Authority are currently developing a Data & Information Plan that will be published in 2023. This will describe how we will increase access to our data & information and outline where we will make further investments to maximise impact. We welcome contribution and support from the Geospatial Commission to help us identify activities and set priorities.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

As previously noted, collaborative initiatives in the areas of earth observation and AI/ML could increase the understanding of these techniques and promote their use.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

East Midlands

Q17. What is the name of your organisation?

The Coal Authority

Q18. What is your role within the organisation?

Principal for Data & Information

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Professional, scientific and technical activities

UK Hydrographic Office

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advancements and consumer behaviour have led to increased use of and reliance on mobile apps and data, and the increased availability and precision of location data. We can collect more and better data than ever before, e.g., from satellites and remote sensing. Consumers are also driving an increasing focus on sustainability – decarbonisation, greener fuels, voyage optimisation in shipping.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

• Crowd sourcing data and automated data collection and monitoring will increase but we anticipate such data will be impacted by consumer's increasing awareness of data security and monetisation of data. Data collectors will need to collect and use responsibly. • Availability of real time data in the marine domain is likely to increase, we will need to identify ways of using this information as we do for terrestrial users (e.g., live traffic updates). • Climate change, environmental concerns and the effects of climate change on the marine domain will be key trends in the coming years. We expect to see an increased interest in sea levels and ice limits, and a focus on greener solutions for logistics.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

To add: • Collection of data through applications, e.g. active and passive crowd sourcing. • Links between Data Capture and Data Transformation, Processing and Systems. • Data evaluation (quality checking) • Data assurance (distinct from data quality) – this affects UKHO's contingent liability and risk as materials produced by UKHO are required for compliance.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The Geospatial Commission should be more active, less passive. It could: • Support the development of automated marine sensors, to increase available marine data which can be used for transport, environmental monitoring and national security. • Facilitate, support and connect organisations to each other, to share information, lessons learned and identify mutual opportunities. • Champion the need for infrastructure to support capturing and storing of geospatial data – forming standards and metadata requirements – would allow for greater innovation across the whole geospatial sector.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Geolocation data could have a significant impact on economic, social and environment by increasing awareness and allowing for better planning across all domains. It would improve the ability to understand, assess and control environmentally sensitive spaces, improve productivity and efficiency, port and voyage optimisation, improve transport.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

• Engaging more with the public and at geospatial events outside of our traditional marine remit, to drive a greater understanding of the way geospatial data is used. • Continuing our work to support the Centre for Seabed Mapping, which is bringing together organisations that collect data, to promote better planning, coordination and sharing of marine geospatial data.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

UKHO participates in a vast amount of collaboration to deliver geospatial outcomes. • International collaboration via relationships with other Hydrographic Offices and regional Commissions. • Collaborative sandbox environments for development of new tools, this could be a way for government, industry and academia to collaborate. • The Centre for Seabed Mapping (CSM) promotes collaboration • The Marine Environment Data Information Network (MEDIN) facilitates provision of quality data • The Open Geospatial Consortium (OGC) is coordinating to create common standards and approaches to geospatial data challenges

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
South West

Q17. What is the name of your organisation?
UK Hydrographic Office (UKHO)

Q18. What is your role within the organisation?
Public Sector Account Manager

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

Public Bodies

Department of Agriculture, Environment and Rural Affairs (DAERA)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The use of marine environmental data has continued to increase over the past five years (the number of requests for data from the Marine Environmental Data and Information Network (MEDIN) network of Data Archive Centres* more than doubled over the past year alone). I think this is partially because of technological advancements, with developments to the systems disseminating location data making it easier for consumers to access data. I believe it is also due to the expansion of new marine industries which require location data at every stage of their operation. * MEDIN currently provides access to marine geospatial data via its network of specialist and accredited Data Archive Centres: UK Hydrographic Office (bathymetry data); British Oceanographic Data Centre (water column oceanography data); British Geological Survey (marine geology and geophysics data); Met Office (marine meteorological data); DASSH (marine species and habitats data); Marine Scotland; Cefas (fisheries data); Archaeology Data Service; Historic Environment Scotland; Royal Commission on the Ancient and Historic Monuments Wales (marine historic environment data).

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

I believe a shift to using a standardised Application Programming Interface (API) to disseminate location data will have a big impact on the use of geospatial data, as it has the potential to simplify the process of accessing data from multiple sources. The Marine Environmental Data and Information Network (MEDIN) has recently trialled a new API standard for Environmental Data Retrieval developed by the Open Geospatial Consortium (OGC). This standard is designed to be extremely flexible, hide the data storage details and be useful to non-expert users. Over the next five years, the move to a net zero carbon society will have an increasing impact on how location data are collected, analysed and stored, especially for those data collected in the marine environment (which are typically collected using sensors and instruments deployed from ships). Marine environmental data (which is inherently a type of location data) will be used increasingly in real-time or near-real-time to inform operational systems across all sectors and I anticipate location data from the marine environment will be increasingly be (re)used in digital twins of the oceans.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I believe the characterisation of the data value ecosystem above takes into account the direct (revenues associated with the sale of data or information products) and indirect (e.g. gains in efficiency or productivity) economic benefits of location data associated with collecting, processing, visualising and applying those data. I feel the societal benefits of location data is less well captured by the ecosystem above. For example the avoided costs associated with environmental mitigation that is informed by location data. The Marine Environmental Data and Information Network (MEDIN) recently collaborated with the Organisation for Economic Cooperation and Development (OECD) and the Global Ocean Observing System (GOOS) to explore value chains in public marine data. The full findings of this work is available in the published report and is extremely relevant to this question. Jolly, C., et al. (2021), "Value chains in public marine data: A UK case study", OECD Science, Technology and Industry Working Papers, No. 2021/11, OECD Publishing, Paris, [Link excluded from publication]. With regards to the direct and indirect economic benefits of the data transformation, processing and systems area, it is worth noting

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

the independent cost benefit analysis of MEDIN carried out in 2019. This analysis found that the benefit to cost ratio of the tools and services to support findable, accessible, interoperable and reusable marine geospatial data that MEDIN provides is over 8:1.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

National mapping agencies should provide services for data captured by UAVs. Too much wastage happening due to non-mapping staff purchasing hardware, software and training on ad-hoc basis. An ever-increasing problem resulting in waste of resources.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Location data and technology are pivotal in defence and mitigation from environmental hazards such as: • storm surges and coastal flooding • sea level rise • seafood security in a changing climate • predicting extreme events To put the first of these into context, Coastal flooding has the second highest risk impact category of civil emergencies in the UK, after pandemics and chemical, biological, radiological and nuclear attacks (National Risk Registry, 2022). Consequences of coastal flooding can include fatalities and casualties; widespread damage to property and infrastructure; disruption to essential services, particularly transport and energy; environmental damage and contamination. Location data are vital to defend the UK coastal infrastructure.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We provide a public facing Marine Map Viewer that supports the marine planning process by providing evidence which is required by public authorities taking decisions which affect, or might affect, the marine area. It can steer potential developers to submit sensible proposals in the most suitable locations, saving everyone time and money.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Marine Environmental Data and Information Network (MEDIN) [Link excluded from publication]. MEDIN is a collaboration between organisations collecting, managing and using marine location data. As a network MEDIN is open to any organisation with an interest in marine location data. MEDIN collaborates with organisations from private and public sectors, as well as academia, charities, and members of the public. As an example of the geospatial applications that MEDIN delivers - MEDIN provides a single place to find UK marine location data – the MEDIN portal. This provides access to marine data owned or managed by over 600 different organisations. MEDIN also provides a marine specific profile (the MEDIN standard) of the national standard for discovery metadata. The European Marine Observation and Data Network (EMODnet) [Link excluded from publication] The European Marine Observation and Data Network (EMODnet) is a network of organisations supported by the EU's integrated maritime policy. These organisations work together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products. EMODnet deliver a suite of thematic marine geospatial data products. MEDIN Data Archive Centres and other MEDIN partners are active members of EMODnet. Open Geospatial Consortium (OGC) [Link excluded from publication] The OGC is a worldwide community committed to improving access to geospatial, or location information. They connect people, communities, and technology to solve global challenges and address everyday needs. The organization represents over 500 businesses, government agencies, research organizations, and universities united with a desire to make location information FAIR – Findable, Accessible, Interoperable, and Reusable.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Northern Ireland

Q17. What is the name of your organisation?

Department of Agriculture, Environment and Rural Affairs (DAERA)

Q18. What is your role within the organisation?

Marine Evidence Manager

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Environmental Protection

Devon and Cornwall Police

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

technological advancements

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

the ability to visualise data with a Z attribute providing height data

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

No

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Funding innovation projects through bidding

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Building digital twins using photogrammetry could reduce carbon footprints and reduce costs and travelling

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We already do a very good job attending national and international events

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

we worked with OS during the G7 to test innovative 3D cities for us in GIS

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South West

Q17. What is the name of your organisation?

Devon and Cornwall Police

Q18. What is your role within the organisation?

GIS Lead

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:
Public administration and defence; compulsory social security

Dorset Council

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

New technology has given people the power to have unlimited access to information and demand products and services. People are more connected and have higher expectations. And Technology is continually evolving and this will impact peoples behaviour and demands. People are more reliant on technology, Covid played a part, and have moved away from more manual tasks e.g. shopping online rather than physically shopping.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The work-from-home culture will change where people live –away from big towns and cities, – possibly into small towns. This will have an impact on where development is focused. The development of social media and technology which can harness location data. Autonomous vehicles continued development will have a large impact on location data. Services (linking health data to address data) and targeted marketed. The reduction of Carbon footprint - local services vs distant services - reduction in travel miles.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

No explanation as to how people consume it. How do they use it/access it?

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Automating data and government services to serve local communities. Particularly allowing the local communities to define the need. Making location data easily available. Working to support the grass-roots projects rather than creating nationally remote applications that often miss the local drivers and are therefore not adopted. Move away from the concept of the urban/rural split - more would be achieved generally.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Autonomous vehicle routes included in rural areas.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We have developed a Geospatial Strategy within our organisation. Could do with support for Local Authorities to produce a strategy and link with the Geospatial Strategy..

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Actively developing a number of projects, soon to become open-source, incl. projects relating to wildfire , flooding and a reusable web-mapping tool that can be utilized by local residents and businesses. Also continuing to improve the ways that people can discover open datasets.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South West

Q17. What is the name of your organisation?

Dorset Council

Q18. What is your role within the organisation?

GIS Team

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Local Government

Dover District Council

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

the trend towards online options for data viewing/editing, via secured means or open data

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

accessing your data from one point of contact - interoperability

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The UPRN is key, all government and local government data must use it to identify place, before personal information identifies person

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Making the UPRN mandatory for all government and local government data, create an easier process to publish open data, key data should have a schema to enable national datasets (Planning Applicaitons, Tree Preservation Orders etc.)

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

during the current cost of living crisis if all economic, benefits and energy data could be linked nationally using the UPRN data could be used to create specific help packages by government to individuals or local authorities

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We intend to have an open data site to enable our information to be consumed externally, when and where appropriate

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We are just moving our GIS to the cloud, we used to store data from 3rd parties, like the Environment Agency, but will move to use that from an open data portal so we are always using the most current data. Other organisations do not share in the same way so we will have to keep requesting copies and storing in our systems meaning key decisions, like planning applications, are made using potentially out of date data

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Dover District Council

Q18. What is your role within the organisation?

GIS Developer

Q19. How many people work for your organisation?
50 - 249

Q20. What best describes the industry that you or your organisation is involved in:
Public administration and defence; compulsory social security

Historic Environment Scotland

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Opening up of spatial data (particularly from the public sector) through permissive licencing (Open Government or CC-BY) is enabling the reuse of spatial more broadly. Provision of Data as a Service through APIs is already transforming the use of spatial content in decision making and this is a trend that will continue to grow over the next five years. Artificial intelligence and machine learning, supported by ever more powerful computing offers new opportunities for spatial analysis from big datasets such as LiDAR. For the historic environment manual identification of heritage features is already being challenged by automated feature identification through machine learning techniques. This is a trend that can only grow in the coming years. Three-dimensional data, including digital twins, is increasingly transforming how spatial data is viewed and used and has major implications for the built heritage of the country. Recognition of the FAIR Data/ Q-FAIR principles is belatedly being acknowledged by the geospatial community. Growth of spatial data in the marine environment continues to increase and it's value to a broad user community is being realised through MEDIN.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Societal challenges and the climate emergency will demand reliable spatial data to model, monitor and inform responses to systemic challenges. There will be an ever increasing use and reliance on Data as a Service. As well as providing new business opportunities, adapting to new modelling and eco-system service business models developed for the land and property market in the private sector are disruptive technologies that will challenge established working practices. There will be increased use of three dimensional modelling / digital twins (both above and below ground) in place making – a trend which needs to include the historic environment. Semantic technologies will harmonise data from large and diverse datasets to develop new understandings and insights. Bigger, better, more powerful computing will enable faster, richer analysis of data, in turn leading to more informed decisions In the marine environment, interdependency of spatial data from a range of providers across the public and private sector will enable better use of expensively gathered data to better inform research and decision making.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Under data transformation and processing systems: standards and specifications to deliver Q-FAIR data across data created for a range of purposes by multiple organisations is implicit in data sharing but this should be an explicit goal. The value chain in figure 1 appears linear whereas a circular economic model returning value to the source datasets would deliver more long term value. For instance the results of visualisation and application could inform existing data. The societal benefits and benefit to cost ratio of good stewardship of spatial data are not acknowledged in this model.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Location data is fundamental to the operation of emerging technologies and meeting some of the grand challenges we face today. We also see it enabling innovation across a variety of sectors including actionable insights and applications that drive growth, efficiency and sustainability. The Geospatial Commission should support projects that combine the strengths of the private sector with those of the academic and the public sector to realise the value of private sector data to deliver societal benefits

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The heritage sector creates and uses a wealth of information in the stewardship of the historic environment but, outside statutory data (constraints) relatively little of that data is easily accessible beyond individual project reports. Yet, this data plays a significant part in informing decision making (contributing approx. £218m to local economies from commercial archaeology and saving up to £1.3 billion in delay and emergency excavation costs. – though further savings can be realised through a coordinated approach across the thriving commercial archaeological sector. Spatial data relating to the historic environment is well placed to document, monitor and mitigate the effects of climate change including - - Climate change including coastal erosion - Addressing energy efficiencies in the built environment (carbon footprint and net zero)

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Our data is used to inform decision making across the environment, in development, sustainability and climate change. We make statutory data available through our portals and as Web services under Open Government Licences. We work with colleagues across the other UK administrations towards a common understanding of the datasets we publish. We champion the use and reuse of spatial data across the wider historic environment and recognise the need to realise the value of spatial data from the private sector and academia. We would welcome opportunities to work with The Geospatial Commission to realise the potential of these expensively gathered and unique datasets in contributing back into the geospatial economy.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We work with colleagues in The Association of Local Government Archaeological Officers (ALGAO) and Historic Environment Records on PastMap - [Link excluded from publication] PastMap provides a map and gazetteer based search across formally protected sites and the wider historic environment for Scotland, including offshore. The data we collectively publish underpins archaeological and environmental consultancy work in Scotland: Planning and Environmental Impact Assessments and stewardship of the historic environment. We work with Historic England and the Archaeology Data Service OASIS [Link excluded from publication] OASIS is a transformative website managing the reporting of project work undertaken by the private sector, academia and community groups to the relevant Local Authority Archaeological Service and national agency. OASIS is underpinned by data standards defined through the Forum for Information Standards in Heritage [Link excluded from publication] We work with other national agencies and other partners in the UK and Ireland to promote data standards – in the historic environment. Through FISH the Hypermedia Research Unit at the University of South Wales publishes our key vocabularies as Linked Data on [Link excluded from publication]. Our Cultural Assets teams works with Dynamic Coasts to inform the Scottish Government on the challenges of coastal erosion in Scotland Historic Environment Scotland is part of the Marine Environment Data Information Network (MEDIN) which provides coordination across a broad range of marine datasets. Historic Environment Scotland is also a partner in the UKRI Towards a National Collection Unpath'd Waters project [Link excluded from publication] a multi-partner research consortium project that aims to unite the UK's maritime collections. Despite the importance of geospatial information in heritage, there are limited initiatives to share data internationally. ARIADNE / ARIADNEPlus [Link excluded from publication] provides a research infrastructure to join data from multiple contributors semantically. The technology is underpinned by the ARIADNE Reference Model [Link excluded from publication] based on the CIDOC-CRM [Link excluded from publication] ARIADNEplus uses location to help index but does not realise spatial potential of the data. Historic Environment Scotland contributes data to the ARIADNEplus portal through the Archaeology Data Service. The potential of the spatial content of data and archive remains untapped.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Scotland

Q17. What is the name of your organisation?

Historic Environment Scotland

Q18. What is your role within the organisation?

Data Manager

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

Improvement Service

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Addressing vulnerabilities in society and the environment

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

As above as we have to address more crises

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Using data to tell stories or set narratives (making it real for people that don't ordinarily handle or understand raw data)

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Ensure that certain key commercial datasets e.g. Acorn geodemographic data, or climate change-related, become free at point of use for public sector

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Local authorities need access to more location data resources (datasets, tools, people) to be able to make better decisions to improve people's lives - that requires funding

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

By combining geospatial data initiatives with other data and policy initiatives (and not using words like 'geospatial' when in discussion with certain audiences)

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The Spatial Hub in Scotland pulls together most geospatial data across the whole of local government (and now health and utilities bodies) to enable better, standardised and more efficient/ usable access to it all

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Scotland

Q17. What is the name of your organisation?

Improvement Service

Q18. What is your role within the organisation?

