Unlocking the power of location.

The UK's Geospatial Strategy, 2020 to 2025.

An introduction to the Geospatial Commission.

The Geospatial Commission was established in 2018 by the government as an independent, expert committee responsible for setting the UK's geospatial strategy and coordinating public sector geospatial activity. Our aim is to unlock the significant economic, social and environmental opportunities offered by location data and boost the UK's global geospatial expertise.

The Geospatial Commission has a mandate and budget to drive and deliver changes by working in partnership with others. This means we:

- **Provide strategic oversight** of the geospatial ecosystem in the UK, setting geospatial strategy, policy and standards.
- **Hold the budget** for the public sector's largest investment in geospatial data.
- **Make targeted investments** in data projects that accelerate innovation and adoption of geospatial data applications.

We have a formal relationship with six partner bodies (the Geo6): British Geological Survey, Coal Authority, UK Hydrographic Office, HM Land Registry, Ordnance Survey and Valuation Office Agency.

Each of these partners will play a central role in the delivery of this strategy – both through the geospatial data they hold and their extensive expertise. Our approach to delivery will be:

- **Use and value driven.** We will prioritise action in areas where there is evidence of the greatest opportunity and impact.
- **Iterative.** We will achieve our vision by adopting new ideas, learning though pilot projects, and monitoring innovation.
- **Whole system.** Technology alone is not enough; leadership, governance, policies, organisations, legal frameworks and skills matter too.
- **Collaborative and open.** Our missions will require collective effort in connecting data, people and systems. Organisations across the nations and regions of the UK, in public, private and third sectors, will play an important role. We will learn from, and work with, other countries.

Geospatial Commission

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"You can't use an old map to explore a new world."

Ministerial welcome.

In our digital world, we are surrounded by data. Information defines who we are and how we interact with the world, as captured by the millions of phones in our pockets and other technology. Innovation is inspired and informed by data, transforming how we live our lives.

The UK has a proud record of innovation. We gave the world the steam engine, the electric motor and the jet engine; railways and Tarmac roads; mass vaccination and penicillin; the theories of gravity and evolution; and we unravelled the structure of DNA. We launched the World Wide Web, sharing information around the globe in a second. Now the government seeks to unleash Britain's potential to lead the world in the data revolution – building on our pioneering expertise in location technology for navigation, trade, and defence.

In 1714, the British government created the Longitude Prize, which led John Harrison to create the first reliable way to determine location at sea. We set the global standards for navigation and timekeeping at Greenwich. We led the world in mapping: establishing an Ordnance Survey to brace for the Napoleonic wars; charting the world's oceans; and creating the world's first geological survey of the rich resources beneath our feet that powered the industrial revolution.

Today, location data is the coal and iron fuelling a new revolution. This government has empowered the Geospatial Commission to unlock the power of location data – equipping our economy to recover and thrive after Coronavirus, and improving the lives of UK citizens.

The creation of a national location data framework with targeted interventions, aligned to the UK's forthcoming national data strategy, will help build economic, social and environmental value.

Rapid technological advances over the last 15 years have put sat navs in cars, maps on our phones, wearable sensors around our wrists and smart devices in our homes, all of which are integral to millions of lives. New and improved technologies are being developed all the time. We will soon get a glimpse of the future – drones being used to map fields, or robots in the street making home deliveries – all making use of geospatial data.

As well as making everyday lives easier, location data and the innovations that spring from it have even greater potential to unite and level up the country – by connecting people, organisations and services. Location data can help us respond to the great challenges of the future such as climate change, as well as tackle the immediate threats we face today.

Indeed, it is already playing an important role in our fight against the Coronavirus, helping to track the spread of the disease, evaluate interventions to slow its spread, and distribute vital medical resources where they are needed most.

Looking ahead, we must ensure we have a clear strategy to harness the huge potential of location data in helping drive the UK's future economic recovery and growth. Location data will be at the fore, empowering and supporting individuals and society. It will support the government to realise its commitments to:

- **Revitalise our infrastructure** – improving our roads, railways and broadband coverage.
- **Level-up communities** and regions left behind by society.
- **Achieve net zero greenhouse emissions** by 2050 by transitioning towards cleaner and more sustainable energy
- **Build a million new homes** to provide affordable housing to the people who need it, where they need it.
- **Prepare the UK for electric vehicles** and autonomous transport.
- **Lead the world** in agricultural technology and land management.

We aim to move quickly. While preparing for the long term, we are also taking immediate action. Today I am announcing:

- **The next phase of our National Underground Asset Programme** (NUAR) that will build on recent pilots in the North East and London to bring together industry utility data. This will allow us to plan infrastructure more effectively, reducing the risk to life, serious injuries and widespread disruption caused when underground pipes and cables are struck by mistake.
- **A commitment to publish new guidelines** for the ethical use of location data and technology – making sure that the benefits which location data can bring to the urgent challenges of today are realised in a way that retains the trust of citizens.
- **An International Geospatial Service pilot** from 2021, to showcase and export UK expertise across the world.

I am grateful to Sir Andrew Dilnot, the Geospatial Commission and their partners for their work to navigate and champion this important agenda.

The UK can and will be at the forefront of scientific and technological innovation, and its practical application in the 21st century. Location data is critical for navigating our new digital world, and for making the UK a better place for all. You can't use an old map to explore a new world.

Lord True CBE
Minister of State

Preface from Sir Andrew Dilnot, Chair of the Geospatial Commission.

A wave of technological change is sweeping through every aspect of our lives, bringing with it a torrent of data. Location-aware devices and connected sensors – the so-called Internet of Things – are now everywhere, giving rise to an abundance of data, in richer and more complex forms than ever before.

The world is starting to see the value in this new resource, including in tackling the threat from the global Covid-19 pandemic. But it is clear that we are only just beginning to harness its power. Data about 'where' (geospatial, or location data) has the potential to underpin huge advances in our digital society, improving our lives and equipping the economy to recover from the effects of Coronavirus.