Data and Engagement Manager

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

Liverpool City Region Combined Authority

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Increased availability and accessibility of geospatial data thanks to proliferation of GIS platforms and the more widespread adoption of cloud-based tech have made it easier for non-technical people to use geospatial data. Growing demand for geospatial data as consumers in various sectors such as transportation, urban planning, natural resource management, etc, recognise the value of geospatial data for informing planning and policy decisions. Covid19 provided an excellent case study in the use of spatial data to track the spread of the virus, inform the public about case numbers in their area and allowed health organisations to identify and respond to new hot spots in near real time.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

We are likely to see the continued growth and development of GIS tools for collecting, analysing and visualising data become more widespread and easier to use. Geospatial data will also be integrated with other types of data from census, social media and other sensor data, which will enable insights by providing a more comprehensive view of the 'real world' picture. Opportunities for collaboration working more closely with other public bodies such as NHS, police, universities etc.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

No comment

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The development of an Open GIS platform for use in public sector bodies would enable data sharing and collaboration between regional authorities and other public sector bodies to enable issues to be more easily addressed on a regional and national level. Right now there are major barriers to finding and accessing data from neighbouring authorities including lack of contact information, lack of data transparency, and very little in the way of uniformity as to how data is collected, collated and formatted.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Being able to analyse demographic data, particularly with the recent release of Census 2021 data to better target our own investment in the region and its people, such as for the better targeting of frontline services or support local authority partners in delivering to their own agendas. Having large numbers of datasets incorporating everything from Air Quality to planning applications to natural capital etc will enable better understanding of the issues facing the city region and provide us with the scope and ability to meet those challenges with robust, evidenced-based solutions.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Make more effort to host and publicise local geospatial data for use by members of the public to empower them to learn more about their local area, as well as incorporating practical information such as live road updates, planning applications, boundary information, etc. Incorporate geospatial data more fully into the pipeline for evidence-based decision making regarding future planning and policy decisions, including working with NHS and Police to create a more holistic picture of the City Region and its issues. Trailblaze with new GIS applications including cloud-based solutions to data sharing, in order to collaborate more effectively with stakeholders. Invest in GIS to expand its role in the public sector as well as encourage and invest in local data companies to produce useful tools to enable the public to more effectively engage with geospatial data.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We collate data monitoring data from our six constituent local authorities to enable modelling of regional Air Quality to aid the LAs in managing and monitoring the LQMA statutory responsibilities and also to allow data sharing and monitoring to occur across regional boundaries. Public sector bodies and research institutions to develop a better understanding of local issues such as resource management and habitation preservation.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

North West

Q17. What is the name of your organisation?

Liverpool City Region Combined Authority

Q18. What is your role within the organisation?

Geospatial Data Officer

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Combined Authority

NHS - South Central and West Commissioning Support Unit

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The global pandemic has certainly had an impact of the use of geospatial data within the health sector. We have seen the use of geospatial data becoming more mainstream and when we think about data in general, location (place) is often a major consideration. Technical advances in the ability to collect, store and share spatial data have led to advances in geospatial data for the health care sector. The ability to easily create an application which shares complex data and information in a simple, easy-to-use web-based map or dashboard is a game changer for us. The lead time for creating a solution has also decreased so that analysis can be carried out more quickly and a solution shared in rapid time. As well as the ability to share data more easily, we are seeing that location data is becoming more readily available. In turn, organisations want to see more of it, allowing analysis to be carried out and results to be achieved. Examples of this relating to health have been the John Hopkins Covid-19 map, showing Covid-19 and vaccination rates. This viral map has further shown the public and those without a geospatial background the power of location data and the art of the possible with spatial data. Advances in automation and computing power over the last 5 year has enabled us to become a more data-driven organisation. It has been crucial in building on our ability to extract, transform and load large data sets increasingly short periods of time.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

We believe the following trends will have the biggest impact on location data over the next 5 years. • Real Time and Near Real Time • 3D • Location Data Ethics • Digital Twins • Smart communities • Machine learning • Increasing use of AR/VR • Shift and change of data owners as data becomes open • Cloud computing platforms • Increased spatial innovation coming from outside of geospatial industry for example, non-geospatial businesses making better use of geospatial data

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

While we agree the geospatial market is not one single sector and best described as an ecosystem, the value chain / lifecycle may not always be linear. Data publishing and sharing are also a major part of the ecosystem which are somewhat overlooked in the categorisation. We also believe people to be a major part of the geospatial ecosystem which is also currently missing. People, education, and industry pathways are crucial for a fully functioning geospatial ecosystem. Without this investment of people, organisations cannot support any stage. People should be at the core of the geospatial ecosystem. We believe that the aforementioned ‘people’ should not just be those geospatial professionals with a degree in GIS, but the wider community including geographers, computer scientists, and business analysts.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

• Innovation and funding - providing an easy to access funding stream for innovation projects. Not just for start-up organisations, but wider opportunity for public sector funding. • Connecting people and organisations - a register of people who are interested in development partnerships (Who has the tech? Who has the ideas? Who wants to test it?) • Support NHS policy where spatial analysis/calculations are key.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Geospatial data is transforming the health and social care sector. By using geospatial as an informative decision support tool, we are putting location (place) at the heart of our decision making. Economic - geospatial data is used as a tool to understand economic impact. For example, when a GP surgery closes, what impact does this have on people and the surroundings surgeries? Social – using geospatial data to better understand health inequalities and what impact geography plays on this. Environmental – Geospatial is being used to support the NHS Green plans and help to improve biodiversity on hospital sites.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

As a Commissioning Support Unit (CSU) we work with a number of NHS regions, National teams, and Integrated Care Boards. As part of our day-to-day engagement, we work to drive awareness of the value of geospatial. Current examples of this include • Producing a quarterly geospatial bulletin for our NHS partner organisations • Running an annual geospatial user forum where we showcase our NHS geospatial solutions. • Producing a public geospatial case study hub SCW Geospatial Services (arcgis.com) and sharing geospatial case studies on our website - Geospatial Services (GIS) - NHS SCW Support and Transformation for Health and Care (scwcsu.nhs.uk). • Investigating a geospatial apprenticeship for 2023 • Promoting geospatial through social media and leadership literature.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Internal Effective collaboration - As an NHS body, we have previously collaborated with teams and departments to produce efficient and effective geospatial solutions. Examples of this include our work around Covid 19 response and the vaccine rollout. - Customer Success Awards - Closing Plenary - AC22 - YouTube Internal upcoming collaboration – Promoting integration between spatial and nonspatial software such as PowerBI and ArcGIS projects. External – The geospatial commission should push joined up ways of working across the public sector to ensure the best possible use and exposure of geospatial.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South West

Q17. What is the name of your organisation?

NHS - South Central and West Comissioning Support Unit

Q18. What is your role within the organisation?

Associate Head of Geospatial Services

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Human health and social work activities

Office for National Statistics

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The Covid19 pandemic has awakened a wider audience to the need for geospatial data to tackle events. There is an ever-increasing number of mobile applications and users requiring data wherever they are; geospatial is no longer the domain of geospatial specialists.

Growth in data production is pushing technology and contributes to the overall challenges of big data storage and analytics. This is the same for geospatial, there seem to be a gap in grasping the trend and have sufficient investment in adequate infrastructure to keep pace with the demand for quick analysis.

The increasing trend of changes to hybrid working and working from home specifically for those in office-based industries such as finance, IT, and communication has continued over the last decade but accelerated since the start of pandemic. This will have significant impact on different markets including that of housing and transport and can result in changes in urban patterns such as migration to lower dense areas. Geospatial data such as mobile phone data can provide more regular insights on changes in travel behaviour in general and commuting more specifically which is essential for planners, modelers, and decision makers.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Over the next five years, further advances in technology will enable further use of big data such as those from satellite images, apps, and telecoms. This in combination with advances in technologies to analyse those data and store them (e.g. cloud based algorithms) will facilitates unlocking new data potentials. In addition, the gradual emergence of self-driving vehicles will have huge impact on the form of cities and range of data.

Growth in required collaboration between government departments and/or industries. Cloud infrastructure or platform that can enable the further sharing of information to enable further collaborative work and respond to complex challenges.
Continual increase in data production and accuracy (timeliness and resolution) meaning increase demand on technology to support storing, viewing, analysing such datasets – with availability brings demand which will need to responded to. This sets a strain on government agencies accessibility to ever changing adequacy of infrastructure..

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

We would suggest expanding the strategic remit of the graphic and of the ecosystem and not only focus the various stages on the technology, which includes datasets (e.g. Data Capture) and would include things like Drone, satellite imagery capturing raw data and images, and Data Transformation. This means making data useable from an end-user perspective.
We suggest adding an additional row with geospatial data as products that might derive from these stages. This would complement the technological aspect of Geospatial value chain.

Another main point to consider is that many of new geospatial data sources (such as mobile phone data) can be much more useful when fused / integrated with other survey data or learning from those. Big data provides statistics in large scale and granular geography but behavioural dimensions can be best measured by traditional surveys. An example is learning the links between socioeconomic characteristics and travel patterns from National Travel Survey and use that to develop algorithms to best estimate those from mobile phone data.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Through a joined attempt in obtaining and facilitating sharing of data.
Provide the ability for UK public sector to access technology platform or infrastructure to manipulate and be innovative with datasets that require a lot of computing power - which currently is very expensive at organisational level and usually prioritised for non-geospatial work (e.g. business intelligence, other more traditional big data requirements).
Pooling resources together
Influencing Education curriculum to build the skills required for tomorrow – adaptability in computing and sciences

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Mobile phone data can be used for faster more granular estimation of journey to work and wider mobility and can potentially replace the question on Census in this aspect.

All sectors are affected by geospatial and can be transformed. Too vast a question to answer in a survey.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Providing training and enabling function and developing tools for analysis of geospatial data

Currently we continue to publish policies, guidance, datasets as Open data under OGL. This includes Github methodology and scripts, including training materials.
We continue to promote the importance of geospatial/ geography to link information at events etc.
Our input would be enhanced if we could be part of a coordinated initiative developed by the pool of expertise from various geospatial government institutions (e,g. Geo6).

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We are developing cloud based model to use telecoms data, land use data, open street map and Census and traditional surveys to generate best estimate of Journey to work. This is currently published every 10 years through Census and we hope to generate some more granular statistics which is reliable for national stats.
Ordnance Survey and ONS geography – always looking at providing better geospatial data products suitable for demography and human geography analysis.
Collaboration on standards and Geo-statistical frameworks under UNGGIM umbrella

Q14. Would you like your response to be confidential? If yes, please give your reason:

Q15. Who are you responding on behalf of?

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Q17. What is the name of your organisation?

Q18. What is your role within the organisation?

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:

Registers of Scotland

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

There have been several areas of accelerated change which have impacted in the use of geospatial data.
- Need: an increase demand for geospatial data from our customers using land related points and polygons to “glue” disparate datasets together.
- Awareness: In more mainstream requests, we have seen an increase expectation of information being available with a spatial component.
- Challenge: we have increasing seen the ask of spatial data and its community to support bigger challenges we all face. Several conferences at European level and beyond have looked to geospatial data to help solve climate change issues.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

- Organisational: The key drive we see is a significant move to bring geospatial data and its processing into mainstream data engineering and data analysis capabilities. This is not a watering down of its importance, quite the opposite. It brings geospatial into the heart of critical business processing. With cooperation between teams providing new insights and more structured geospatial development.
- Technology: better simpler access to national datasets enabling reduced business costs and better opportunities to collaborate. Using more options for Cloud sharing of data and a maturity of could AI and machine learning capabilities with geospatial datasets.
- Data democratisation: ensuring the right people have the right geospatial data at the right time, with the right licencing, with the right cadence - lowering the bar to link, analyse and share geospatial datasets for more people.
o platform -browser, tablet, mobile as well as traditional hardware
o Licencing – simpler human readable licenced such as OGL
o Cost – new models to enable ad-hoc customers to make more use of spatial data
o Availability – easier to find, standardised metadata and attribution.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

As mentioned above, data democratisation is a key ask of any ecosystem and geospatial data is no different.
- Cost: Good data costs money to create and maintain on a meaningful cadence and as the detail / cadence increases, costs multiply exponentially, so understanding what is good enough is key.
- Change: replacing datasets or services is expensive and disruptive to customers. Customer consultation and long-term parallel running while expensive and slow is important to ensure public bodies have time to find budget and adapt systems and processes.
- Access: Embrace the cloud. While public cloud computing is still being adopted in the public body space, it has huge potential for innovation in data access and pre-processing for tailored customer re-use.
- Licensing: data use and re-use is exceptionally complex and stifles innovation and data reuse. Finding a better model is key to maximise the value of geospatial data while protecting the IPR of the data’s creators.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Key support needed in simplified data license for data use and re-use, there is no point having data if it is dangerous or expensive to work out how someone can consume and reuse safely. A second area is in APIs and real time data consumption. Start-ups do not have the bandwidth to take on the responsibility of data ownership. APIs and hosted workbenches will accelerate innovation and Geovation projects.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Climate change and green tech start-ups have a huge opportunity when looking at spatial datasets

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Registers of Scotland deliver the Geovation start-up in Scotland. I, as CDO am more than happy to talk at events around the power of spatial data and is use.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Registers of Scotland deliver the Geovation start-up in Scotland collaborating with other tech start-ups across Scotland and UK.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Scotland

Q17. What is the name of your organisation?

Registers of Scotland

Q18. What is your role within the organisation?
Chief Data officer

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Other: Land registration

The Crown Estate

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Marine environmental data is inherently geospatial. Technological advancements (such as improved aerial imagery and videography) have improved our capability to collect marine environmental data in greater volume, over longer periods and with lower cost. These advancements have in part been driven by the expansion of offshore industries such as offshore wind, which require geospatial data at every phase of development. The push for net-zero and other climate and biodiversity crisis have also changed how we think about marine data, highlighting the importance of good quality, wider coverage marine environmental data. Consumer behaviour is changing too, with a greater awareness of the environment and our own impact driving changes in decision making, which lead to knock effects in industries such energy and fisheries. Improved access to Marine environmental data through portals such as the MDE and MEDIN metadata portal have also enabled greater reuse of marine environmental data.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The continued focus on net-zero targets and the energy crisis will continue to drive the expansion of offshore industry, and thus innovation in the collection and use of marine environmental data. The increased focus on ‘personal data’ may also play a role in how we use and share certain types of ‘human’ marine data, such as fishing vessel tracks. The twin crises of climate change and biodiversity will also impact the use of marine geospatial data, as well as the scale of such data collection. Citizen science may play an increasing role in marine spatial data collection as well. The shift to using a standardised Application Programming Interface (API) to share location data will have a big impact on the use of geospatial data, simplifying acquisition and improving accessibility of data.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

A value chain suggests a linear sequence of stages to derive value. The first two stages of the ecosystem are linear, foundational elements and are likely common to all industries. The data analysis, visualisation and applications could be split up in various other ways depending on perception (e.g. is route planning application of data or data analysis) and all elements of this may not be common in all industries. The ecosystem doesn’t properly capture the societal/environmental benefits of location data. For example the avoided costs associated with environmental mitigation that is informed by location data.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Edge computing could support industries in rural locations where bandwidth is less good and access to location-based application is challenging. Geo AR can be used to provide a new and different experiences for consumers visiting destinations, encouraging more time spent at locations and more consumer spending.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Smart devices and smart offices could transform the office working model. Providing better experiences when at the physical location and seamless working for those at home. Increased productivity would have an economic benefit.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

As a sponsor of the Marine Environmental Data and Information Network (MEDIN), we will continue to support them in their mission to make marine environmental data conform to the FAIR principles, and encourage the wider awareness of marine environmental data. We would also look to share the impact of marine spatial data on our decision making processes, as well as sharing the insights we can glean from the data. We want to share these findings more widely via the Marine Data Exchange and other platforms. Sharing how marine spatial data feeds into our approach to leasing and HRA would highlight the value of geospatial data. We are already taking steps in this direction through the use of ArcGIS story maps to explain and display our decision making in upcoming leasing rounds in the Celtic Sea.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Collaboration between the organisations of the MEDIN network has produced a number of important data standards and metadata standards as well as the MEDIN portal, a valuable search tool which allows users to explore thousands of marine metadata records all in one place. MEDIN is key to how marine environmental data is shared across the UK. A number of organisations, including The Crown Estate, De Rijke Noordzee, CEFAS and The Flanders Marine Institute (VLIZ) have collaborated within the OWEC North Sea Net Gain project to produce OneBenthic, a portal and modelling tool which visualises benthic data across the North Sea and UK waters. The outputs of this project have lead to improved data standardisation and accessibility, as well modelling broad scale habitat maps which can help predict the occurrence of certain species in areas with certain environmental conditions.

Q14. Would you like your response to be confidential? If yes, please give your reason:
No

Q15. Who are you responding on behalf of?
A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
London

Q17. What is the name of your organisation?
The Crown Estate

Q18. What is your role within the organisation?
GIS Manager

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify):

The Royal Commission on the Ancient and Historical Monuments of Wales

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The use of marine environmental data has continued to increase over the past five years (the number of requests for data from the network of MEDIN Data Archive Centres* more than doubled over the past year alone). I think this is partially because of technological advancements, with developments to the systems disseminating location data making it easier for consumers to access data. I believe it is also due to the expansion of new marine industries which require location data at every stage of their operation. From our perspective (The RCAHMW) this is directly linked to the Welsh National Marine plan and the need to provide comprehensive data on the location of marine historic assets within the marine planning zone. * MEDIN currently provides access to marine geospatial data via its network of specialist and accredited Data Archive Centres: UK Hydrographic Office (bathymetry data); British Oceanographic Data Centre (water column oceanography data); British Geological Survey (marine geology and geophysics data); Met Office (marine meteorological data); DASSH (marine species and habitats data); Marine Scotland; Cefas (fisheries data); Archaeology Data Service; Historic Environment Scotland; Royal Commission on the Ancient and Historic Monuments Wales (marine historic environment data).

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

I believe a shift to using a standardised Application Programming Interface (API) to disseminate location data will have a big impact on the use of geospatial data, as it has the potential to simplify the process of accessing data from multiple sources. MEDIN has recently trialled a new API standard for Environmental Data Retrieval developed by the Open Geospatial Consortium (OGC). This standard is designed to be extremely flexible, hide the data storage details and be useful to non-expert users. Over the next five years, the move to a net zero carbon society will have an increasing impact on how location data are collected, analysed and stored, especially for those data collected in the marine environment (which are typically collected using sensors and instruments deployed from ships). Marine environmental data (which is inherently a type of location data) will be used increasingly in real-time or near-real-time to inform operational systems across all sectors and I anticipate location data from the marine environment will be increasingly be (re)used in digital twins of the oceans.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I believe the characterisation of the data value ecosystem above takes into account the direct (revenues associated with the sale of data or information products) and indirect (e.g. gains in efficiency or productivity) economic benefits of location data associated with collecting, processing, visualising and applying those data. I feel the societal benefits of location data is less well captured by the ecosystem above. For example the avoided costs associated with environmental mitigation that is informed by location data. MEDIN recently collaborated with the Organisation for Economic Cooperation and Development (OECD) and the Global Ocean Observing System (GOOS) to explore value chains in public marine data. The full findings of this work is available in the published report and is extremely relevant to this question. Jolly, C., et al. (2021), "Value chains in public marine data: A UK case study", OECD Science, Technology and Industry Working Papers, No. 2021/11, OECD Publishing, Paris, [Link excluded from publication]

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Funding - maybe in a pot that can be applied for with no preconditions, such as being a research institute, and in smaller amounts (seed funding) to enable organisations from multiple different backgrounds to be able to develop innovative applications of all of the above technologies to their particular locational data.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Location data and technology are pivotal in defence and mitigation from environmental hazards such as: • storm surges and coastal flooding • sea level rise • predicting extreme events. To put the first of these into context, Coastal flooding has the second highest risk impact category of civil emergencies in the UK, after pandemics and chemical, biological, radiological and nuclear attacks (National Risk Registry, 2022). Consequences of coastal flooding can include fatalities and casualties; widespread damage to property and infrastructure; disruption to essential services, particularly transport and energy; environmental damage and contamination. Location data are vital to defend the UK coastal infrastructure.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

The RCAHMW contributes spatial data to the Welsh National Marine Planning Portal. We are also a member of MEDIN. MEDIN currently works with the marine data community and has a key objective to raise awareness of marine geospatial data. We use a variety of fora to increase awareness of marine geospatial data. We would be very happy to share examples of the value of geospatial data from other sectors with our stakeholders. We would also welcome working with the Geospatial Commission to further raise awareness of the value of marine geospatial data and tools.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Welsh Marine Planning Portal: Contains a myriad of spatial data from across all sectors within Wales, and includes forward looking evidence-based data for things like Strategic Resource Areas in the future. Data is free to download and reuse in order to encourage developers to make the most of an effective evidence base.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Wales

Q17. What is the name of your organisation?

The Royal Commission on the Ancient and Historical Monuments of Wales. Also part of MEDIN.

Q18. What is your role within the organisation?

Senior Investigator (Maritime)

Q19. How many people work for your organisation?

10 - 49

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Cultural Heritage. In this case the Marine Historic Environment.

The Scottish Government

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The increase in the use of geospatial or location data over the last five years has be incredible, with the main factor being consumer or citizen awareness, you only have to look at the Covid pandemic at the use of location data both by both citizens and the organisations as the most effective way of disseminating critical information. In addition I would also add technical advancements such ESRI AGOL, the proliferation of web services from data providers.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

• The use and availability of EO data to track changes and support robust policy and decision making. • The increase in awareness and use of GI tools and techniques, should become more mainstream in education and general awareness. With the increasing demand for GI capabilities within organisations there is a potential lack of skilled employees to meet the future demands

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I believe the characterisation of the data value ecosystem is correct however I would stress that the capture and creation of any new data needs to be aligned to stakeholder requirements, especially given the devolved administration differing requirements. The data capture or created need to be relevant to support policy initiatives in order to add value.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

The current EO pilot is a good example of a collaborate procurement that will allow geospatial organisation to innovate using high quality robust data.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Climate change a how we look at a Nation Coastal Change Assessment, Civil Contingencies, Health and Social Care and equal access to services

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

The use of a national LiDAR dataset would be opportunity to demonstrate the value of data, better stakeholder engagement within the public sector

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Effective collaborative procurement to achieve economies of scale, improvement of Data Standards, Improvement of Skills awareness with Edinburgh University. Collaborations with Health organisations

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Scotland

Q17. What is the name of your organisation?

The Scottish Government

Q18. What is your role within the organisation?
Head of Geospatial

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Central Government

Torfaen County Borough Council

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Consumer Behaviour - Online marketplace

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Market Conditions - economic downturn and technology

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Maybe include some more varied applications of data. e.g Emergency Planning, emergency services etc

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Internet of things as the basis to inform the placement of sensors to help develop local networks in Cities and towns. WiFI networks and storing information about local environmental conditions, air quality, traffic flow, footfall etc

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Self driving vehicle technology

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Make data more accessible, discoverable, cuurent and accurate

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Data Map Wales hosting data and developing project based GIS solutions. E.g Active Travel Networks, SiS/NUAR underground Infrastructure

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Wales

Q17. What is the name of your organisation?

Torfaen County Borough Council

Q18. What is your role within the organisation?

Geospatial Analyst

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:
Administrative and support service activities

Welsh Government (1)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Within the marine environmental sector, the use of marine environmental data has continued to increase over the past five years (the number of requests for data from the network of MEDIN Data Archive Centres* more than doubled over the past year alone). I think this is partially because of technological advancements, with developments to the systems disseminating location data making it easier for consumers to access data. I believe it is also due to the expansion of new marine industries which require location data at every stage of their operation. * MEDIN currently provides access to marine geospatial data via its network of specialist and accredited Data Archive Centres: UK Hydrographic Office (bathymetry data); British Oceanographic Data Centre (water column oceanography data); British Geological Survey (marine geology and geophysics data); Met Office (marine meteorological data); DASSH (marine species and habitats data); Marine Scotland; Cefas (fisheries data); Archaeology Data Service; Historic Environment Scotland; Royal Commission on the Ancient and Historic Monuments Wales (marine historic environment data).

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

I believe a shift to using a standardised Application Programming Interface (API) to disseminate location data will have a big impact on the use of geospatial data, as it has the potential to simplify the process of accessing data from multiple sources. MEDIN has recently trialled a new API standard for Environmental Data Retrieval developed by the Open Geospatial Consortium (OGC). This standard is designed to be extremely flexible, hide the data storage details and be useful to non-expert users. Over the next five years, the move to a net zero carbon society will have an increasing impact on how location data are collected, analysed and stored, especially for those data collected in the marine environment (which are typically collected using sensors and instruments deployed from ships). Marine environmental data (which is inherently a type of location data) will be used increasingly in real-time or near-real-time to inform operational systems across all sectors and I anticipate location data from the marine environment will be increasingly be (re)used in digital twins of the oceans.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I believe the characterisation of the data value ecosystem above takes into account the direct (revenues associated with the sale of data or information products) and indirect (e.g. gains in efficiency or productivity) economic benefits of location data associated with collecting, processing, visualising and applying those data. I feel the societal benefits of location data is less well captured by the ecosystem above. For example the avoided costs associated with environmental mitigation that is informed by location data. MEDIN recently collaborated with the Organisation for Economic Cooperation and Development (OECD) and the Global Ocean Observing System (GOOS) to explore value chains in public marine data. The full findings of this work is available in the published report and is extremely relevant to this question. Jolly, C., et al. (2021), "Value chains in public marine data: A UK case study", OECD Science, Technology and Industry Working Papers, No. 2021/11, OECD Publishing, Paris, [Link excluded from publication].

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

?

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Location data is key to marine planning and ensuring the sustainable development of the marine environment. Understanding current use of the marine environment and how activities can be co-located is key to ensuring the economic benefits that can be obtained from the marine environment are sustainable. Location data and technology are pivotal in defence and mitigation from environmental hazards such as: • storm surges and coastal flooding • sea level rise • seafood security in a changing climate • predicting extreme events To put the first of these into context, Coastal flooding has the second highest risk impact category of civil emergencies in the UK, after pandemics and chemical, biological, radiological and nuclear attacks (National Risk Registry, 2022). Consequences of coastal flooding can include fatalities and casualties; widespread damage to property and infrastructure; disruption to essential services, particularly transport and energy; environmental damage and contamination. Location data are vital to defend the UK coastal infrastructure.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

MEDIN currently works with the marine data community and has a key objective to raise awareness of marine geospatial data. It uses a variety of fora to increase awareness of marine geospatial data but there is still a lot of marine data that does not end up in the data archive centres. More needs to be done to change the perception of making data open.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Marine Environmental Data and Information Network (MEDIN) [Link excluded from publication]. MEDIN is a collaboration between organisations collecting, managing and using marine location data. As a network MEDIN is open to any organisation with an interest in marine location data. MEDIN collaborates with organisations from private and public sectors, as well as academia, charities, and members of the public.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

As an example of the geospatial applications that MEDIN delivers - MEDIN provides a single place to find UK marine location data – the MEDIN portal. This provides access to marine data owned or managed by over 600 different organisations. MEDIN also provides a marine specific profile (the MEDIN standard) of the national standard for discovery metadata. The European Marine Observation and Data Network (EMODnet) ([Link excluded from publication]) The European Marine Observation and Data Network (EMODnet) is a network of organisations supported by the EU's integrated maritime policy. These organisations work together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products. EMODnet deliver a suite of thematic marine geospatial data products. MEDIN Data Archive Centres and other MEDIN partners are active members of EMODnet. Open Geospatial Consortium (OGC) [Link excluded from publication] The OGC is a worldwide community committed to improving access to geospatial, or location information. They connect people, communities, and technology to solve global challenges and address everyday needs. The organization represents over 500 businesses, government agencies, research organizations, and universities united with a desire to make location information FAIR – Findable, Accessible, Interoperable, and Reusable.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No
Reason:
.

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Wales

Q17. What is the name of your organisation?

Welsh Government

Q18. What is your role within the organisation?

Head of Digital and Data for Marine and Fisheries

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Public administration and defence; compulsory social security

Welsh Government (2)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Awareness and availability of data and GIS has improved significantly. Improvements in technology, such as IoT, satellites (earth observation data) and drones are generating more data. However, although there is far more data available, it isnt always of sufficient quality. There is better use of geospatial data in policy making and devolution is pushing different uses of data and approaches between the nations. The impact of covid means that we are having to re-assess baselines and information pre-pandemic. Geospatial skills are also being used more widely now and in other professions such as data science. Open source tools are facilitating that.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Data ownership, governance and ethics are going to be key drivers in the future. For example, more granular satellite imagery raises greater ethics and privacy concerns that are perhaps not being considered sufficiently at the moment. Public awareness must complement that and be improved too. As habits and behaviours change, the use of location data also must change. For example autonomous vehicles means that we will need new data sets and more accurate information to support those changes. There is going to be increased demand for location data, the pandemic really pushed the use of mobile data and that is likely going to be accelerated going forward. The way in which we process data will also impact – for example machine learning and the way that it can use to process data. For things like earth observation data, the ability to plug high quality machine learning algorithms into that will make the data and create outputs that are accessible and better quality.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The value chain is probably not linear, its more likely circular. Data ethics and privacy should be a fundamental part of each stage.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Investment in technology such as remote sensing, especially LiDAR surveys. Having a time series of LiDAR surveys is necessary to quantify rates of change in dynamic environments – coasts, rivers, coal tips. Use of digital twins using location data and how they can be used would provide examples to others of how they can be used. Investment in cloud computing and storage capacity and utilising data science techniques. Ensuring that code etc is made openly available as well as data. Libraries for machine learning and AI for making those more visible. These would help to upskill and allow wider re-use for others who do not have the capacity or expertise. Ensuring that techniques and technologies are applied consistently across the UK so standards and definitions used are the same. Training on innovative applications would be beneficial. Helping to demonstrate how ethics and information governance can be applied when using innovative applications of location data. This is beyond advice and guidance that already exists, but looking how new technologies can be utilised with due consideration to data ethics.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Welsh Government has responsibility for a broad range of areas. The impact of using location data/technology is transformational in which ever area it would be used. Below are some specific examples: • Application of Geospatial data in retail and finance (i.e. spatial finance), linking with the second phase of the Green Finance strategy. This is crucial for delivering market incentives for sustainable practices and identification of ‘market failures’ arising from climate related financial risks. • Mobility as a service – MAAS is the future. For example using an app on your phone which gives you different transport options and you can then decide which one best suits you. It could support reductions in car usage, and boost the economy by getting you in the right place at the right time. • Location data and technology could also be transformational for both smart agriculture and enhanced environmental monitoring & the impact across economic/social/environment would be significant.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Welsh Government has already delivered a unique solution to geospatial data with its DataMapWales platform. DMW is helping to drive awareness of the value of geospatial, such as its use for National Forest consultation, Active Travel and securely sharing the location of vulnerable households in an emergency (JIGSO). We are holding regular engagement sessions with stakeholders to which is raising awareness. We also have our DataMapWales twitter account that we are using to promote the service. We have also promoted how we have been using Living Wales. We could also: Promote statistics and research with a geospatial element Improve outreach to schools, universities, and the public.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

• DataMapWales has been built as a geospatial platform for the whole of the Welsh public sector to use. It responds to the needs of its users/partners and collaboration between teams in Welsh Government and the wider public sector in Wales has been key to its success and adoption. • We have multi-user licencing such as the HR/HF satellite imagery contract which allows use by various public sector bodies and academic institutions in Wales. Living Wales, which is a collaboration with academia, with buy in from the organisations such as Forest Research, National Resources Wales and local authorities. • We have also been leading on how the Unique Property Reference Number can be used to enhance and improve

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

public sector delivery to the public. For example, it was used for shielding in Wales, with the UPRNs provided to local authorities with support from several local authorities and GeoPlace. UPRN is also a key part of JIGSO, our emergency planning and response application, where the UPRN of vulnerable households is securely shared in an emergency – that is with a range of organisations, such as fire, police and local authorities using data from utility companies. We have worked closely with local resilience forums to develop JIGSO.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No
Reason:
*if quoting please do check anything with us

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Wales

Q17. What is the name of your organisation?

Welsh Government

Q18. What is your role within the organisation?

Head of data and geography

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:

Public administration and defence; compulsory social security

Welsh Revenue Authority

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Over the last 5 years we've seen greater improvements in the accessibility of location data. Through the PSGA, members are better able to utilise location data into the design of new systems and processes. Whilst there are still improvements to be made, with access to better location data we can better support government decision making, and in turn make better decisions for our citizens.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Recently we started to explore the value a land and property data platform could have to inform us, government and the public on current and future issues. User research from this project specified they wanted a more consistency between datasets relating to property unique identifiers. Due to the on-going improvements in location data, in the next five years enabling more consistency in location data between datasets will have the largest impact for both governments and their citizens. For example, this could be by opening more datasets with location-based identifiers such as adding UPRNs to VOA data such as council tax or business rate, and/or land registry data, to enable new and innovative policies.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

n/a

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

We'd like to see more made of existing property / building data, and aligning sources, so we can build coherent mapping services, over the cloud

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

We did and could still (if funding were available) envisage a Wales property platform supporting property or location based public services

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

With the potential of regional based land transaction tax being introduced in Wales, we have worked with our partners to improve the awareness of the value of geospatial data. We will continue to speak to our users to understand how we can improve or reduce errors in our systems when capturing information on land and properties. We will also continue to have conversations with subject leaders to make sure our processes are still relevant and identify improvements where possible.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The development of Datamap Wales within Wales is a successful example of collaboration between different layers of government to deliver a one stop shop for geospatial information with Wales.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

A public body

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Wales

Q17. What is the name of your organisation?

Welsh Revenue Authority

Q18. What is your role within the organisation?

Data lead for Service Design

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Public administration and defence; compulsory social security

Individual Responses

1Spatial Group Limited – Individual Response

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Data literacy (i.e. consumer behaviour) is increasing. Society is generally more knowledgeable about the presence & reliance of data and how it can be a force for good - personally and for business. All three of the trends are interrelated, so I don't think its a binary choice. More online apps (e.g. from /gov.uk services such tax returns to checking progress of deliveries) all serve to increase data literacy.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Data collection devices particularly IoT real time devices and drones. But real time will be a growing factor

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I think this still a valid categorisation. Innovation cuts across all of them, so shouldn't be separated out. Maybe between transformation and analysis, there could be a new category which is around data access - e.g. portals - or just include it in the Data Transformation category

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Part of what we do
Application of data	Not part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Funded POCs via research challenges

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Environmental compliance in support of climate change. Collecting the necessary data around carbon footprints is very time consuming hence inaccurate, non-uniform and not timely. Smart meters in every devices that has a carbon footprint so that metrics cans be gathered more accurately, uniformly and faster

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

As part of our Business As Usual we hold seminars advocating the use of smart data with government, utilities and transports. We are aware there are many other sectors that we don't currently operate in such as finance, insurance and health but this is a function of the geospatial data maturity of those markets

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Academia and industry works best - ensures you get best blend of bleeding edge technology (technical feasibility) with commercial viability

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

East of England

Q17. What is the name of your organisation?

1Spatial Group Limited

Q18. What is your role within the organisation?

Managing Director

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
We provide data management services and tools, so we cover multiple sectors where location data is an input or an output

Complete Technology Group – Individual Response

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technology enabling location data. Plus social media with having a geographical tag now becoming the norm

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Use of technology in driverless cars and autonomous drones

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I'd question the wording in the last two. Analytics is there to analyse/ find out about something. Application is the doing part of the analysis

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Develop a sensible model / payment model for NUAR and get all the biggest stakeholders involved

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Drone use for habitat monitoring, location based sensors for modelling digital twins

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We work with our clients and use spatial information to inform them

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

For HAs spatial information can be used to support green projects, social projects, and to reduce negative behaviours on their estates. Telecoms groups can work together to develop a standardised rollout so people get a decent service

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Complete Technology Group

Q18. What is your role within the organisation?

Senior Data Analyst

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

Deliveroo – Individual Response

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

I don't think you can narrow it down to one of these, tech on it's own is useless without a purpose and a customer need. If something is useful and usable then it will be used.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

contextual information being used by just about every business out there

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

no

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

open up the postcode address file

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

huge, it's a fundamental barrier to innovation

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

n/a

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

n/a

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

Deliveroo

Q18. What is your role within the organisation?

Group Product Manager

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:
Transportation and storage

Home Office – Individual response

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Consumer preferences for privacy, greater access to smartphones, commercialisation of data

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Legislative + company privacy policies

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

No - looks right to me (visualisation and application of data may be hard to distinguish at times)

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

We do not make use of location data

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Predictive analytics using machine learning with underpinning geo-data. Use ML to detect changes in satellite imagery to detect everything from forest fires, conflict overseas to vulnerabilities in UK borders (Small-boats)

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

N/a

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

1) Get Ministers and seniors sighted on work with tangible outcomes; 2) Using Ministers' expectations for products, embed geo-spatial in business as usual products 3) Acquire and train skill sets in data vis and data science. We need organisations to provide better training opportunities + IT/data engineer support teams

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

We need a greater emphasis on promoting the art of the possible to policy makers and the need for collaborative teams - policy/strategy lead, data scientists/analysts, data engineers

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Other (please specify):
Civil servant - Home Office

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

CONTEST Unit, Home Office

Q18. What is your role within the organisation?

Team Leader, Risk and Performance (Data science advocate)

Q19. How many people work for your organisation?
250+

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Government

Individual Response (1)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

On balance, I suggest technological advancements (as opposed to market conditions or consumer behaviour). Consumers may wish to access location data but if that location data is not available then obtaining such data is not possible.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

All three (market conditions / consumer behaviour / technological advancements) will be relevant. However, perhaps consumer behaviour could be most important. Consumers will be able to lobby for improvements in the availability of location data. For example the very useful Surrey County Council Interactive Map (provided on the SCC website) enables the public or businesses to print off the relevant map page. By contrast unfortunately the equivalent map provided by Southampton City Council apparently does not allow the relevant map to be printed off.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

This seems fine.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

We do not make use of location data

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Not part of what we do
Data analysis and visualisation	Not part of what we do
Application of data	Not part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

No comment.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?
No comment.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?
No comment.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)
No comment.

Q14. Would you like your response to be confidential? If yes, please give your reason:
No

Q15. Who are you responding on behalf of?
Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
South East

Q17. What is the name of your organisation?
Not applicable

Q18. What is your role within the organisation?
Not applicable

Q19. How many people work for your organisation?
Not applicable

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): When I was in the "world of work" of the above categories it was a mixture of the professional category and the public admin category.