It can be hard to visualise the extent to which this will change our world. Let me try to make it more concrete:

- **Location data already has a significant impact on our lives.** It tells us about travel disruption, allows us to check the weather before making plans, and helps us find the place we need to be. It tracks deliveries and even shows us how well we're exercising. Our demand for location services has caused new, location-hungry business models to emerge – such as taxi hailing firms, travel planning apps, and location-based search engines which are transforming our cities and connecting communities.

- **In the future, better location data will improve our lives further.** It will guide autonomous vehicles as they drive us home minimising time and impact on the environment. Parcels will be delivered to where we are, not where we live. If we choose, digital advertising will personalise offers because of where we are, where we've been, or where we're going. We will be able to make better decisions on everything from where to build new schools and hospitals, to how to manage precious resources such as land and energy – thereby reducing the impact of climate change and helping the transition to a low carbon economy.

- **Over the longer-term, almost all sectors of the economy will see sustainable productivity gains.** From housing and infrastructure, to retail sales and logistics, the impact of location data will be considerable. Complete 'digital twins' – realistic digital representations of physical systems – will automate and optimise services. Across the globe, a country's location data capability will soon be a key factor in its competitiveness and quality of life.

The Geospatial Commission was set up to take advantage of the significant opportunities that location data and technology offer to the UK. Since the appointment of Commissioners in 2019, the Geospatial Commission has:

- **Completed two successful pilots,** in the North East of England and in London, to test a National Underground Asset Register (NUAR) – a digital map of all underground pipes and cables. A national approach would reduce the risk of asset strikes which endanger life, cause delays, cost money, and disrupt traffic and local economies.

- **Negotiated a £1 billion investment** over 10 years to ensure that Britain's fundamental national location data continues to be world leading and that everyone can have better access to it. This Public Sector Geospatial Agreement (PSGA) will support more effective and efficient public services and encourage innovation and economic growth. Other contracts, that provide access to post code and imagery data, have also been retendered and agreed.

- **Announced that key parts of Ordnance Survey's highly detailed MasterMap will be made completely open**, with the remaining data being made freely available up to a threshold of transactions. This will release an estimated £130 million of economic value each year.

- **Released on open terms for the first time the core location identifiers** – Unique Property Reference Numbers (UPRNs) and Unique Street Reference Numbers (USRN) – that provide a golden thread to link a wide range of datasets together to provide insights that would not otherwise be possible.

- **Funded 10 projects through our crowd-sourcing competition,** encouraging innovative applications of location data that create economic, social and environmental value. Examples include a project to develop an indoor mapping system to navigate complex buildings, a safer and more efficient navigation system for cyclists, and a project to map every tree in the UK to inform urban and rural forestry policymaking.

- **Invested £5 million in a data improvement programme** with our six partner bodies to enhance public sector geospatial datasets. We have developed comprehensive catalogues of location data, a harmonised Data Exploration License, and best-practice guides about linked identifiers.

The national strategy will become a reality with the continued focus of the strong team at the Geospatial Commission and committed investment from the government to enable the delivery of the activities set out in this strategy. We can't do everything at once, so we will prioritise our next investments in areas where there is evidence of the greatest opportunity, and we will measure our impact. We will focus our efforts around four missions:

- **Mission 1:** Promote and safeguard the use of location data.

- **Mission 2:** Improve access to better location data.

- **Mission 3:** Enhance capabilities, skills and awareness.

- **Mission 4:** Enable innovation.

I would like to thank the hundreds of individuals, institutions and businesses that have contributed to the Geospatial Commission's work to date and the development of this strategy. We received over 200 responses to our Call for Evidence and together we are building a new and growing community of practice.

This strategy builds on earlier initiatives across the UK, including areas where Scotland, Wales and Northern Ireland are leading the way, as well as global best practice. We would like to extend particular thanks to the US Federal Geographic Data Committee, the Swedish Lantmäteriet, the Netherlands Kadaster, the Singapore Land Authority, Land Information New Zealand, and Ordnance Survey Ireland as we have learnt much from them. We have closely aligned this strategy with the Integrated Geospatial Information Framework (IGIF) developed by the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) and the World Bank, and the government's forthcoming national data strategy.

Sir Andrew Dilnot,
Chair of the Geospatial Commission

Executive summary.

Data about location, or 'geospatial' data, is the record of what we do, and where we do it. It underpins a modern digital society and offers substantial opportunities for the recovery of the UK economy following the Coronavirus pandemic. It's a field that the UK, as a global leader in the use of location data, is primed to exploit.

The Geospatial Commission has been established as an independent expert committee to advise the government and develop a national strategy that sets out how, together, we can enable the UK to unlock the power of location.

Our vision is that by 2025 the UK will have a coherent national location data framework. Future technologies will be underpinned by data about events occurring at a time and place. Location data will be the unifying connection between things, systems, people and the environment.

Valuable data that currently sits locked in silos will be easy to access and combine securely to create new insights, new services and new businesses that are almost unimaginable today. Innovation across the economy made possible by better location data, skills and tools will help drive economic stability and national productivity. Everyone will feel the benefits of being at the leading edge of the data revolution in our homes, towns, regions and globally. UK expertise will be sought after internationally, and our flourishing location-enabled digital economy will export its knowledge, products and services worldwide.

We already have a number of UK success stories to report – from the response to Covid19, to implementing large scale infrastructure projects. And we can see further exciting opportunities ahead. There is potential across a range of industry sectors and public services including infrastructure, construction, housing, transport, retail, the environment, healthcare and emergency response.

In order to maximise these opportunities, we need to respond to some fundamental technological changes. We identify six trends that are most likely to affect the use of location data. These include the proliferation of cheap location sensors, increased connectivity, cloud computing and the rise of artificial intelligence.

The UK will need a coordinated approach to deliver this transformative vision. The Geospatial Commission's work to date has identified key challenges that the UK must work to overcome – challenges that have resulted in a complex and fractured policy landscape surrounding the UK's geospatial data assets. We have set four strategic missions to address these challenges and deliver a coherent national location data framework for the UK.

Mission 1: Promote and safeguard the use of location data. We need to provide an evidenced view of the market value of location data, set clear guidelines on data access, privacy, ethics and security, and promote better use of location data.