Individual Response (2)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

cheap and reliable personal location/situation awareness, availability to free/cheap live data/ realtime model/forecast. Widespread use and adoption of spatially enabled content and services

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Food, water, energy all 'flow', or have economic variability, as a result of their spatial position and temporal availability. understanding stock and change in our main supporting natural and managed systems of resources will be key to ensuring availability and resilience to fluctuating supplies.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The ecosystem is fine, the problem has always been that the money/effort required for each component is not uniform and some times the different components compete with each other (some folks just want the exciting new stuff, some just want to sort out what we have).. all require longer term investment. Current funding cycles (for example in UKRI are 6 month, 12 mnth, 3 year..if you are lucky 5 year...some of the things we need to do, require ring fenced funding for 10 or more years (and no government ever commits to that). they also need a clear aim/outcome ..so lets not just do 'asset management' lets have an ambition to reduce cost of legacy assets in UK by managing their failure rates and maintenance cycles in a way that isnt related to shareholder dividends. (which requires a different approach to who owns infrastructure)

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Rethink how we me make spatial data relating to ecosystems services and natural capital available.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

New power connections for EV and micro gen, better understanding of soils and water in landscape.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

we apply science to solve geoscience problems

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

BGS, CEH, online resources for soil/landscape(mysoil/UKSO), BGS/TCA > online geology and mining hazard portals,

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

East Midlands

Q17. What is the name of your organisation?

Me

Q18. What is your role within the organisation?
to be me

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Professional, scientific and technical activities

Individual Response (3)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Technological advanncements

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Integration of spatial datasets from different sources

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Oil & Gas companies produce a huge data stream of spatial information for different end users

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Bathymetry integration of datasets from different sources

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Higher level of knowledge from integrated datasets

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Education of what data sets exist

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

More selective education for different spatial specialists

Q14. Would you like your response to be confidential? If yes, please give your reason:

No
Reason:
I want to help

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South East

Q17. What is the name of your organisation?

Geomatics Consultant

Q18. What is your role within the organisation?

Geomatics Consultant

Q19. How many people work for your organisation?

Not applicable

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Oil & Gas

Individual Response (4)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Availability and stability of 4G and 5G signals across the country. Covid was a clear driver of food delivery businesses.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Journey planning using real time traffic conditions and not eh go route updates for optimal delivery times and fuel use, even reduction of emissions. I'd love to think it would drive overall reductions of motor vehicle traffic in our large towns and cities

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

The last element in the chain should circle back to the data capture and creation. The applications should NOT be limited by existing data that is available. Sometimes we should anticipate that the creation of an application may drive the capture of different types of data or more refined or frequent capture.

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

We do not make use of location data

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Not part of what we do
Data analysis and visualisation	Not part of what we do
Application of data	Not part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

I think this question is a mistake. One thing we should know by now is that the uses of modern tech driven by the computing power of smart phones and mobile networks is extremely hard to predict. We KNOW that virtually everybody who attempts to predict the future will be wrong - some will be right a la thousand monkeys on typewriters! Key is to make the data available, make it free (if possible), make it

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

high quality, make it dynamic. Ensure the hardware requirements can be delivered once need is found. Ensure the skills exist - education is key (stop ministers wasting their time whining about woke universities please!).

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

We should ensure that this data helps to provide equitable access to services. I suspect a key challenge is to ensure this data isn't sued by this increasingly authoritarian government for nefarious purposes - I'm sure you know there are ministers who would love to know where some people are and will be at any time without their knowledge. Our freedom should not be sacrificed on this altar.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

No comment

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

I think this is hard to answer (I'm answering as a private citizen). I worry this question pre-supposes we know what applications will be provided - we don't!

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

East Midlands

Q17. What is the name of your organisation?

N/A

Q18. What is your role within the organisation?

N/A

Q19. How many people work for your organisation?

Not applicable

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
N/A

Individual Response (5)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Commodification of geospatial data and proliferation of simple APIs for widely needed, but complex tasks like geocoding

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Availability of more and more geospatial data in preprocessed form behind simple, free (or cheap) APIs

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I believe the bit about infra is a bit out of place. Computing resources are a commodity, I don't think they need to be considered as a part of geospatial ecosystem. On the other hand, the chart misses services like SmartyStreets, enabling business innovation on a large scale

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Not part of what we do
Data analysis and visualisation	Not part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Opening the Postcode Address File would allow businesses to improve their service, eliminate issues with old postcode data, and enable new startups to achieve rough and privacy-respecting geocoding for free

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Every merchant form online can use PAF-based autocompletion. Application developers can use postcodes to achieve privacy-respecting geolocation, e.g. allowing people to find their nearest council-provided waste disposal site via postcode

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

I can promote types of geospatial data available from the UK government across my social network and professional connections

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Online merchants using services like SmartyStreets to validate and canonicalise addresses. Canonicalisation alone reduced the amount of parcels returned by about 90% in my practice

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

I don't represent any organisation at the moment

Q18. What is your role within the organisation?

CTO in the previous organisation

Q19. How many people work for your organisation?
Not applicable

Q20. What best describes the industry that you or your organisation is involved in:
Education

Individual Response (6)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Greater use of mobile phones / bluetooth / QR codes

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Whether the PAF is opened up or not

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

no

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Part of what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Free the PAF

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

New apps, new services, new micro businesses and fun website games, all based on the PAF, more efficient routing, better thermal efficiency in buildlings, complex data analysis of so many other datasets, made better by a free PAF

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

n/a

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

n/a

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

n/a

Q18. What is your role within the organisation?

n/a

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Other service activities

Individual Response (7)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Freely available, accurate maps on smartphones

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Making PAF data free, and linking it to what.three.words would increase usefulness of portable mapping, navigation services, especially for deliveries in rural areas

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

No I don't

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

We do not make use of location data

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Not part of what we do
Data analysis and visualisation	Not part of what we do
Application of data	Not part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Set the PAF free! A simple change with huge benefits.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

With free access to PAF, new applications that need to locate resources, customers and users could be imagined.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

As an individual

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Not from me, sorry

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Yorkshire and the Humber

Q17. What is the name of your organisation?

Me

Q18. What is your role within the organisation?

None

Q19. How many people work for your organisation?

Not applicable

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Service user

Individual Response (8)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Open APIs, like those that allow apps like CityMapper to use transport info

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

More Open APIs - e.g. make PAF open and free to use

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Makes sense

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Core to what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Make PAF open

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

PAF is the "critical missing open dataset" [Link excluded from publication] and would transform the application of location & geospatial data

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

N/A

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Unsure

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

London

Q17. What is the name of your organisation?

I was responding as a private citizen not on behalf my company (though the answers I gave about the company referred to it, not me)

Q18. What is your role within the organisation?

I was responding as a private citizen not on behalf my company (though the answers I gave about the company referred to it, not me)

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:
Information and communication

Individual Response (9)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Brexit together with the Pandemic and geopolitical strains regarding supply chains that require a reshoring of economic activity and its embedding into local economic activity, requiring as a starting point that we map supply flows at a local and regional level - something that is far beyond the current dataset capabilities of the National Statistics Office.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

The rebuilding of local economies both in respect of driving innovation clusters to make the UK globally competitive and in respect of driving an export, productivity and sustainable economic growth component to enable "Levelling Up"

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

I would add two further blocks (i) statsitical transformation that focused on using Geospatial data to add to Office of National Statistics and bank of England "Nowcasting" capabilities which can then be associated by academic and commercial users with other data sets to provide far more granualar statistics to drive evidence based policy and (ii) a "Strategic Development" analysis to provide in depth data sets that can be used to provide a geospatial view of economic development policy that can be linked to cluster and infrastructure development and industrial sectors and associated innovation

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Not part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Mappaing of local and regional supply chain flows combined with onward sales flows, intellectual property flows and export density to indentify (i) local and regional anchor firms, their industries, competitive status and how integrated they are to national and export markets (ii) from this identify both export and innovation clusters (likely to be the same) plus the gaps in their local supply chain so a "gap filling" strategy can be pursued to develop a cohesive regional / local economic power house. Tow overseas examples of such geo spatial clusters are the Baden Wurtemburg Automtive Cluster near Stuttgart in Germany (which has very high levels of SME mittlestadt innovation and productivity) and Silicon Valley. This approach rests of identifiying anchor firms and then using "smart policy" based on actual flow data to "gap fill" missing capabilities thereby raising innovation rates and productivity and replacing imports with exports.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

The Sardex SME development network in Sardinia is an example of developing an SME sector through building electronically facilitated local economiuc ties; this model can be extended (they did not have the geo spatial data we now do) to proactively create local / regional clusters of excellence focused around identified anchor firms.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Academic research coupled with practical implementation though small pilot projects that act as templates for wider roll out.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Not applicable to this response

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
South East

Q17. What is the name of your organisation?
Private Individual

Q18. What is your role within the organisation?
Visiting Fellow At The University of Hertforshire

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:
Education

Individual Response (10)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Increased digital shopping and remote working, leading to a greater need for accurate real-time geo data. Availability of "apps" that make innovative use of location data, for example displaying events locations on a map

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Increasing digitalisation. Increased used of small delivery companies vs prior Royal Mail monopoly

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

N/A

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Not part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

1. Needing to pay for PAF access is unacceptable for something so basic. Most other countries provide as fundamental data. Should not have been sold off with Royal Mail or be run for profit. Hurts the ability of private individuals, independent journalists, small businesses and startups to innovate in this area. 2. Government data releases are infrequent and in random formats (e.g. Excel). Not consistent about hierarchies used (e.g. historical counties vs postal county vs LSOA vs MSOA vs region). Different agencies report differently and are not comparable. Please make this a consistent real-time API using JSON for all data releases, including national statistics, elections, schools, health etc.

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

If location data was free and interoperable, would not need to employ thousands of data entry admins to constantly clean data. Would save the economy millions per year.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

N/A

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

N/A

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

East Midlands

Q17. What is the name of your organisation?

Mr A. Robinson

Q18. What is your role within the organisation?

Individual - with an interest in geospatial app development, machine learning and data journalism

Q19. How many people work for your organisation?

Not applicable

Q20. What best describes the industry that you or your organisation is involved in:
Other (please specify): Individual

Individual Response (11)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

The biggest shift in the last 5 years around location data has been the emergence of war on the European continent. While not happening in the UK itself, the changes and techniques playing out are likely to set the scene for future development. Some of the most ingenious innovation comes from urgent requirement in wartime, and Ukraine has shown examples of this. This drives the requirement for trust, security and confidence in location data. A number of these show how location data can be a force multiplier – GPS Arta, proclaimed as “Uber for Artillery”1. This shows the value in being able to use reliable, robust and trusted location data in a distributed and decentralised way for command and control. For this to work, a secure communications around location data is required, in order to build trust and confidence in the targeting data and its provenance. The use of UAVs for artillery spotting and fire direction also shows the immense value in being able to locate a large number of moving objects simultaneously. From a consumer perspective, the availability of near-ubiquitous GNSS in devices has certainly had a significant impact (smartphones, watches, etc), and ultimately has driven down the cost of GNSS receivers to the point they are available for applications like GPS Arta, for installation on low-cost UAVs, and are available to civilians for manual reporting of position information.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

1. GNSS denial, and a general loss of trust or confidence in the resilience of GNSS-based positioning. This is already an issue in some areas of NATO territory. Location data is only useful when it is sufficiently reliable and robust that you can use it. As civilian aircraft increasingly move towards flight manoeuvres which assume availability of GNSS, our wider resilience to a loss of GNSS is reduced. Today, mobile telecoms networks in TDD mode frequently rely on GNSS-based time synchronisation to prevent masts from interfering with each other. While this is reliance on GNSS for time synchronisation, rather than position and location, the same technology drives both.

2. Government policy towards net zero requiring an increase in electrification of vehicles and heat, which drives a requirement for electricity at quantities which cannot be delivered by current infrastructure. This will lead to resilience challenges for energy network operators, much of which will need to be driven by geospatial data and intelligence. Cable routes and loadings will need to be better understood in real-time. Supply and demand will need to be balanced in real-time, perhaps using real-time pricing and other measures to control demand. Network capacity will need to increase. Consumer behaviours will change with the adoption of electric vehicles, and better information around charging stations and their status will be overlaid with spatial data, in order to help users to charge their vehicles while on the move, feeding into their journey plans.

3. Roll-out of wider connectivity into rural areas – Government policy has set targets for delivery of Gigabit capable connectivity to the whole country. This introduces challenges to reach rural and commercially unappealing areas. To some extent, these challenges are significantly geospatial, and many of the solutions are likely to arise by using location data to drive solutions which are commercially viable and technically feasible. For example, there is already a level of interest and willing to use and share information about asset locations (including both above and below ground) to find opportunities to deploy mobile infrastructure. Local authorities are willing to share access to assets and infrastructure (as demonstrated through the DCMS DCIA programme, such as the Wessex DIA pilot). To do this, accurate location data is required for assets captured by local Government, central Government and industry. Where this can be done, and data on above and below ground assets can be combined, there is a multiplicative opportunity – underground fibre and passive infrastructure can be used to enable either wholesale connectivity provision, or new build of fibre at cheaper prices using existing ducts or assets, which can be tied to availability of power, and a suitable host asset for a mast or other antenna structure. Combining this spatial data gives an increase in value for everyone, but sharing data

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

in the telecoms sector is a challenge, and a change/trend to facilitate appropriate, trusted, reliable access to shared datasets of location data will be key to enabling this. This is the concept which Asset Hub is trialling in the Wessex DIA project at present.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Provenance, security, integrity and resilience. These probably belong as key enablers beneath (and supporting) the whole value chain. Location data is of little value if it has been tampered with during the capture process. Similarly, if it is not held securely, and maintained on secure systems, its integrity is at risk, and others are less likely to have confidence to store their data in such a manner. Finally, it is important that the systems holding location data, as well as the enabling PNT systems (such as GNSS and other methods of location) are resilient enough that location data can be put to use.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	
Data transformation, processing and systems	
Data analysis and visualisation	
Application of data	

Supporting innovation and emerging technologies

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?

Other (please specify)

security of data and systems used to process it.
While many of the problems in the cyber-security community are technically solved, to put location data to effective use, we need to build greater skills in these areas, and ensure that we have suitable technical (not just non-technical) leadership in place to protect systems and organisations which use data (including location data).
There are skills challenges and shortages in these areas, in addition to other "deep tech" areas. We need to look at how to make these career areas more attractive to young people, as well as to those switching career, and look at how Government can ensure the high-level, high-skill digital roles exist, to attract and retain these people in the UK. As the example given in Q1 shows, Ukraine has demonstrated the importance and value of being able to
innovate rapidly in the use of location data, to significant effect. This is a very tangible example of why we need to have people with these skills being put to best use in the UK, working on complex technical challenges, giving them the best possible understanding of all of the enabling technology we rely on in location services. This includes chipsets, standards, GNSS technology, satellites, and similar.

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Location data has huge potential to make better use of the assets we already have buried under the ground, as well as available above the ground, to boost roll-out of telecoms infrastructure. Laying new ducted fibre costs of the order of high tens or hundreds of pounds per metre when all relevant costs are considered, and certainly more in busy locations where opportunity costs and wider economic impacts are measured. If better connectivity can be delivered to people at a lower price, as a result of telecoms companies and infrastructure owners being able to understand available assets, and gain permission to make use of these, there could also be significant social benefit – this could likely be quantified by work by DCMS and Ofcom around the value of connectivity. Moving to “dig once” and being able to leverage existing infrastructure could be a real help in speeding up roll-out of connectivity. The energy sector is likely to face similar challenges that will drive this – they need more connectivity to data networks to de-carbonise their networks and support electric vehicle charger roll-out, but this will be more costly than they can afford to invest at this current time, with pressures on bill-payers at an all-time high. Anything we can do to make it easier for digital connectivity to reach the locations needed to support the energy transition, and reach rural homes, businesses, and communities, using existing infrastructure, is likely to be hugely valuable. Where energy network capacity is reached already, being able to get resilient and reliable communications to areas more cheaply will directly help reduce the impact on the public and bill-payers, as active network management technology (underpinned by spatial intelligence of the energy network) can help to better utilise existing energy network assets.

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

International standards participation and coordination is key, but this needs to be properly organised by Government, since standards are highly political, with complex interest groups present. The UK has historically not made the most of the opportunity to present a coordinated single view to international standards bodies. The UK Telecoms Data Taskforce (which I am the deputy chair of, and which the Geospatial Commission is represented on) is a good example of an effective collaboration which shows how industry, Government, Academia and others can work together on a non-competitive, non-commercial, voluntary basis, to help Government to deliver on its goals, and understand the opportunities and possibilities to do things better.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?
Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):
Scotland

Q17. What is the name of your organisation?

Q18. What is your role within the organisation?

Q19. How many people work for your organisation?

Q20. What best describes the industry that you or your organisation is involved in:

Individual Response (12)

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

In 2018 the Open Data Institute published a report on geospatial reference data providing evidence for the following trends at a global level:
● The increasing trend of government mapping agencies publishing geospatial reference data as open data
● That non-government actors, such as businesses and communities, were becoming more important in collecting and maintaining geospatial data
● The growth in new data collection methods, such as satellites and LiDAR systems
● Continuing advances in analytics and extraction techniques, such as AI/ML models
● That the growth of digital services would see an increasing amount of linkage between geospatial reference data and people
● That some of the most accurate mapping data was now held within commercial organisations and that their services would see increasing use
Although the UK's mapping agencies have not kept pace with other countries in publishing open data, the rest of the trends apply to the UK as much as they do other countries. We suspect that the growth in awareness of the concept of "digital twins" may also have had an impact at the UK level.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

We anticipate that the growth of open and collaboratively maintained geospatial reference data, such as in the ecosystem surrounding OpenStreetMap will have the biggest impact in the next five years. This ecosystem includes governments, communities, startups and large global firms like Facebook, Apple, Amazon, and Microsoft.
As the UK's geospatial agencies are not currently embracing open data at the same pace as most other high-income countries, then effects of this trend are likely to be different within the UK than they will be elsewhere.
It seems likely that the result of this trend is that the UK will see greater use of alternative geospatial reference data created within commercial organisations (such as What3Words or Google), with a corresponding decrease in the share of usage of official geospatial reference data created by the UK's national agencies.
This increase in dominance of commercial mapping companies will have an impact on the ecosystem and on the critical data infrastructure that people rely on in their day-to-day lives.
The impacts are varied and complex, for example a private sector firm could:
● decide to stop providing high-quality reference data in unprofitable parts of the market, or country, leaving places or people underserved. A public sector organisation delivering public services will have differing incentives when faced with such a challenge.
● use a dominant position in the geospatial reference data market to provide it with a unfair advantage in other market segments, this could hinder effective competition and create worse outcomes for people and society. The 2019 Furman Review recommended greater data openness as one way of overcoming this kind of competition issue.

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Compared to other data value chain frameworks, specifically the GSMA data value chain and the data value chain used by the OECD's digital government team, the Geospatial Commission's framework misses a few activities.

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Data generators: geospatial reference data is collected through a range of non-geospatial services with input from humans, devices and systems. For example logistics firms collect addresses from their users, while sports apps and devices - such as Strava and Garmin - collect information about places.
Data exchange: geospatial reference data is packaged and traded in a number of different ways. For example the Ordnance Survey, the Royal Mail, and a number of other private sector firms sell a range of datasets derived from geospatial reference data produced by the public sector.
Regulatory bodies: the data value chain misses the role of regulation and regulatory bodies in supporting the data value chain, for example the INSPIRE and RoPSI regulations, the Information Commissioner's Office, and a wide range of sectoral regulations and regulators.

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Supporting innovation and emerging technologies

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?

Other (please specify)

The main blocker is poor accessibility due to a combination of the cost of access and licensing for geospatial reference data that is created by the public sector. The UK differs from most other high-income countries in not making this data available as open data.
This accessibility issue stems from the business model that the central government has mandated for the UK's national mapping agencies, i.e. that they should generate direct revenue by selling data, rather than maximise economic and social impact by providing access to data.
These accessibility issues affect interoperability and reusability. This manifests in issues such as the low usage of UPRNs (Unique Property Reference Numbers) across both public and private sector organisations. UPRNs are identifiers that could provide significant interoperability benefits.
UPRNs themselves are highly accessible but the UK's address-UPRN mapping tables are only available for a fee and with restrictive licensing conditions. This has contributed to low UPRN adoption rates with no visible plan to understand and address the issue.
Meanwhile the restrictive licensing conditions and uncertainties caused by the grey areas in derived database rights, hinder reusability. Organisations are often unsure whether they can reuse geospatial reference data and for what purposes they could reuse it for. This particularly affects business innovation with geospatial reference data.
Finally, we would highlight collaboration and maintenance. In our research around address data we have heard multiple stories of people and businesses struggling with incomplete and inaccurate address data, but with no clear path to resolving the issues. This indicates that there are specific issues around responsibility and accountability within the address data ecosystems, but it also highlights a lack of a collaborative approach to improving data quality across the broader geospatial reference data ecosystem.

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?

More collaborative ecosystems - such as OpenStreetMap, or those generated by the real-time feedback loops within platforms like Google Maps and Waze - can make it easier to resolve such problems as they provide a greater number of methods for issue resolution.

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years?

Other (please specify)

Prioritising in this manner does not seem helpful. Geospatial reference data should be useable across a wide range of technologies and business domains. Each of these technologies, and domains, contains a wide range of overlapping geospatial reference data use cases in a number of sectors. These Technologies will evolve rapidly over the next five years.
Rather than prioritising a particular technology, or technological domain, we recommend that the Geospatial Commission identify problems that are relevant to society and the economy and limit its own work to ensuring that geospatial reference data is available, at an appropriate quality, for geospatial reference data users who are tackling those problems.
For example, this might mean ensuring that there is free and openly available geospatial reference data available for use in house planning and development, health services, public procurement, or tackling economic crime.

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Publishing the UK's geospatial reference data under an open licence - with a comprehensive national dataset available from an appropriate public body that has a statutory duty to make the data available and is funded by central government to do so - would be the most transformational step that could be taken. Most other Northern and Western European countries are moving in this direction as they have determined that the economic, social and environmental benefits outweigh the costs. This work typically occurs within their digital government transformation programmes.
To take just one dataset and one country, Denmark saw a 30-to-1 financial benefit-to-cost ratio when it opened up address data.
We are aware that parts of the UK government disagree with this step. Unfortunately the reasoning and evidence behind their disagreements are not in the public domain.
In 2016 the UK Government spent up to £5m exploring options for an open address register. The information about the benefits and costs of such a register that was collected during this project has not been made publicly available.
The Geospatial Commission has informed us that while preparing the 2020 Geospatial Strategy it did not assess the potential social and economic benefits of such a step, or collect information about the volumes and type of geospatial-related issues that affect citizens when using public services. Collecting and publishing the evidence held by the government w

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We already work on this awareness. If the UK's geospatial reference data was more accessible, interoperable and reusable then we would raise more awareness of the value of geospatial.

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

The world's most impactful collaboration to deliver geospatial applications is the OpenStreetMap ecosystem. The OpenStreetMap Foundation is legally based in the UK, but it acts and operates globally and has millions of contributors including individuals, communities, governments, startups and global businesses. We recommend that the Geospatial Commission engage with the OpenStreetMap community to understand the drivers behind this success and how they could either emulate it within the UK or join with the global OpenStreetMap ecosystem.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Q17. What is the name of your organisation?

We are a group of individuals.

Q18. What is your role within the organisation?

We all hold the same role.

Q19. How many people work for your organisation?

<10

Q20. What best describes the industry that you or your organisation is involved in:

Information and communication.

North Sea Authority – Individual Response

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

use of peoples' geospatial locations to aid tracking COVID. Use of locational services to track other services (location of delivery / location of taxi etc.). Greater use of spatial data in search results.

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Far greater ability to track anything and everything (locations anywhere (including offshore UKCS)). Use of data to help supply chain consolidate transportation requirements (reduced vehicle use / positive environmental impact / reducedcosts)

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Data Quality is likely included in 'data management' - suggest that data quality is specifically mentioned. Huge amounts of work will be required in order for existing data to be utilised effectively. Intergration of data from various sources will present further challenges, do 'data definition' need to be part of data quality. The maintenance (keeping UpToDate) will be a further challenge)

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

We can reduce costs to UK businesses. We make them more efficient, effective. safer, cleaner etc. We will increase productivity. Digitalisation of the economy with introduce efficiencies and make the UK an attractive place to do business

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Improved infrastructure management (water / telecoms / power / road building and repair) + Improvements in supply chain. From producers / transportation / consumers. Basically, everything we do that have a spatial element working more effectively

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We are doing it - we are publishing huge amounts of spatial data that was not previously disclosed. It is of huge benefit to the sector I work in

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Collaboration with OFGEM / Crown Estate / CES / NSTA on publication of lease data in the UKCS to help seabed usage planning

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Other (please specify):
Interesting this is not multi select. We are located in London and Scotland

Q17. What is the name of your organisation?

North Sea Authority

Q18. What is your role within the organisation?

Head of Data Services and Compliance

Q19. How many people work for your organisation?

50 - 249

Q20. What best describes the industry that you or your organisation is involved in:

Other (please specify):
Oil & Gas and Carbon Storage

The University of Edinburgh / AGI Scotland – Individual response

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

Increased data availability particularly free data from the likes of OpenSteetMap, and government (e.g. Scottish Govt LIDAR), but also technology and the plethora of applications (inc smartphone apps) which use geospatial data and technologies, together with consumer expection of efficiencies from by this technology

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

Skills shortage (traditional entry to the profession via masters programmes is way down due to lack of funding, nothing in colleges building apprenticeship schemes etc, no signposting of this as a career in schools. Novel and diverse data, increasing adoption of WMS and associated technologies, application fusion with data science, freely available government data in a consumable form

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

Too much emphasis on data, need more on consumable and user-facing services; data storage, management and linking (via comprehensive gazetteers) are key

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Build a data discovery service (UK has missed opportunities from askGIraffe, GIgateway, location.data.gov.uk. Funding awareness materials for schools and training in colleges / universities; THERE WILL BE A DIRE SKILLS SHORTAGE UNLESS GOVT TAKES ACTION HERE

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

There is much more which can be done in health / NHS in terms of gaining efficiencies, improving services; integrated local and national services; housing; energy / homr renewable energy;

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

Contribute to highlighting importance / raising awareness of the opportunities and challenges of geospatial to the data science community; career opportunities in schools;

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

Remembering there are different organisations and institutions in Scotland there are many possibilities. Our track record for international collaboration has been poor, especially since brexit.

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Other (please specify):
This is a personal response, but representing the views distilled within an academic institution and industry association

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

Scotland

Q17. What is the name of your organisation?

The University of Edinburgh / Association for Geographic Information in Scotland

Q18. What is your role within the organisation?

Senior Lecturer in Geographical Information / Chair AGI-S

Q19. How many people work for your organisation?

Not applicable

Q20. What best describes the industry that you or your organisation is involved in:

Education

UK Hydrographic Office – Individual Response

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

technological advances allowing even bigger datasets to be collected and used

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

even more computing power

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

seems like a sensible categorisation

Q4. How integral is location data to your or your organisation's activities? Select one from the following list

Core to what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select "Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Core to what we do
Data transformation, processing and systems	Core to what we do
Data analysis and visualisation	Core to what we do
Application of data	Core to what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

Access to training courses

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

-

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

outreach in local community

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

government agencies working together

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South West

Q17. What is the name of your organisation?

UK Hydrographic Office

Q18. What is your role within the organisation?

Data Scientist

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:
Public administration and defence; compulsory social security

University of Plymouth - Individual Response

Changing context

Q1. Which changes or trends over the last five years do you think have had the biggest impact on the use of location data (e.g. market conditions, consumer behaviour, technological advancements)?

technological advancements in open data

Q2. Which changes or trends do you anticipate having the biggest impact on the use of location data in the next five years?

I hope, an open API to postcode data to support businesses develop services to the doorstep

Unlocking innovation across the geospatial value chain

Q3. Do you have any comment on this characterisation of the ecosystem, and is there anything you would add, remove or change?

the characterisation neglects 'data ownership' which imposes significant barriers between each layer

Q4. How integral is location data to your or your organisation’s activities? Select one from the following list

Part of what we do

Q5. Which section(s) of the data value chain does your organisation operate in? For each section of the value chain select “Core to what we do / Part of what we do / Not part of what we do"

	Organisational importance
Data capture and creation	Part of what we do
Data transformation, processing and systems	Part of what we do
Data analysis and visualisation	Part of what we do
Application of data	Part of what we do

Examples of innovative applications

Q10. Please give specific examples of how the UK public sector / the Geospatial Commission can support innovative applications of location data with these technologies?

provide an open API for postcode and other location data

Applying location data to industry-based challenges

Q11. Please give specific examples of where location data and technology could be transformational in sectors across the economy. What scale of economic, social and/or environmental impact do you anticipate as a result?

Scientific research - cross referencing data from sensors to other datasets supporting energy use and sustainability analyses; SMEs developing novel applications for location data

Awareness of geospatial in other sectors

Q12. How could you or your organisation contribute to driving better awareness of the value of geospatial?

We already publish scientific research using GIS but could do more if there were an open API for postcode and other governmental location data

Q13. Please give specific examples of effective collaboration to deliver geospatial applications, and the type of people or organisations that do, or could, collaborate. (Please include international collaboration if appropriate)

This question is too general to provide a reasoned answer. It would take a whole report to summarise them

Q14. Would you like your response to be confidential? If yes, please give your reason:

No

Q15. Who are you responding on behalf of?

Yourself / a member of the general public

Q16. Where are you / your organisation based? (if you are based outside of the UK, please specify the country):

South West

Q17. What is the name of your organisation?

University of Plymouth

Q18. What is your role within the organisation?

Professor

Q19. How many people work for your organisation?

250+

Q20. What best describes the industry that you or your organisation is involved in:
Education

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Responses to Multiple Choice Questions

Question 6

Below is the summary of responses for Question 6 of the Call for Evidence, as well as a detailed breakdown of the options picked by the respondents. The summary of responses includes those that wish to remain confidential, but the details of those respondents, and their answers, are not included in the subsequent detailed breakdown

Question 6 – Summary of Responses

	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding
High	32	46	47	30	36	30	24	24	57
Medium	44	48	46	50	43	36	40	47	31
Low	32	18	15	27	31	46	46	42	21
Unsure	2	2	5	4	3	2	2	1	2
Not applicable/ Not answered	14	10	11	13	11	10	12	10	13

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Question 6 – Detailed Responses

Private Companies

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
1Spatial	High	Medium	High	Medium	Low	Medium	Not applicable	Not applicable	Not applicable	Data Quality - Q-FAIR
Airbus	Low	Medium	Low	Low	Low	Low	Low	Low	High	
Built AI	High	High	Medium	Low	Medium	High	Low	Low	Medium	Convincing stakeholders to provide/share data, ie guaranteeing privacy while showing benefits of aggregation and analysis
Business Navigators Ltd	Medium	Medium	High	Medium	Low	Low	Medium	High	High	-
Carto DB	High	High	Medium	Medium	Medium	Low	Medium	Medium	Medium	-
Costain	Medium	High	Medium	Medium	High	Low	Medium	Medium	Unsure	-
Cyient	Medium	Medium	High	High	High	High	Medium	High	Medium	-
Databricks	Low	Low	Low	Low	High	Medium	Medium	Low	Low	-
Energy Networks Association	Medium	Medium	Medium	Medium	Medium	High	Medium	Medium	Medium	-
EOLAS Insight Ltd	Medium	Medium	Low	Low	Low	Low	Medium	High	High	Size of datasets and ability to process them (although this may fall under accessibility)
Esri UK Ltd	Low	Low	Low	Medium	High	Medium	Medium	Low	High	-
FISH Digital Forensics	Low	Low	Low	Low	Medium	High	Medium	Low	High	-
Fugro	Medium	High	High	High	Medium	High	Medium	High	High	-
Geollect	Medium	Medium	Medium	Medium	Medium	High	Low	Low	Medium	-
GMV	Low	Low	High	Low	Low	Low	Medium	Medium	High	GMV sees some additional blockers in relation to: data fusion (H), preservation of content (H), authentication and integrity of location data (VH)
ICEYE	Not applicable	Not applicable	Not applicable	Not applicable	High	Low	High	High	High	Lack of governmental anchor customer to purchase services on national level
Idox	Medium	High	Medium	Low	Medium	Medium	Medium	Medium	High	Lack of common data standards across local government, patchwork of open data on offer from local government making it difficult to use consistently at an aggregated level
Inakalum UK Ltd.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Low	Low	Low	High	-

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Private Companies (Continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
Locatum Limited	High	High	Medium	Low	High	Low	Medium	Medium	Low	"price" or "cost" is often cited as a barrier and more effort needs to be made by stakeholders across the ecosystem to illustrate value (in all data) in part as a push back against datafication; for instance, Tesco now ascribe value to data through differential pricing depending on whether or not you have a clubcard; GC should be an advocate for the value that is added across the data value chain
Loquis	Medium	Medium	Unsure	High	Medium	Medium	Low	Low	High	-
Manchester Geomatics	Medium	Medium	High	High	Medium	Low	High	High	High	-
one.network	Low	Low	Medium	Medium	Medium	High	Low	Low	Medium	-
Optimal Cities Ltd	Low	Medium	Medium	Medium	Low	High	Low	Low	Low	-
Oracle Corporation UK	Not applicable	Medium	Low	Low	High	Low	Not applicable	Medium	Not applicable	-
Orbit Group	Medium	Medium	High	Low	High	High	Low	Low	Medium	Data Currency & Completeness
Orbital Insight	High	Medium	Low	Low	Medium	High	Low	Medium	Medium	-
Placecube	Medium	High	High	High	Medium	Medium	High	High	High	-
Ricardo	Low	Medium	Low	Medium	Low	High	Low	Medium	Medium	Licensing rules on things like OSM maps for example are tricky to navigate
Satellite Applications Catapult	Medium	Medium	Medium	Low	Low	Low	Low	Low	Low	-
Search Acumen	Medium	High	High	High	Low	Low	Low	Low	Low	-
Skanska UK Infrastructure	High	High	High	High	High	Low	High	Medium	High	The education of digital geospatial and how it is captured, processed and reapplied in the real world. Beyond BIM models and non geolocated bling.
Streetwave Ltd	Low	Low	Low	Low	Medium	Medium	Low	Medium	High	-
Streetwise Maps	High	Medium	Medium	High	High	High	Low	Low	Low	-
Sun Spiral Innovation	High	High	Medium	Medium	Low	Medium	Low	Low	High	-
Tensing	High	Medium	High	Medium	High	High	Low	Low	Medium	-
Teragence	Low	Medium	Medium	Low	Medium	Medium	Medium	Low	Medium	-

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Private Companies (continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
TravelAi Ltd	High	High	High	Medium	Low	Low	Low	Medium	High	The NAPTAN database is a great example and template of how the OZEV public EV charging registry should be run. It is vital that the location, owner, speed, connector types and payment type all become public commons/open source data so SME and startups can be free to innovate around this crucial dataset.
Turley	High	High	High	High	Medium	Medium	Medium	Low	Low	N/A
Univrses AB	Low	Low	Medium	Low	Medium	High	Medium	Medium	Medium	-

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Non-Government Organisations and Industry Associations

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
Centre for Seabed Mapping (CSM)	Low	Medium	Medium	Medium	Medium	Low	Medium	Medium	High	Low quality of data. Data validation resource heavy. Additional funding required to match requirements for seabed mapping data and products. Collaboration across the geospatial community key. A key factor that limits availability of data is the lack of legislative requirement that all data will be made freely available to the Data Archive Centres. Providing data in an accessible format to an unskilled end user without specialist software is often a key blocker.
Connected Places Catapult	Medium	High	High	Medium	Low	Medium	Medium	Low	High	
GeoPlace	Low	Low	High	Medium	Low	Low	High	Medium	Medium	Appreciation of socio-economic value of government and private sector geospatial data to the growth of the economy.
GeoPlace LLP	Low	Medium	High	Medium	High	High	Low	Low	Medium	-
Northfield Community Partnership	Medium	Medium	Medium	Not applicable	High	High	High	High	High	-
Open Geospatial Consortium (OGC)	High	High	High	High	Low	Low	Low	Medium	High	-
OSGeo:UK	Medium	Medium	High	High	High	Medium	Low	Low	High	-
Royal Geographical Society (with IBG)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	High	High	Not applicable	We advocate for the value of geospatial insights. We support the pipeline of skills development, from schools, through university (and other pathways) into professional practice. We support professionals using geospatial data, through professional development, recognition and representation.
Royal Institution of Chartered Surveyors (RICS)	Medium	Medium	High	Medium	Medium	Low	High	Medium	Medium	-
Sustainability First	High	High	High	High	High	High	Unsure	Medium	High	See our Sustainability First PIAG project on 'Access to Smart Meter Data for a Public Interest Purpose' - [Link redacted for publication]

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Non-Government Organisations and Industry Associations (Continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
The Marine Environmental Data and Information Network (MEDIN)	Low	Low	Medium	Low	Low	Low	Low	Low	Medium	The Marine Environmental Data and Information Network (MEDIN) was established in 2008 to improve access to and management of UK marine data. MEDIN's vision is that UK marine data are Findable, Accessible, Interoperable and Reusable (FAIR) and MEDIN provide a range of resources for the UK marine community to achieve that. I have allocated a medium blocker score to areas where I feel MEDIN tools have already made a significant impact. I have allocated a high blocker score to areas where I feel there is still more to do.
The National Oceanography Centre	Medium	Medium	Medium	Medium	Low	Low	Low	Medium	Medium	-

Academic Institutions

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
Consumer Data Research Centre University of Leeds	Medium	High	High	Medium	High	High	Medium	Medium	High	
EDINA, University of Edinburgh	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	High	-
The Alan Turing Institute, Urban Analytics Programme	Low	High	Medium	Medium	Low	High	Low	Low	High	-

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Geo 6 Partners

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
British Geological Survey	Low	High	Medium	Low	Medium	Low	Low	Medium	Low	n/a Legacy datasets - for which data access conditions are not properly attributed or understood, meaning these valuable data sources have to be excluded from geospatial modelling
HMLR	Medium	Medium	Medium	Medium	Low	Low	High	High	High	
Ordnance Survey	high	Medium	High	medium	Low	Low	High	High	High	Licensing and data management
The Coal Authority	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	-
UK Hydrographic Office (UKHO)	Medium	Medium	High	High	Medium	Low	Medium	Medium	Low	• Quality of data, it's accuracy and precision. • Data sharing with partners and collaborators is challenging and is usually done via extract rather than continuous data sharing. This leads to patchwork data, with varying permissions/IP, all of which must be managed to create a cohesive dataset. • Business cases for building geospatial services are not well understood. • Data assurance (distinct from data quality) – this affects UKHO's contingent liability and risk as materials produced by UKHO are required for compliance.