So far we have launched a detailed geospatial data market study, building on evidence from over 200 responses through our Call for Evidence and regular in-depth industry engagement. The next steps include:

- **Publish recommendations for policy interventions** to support growth, competition and innovation, based on our geospatial data market study, by the end of 2020.
- **Publish guidance for measuring** the economic, social and environmental value of location data by 2021.
- **Develop a set of harmonised and machine readable data licences** for the use of public sector location data by 2021.
- **Take an active and considered role in identifying** the high value opportunities and corresponding barriers and incentives to enable more private sector data to be shared to drive economic growth and improve services to citizens and consumers.
- **Provide guidance** on how to unlock value from sensitive location data while mitigating security, ethical and privacy risks.
- **Promote the success** of organisations that use location data, and champion the UK's geospatial interests overseas.

Mission 2: Improve access to better location data. We will streamline, test and scale the development of new and existing location data ensuring it is findable, accessible, interoperable, reusable and of high quality.

So far we have completed two regional pilots for a National Underground Assets Register (NUAR); negotiated a £1 billion investment in public sector geospatial data; announced the opening up of Ordnance Survey's MasterMap, Unique Property Reference Numbers (UPRNs) and Unique Street Reference Numbers (USRN); and invested millions to improve the UK's core geospatial data. The next steps include:

- **Prepare for a national roll-out** of NUAR, which will build on our successful pilots in the North East and London to bring together industry utility data, starting with a regional platform.
- **Improve access to better data** from 2020 that enables house building and improves the house buying and selling process across the UK.
- **Assess how location data can support** the future of mobility and next generation transport networks.
- **Identify how improved access** to better location data can support environmental outcomes.
- **Identify a targeted approach,** such as pilots, to support delivery of a national land use framework.
- **Explore ways to rationalise** the public sector's procurement of Earth Observation (EO) data and services.
- **Work with partners to invest** further in location data quality and access improvements across the public sector.

Mission 3: Enhance capabilities, skills and awareness: To achieve our vision we must develop more people with the right skills and tools to work with location data, across organisations and sectors, to meet the UK's future needs and support global development.

Through our engagement and evidence gathering so far, we have identified three key skills challenges: to meet increasing demand; to put location analytics into mainstream use; and to continue to evolve skills and techniques to keep pace with technological advances. The next steps include:

- **Produce a skills demand study** in 2020 to pinpoint specific sectors and roles that need geospatial skills now and in the future.
- **Convene a skills forum** during 2020 to bring together the full range of relevant industry and public sector representatives to tackle specific skills challenges in a coordinated way.
- **Develop geospatial apprenticeships** for the public and private sectors by 2021, working with employers and professional associations to draw together geospatial, data science, digital and sector expertise.
- **Pilot an International Geospatial Service** in 2021, which will showcase and export UK expertise across the world.

Mission 4: Enable innovation: We will maximise the commercial opportunities for innovation and promote market-wide adoption of high value emerging location technologies.

So far we have funded ten projects through our crowdsourcing competition, encouraging innovative applications of location data that create economic, social and environmental value, and we have published a Future Technologies Review of the commercial opportunities for use of geospatial data in the UK. The next steps include:

- **Establish a Location Data Innovation Programme** in 2020 to ensure that innovative uses of location data feed into existing innovation catalysts across the UK.
- **Support Scotland's first Geospatial Network Integrator** to accelerate the development of an emerging geospatial cluster from 2020, alongside the Scottish Government and Scottish Enterprise, with a view to future roll out in other regions.

What is location data?

We use the term ‘location data’ throughout this strategy as an umbrella term for any data that has a location element. Another term for this, ‘geospatial data’, is well known to specialists and is growing in use internationally. We use these terms interchangeably.

Location data, or geospatial data, is the record of what we do, and where we do it. It tells us where people and objects are in relation to a particular geographic location, whether in the air, on the ground, at sea or under our feet. It includes:

- **Foundational geospatial data:** Information where location is a key feature of its source and or purpose for which it is used.
- **Positional data:** Datasets that describe activity or objects grounded in a particular place.
- **Geospatial identifiers:** Data that provides the means of linking different datasets using location as a common point of reference.
- **Geospatial services:** Higher-level insights and products, often involving layers of various types of location data.

Delivery and monitoring.

We will monitor how these targeted actions generate economic, social and environmental value, and use this evidence to inform our next steps. As technology is developing rapidly, we will stay alert to change, try new ideas, assess impact through pilots and continuously gather evidence of the latest innovations, including from overseas. This approach requires sustained financial support from the government as we seek to develop a location data framework for the UK and implement the necessary practical steps to align incentives for better data access and sharing.

The Geospatial Commission will publish annual plans assessing progress and next steps towards implementation, and a mid-point refresh of this strategy. These will include an up-to-date perspective on the alignment of our six partner bodies (the Geo6), and the core location data they hold, with this strategy.

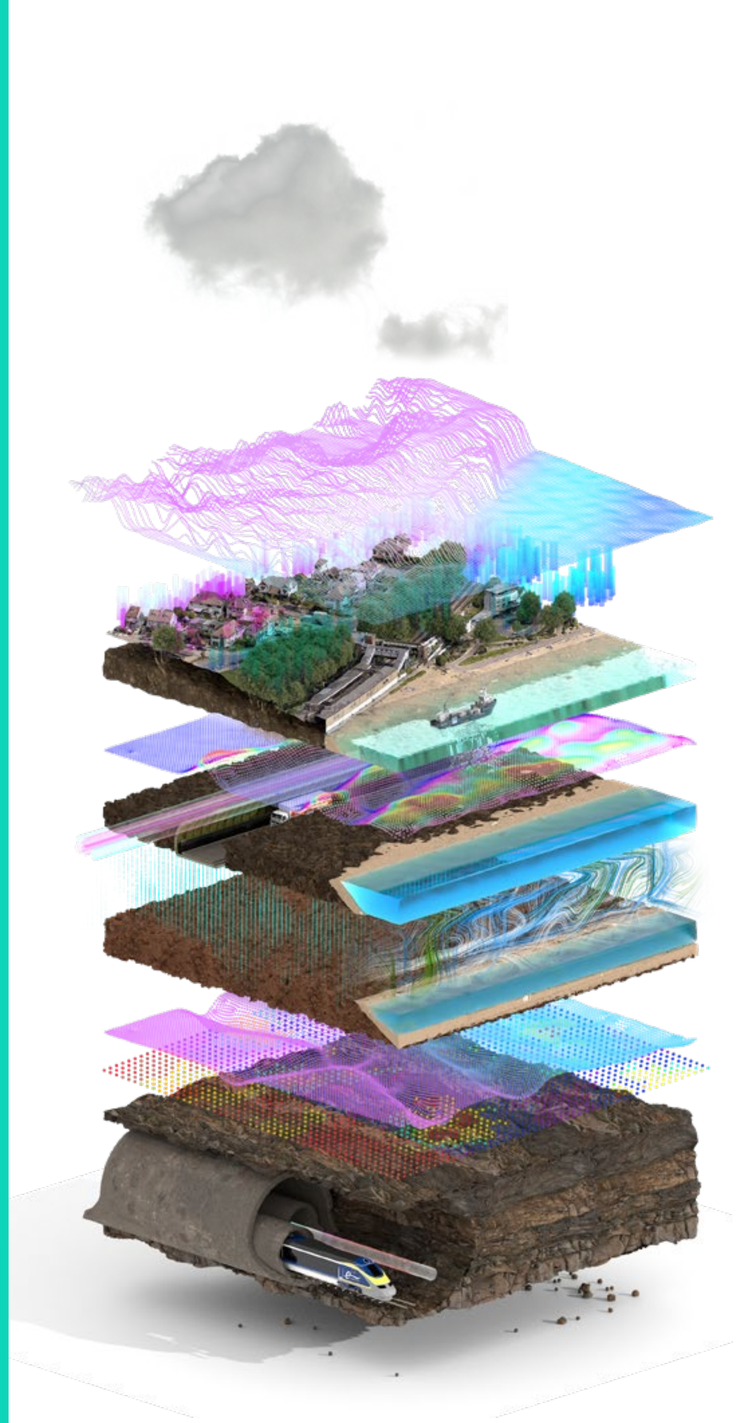
We need the continued collective effort of everyone involved in order to achieve the national geospatial strategy in full. Organisations across the nations and regions of the UK, in the public, private and third sectors can all play a part. This is an exciting moment for the country to build on its reputation as a world leader, and deliver a location powered UK.

Unlocking the power of location.

By 2025 the UK will have a coherent national location data framework underpinning a flourishing digital society. Future technologies will be underpinned by data about events occurring at a time and place. Location data will be the unifying connection between things, systems, people and the environment.

Location data is already pervasive and its benefits will continue to increase throughout the economy and across all regions supporting economic stability, improving productivity, attracting investment, creating jobs and boosting UK exports in an environmentally sustainable way. The outcome will be significant economic, social and environmental value.

Geospatial Commission



9 Location Data Opportunities

- Infrastructure
- Transport
- Housing
- Environment
- Public health
- Emergency response
- Ocean economy
- Retail
- Finance

Mission 1: Promote and safeguard the use of location data.

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The location opportunity.

Nine location data opportunities.

Our vision is that by 2025 the UK will have a coherent national location data framework. Future technologies will be underpinned by data about events occurring at a time and place. Location data will be the unifying connection between things, systems, people and the environment.

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Everyone will feel the benefits of being at the leading edge of the data revolution in our homes, towns, regions and globally. UK expertise will be sought after internationally, and our flourishing location-enabled digital economy will export its knowledge, products and services worldwide.

Location data is already pervasive and its benefits will continue to increase throughout the economy and across all regions supporting economic recovery, attracting investment, creating jobs and boosting UK exports in an environmentally sustainable way. Initial research carried out in 2018 suggested that location data has a potential economic benefit to the UK of up to £11 billion per year[1].

The UK is already innovating with location data, and further opportunities are ahead. In the longer term, location data will underpin the next generation of public services and business across a range of sectors including infrastructure, construction, housing, transport, retail, the environment, healthcare and emergency response. More immediately, it could form the basis of innovations and collaborations to help the UK tackle the Covid-19 threat, and make long-term provision to help manage future dangers.

Here are nine areas where location data will have a significant impact on our daily lives. This list is not exhaustive - the potential for location data to support growth and sustainability reaches across almost all parts of the economy and society.