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Public Bodies

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
Department of Agriculture, Environment and Rural Affairs (DAERA)	Low	Low	Low	Medium	Low	Medium	Low	Medium	Low	-
Devon and Cornwall Police	Low	Medium	Unsure	Low	Medium	Low	Medium	Medium	Low	-
Dorset Council	Medium	Medium	High	High	Medium	Medium	High	Medium	High	-
Dover District Council	High	Medium	Medium	Medium	Low	Low	Low	Low	High	-
Historic Environment Scotland	Low	Low	High	Medium	Medium	Low	Low	High	High	Spatial data is widely used across Historic Environment Scotland (HES) with different parts of the organisation having specific expertise (e.g. our survey and publications teams are strong in their given areas. HES also has a lead role in championing the historic environment across academia, the public and private sectors and this area of work lacks the capacity, leadership and vision, through co-ordination, standards setting and training to realise the potential of a wealth of spatial data.
Improvement Service	Medium	High	Medium	Medium	High	Medium	Low	Medium	High	-
Liverpool City Region Combined Authority	Medium	Low	Medium	Medium	High	Low	Medium	Low	High	-
NHS - South Central and West Comissioning Support Unit	Medium	Low	Medium	High	Low	High	High	Medium	Not applicable	-
ONS	Medium	High	High	Medium	High	High	Medium	High	High	
Registers of Scotland	Low	Medium	Medium	Hhigh	Low	Low	Low	medium	Low	Licencing and robust data use and reuse is an ongoing concern.
The Crown Estate	Low	Low	Medium	Medium	High	Medium	Low	Medium	Low	-

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Public Bodies (continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
The Royal Commission on the Ancient and Historical Monuments of Wales. Also part of MEDIN.	Medium	Medium	Medium	Medium	High	Low	Low	Medium	High	-
The Scottish Government	Medium	Medium	Medium	Low	Medium	Low	Low	Low	High	Lack of alignment of geospatial datasets with policy requirements
Torfaen County Borough Council	Medium	Medium	Medium	Medium	High	Medium	Low	Medium	High	-
Welsh Government	Medium	Medium	High	Medium	Medium	High	Medium	High	High	-
Welsh Government	High	High	High	High	Medium	High	Medium	Medium	High	-
Welsh Revenue Authority	Low	Low	Low	Medium	Low	Low	Low	Low	Medium	-

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Individual Responses

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
1Spatial Group Limited - Individual Response	Not applicable	Not applicable	Not applicable	Not applicable	Low	High	Medium	High	Medium	-
Complete Technology Group - Individual Response	Medium	Medium	Medium	Medium	Medium	Low	Medium	Medium	High	Licensing is complicated and expensive
Deliveroo - Individual Response	High	High	High	High	High	Low	Low	Medium	High	-
Home Office - Individual Response	High	High	High	Unsure	Medium	High	Medium	High	Medium	Hosting and processing data (we can't yet host on servers so reliant on large excel spreadsheets) - IT blockers!
Individual Response 1	High	High	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Please see my response to Question 2 about Interactive Maps. An interactive map is useful for both individuals and businesses, especially where residential roads only have house names as opposed to house numbers. It would be helpful if all local authorities were required to provide interactive maps on their websites.
Individual Response 2	Low	High	Low	Low	High	High	Low	Low	High	-
Individual Response 3	High	Medium	Medium	Unsure	Medium	Medium	Medium	Medium	Medium	Integration of datasets
Individual Response 4	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	On behalf of those who would make use I should mention that the PAF (Postcode database) should be opened up for free. This would likely drive a lot of innovation.
Individual Response 5	Medium	High	Medium	Medium	Unsure	Low	Medium	Low	Low	-
Individual Response 6	High	High	High	High	High	Medium	Low	Low	Medium	High PAF fees
Individual Response 7	Low	High	Medium	Low	Low	Low	Low	Low	Low	Cost and difficulty of accessing and using PAF
Individual Response 8	Medium	High	High	Low	Low	Medium	Not applicable	Low	Low	-
Individual Response 9	High	High	High	Medium	High	Medium	High	Medium	High	Lack of "thinking out of the box" on how this data can help economic development and industrial strategy
Individual Response 10	Medium	High	High	High	Medium	Medium	Medium	Medium	High	-
Individual Response 12		High	Medium	Medium						Collaboration

Q6. What are the main blockers for you or your organisation in using location data to achieve your objectives?
Please rate the importance of the following: (high / medium / low)

Individual Responses (Continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
North Sea Authority - Individual Response	High	High	High	High	High	Medium	Medium	Medium	Low	Poor data quality is an issue
The University of Edinburgh / AGI Scotland - Individual Response	High	Medium	Medium	Medium	Not applicable	Low	High	Medium	High	-
UK Hydrographic Office - Individual Response	Medium	Medium	Medium	Medium	Medium	Low	Low	Medium	Medium	-
University of Plymouth - Individual Response	Low	High	Low	High	Low	Medium	Low	Low	Medium	-

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy? Please rate the importance of any additional blockers: (high / medium / low)

Question 7

Below is the summary of responses for Question 7 of the Call for Evidence, as well as a detailed breakdown of the options picked by the respondents. The summary of responses includes those that wish to remain confidential, but the details of those respondents, and their answers, are not included in the subsequent detailed breakdown

Question 7 – Summary of responses

	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding
High	34	39	34	26	38	23	29	26	45
Medium	29	28	29	32	30	29	37	36	23
Low	13	11	12	18	8	20	10	15	9
Unsure	12	12	13	12	12	14	14	13	14
Not answered	36	34	36	36	36	38	34	34	33

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy? Please rate the importance of any additional blockers: (high / medium / low)

Question 7 – Detailed responses

Private Companies

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
1Spatial	-	-	-	-	-	-	-	-	-	Data Quality - Q-FAIR
Airbus	Low	Medium	Low	Low	High	Low	Low	Low	High	Access to Copernicus data in the future could become problematic. Lack of awareness and funding support for UK sovereign EO missions a blocker on uptake. The UK is almost unique amongst its peers in not having a national EO programme. There is the opportunity to support a mission with the objective of supporting the UK's policy areas that are of most concern, for example, maritime surveillance, air quality and smart cities. The UK has the potential to move from being a follower to a leader in this regard.
Built AI	-	-	-	-	-	-	-	-	-	-
Business Navigators Ltd	Low	Medium	Medium	Low	Low	-	Medium	High	High	-
Carto DB	-	-	-	-	-	-	-	-	-	-
Costain	Medium	High	High	Medium	High	Medium	Medium	Medium	High	-
CWMPAS	Medium	Medium	Medium	Medium	High	High	High	High	High	-
Cyient	Medium	High	High	High	High	High	High	High	High	-
Databricks	High	High	High	High	High	Low	Low	Low	Low	Cloud computing skills (HIGH)
Energy Networks Association	Medium	Medium	Medium	Medium	Medium	High	Medium	Medium	Medium	-
EOLAS Insight Ltd	High	Medium	Low	Low	Medium	High	Medium	High	High	-
Esri UK Ltd	Medium	Low	Low	Medium	High	Medium	Medium	Low	High	-
FISH Digital Forensics	-	-	-	-	-	-	-	-	High	-
Fugro	Medium	Medium	Medium	High	High	High	High	High	High	-
Geollect	High	High	High	Medium	Medium	High	Medium	Medium	Medium	-

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?
Please rate the importance of any additional blockers: (high / medium / low)

Private Companies (continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
GMV	Low	Medium	Medium	Low	Low	Medium	Medium	Medium	Medium	GMV considers the loss of access to the EU Copernicus system and the absence of a sovereign Earth Observation capability will limit the UK potential to exploit the market opportunities within geospatial sector. There remains some difficulty in scaling the solutions. When undertaking geospatial analysis there is often a constraint where the results from one geographical area cannot be extrapolated easily to other regions/climates/landscapes. The analytical approach may not be valid. This makes it difficult to scale up the business case. This also offers an opportunity for further R&D as well as creating an opportunity for customized value added services. GMV highlights that modern Position, Navigation and Timing (PNT) systems can now provide positioning at accuracies that are in excess of most mapping and geospatial datasets. There is a drive by the major Global Navigation Satellite Systems (GNSS) to offer global 30cm positioning performances from open signals which are free at the point of use. Access to 30cm accuracy positioning will drive the need for geospatial datasets to keep pace with positioning technology to enable next generation applications to emerge. As an example, next generation “satnav” is moving towards lane guidance (needing 30cm accuracy positioning) and augmented reality for directions. Additionally 5G, BT and WiFi RTT will open up indoor positioning systems. This will drive the need for indoor mapping to keep pace to enable next generation applications.
ICEYE	Low	Low	Low	Low	High	Low	High	High	High	Lack of governmental anchor customer to purchase services on national level

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy? Please rate the importance of any additional blockers: (high / medium / low)

Private Companies (continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
Idox	Medium	High	Medium	Low	Medium	Medium	Medium	Medium	High	Lack of common data standards across local government. Patchwork of open data on offer from local government making it difficult to use consistently at an aggregated level. Costly licences associated with the premium Ordnance Survey datasets (Addresses, OS MasterMap) inhibit commercial opportunities to create value added products and services as well as to maximising the use of geospatial data.
Inakalum UK Ltd.	High	Medium	Medium	Medium	High	Low	High	High	High	-
Locatum Limited	High	High	Medium	Low	High	Low	High	High	Low	-
Loquis	High	High	Medium	Medium	Medium	Low	Medium	Low	Medium	-
Manchester Geomatics	Medium	Medium	Medium	Medium	Medium	Low	Medium	Medium	High	-
one.network	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	-
Optimal Cities Ltd	Medium	Low	Low	Medium	High	Medium	High	High	Low	-
Oracle Corporation UK	-	-	-	-	-	-	-	-	-	-
Orbit Group	Medium	High	High	medium	High	Medium	medium	Medium	Medium	
Orbital Insight	Medium	Medium	Medium	Medium	High	High	High	High	High	-
Placecube	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	-
Ricardo	Medium	Medium	High	Medium	High	High	Medium	Medium	Medium	-
Satellite Applications Catapult	High	High	High	High	Medium	Medium	Medium	Medium	High	-
Search Acumen	-	-	-	-	-	-	-	-	-	-
Skanska UK Infrastructure	Medium	Medium	High	High	High	Low	High	Medium	High	Public organisation not thinking about National data and relying on the good nature in people to share the data, and know where to share the Nationally purchased data. Specific to new construction.
Streetwave Ltd	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	-
Streetwise Maps	High	Medium	Medium	High	High	High	Medium	Medium	Medium	-
Sun Spiral Innovation	-	-	-	-	-	-	-	-	-	This is basically the same question as the last one - very confusing, not sure what to put here!
Telint										
Tensing	High	High	High	Medium	High	High	Medium	Medium	Medium	-
Teragence	Low	Low	Low	Low	High	-	High	Medium	Medium	-

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?
Please rate the importance of any additional blockers: (high / medium / low)

Private Companies (continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
TravelAi Ltd	High	High	High	High	Medium	Medium	Medium	Medium	High	-
Turley	-	-	-	-	-	-	-	-	-	Other blockers include a lack of consistent data and consistency of access to attributes and content across local authority districts. In addition, accessibility via web maps or spatial data feeds could be improved for built environment applications (e.g. local plan representations on behalf of clients.). A specific spatial data barrier we regularly encounter is the lack of consistent and available brownfield land data across English authorities.
Univrses AB	-	-	-	-	-	-	-	-	-	-

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy? Please rate the importance of any additional blockers: (high / medium / low)

Non-government Organisations and Industry Associations

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
Centre for Seabed Mapping (CSM)	Medium	Medium	Medium	Medium	High	Low	Medium	Medium	High	Low quality of data. Data validation resource heavy. Additional funding required to match requirements for seabed mapping data and products. Collaboration across the geospatial community key. A key factor that limits availability of data is the lack of legislative requirement that all data will be made freely available to the Data Archive Centres. Providing data in an accessible format to an unskilled end user without specialist software is often a key blocker.
Connected Places Catapult										
GeoPlace	High	High	High	High	Medium	Low	High	Medium	High	
GeoPlace LLP	-	-	-	-	-	-	-	-	-	-
Northfield Community Partnership	-	-	-	-	-	-	-	-	-	-
Open Geospatial Consortium (OGC)	High	High	High	High	Medium	Medium	Medium	Medium	High	-
Royal Geographical Society (with IBG)	-	-	-	-	-	-	-	-	-	The greatest blockers are the absorptive capacity of individuals and organisations to understand the value of geospatial data and analysis. We need more professionals with 'deep' specialist skills, but we also need broader training, awareness, and use of case studies to illustrate the value that geospatial data can add across sectors, and how this can be achieved. In this context, we believe investment in education is essential, as is the development of new pathways (T-levels. Apprenticeships etc) which are not only geospatial specific but also embed geospatial skills.
Sustainability First	High	High	High	High	High	High	Unsure	Medium	High	See our Sustainability First PIAG project on 'Access to Smart Meter Data for a Public Interest Purpose' - [Link redacted for publication]

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?
Please rate the importance of any additional blockers: (high / medium / low)

Non-Government Organisations and Industry Associations (continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
The Marine Environmental Data and Information Network (MEDIN)	Medium	Medium	High	Medium	Medium	Medium	Medium	Medium	Medium	Skills to use different types of marine data are sometimes siloed and, as marine data are often multidisciplinary, this can be a blocker. In some marine sectors there exists a lack of trust that data will be used responsibly and within the limits of their license. This can sometimes put a blocker on organisations making their location data available to the wider economy.
The National Oceanography Centre	-	-	-	-	-	-	-	-	-	None

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?
Please rate the importance of any additional blockers: (high / medium / low)

Academic institutions

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
Consumer Data Research Centre University of Leeds	High	High	High	High	High	High	High	medium	medium	
EDINA, University of Edinburgh	-	-	-	-	-	-	-	-	-	-
The Alan Turing Institute, Urban Analytics Programme	-	-	-	-	-	-	-	-	-	Commercialisation, data ownership/custody of data, ethics and privacy. In order to unlock the data to maximum advantage it will be important to continue to pay significant attention to questions of ethics, privacy and confidentiality in the management of data, and to questions such as transparency and algorithmic bias in the way that they are processed and structured. Care should be taken to ensure that members of the geospatial data community are fully connected to the relevant national bodies such as the Ada Lovelace and Centre for Data Ethics and Innovation. The Alan Turing Institute is also well placed to progress links from geospatial technologies to safe and ethical AI, and to online harms, which are both specialisms of the Turing. Difficulties in access to commercial data has the potential to continue to impede academic research and business innovation with geospatial data e.g. in relation to telephony and social media.

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?
Please rate the importance of any additional blockers: (high / medium / low)

Geo 6 partners

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
British Geological Survey	-	-	-	-	-	-	-	-	-	-
HMLR		High	Hgih						High	
Ordnance Survey	Medium	Medium	Medium	Low	High	Low	Low	Low	medium	Risk and legal liability concerns. E.g. GNSS used for CAV within the UK SBAS programme
The Coal Authority	-	-	-	-	-	Medium	Medium	Medium	Medium	-
UK Hydrographic Office (UKHO)	Medium	High	Medium	High	High	Medium	Medium	Medium	Medium	• Quality of data – bad data can prohibit or delay processing of good data • Data assurance (distinct from data quality) – this affects UKHO's contingent liability and risk as materials produced by UKHO are required for compliance.