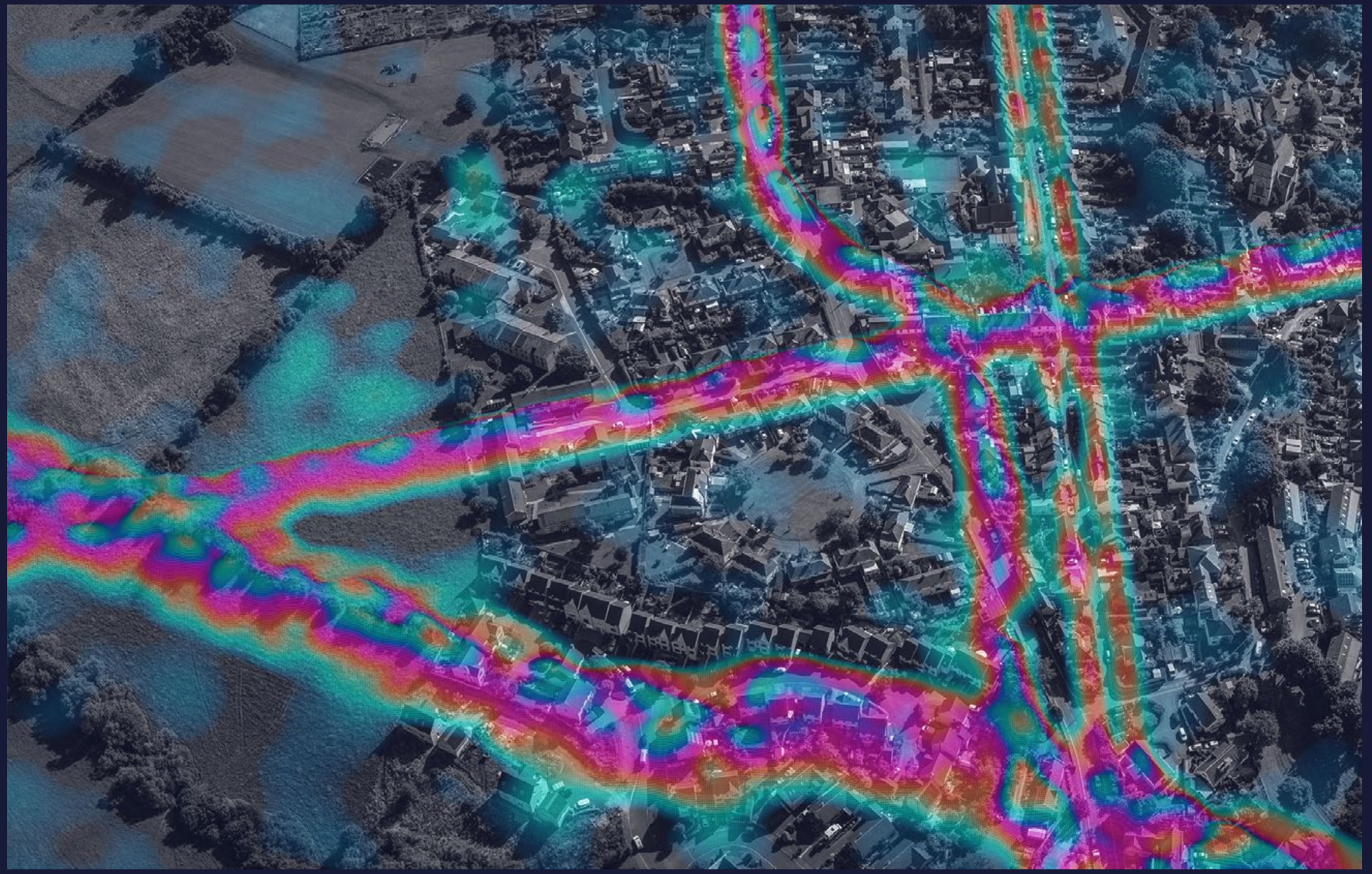
1. Infrastructure
2. Transport
3. Housing
4. Environment
5. Public Health
6. Emergency Response
7. Ocean economy
8. Retail
9. Finance

Opportunity 1 Infrastructure: Building data for the future.

Every day, we rely on a wide range of services that we often take for granted – until they go wrong. Our national infrastructure keeps the lights on, water flowing, internet connected and transport moving.

There is huge potential for location data to improve the way that national infrastructure is planned, built and managed – from informing where our future gigabit broadband and 5G networks need to go, to connecting utilities, enabling smart ports and autonomous shipping, and planning new housing developments. Analysis from 2018 suggests that more accessible and better quality location data in infrastructure and construction could be worth over £4 billion per year[2].

Creating location-enabled 'digital twins' using sensor technology and advanced data analysis could improve the resilience of our infrastructure by monitoring environmental features, reducing operational costs and increasing efficiency[3]. In 2014, the construction industry saved an estimated £840 million[4] by using Building Information Modelling (BIM). Wider and improved use of BIM can further support efficiency in the sector.



CASE STUDY

Creating an underground map that will save lives and prevent disruption.

We all know how inconvenient it is when your power or internet is disrupted. Every year, accidental strikes on underground pipes and cables cost the economy an estimated £1.2 billion and put lives at risk.

There is currently no single map of the underground pipe and cable network in the UK, but the Geospatial Commission, with its partners, has completed two regional pilot schemes to bring together existing data on underground assets.

If these pilots were expanded to cover the whole country, key infrastructure projects could use the data to plan more effectively, save lives and reduce the disruption caused when underground assets are struck by mistake.

Opportunity 2 Transport: Putting ourselves in the fast lane.

Location data and technology will help improve transport services, enabling the efficient delivery of new networks and transport corridors. It will help connect people with the jobs they need, the goods and services they want, and the places they want to go.

To enable electric vehicles we will need to determine what charging infrastructure to build, and where. Longer term, we will need richer and more interoperable location data to unlock the full value of autonomous vehicles. Location data will also be increasingly vital for our roads, both in the maintenance of existing routes and the development of new ones. It will help us optimise and transform logistics, from the movement of raw materials, distribution of wholesale goods, storage and warehousing, right through to final delivery. Our initial analysis suggests that new and more sophisticated techniques for route optimisation, along with the use of unmanned drones, could realise up to £2 billion per year[5].

Smarter mobility solutions, underpinned by location data, will enable us to make the most of our transport networks by boosting capacity, reducing environmental impacts and decreasing travel times.

CASE STUDY

Self-driving vehicles.

For a long time, the idea of self-driving vehicles was nothing more than speculation by futurists. Today through, Connected and Automated Vehicles (CAVs) represent an exciting new development in the future of mobility, promising a safer, more efficient and affordable way to travel.

If we want to enable the full benefits of self-driving vehicles, we need to be able to collect, store and analyse vast amounts of sensor data within a high-resolution 3D map in real time. According to a report published jointly by Zenzic and Ordnance Survey, one of the biggest challenges to enabling CAVs has been the availability of detailed location data about features such as street furniture and road markings[6]. Their research indicates that CAV deployment will be dependent on high resolution and interoperable data utilising open source formats. To support this, the Department for Transport is developing a Traffic Regulation Order Data Model which provides geospatial data about changes to the road network in a nationally consistent and open format. In the longer term, we will need to develop standards defining 'minimum-safe' requirements for geospatial data to ensure smooth operation of self-driving vehicles. Data sharing is a significant challenge; to address this, the government has invested in ConvEx, which seeks to create new business models for the exchange of data.

Geospatial information generated by CAVs is likely to have an additional benefit if shared: it could update maps in real time, feed accident information to emergency services, and provide local authorities with information on road conditions. The government's Future of Mobility: Urban Strategy[7] describes how data, connectivity, and automation are transforming the way people and goods move, underpinned by location data.

Opportunity 3 Housing and local planning: Laying solid foundations for growth.

Providing housing that meets people's different needs across the UK is a key national challenge. Improved location data alone cannot tackle this challenge, but data-driven innovation in the land and property sector has the potential to support national housing targets through increased transparency, efficiency, and productivity.

Innovation in property-related technology or "PropTech" is transforming how developers find land and evaluate building potential, how local authorities and residents approach planning, and how homes are bought, sold or rented. The Housing Minister announced a PropTech Innovation Council in November 2019 to address the potential we have to make the UK the global epicentre of PropTech, and to further develop the government's role in supporting this new industry.

The London Borough of Waltham Forest trains a satellite eye on new builds, helping planners make better informed decisions.

CASE STUDY

Satellite eye

Local Government has been exploring how location data could be used to help planners make better informed decisions. Having been awarded a grant through a GovTech Catalyst Challenge, Waltham Forest has been looking into the potential for satellite imagery to help identify various stages of building construction, to help monitor the progress of housing developments. The borough is also testing the effects of earlier allocation of Unique Property Reference Numbers (UPRNs) to a development site, to help build and maintain a complete timeline of development.

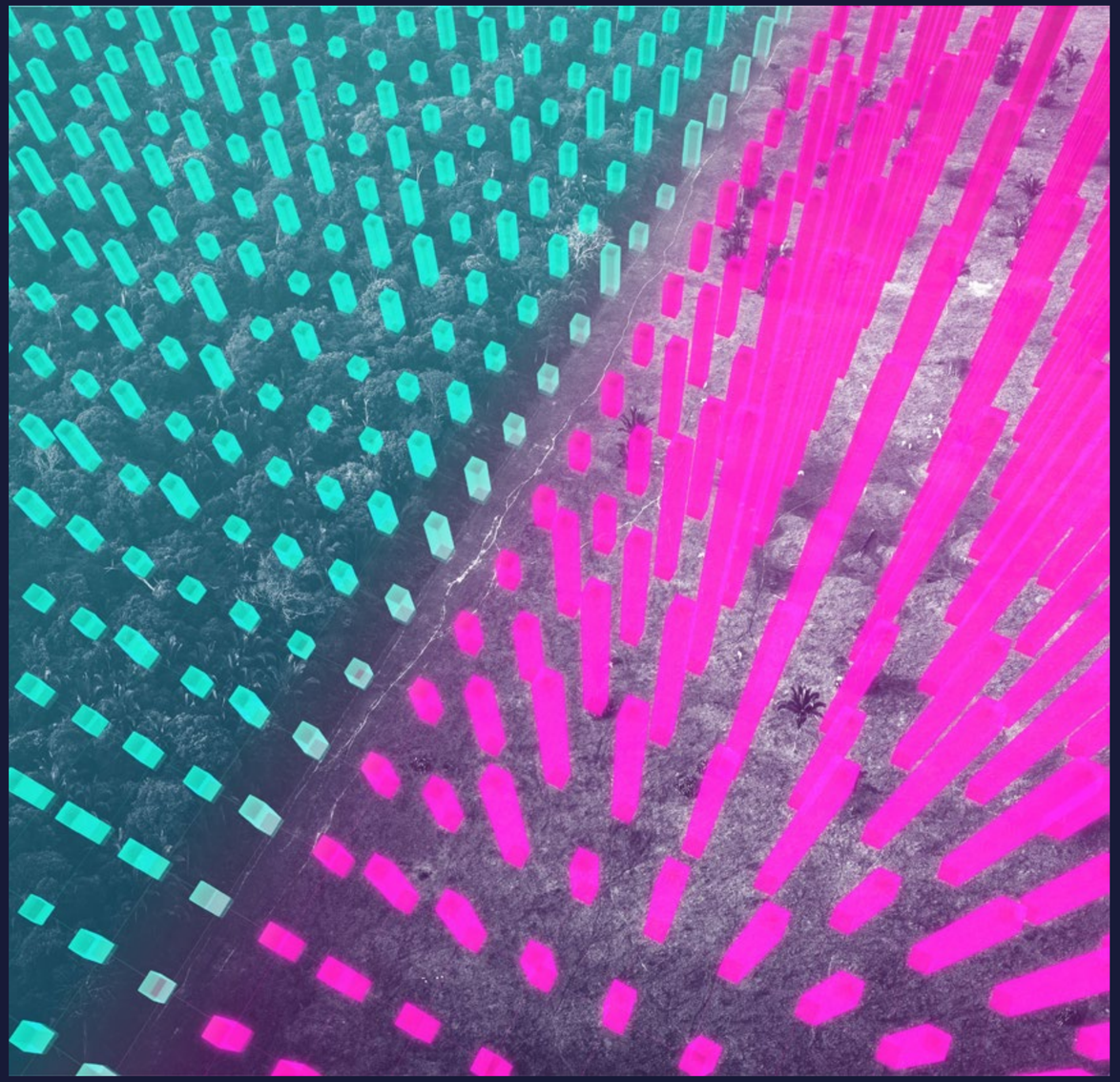
Opportunity 4
The environment:
Protecting the world around us.

Location data, technology and science are crucial to managing the multiple challenges the environment faces, and the effects of environmental damage on society. Immediate advantages of location data are apparent in preparing for and responding to flooding, and measuring air quality. Location data is also essential to get ahead of problems such as climate change, to achieve net zero greenhouse gas emissions by 2050, and to help us adapt to the consequences of global warming.

Location data is also being used to boost productivity and sustainability of the UK's agriculture systems through enabling automation, greater precision, better exploration and remote monitoring.

Improvements in decision-making for agriculture will need to be coupled with data that informs other choices for land use such as housing, transport, recreation, carbon sequestration and the production of goods and services.

The environmental benefits extend beyond the land habitat. Aquaculture for instance is projected to be the primary source of seafood by 2030, creating a global market in excess of £200 billion and offering a significant opportunity to diversify farming[8]. Offshore wind represents a sustainable means of meeting our increasing energy requirements, alongside net zero commitments. Floating offshore wind farms could reduce the marine impact of fixed turbines, and commercialise wind-based energy production in deeper waters[9]. Location data can be used to identify the best sites for these developments, and continuously monitor and enhance their productivity.



CASE STUDY

Satellite data to reduce greenhouse emissions.