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy? Please rate the importance of any additional blockers: (high / medium / low)

Public Bodies

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
Department of Agriculture, Environment and Rural Affairs (DAERA)	Medium	Medium	High	Medium	Medium	Medium	Medium	Medium	Medium	Skills to use different types of marine data are sometimes siloed and, as marine data are often multidisciplinary, this can be a blocker. In some marine sectors there exists a lack of trust that data will be used responsibly and within the limits of their license. This can sometimes put a blocker on organisations making their location data available to the wider economy
Devon and Cornwall Police	Low	Low	Unsure	Low	Medium	Low	Low	Medium	Low	-
Dorset Council	High	High	High	High	Unsure	Unsure	Unsure	Unsure	High	-
Dover District Council	High	Medium	Medium	Medium	Low	-	High	High	High	-
Historic Environment Scotland	Low	Low	High	Medium	High	Low	Medium	High	High	The need to raise awareness of the benefits for and challenges of geospatial science at senior level across the historic environment. The lack of a thematic spatial data infrastructure, embracing the standards and specifications, management and publication is a fundamental blocker. Without the coordination and infrastructure to realise the potential of primary data, created by the private sector and academia, the long term value of that data cannot be realised beyond the short term goal of project delivery.
Improvement Service	High	High	High	High	High	High	High	High	High	-
Liverpool City Region Combined Authority	High	High	Medium	Medium	High	Low	High	High	High	-
NHS - South Central and West Commissioning Support Unit	High	Medium	Low	High	High	Medium	High	High	Medium	-
ONS										
Registers of Scotland	Medium	Low	Medium	High	Medium	High	Medium	High	High	
The Crown Estate	-	-	-	-	Medium	-	Medium	High	-	-

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy?
Please rate the importance of any additional blockers: (high / medium / low)

Public Bodies (continued)

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
The Royal Commission on the Ancient and Historical Monuments of Wales. Also part of MEDIN.	Low	Medium	Medium	Low	Medium	Low	Low	Low	Medium	Skills to use different types of marine data are sometimes siloed and, as marine data are often multidisciplinary, this can be a blocker In some marine sectors there exists a lack of trust that data will be used responsibly and within the limits of their license. This can sometimes put a blocker on organisations making their location data available to the wider economy.
The Scottish Government	Medium	Medium	Medium	Low	Medium	Low	Low	Low	High	The cost of EO data
Torfaen County Borough Council	Medium	Medium	Medium	Medium	High	Medium	High	High	Medium	-
Welsh Government	Medium	Medium	Medium	Medium	Medium	Medium	High	High	High	-
Welsh Government	-	-	-	-	-	-	-	-	-	Skills to use different types of marine data are sometimes siloed and, as marine data are often multidisciplinary, this can be a blocker In some marine sectors there exists a lack of trust that data will be used responsibly and within the limits of their license. This can sometimes put a blocker on organisations making their location data available to the wider economy. The Marine Environmental Data and Information Network (MEDIN) was established in 2008 to improve access to and management of UK marine data. MEDIN's vision is that UK marine data are Findable, Accessible, Interoperable and Reusable and MEDIN provide a range of resources for the UK marine community to achieve that.
Welsh Revenue Authority	Medium	Low	Low	Medium	Medium	Medium	Medium	Medium	Medium	-

Q7. Are there any additional blockers, beyond those you have identified in the previous question, that prevent the application of location data across the wider economy? Please rate the importance of any additional blockers: (high / medium / low)

Individual responses

Organisation name	Findability of data	Accessibility of data	Interoperability of data	Reusability of data	Lack of awareness and/or difficulty communicating about location data	Privacy laws and/or ethical considerations for the use of location data	Geospatial skills (e.g. surveying, GIS)	Wider data skills (e.g. data science)	Funding	Other (please specify)
1Spatial Group Limited - Individual Response	-	-	-	-	-	-	-	-	-	No additional blockers
Complete Technology Group - Individual Response	-	Unsure	-	-	-	-	-	-	-	-
Home Office - Individual Response	High	-	-	-	-	-	-	-	-	Key challenge for HMG is the fact data streams may change of be cut off in an arms race between privacy controls vs market. Any HMG contract should be short term (annual/2 yrs max - with an emphasis on the supplier finding new data streams to match/boost coverage))
Deliveroo - Individual Response	-	-	-	-	-	-	-	-	-	-
Individual Response 1	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	-
Individual Response 2	Unsure	Unsure	Unsure	Unsure	High	High	Unsure	Unsure	High	-
Individual Response 3	Medium	Low	Medium	Low	Medium	High	Medium	Medium	-	-
Individual Response 4	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	-
Individual Response 5	High	High	Medium	Medium	Medium	Medium	High	Low	Low	-
Individual Response 6	-	-	-	-	-	-	-	-	-	-
Individual Response 7	Low	High	Low	Low	Low	Low	Low	Low	Low	PAF access limits access to vital data especially hindering small businesses
Individual Response 8	Medium	High	High	Medium	High	Medium	Unsure	Low	Unsure	-
Individual Response 9	High	High	High	Medium	Medium	Medium	Medium	Medium	High	-
Individual Response 10	-	-	-	-	-	-	-	-	-	-
Individual Response 11										
North Sea Authority - Individual Response	High	High	High	High	High	Medium	Medium	Medium	High	-
The University of Edinburgh / AGI Scotland	High	Medium	Medium	Medium	Medium	Medium	High	Medium	Unsure	Parallelisation of systems/algorithms for use in high perforance computing
UK Hydrographic Office - Individual Response	-	-	-	-	-	-	-	-	-	-
University of Plymouth - Individual Response	Medium	High	Medium	High	Medium	Medium	Low	Low	Low	-

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Question 8

Below is the summary of responses for Question 8 of the Call for Evidence, as well as a detailed breakdown of the options picked by the respondents. The summary of responses includes those that wish to remain confidential, but the details of those respondents, and their answers, are not included in the subsequent detailed breakdown

Question 8 – Summary of responses

Score	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing
High	69	30	24	41	24	46	58	88	29	18	10	24
Medium	35	33	41	38	38	31	29	19	43	31	18	25
Low	7	38	35	13	37	24	18	7	32	43	47	30
Unsure	5	8	12	15	13	10	7	2	8	17	31	28
Not applicable/ Not answered	8	15	12	17	12	13	12	8	12	15	18	17

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Question 8 – Detailed responses

Private Companies

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
1Spatial	High	Medium	High	High	Unsure	Unsure	High	High	Unsure	Unsure	Medium	Medium	-
Airbus	High	Not applicable	Low	Not applicable	Low	Not applicable	High	Medium	Low	Medium	Low	Medium	
Built AI	High	Medium	Medium	High	Medium	High	High	High	High	Low	Low	Low	-
Business Navigators Ltd	High	Medium	Medium	Low	Low	Medium	Low	High	High	Low	High	Medium	-
Carto DB	High	Not applicable	Low	Medium	Unsure	High	Medium	High	High	Unsure	Not applicable	Not applicable	Cloud Native solutions and analytics
Costain	High	Medium	Medium	High	High	High	Medium	High	Low	Low	High	High	-
CWMPAS	Medium	Medium	Medium	Medium	High	High	High	High	High	High	Medium	Medium	-
Cyient	High	High	Low	High	High	High	High	High	High	High	Medium	High	-
Databricks	High	Low	Low	High	Low	High	High	High	High	Low	Unsure	Not applicable	-
Energy Networks Association	High	High	Medium	High	Medium	High	Medium	High	High	Medium	Medium	Medium	-
EOLAS Insight Ltd	High	Low	Low	Medium	Low	High	High	High	Medium	Low	Low	Medium	-
Esri UK Ltd	High	Low	Medium	High	Medium	Medium	High	High	High	Medium	High	High	-
FISH Digital Forensics	High	Medium	Low	Not applicable	Low	High	High	High	Low	High	Not applicable	High	-
Fugro	High	High	High	High	Medium	Medium	High	High	Medium	High	High	High	-
Geollect	High	Medium	Medium	High	Medium	High	High	High	High	Medium	Low	High	-
GMV	High	High	Medium	High	High	High	High	High	Medium	High	Medium	Medium	-
ICEYE	High	Unsure	Unsure	Unsure	Unsure	Unsure	High	High	Low	High	Low	Low	5G
Idox	Medium	Low	High	High	High	Medium	Medium	High	Low	Low	Low	Low	-
Inakalum UK Ltd.	High	Low	Low	Medium	Low	Medium	Low	High	Low	Low	Low	Low	AI Security; blockchain/distributed ledgers;
Locatum Limited	High	High	Medium	Medium	Medium	High	High	High	Low	High	Low	High	-
Loquis	High	Low	Medium	Low	Medium	Medium	Medium	Medium	Medium	Low	Low	Low	

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Private Companies (continued)

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Manchester Geomatics	Medium	Low	Medium	Medium	Medium	Low	Low	Medium	Medium	Low	Unsure	Unsure	-
one.network	High	Medium	Low	High	Low	High	Medium	High	Medium	High	Low	Medium	-
Optimal Cities Ltd	Medium	Low	High	High	Medium	Medium	High	High	Low	Low	Low	Low	-
Oracle Corporation UK	High	Not applicable	High	Not applicable	Not applicable	Medium	High	High	Not applicable	Not applicable	Not applicable	Not applicable	-
Orbit Group	Low	Low	High	Unsure	Low	Medium	Medium	High	medium	Low	Low	Low	
Orbital Insight	High	Low	Medium	Medium	Medium	High	High	High	Medium	High	Medium	High	-
Placecube	High	Unsure	Low	Medium	Low	Medium	Medium	Medium	Medium	High	Unsure	Unsure	-
Ricardo	High	Low	Low	High	Medium	High	Medium	High	Low	Medium	High	High	-
Satellite Applications Catapult	High	Low	Medium	High	Medium	Medium	High	High	Medium	High	High	High	-
Search Acumen	High	High	Medium	Medium	Low	Low	Medium	High	Low	Low	Unsure	Unsure	-
Skanska UK Infrastructure	Medium	Medium	High	High	High	High	High	Medium	Medium	Medium	Medium	Medium	Precision and Accuracy in the capture of the information in XYZ.
Streetwave Ltd	Medium	Low	Low	Medium	Low	High	High	High	Low	Low	Low	Medium	-
Streetwise Maps	Medium	Medium	Medium	Medium	High	High	High	High	Low	Medium	High	High	-
Sun Spiral Innovation	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	This is back to front. You should be asking about most important problems, not technologies, because they are enablers, not drivers.
Telint													
Tensing	Low	Low	Medium	Medium	Medium	Low	Low	High	Low	Low	Low	Low	ETL tools - the ability to work with geospatial data and manipulate it, load it into different data stores and systems.
Teragence	High	Low	Low	Unsure	Low	High	Low	High	High	Low	Low	Low	-
TravelAi Ltd	High	Medium	Low	Not applicable	Not applicable	Not applicable	Low	High	Medium	Not applicable	Unsure	High	-
Turley	High	Low	High	High	Medium	High	High	High	High	Low	Low	Low	N/A
Univrses AB	High	High	Low	Medium	Low	Low	Low	Medium	Medium	Medium	Low	High	-

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Non-Government Organisations and Industry Associations

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Centre for Seabed Mapping (CSM)	High	High	Low	Medium	Medium	Medium	High	High	Medium	Medium	Unsure	Unsure	Skills to use different types of marine data are sometimes siloed and, as marine data are often multidisciplinary, this can be a blocker In some marine sectors there exists a lack of trust that data will be used responsibly and within the limits of their license. This can sometimes put a blocker on organisations making their location data available to the wider economy.
Connected Places Catapult	High	Medium	High	High	Medium	High	Medium	Low	Unsure	Unsure	Unsure	High	
GeoPlace	High	Not applicable	Medium	Medium	Low	Low	High	High	Medium	Not applicable	Not applicable	Not applicable	-
GeoPlace LLP	Medium	Medium	High	High	High	High	Medium	Low	Medium	Low	Low	Low	-
Northfield Community Partnership	Unsure	Unsure	Not applicable	Unsure	Unsure	Low	Unsure	Medium	Medium	Unsure	Unsure	Unsure	-
Open Geospatial Consortium (OGC)	High	High	High	High	High	High	High	High	High	Medium	Medium	Medium	Uncrewed Systems (UxS) [high]; Application Programming Interface (API) technologies [high]. OGC is particularly keen on the application of geospatial technologies in improving sustainability and responding to climate change. For example, the ILIAD project that OGC is involved in is researching the application of Digital Twins technology to the Ocean. Another example is the CLINT (Climate Intelligence) project that is researching the use of Artificial Intelligence/Machine Learning applications in responding to climate change and improving climate resilience. References: ILIAD,[Link removed for publication]; CLINT,{link removed for publication]

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Non-Government Organisations and Industry Associations (continued)

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
OSGeo:UK	Medium	Medium	High	Medium	Medium	High	High	High	High	Medium	Low	High	-
Royal Geographical Society (with IBG)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	It is our view these technologies, as well as visualisation techniques, will develop over the next five years. This could include application of geospatial for climate, net zero, green finance and other place-based initiatives to stimulate economic growth and reduce inequalities.
Royal Institution of Chartered Surveyors (RICS)	Medium	Medium	Medium	High	High	Low	Medium	Low	Low	Medium	Medium	Medium	-
Sustainability First	High	High	High	High	Medium	High	Unsure	High	Low	Low	Unsure	Unsure	-
The Marine Environmental Data and Information Network (MEDIN)	Medium	Medium	Unsure	High	Medium	High	Medium	High	Medium	Medium	Unsure	Unsure	-
The National Oceanography Centre	Medium	High	Unsure	Medium	Unsure	High	High	Medium	Medium	High	Unsure	High	-

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Academic Institutions

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Consumer Data Research Centre University of Leeds	High	Low	Medium	High	High	High	Medium	High	High	Medium	unsure	low	Visualisation and immersive technologies are a growing priority for CDRC, with recent increased resource allocation in derived data products, including visualisations. We have already acquired data sets that collect location data through and Internet of Things (e.g. wearables, connected vehicles), and developing the size and sensitivity of sensors will continue to help us develop in this way. Edge computing is currently a low priority for CDRC, but this will depend on how it begins to be used in the wider economy.
EDINA, University of Edinburgh	Medium	Low	Medium	Medium	Low	High	Medium	High	Medium	Medium	Low	Medium	-
The Alan Turing Institute, Urban Analytics Programme	High	Low	Low	High	Low	Medium	High	High	Medium	Low	Low	Low	-

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Geo 6 Partners

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
British Geological Survey	High	Low	Medium	Medium	High	Low	High	High	Low	Medium	Low	Medium	-
HMLR	High	High	Medium	Medium	Unsure	Unsure	Unsure	High	Medium	Unsure	Unsure	Unsure	
Ordnance Survey													
The Coal Authority	Medium	Low	Low	Medium	Medium	Medium	High	High	Low	Low	Low	Low	-
UK Hydrographic Office (UKHO)	High	High	Low	High	Medium	Low	High	High	Medium	Medium	Medium	Medium	-

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Public Bodies

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Department of Agriculture, Environment and Rural Affairs (DAERA)	Medium	Medium	Low	High	High	High	High	High	High	Medium	Unsure	Unsure	-
Devon and Cornwall Police	Low	Low	Low	High	High	Medium	Medium	Low	Low	Low	Low	Low	-
Dorset Council	Medium	High	Medium	Low	High	High	High	High	Medium	Unsure	Unsure	Unsure	Open-source - High
Dover District Council	Medium	Low	Low	Low	Low	High	Low	High	Medium	Medium	Low	Low	-
Historic Environment Scotland	Medium	Medium	Medium	High	Medium	Low	High	High	Medium	Low	Unsure	Unsure	
Improvement Service	Medium	Medium	Medium	Medium	Low	High	Medium	Medium	High	Medium	Low	Unsure	-
Liverpool City Region Combined Authority	High	High	High	Not applicable	Low	High	High	High	High	Low	Not applicable	Not applicable	-
NHS - South Central and West Commissioning Support Unit	Medium	Low	Medium	Medium	Low	Low	Low	High	High	Not applicable	Unsure	Unsure	-
ONS	High	Medium	Low	Medium	Unsure	Medium	High	High	Unsure	Medium	High	High	-
Registers of Scotland	Medium	high	Low	Low	Low	Low	Medium	High	Medium	Low	Low	Low	Automation of processing and cloud are our key focuses

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Public Bodies (continued)

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
The Crown Estate	High	Medium	High	High	Medium	Medium	Medium	High	Low	Low	Not applicable	Medium	-
The Royal Commission on the Ancient and Historical Monuments of Wales. Also part of MEDIN.	Medium	Medium	Unsure	Medium	Medium	Medium	High	High	High	High	High	High	-
The Scottish Government	Medium	Low	Medium	Medium	Medium	Medium	High	High	Medium	Low	Medium	Medium	-
Torfaen County Borough Council	Medium	Medium	Medium	Unsure	Medium	High	High	High	Low	Medium	Unsure	Unsure	-
Welsh Government (1)	High	High	Low	Medium	Low	High	High	High	Medium	Low	Low	Low	-
Welsh Government (2)	High	Medium	Unsure	Unsure	Low	Unsure	Medium	High	Medium	Medium	Unsure	Unsure	-
Welsh Revenue Authority	Medium	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	High	Medium	Unsure	Unsure	Unsure	-

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Individual Responses

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
1Spatial Group Limited - Individual Response	High	High	High	High	Medium	High	Low	Medium	Medium	Low	Medium	Medium	-
Complete Technology Group - Individual Response	Medium	Medium	High	High	High	High	Medium	High	Unsure	Unsure	Unsure	Unsure	-
Deliveroo - Individual Response	High	High	Low	Low	Low	Medium	Not applicable	Medium	Low	Low	Low	Low	-
Home Office - Individual Response	High	High	Low	Low	Low	Low	Medium	Medium	Medium	Unsure	Low	Unsure	-
Individual Response 1	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Within the consultation document above Question 8 it is stated: "Advances in technology are creating new market trends and opening up opportunities for the use of location data. The ubiquity of the Internet of Things and sensors are creating new datasets with location attributes and enabling real time insights, including data from wearable and smart technology, connected vehicles and satellites." I understand that the above seems to reflect the way that things are going. However, this sounds somewhat like the George Orwell futuristic novel "1984". It is a while since I have been familiar with that novel however, I recall that there was constant surveillance on all citizens which was horrifying. Naturally, this country would want to avoid becoming a surveillance society, though inadvertently could end up becoming one?