The recent increase in the range of Earth Observation (EO) data available from land, marine, airborne and satellite platforms is pushing many exciting new opportunities to the forefront.

Take, for example, the production of high-resolution data about greenhouse gas emissions, which could be used to generate estimates of the carbon footprints of specific buildings or facilities. The UK and France are working together to lead the delivery of the MicroCarb mission, the first European satellite measuring the atmospheric concentration of CO2 with very high precision and global coverage.

The UK is leading on the assembly, integration and testing of the satellite and contributing UK science expertise to the mission. When launched, MicroCarb's innovative 'CityScan' mode will showcase how satellite data can improve our understanding of carbon emissions at the urban scale.

The environmental potential of EO data is even broader. New change detection algorithms can automatically identify new areas of deforestation or urban development for example, and can also support damage assessment following a disaster.

Opportunity 5 Public health: Tracking and preventing disease.

Location data has been used to identify causes of disease, track its spread and monitor the recovery of patients since the 19th century, when John Snow famously mapped cholera outbreaks in London. Modern location enabled technologies have huge potential to further improve public health outcomes.

At an individual level, with wearable technology we can track our exercise over time and set incentives to stay fit. At a regional level, we can understand health inequalities and the way the environment, such as air quality, can affect us and design more targeted and informed health interventions. At a global level, new technology offers the potential to track the real-time spread of a disease during an epidemic and monitor interventions to stop it in its tracks. We can identify the proximity of communities to required healthcare services, and track the provision of resources, equipment, and life-saving medical supplies such as medicine, blood or organs for transplant.

CASE STUDY

Responding to Covid-19.

From the outbreak of the Covid-19 pandemic, the UK has sought to utilise location data to manage the response to the virus. A few examples are:

Tracking virus spread: Geospatial data is essential to monitoring and predicting the spread of viruses. Public Health England (PHE) presents reported cases of coronavirus across the regions, supporting local and national decision-making.

To supplement the official information, voluntarily donated crowdsourced data, collected for example by individuals filling in user-friendly applications, can support longer-term analysis by also including data about individuals not infected.

Monitoring social distancing and movement: Innovative applications of geospatial data techniques are being used to monitor aggregate compliance with social distancing guidelines. Anonymised mobile phone data can provide aggregate information on where people visit and what time of day. Urban surveillance technology, such as footfall counters typically used to monitor engagement with services in our town centres, can also track change in population distribution over time. Live camera feeds – already prevalent and used for a variety of essential services like traffic management – coupled with new image processing algorithms and anonymisation, can be used to observe the distance between pedestrians.

Medical resources: The Department of Health and Social Care (DHSC) and the NHS are working with a range of tech firms to pull together existing data across health and social care – such as ventilator usage and location, levels of staff sickness, patient occupancy and capacity, and the length of stay for patients with Covid-19 – into a single digital, spatial platform. Such data is crucial for frontline NHS workers to monitor and allocate medical supplies, resources, and staff.

Opportunity 6 Emergency response: Harnessing data to save lives.

Emergency services and civil defence agencies use detailed location data to plan emergency response actions, whether responding to an urgent 999 call, defending against flooding, or orchestrating complex inter-agency responses to major incidents.

Having accurate information about building entry points, floorplans and the location of vital infrastructure is critical. New location technology offers the potential for faster response times, as well as real-time information about how a life threatening situation is unfolding – whether on the ground, at sea, or inside a building.

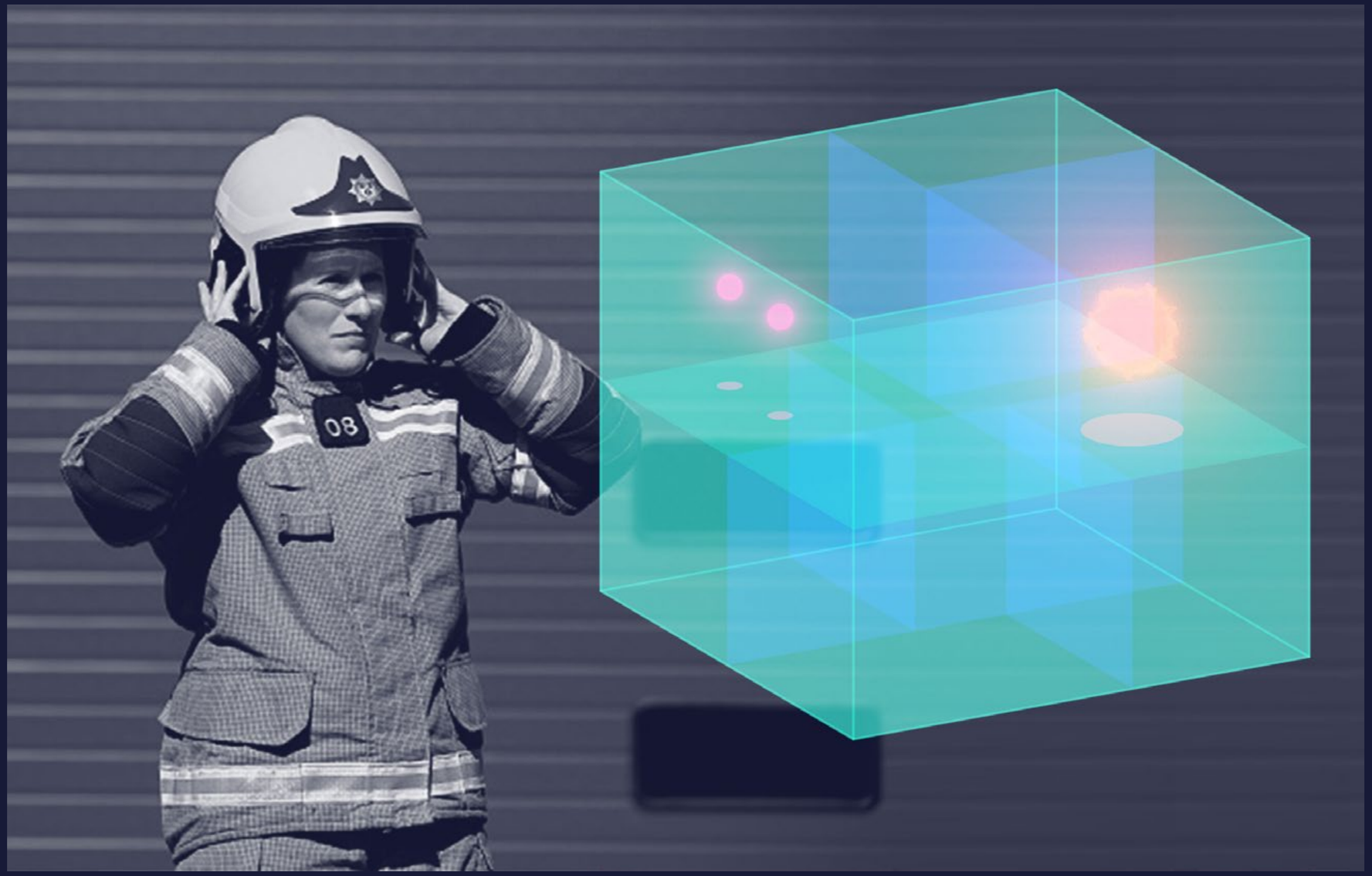
Mobile location technology transmits a precise location directly to 999 responders, to an accuracy of within just a few metres.