Q8. Which technologies are likely to be the most important for you or your organisation when using or innovating with location data over the next five years? Please rate the importance of the following: (high / medium / low)

Individual Responses (continued)

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Individual Response 2	Medium	Unsure	Unsure	Medium	Medium	Medium	High	Low	Unsure	Unsure	Not applicable	Not applicable	New stuff is always lovely, erm, has anyone finished off and fully delivered teh new stuff from 5 years ago? (I am still using a laptop from 2011)
Individual Response 3	Medium	Low	Medium	Medium	Low	Medium	Medium	High	Medium	Medium	Medium	Medium	-
Individual Response 4	Low	Medium	Medium	Medium	Low	Low	Medium	Medium	Medium	High	Medium	Medium	-
Individual Response 5	Low	Low	Low	Low	Low	Low	Low	Medium	Low	Low	Low	Medium	-
Individual Response 6	High	High	Medium	Unsure	Low	Medium	Low	Medium	Low	Medium	Unsure	Unsure	-
Individual Response 7	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	-
Individual Response 8	Medium	Low	Medium	Not applicable	Medium	Medium	Low	High	Low	Low	Low	High	-
Individual Response 9	Medium	Medium	High	Not applicable	Medium	Low	Low	Low	Unsure	Unsure	Unsure	Unsure	-
Individual Response 10	High	Medium	Unsure	Unsure	Unsure	Unsure	Unsure	High	Medium	Unsure	Unsure	Unsure	-
North Sea Authority - Individual Response	High	Medium	Unsure	Medium	Medium	Medium	Medium	High	Low	Low	Low	Low	-
The University of Edinburgh / AGI Scotland - Individual Response	High	Low	Low	Low	Medium	High	High	High	High	Low	Low	Low	Web services, web delivery systems, dbms, 3D systems, data and WMS/WFS finding aids
UK Hydrographic Office - Individual Response	High	High	Unsure	High	Unsure	High	High	High	Low	Unsure	Unsure	Unsure	-
University of Plymouth - Individual Response	Medium	Medium	Medium	Medium	High	Medium	High	Medium	Medium	Medium	Low	Low	-

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Question 9

Below is the summary of responses for Question 6 of the Call for Evidence, as well as a detailed breakdown of the options picked by the respondents. The summary of responses includes those that wish to remain confidential, but the details of those respondents, and their answers, are not included in the subsequent detailed breakdown

Question 9 – Summary of responses

Score	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing
High	83	43	36	54	28	47	70	64	36	29	23	24
Medium	20	36	39	31	42	31	28	29	44	40	25	31
Low	4	13	12	4	21	16	3	7	16	17	26	19
Unsure	4	13	19	18	15	14	8	7	12	19	32	31
Not answered	13	19	18	17	18	16	15	17	16	19	18	19

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Question 9 – Detailed responses

Private Companies

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
1Spatial	High	Medium	High	High	Unsure	Unsure	High	High	Low	Unsure	Unsure	Unsure	What about data priorities? Technology is an enabler for data
Airbus	High	Unsure	Medium	Medium	Low	Unsure	High	Medium	Low	Medium	Low	Medium	
Built AI	High	-	-	High	-	-	-	-	-	-	-	-	-
Business Navigators Ltd	High	Medium	-	Medium	Medium	Medium	Medium	High	Medium	Low	High	Medium	-
Carto DB	High	Unsure	Medium	Medium	Unsure	High	High	High	High	Unsure	Low	Low	cloud native solutions and analytics
Costain	High	Medium	High	High	High	High	High	High	Medium	Medium	High	High	-
CWMPAS	High	High	High	High	High	High	High	High	High	High	High	High	-
Cyient	High	High	Medium	High	Medium	Medium	High	High	Medium	High	High	High	-
Databricks	High	Low	Medium	High	Low	High	High	High	Medium	Low	Low	Low	-
Energy Networks Association	High	High	Medium	High	Medium	High	Medium	High	High	Medium	Medium	Medium	-
EOLAS Insight Ltd	Medium	Low	High	High	Medium	Medium	Medium	High	Medium	Medium	Low	Medium	-
Esri UK Ltd	High	Medium	Medium	High	Medium	Medium	Medium	Medium	Medium	Low	Low	Low	-
FISH Digital Forensics	High	High	Unsure	Unsure	Unsure	High	High	High	Unsure	High	Unsure	High	-
Fugro	High	High	High	High	Medium	Medium	High	High	Medium	Medium	High	High	-
Geollect	High	High	Medium	High	Medium	High	High	Medium	High	Low	Low	High	-

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Private Industry (Continued)

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
GMV	High	High	Medium	High	High	High	High	High	Medium	High	Medium	Medium	GMV would query whether this is Is it just an issue of economic growth and prosperity or should we also consider the needs of "assured" geospatial datasets to support national security and resilience? Especially given the potential of deep-fake technology to falsify critical geospatial information.
ICEYE	-	-	-	-	-	-	High	-	-	-	-	-	-
Idox													
Inakalum UK Ltd.	High	Unsure	Unsure	High	Medium	High	Unsure	Medium	Medium	Medium	Unsure	Unsure	There is a lot of geospatial data that cannot be harvested or gathered using technology along, such street asset data, so investment in solutions for building geospatial datasets from scratch is very imporant.
Locatum Limited	High	High	Low	High	Medium	High	High	Medium	Low	High	Medium	Medium	-
Loquis	High	Medium	High	Medium	High	High	High	High	High	Medium	Medium	Medium	-
Manchester Geomatics	High	Low	High	High	Medium	Low	Low	High	High	Low	Unsure	Unsure	-
one.network	High	Unsure	High	High	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	
Optimal Cities Ltd	High	Medium	Medium	Medium	High	Medium	High	Low	Low	Medium	High	Medium	-
Oracle Corporation UK	High	-	High	-	-	Medium	High	High	-	-	-	-	Open Geospatial Data will also be key. e.g. [Link removed for publication]
Orbit Group	High	medium	medium	Unsure	Medium	High	High	hhigh	medium	Medium	High	Medium	
Orbital Insight	High	High	High	Medium	High	High	High	High	Medium	High	High	High	-
Placecube	High	Unsure	Unsure	Medium	Unsure	High	Medium	Low	High	High	Medium	Medium	-

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Private Industry (Continued)

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Ricardo	High	High	Medium	High	Medium	High	Low	High	Medium	Medium	High	Medium	-
Satellite Applications Catapult	High	Medium	High	High	Medium	Medium	High	High	Medium	Medium	High	High	The UK is already heavily invested in many of these areas and world leading, but not at the intersection with geospatial.
Search Acumen	High	High	High	High	Medium	Low	Medium	Medium	Low	Low	High	Low	-
Skanska UK Infrastructure	High	Medium	High	High	High	High	High	Medium	Medium	High	Low	Low	Precision and Accuracy in the capture of the information in XYZ in the virtual world and the real world and how to move the data between them in a round world not a flat earth.
Streetwave Ltd	High	Unsure	-	Medium	Unsure	High	High	High	Unsure	Unsure	Unsure	Medium	-
Streetwise Maps	Medium	Medium	Medium	Medium	Medium	High	High	High	High	Medium	Medium	Medium	-
Sun Spiral Innovation	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Question makes no sense. It should be up to the innovators to pick the right tech, not for the "UK" to prioritize.
Telint													
Tensing	Low	Low	Low	Low	Low	Low	Low	Medium	Low	Low	Low	Low	open data portals, consistency in data formats - get the basics right first
Teragence	High	Low	Low	Medium	Low	Medium	High	High	Medium	Unsure	Unsure	Unsure	-
TravelAi Ltd	High	Medium	Low	Low	Medium	Medium	Medium	High	Medium	Medium	High	High	-
Turley	High	Unsure	High	High	High	Medium	High	High	Unsure	Unsure	Unsure	Unsure	N/A
Univrses AB	High	High	Low	Low	Low	Low	High	High	High	High	Low	High	-

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Non-Government Organisations and Industry Associations

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Centre for Seabed Mapping (CSM)	High	High	Medium	High	Low	Medium	High	Medium	Medium	Medium	Medium	Medium	
Connected Places Catapult	High	Medium	High	High	Nedium	High	High	Low	Medium	Medium	Medium	High	
GeoPlace	High	Medium	High	High	High	High	High	High	High	Medium	Low	Medium	-
GeoPlace LLP	High	Medium	Medium	High	High	High	Medium	Medium	Medium	Low	Low	Low	Connected vehicles
Northfield Community Partnership	Medium	High	Unsure	Unsure	Unsure	High	Unsure	High	High	Unsure	Unsure	Unsure	-
Open Geospatial Consortium (OGC)	High	High	High	High	High	High	High	High	High	Medium	Medium	Medium	Uncrewed Systems (UxS) [high]; Application Programming Interface (API) technologies [high].
OSGeo:UK	Medium	Medium	High	Medium	Medium	High	High	Medium	High	Medium	Low	Medium	-
Sustainability First	-	-	-	High	-	-	-	High	-	-	-	-	-
Royal Geographical Society (with IBG)	-	-	-	-	-	-	-	-	-	-	-	-	Technologies are important but so too are skills in their use and uptake.
Royal Institution of Chartered Surveyors (RICS)	High	High	Medium	High	High	Low	Medium	Medium	Medium	High	Medium	Medium	-
The Marine Environmental Data and Information Network (MEDIN)	High	Medium	Unsure	High	Medium	High	Medium	Medium	Medium	High	Unsure	Unsure	-
The National Oceanography Centre	High	High	Unsure	High	Medium	High	Medium	Medium	High	High	Unsure	High	-

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Academic Institutions

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Consumer Data Research Centre University of Leeds	High	High	Medium	High	Medium	Low	High	Medium	Low	Medium	Unsure	Medium	CDRC recognises that automation can lead to freedom, by managing and even speeding up processes previously ascribed to humans. This is why we believe it is of a high priority for the economy, though not CDRC. Visualisation and immersive tech, cloud computing, and the Internet of Things, now appear to be part and parcel of the data landscape in the UK, and we see little need to continue to prioritise their development. Management and development of UK-owned/-managed satellite technology may prove to be important in the wake of shifting global politics. For example, many satellites are maintained by China, and access to these will become difficult should there be any increased tensions between the UK and China. While we recognise quantum computing may be a useful direction in geospatial research, we believe innovation in this area is being led by the private sector and therefore not worth prioritisation by UK Government.
EDINA, University of Edinburgh	High	High	Medium	Medium	Medium	Medium	High	High	Medium	High	High	High	-
The Alan Turing Institute, Urban Analytics Programme	High	Low	Low	High	Low	Medium	High	High	Medium	Low	Low	Low	-

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Geo 6 Partners

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
British Geological Survey	High	Low	Low	High	High	Medium	High	High	Medium	Medium	Medium	Medium	-
HMLR	High	unsure	Unsure	High	High	Unsure	High	High	Unsure	Unsure	Unsure	Unsure	
Ordnance Survey													
The Coal Authority	High	-	-	-	-	-	High	-	-	-	-	-	Better connectivity via (1) Consistent mobile network (4G +) and (2) More reliable universal broadband
UK Hydrographic Office (UKHO)	High	High	Medium	High	Low	Low	High	Medium	Low	Medium	Low	Low	-

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Public Bodies

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Department of Agriculture, Environment and Rural Affairs (DAERA)	High	High	High	High	High	High	High	High	High	High	Unsure	Unsure	-
Devon and Cornwall Police	Low	Low	Medium	High	High	Low	Medium	Low	Low	Low	Low	Low	-
Dorset Council	High	High	Medium	Unsure	High	Medium	High	Medium	Medium	Unsure	Unsure	Unsure	Open-source - High
Dover District Council	Medium	Medium	Medium	Medium	Medium	High	Medium	Medium	High	High	Medium	Medium	-
Historic Environment Scotland	Medium	Medium	Medium	High	Medium	Unsure	High	Medium	Low	Unsure	Unsure	Unsure	-
Improvement Service	Medium	Medium	Medium	High	Low	High	Medium	Medium	High	High	Low	Low	-
Liverpool City Region Combined Authority	High	High	High	Unsure	Low	High	High	High	Medium	Medium	Low	Unsure	-
NHS - South Central and West Commissioning Support Unit	High	Medium	High	Medium	Medium	High	High	High	Medium	Medium	Medium	Medium	
ONS													
Registers of Scotland	Medium	High	Low	Medium	Medium	Medium	Medium	High	Medium	Medium	Low	Low	-
The Crown Estate	High	Low	High	High	Medium	High	Medium	High	High	Medium	Low	Medium	

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Public Bodies (continued)

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
The Royal Commission on the Ancient and Historical Monuments of Wales. Also part of MEDIN.	High	High	High	Unsure	Low	Unsure	High	High	High	High	High	High	-
The Scottish Government	High	Low	Medium	Medium	Medium	Medium	High	High	Medium	Low	Medium	Medium	-
Torfaen County Borough Council	High	High	Low	Unsure	Medium	High	High	High	Medium	High	Unsure	Unsure	-
Welsh Government	High	Medium	Medium	Medium	Medium	High	High	High	High	Medium	Medium	Medium	-
Welsh Government	High	High	Unsure	Unsure	Medium	Unsure	High	High	Medium	Medium	Unsure	Unsure	-
Welsh Revenue Authority	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	-

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Individual Responses

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
1Spatial Group Limited - Individual Response	High	High	Medium	Medium	Medium	High	Medium	Medium	Medium	Medium	Medium	Medium	-
Complete Technology Group - Individual Response	Medium	High	High	High	Medium	High	High	High	High	High	Unsure	Unsure	Develop standards for IoT so they are no so vulnerable to hacking
Deliveroo - Individual Response	High	High	High	-	-	High	-	-	High	-	-	-	-
Home Office - Individual response	High	High	Unsure	High	High	Medium	Medium	High	Medium	Unsure	High	Unsure	-
Individual Response 1	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	I appreciate the need for economic growth. However, I refer to my response to Question 8 about avoiding this country becoming a surveillance society.
Individual Response 2	Medium	High	Low	Medium	Low	Low	High	Medium	Low	Low	Unsure	Unsure	-
Individual Response 3	Medium	Medium	Medium	Medium	Low	Medium	Medium	High	High	High	High	Medium	-
Individual Response 4	Medium	High	Medium	Medium	Low	Medium	High	Medium	High	High	Medium	Medium	-
Individual Response 5	Low	Medium	Medium	Low	Low	Low	High	Low	Medium	Medium	Low	Low	opening the Postcode Address File
Individual Response 6	-	-	-	-	-	-	-	-	-	-	-	-	-
Individual Response 7	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	-

Q9. Which technologies should the UK prioritise development for to provide new opportunities to process and exploit location data for economic growth over the next five years? Please rate the importance of the following: (high / medium / low)

Individual Responses (Continued)

Organisation name	Artificial intelligence/ Machine learning	Automation and robotics	Geo-Building Information Modelling (BIM)	Digital twins	Visualisation and immersive tech (AR/VR/MR)	Internet of Things	Satellite and airborne remote sensing (including earth observation)	Cloud computing	Crowd-sourced data	Miniaturisation of new sensors	Quantum computing	Edge computing	Other (please specify)
Individual Response 8	High	Medium	Medium	Unsure	Medium	Medium	Medium	High	Medium	Low	High	High	-
Individual Response 9	High	High	High	Medium	High	High	High	Low	High	High	High	High	-
Individual Response 10	-	-	-	-	-	-	-	-	-	-	-	-	-
Individual Response 11													
North Sea Authority - Individual Response	High	High	Medium	High	Medium	High	Medium	High	Low	Low	Low	Low	We should focus on the suppply of good quality data (and encourage others [via regulations if needed] to provide the necessary data - how that data is used and with what technology will accelerate and innovate rapidly if the data is available - is is the lack of quality data that is the current constratint
The University of Edinburgh / AGI Scotland - Individual Response	High	-	-	-	-	Medium	Medium	-	High	-	Low	-	DATA FINDING SERVICE / TOOLS !!
UK Hydrographic Office - Individual Response	High	High	Unsure	Medium	Medium	High	Medium	High	Low	Unsure	Unsure	Unsure	-
University of Plymouth - Individual Response	Low	Medium	Medium	Medium	Low	Low	Medium	Low	Low	Medium	Medium	Medium	-

Call for Evidence Responses not relating to the Questions

Open Data Institute

About the ODI

The Open Data Institute (ODI) is an independent, non-partisan, not-for-profit organisation founded by Sir Nigel Shadbolt and Sir Tim Berners-Lee in 2012.

The ODI wants data to work for everyone: for people, organisations and communities to use data to make better decisions and be protected from any harmful impacts. We work with companies and governments to build an open, trustworthy data ecosystem. Our work includes:

- **pilots and practice:** working as a critical friend with organisations in the public, private and third sectors, building capacity, supporting innovation and providing advice
- **research and development:** identifying good practices, building the evidence base and creating tools, products and guidance to support change
- **policy and advocacy:** supporting policymakers to create an environment that supports an open, trustworthy data ecosystem

We believe that:

- Sectors and societies must invest in and protect the data infrastructure they rely on. Open data is the foundation of this emerging vital infrastructure.
- Everyone must have the opportunity to understand how data can be and is being used. We need data literacy for all, data science skills, and experience using data to help solve problems.
- Data must inspire and fuel innovation. It can enable businesses, startups, governments, individuals and communities to create products and services, fuelling economic growth and productivity.
- Everyone must benefit fairly from data. Access to data and information promotes fair competition and informed markets, and empowers people as consumers, creators and citizens.
- People and organisations must use data ethically. The choices made about what data is collected and how it is used should not be unjust, discriminatory or deceptive.
- Everyone must be able to take part in making data work for us all. Organisations and communities should collaborate on how data is used and accessed to help solve their problems.

We have a mixed funding model and have received funding from multiple commercial organisations, philanthropic organisations, governments and intergovernmental organisations to carry out our work since 2012.

Consultation response

This is the ODI's response to the Geospatial Commission's call for evidence on 'Geospatial opportunities across the economy'.

Instead of responding directly to the questions posed in the call for evidence, we have drawn on the ODI's unique evidence base to discuss two themes that we see as important to unlocking the value of geospatial data. These are:

- The importance of open geospatial data as a critical component of national data infrastructure;
- The need for data assurance to increase trust in geospatial data, allowing its full value to be unlocked.

For more detailed responses to the questions posed in the consultation, we would refer readers to the response submitted by Lord Allan and colleagues, and published online here.

Open geospatial data

The ownership and management of the UK's national geospatial data has been consistently fragmented, and campaigns for it to be collected by publicly-owned bodies and made available to the UK taxpayer have been a feature of public debate for over a decade.

Contradictory government decisions have limited availability of some key geospatial assets, which has in turn limited the social and economic value they generate. Address data is a case in point. In 2010, the government announced that postcode data would be available for free, but then included the Postcode Address File (PAF) – a key part of the UK's geospatial data infrastructure – in the 2013 privatisation of the Royal Mail. A 2012 report from the PAF Advisory Board estimated its value to the UK economy to be between £992m–1.32bn each year.

The decision to sell this key part of national data infrastructure has meant that innovators wanting to use this address data in their products or services face considerable legal and financial challenges. Initiatives like Open Addresses attempted to provide an alternative source of geospatial information to encourage innovation but demonstrated that this was not possible without significant investment or government action.

We expect that over the next five years the growth of open and collaboratively maintained geospatial reference data will have a significant impact. By this we include examples such as the ecosystem surrounding OpenStreetMap, which includes governments, communities, startups and large global firms like Facebook, Apple, Amazon, and Microsoft.

As the UK's geospatial agencies are not currently embracing open data at the same pace as most other high-income countries, the effect of this trend could be different within the UK than it will be elsewhere. As a result the UK could see greater use of alternative geospatial reference data created within commercial organisations (such as What3Words), with a corresponding decrease in the share of usage of official geospatial reference data created by the UK's national agencies.

Trusted geospatial data

Applications of geospatial data rely on quality trusted data – both the geospatial data itself, and other data that might be combined with it. Organisations and individuals collecting, using and sharing geospatial data need to be confident that the data in question is fit for purpose.

We believe that the adoption of data assurance products and services should reassure organisations who want to share or reuse geospatial data, and support better data governance practices, fostering trust and sustainable behaviour change.

Data assurance is “the process, or set of processes, that increase confidence that data will meet a specific need, and that organisations collecting, accessing, using and sharing data are doing so in trustworthy ways” . These activities can help to build trust in geospatial data, products and services derived from it, and organisations using it.

Business-to-business (B2B) data assurance, including assurance of geospatial data, is an emerging sector in which rapid growth is expected over the coming years. Research carried out for the ODI by Frontier Economics and glass.ai in 2021 found a nascent but buoyant market of UK business to business data assurance firms and services, with around 900 firms offering data assurance products and services in the UK and more than half of them having been incorporated in the previous 10 years.