CASE STUDY

Location precision

Pinpoint accuracy on location data cuts emergency response times. When responding to urgent situations, emergency teams need to get to the situation as quickly as possible. One of the biggest challenges to 999 responders has always been identifying a precise location, especially when individuals are lost or incapacitated.

Advanced Mobile Location (AML), developed in the UK, now uses mobile location technology to transmit a precise location directly to 999 responders, to an accuracy of within just a few metres. It increases the chance of our para-medics, firefighters, and police officers getting to a precise location quickly enough to save lives.



CASE STUDY

Finding firefighters in the midst of a blaze.

Firefighting is a dangerous profession, where one wrong move can lead to serious injury or death. Knowing exactly where a firefighter is in a smoke-filled building will protect that firefighter's life, tackle a fire efficiently, and ensure the safety of those in need of rescue.

In 2018, the GovTech Catalyst provided £1.25 million to the Mid and West Wales Fire and Rescue Service to develop a real-time tracking solution for firefighters. There are two critical geospatial dimensions to this: firstly, developing a live tracking system, and secondly, developing a virtual model, or 'digital twin', of the building to monitor tracked firefighters. While the UK has authoritative data at ground level, we have less accessible data about the layout and floorplans of buildings.

Opportunity 7
Ocean economy:
Discovering uncharted seas.

The power of location data is not limited to land. Oceans may be out of sight for many of us, but they are an important part of everyone's day-to-day life. In the UK alone, the ocean provides jobs for over 500,000 people and contributes more than £47 billion to the economy. 90% of UK goods are imported by sea[10]. It is also home to the majority of the world's biodiversity, regulates our climate and is the world's largest carbon sink.

Given our obligations to protect this fragile and valuable asset for future generations, it's vital for us as a nation to use it responsibly and care for it as best we can.

Almost every activity in the ocean economy is underpinned by marine geospatial data including information describing the shape and geology of the seafloor, deep sea biodiversity, direction of the tides and the temperature of the water[11]. But while 70% of the world's surface is covered by water, only 5% has been mapped to modern standards. We know more about the surface of the moon than the ocean.

The importance of our oceans has been recognised by the government through the Maritime 2050 Strategy and the forthcoming International Ocean Strategy. We must work internationally to realise common interests to improve interoperability of data, and tackle challenges around data collection, access, collaboration and consistency of standards, and our world-leading marine geospatial sector has an important role to play.

CASE STUDY

Satellite data keeps mangrove forests flourishing.

Mangroves are tree species that grow on the coast in equatorial regions, and provide numerous ecosystem services, such as carbon sequestration and natural sea defences. Due to the transitory environments in which they thrive, and because of their rapid growth, mapping mangroves can be a challenge.

In conjunction with Notbinary, the UK Hydrographic Office (UKHO) has developed deep learning algorithms to automatically process large volumes of previously unmanageable data relating to mangrove identification.

This kind of mangrove identification and classification enables better environmental management of these valuable natural resources in addition to enhanced and more accurate navigational mapping services.

The data can also support increased accessibility to the development of carbon market opportunities in developing economies[12].

Opportunity 8 Retail: Locating customer demand.

The UK has a vibrant and innovative advertising market, of which digital advertising is the largest and fastest growing segment[13]. Location data provides valuable information about how consumers travel, the shops they visit and the restaurants they favour. Retailers are increasingly analysing the interplay between the online and offline retail markets[14].

This helps retailers differentiate customers' preferences, and target product supply to respond to local needs. It means less waste, greater choice and better value for money. Ethical and privacy concerns need to be considered as information about personal movements become ever more central to the individual tailoring of services.

We estimate that better adoption of location data analysis for digital advertising, optimisation of retail spaces and improvement of supply chains could realise up to £2 billion per year[15].

Location data spatially identifies high streets, sheds new light on local challenges and supports regional economic growth.

CASE STUDY

Supporting high street recovery

Towns face significant challenges. The economic impact of Covid-19 has come at a time when increased competition from online retailers has taken a toll on our high streets.

Reviving our towns and high streets is a key government priority. The government launched a £3.6 billion Towns Fund in 2019 to unleash the full economic potential of over 100 places and level up communities throughout the country[16].

There are many factors that determine the strength of a local economy. Each town will have different assets, and a unique path to prosperity. To shed new light on local challenges, Ordnance Survey and the Office for National Statistics (ONS) have used location data to spatially identify the high streets of Great Britain for the first time.

This work used algorithms to identify 7,000 high streets. By linking this to socio-economic data from ONS, the project is providing new insights about local needs. This will help target support through the Future High Streets Fund, the Towns Fund, the Coastal Communities Fund and wider regeneration work that will need to take place to manage the local impacts of Covid-19.

Opportunity 9 Finance: Mapping risk to protect and grow markets.

The UK's financial sector contributed £132 billion to the economy (or 6.9% of total economic output) in 2018. Financial services firms rely on significant amounts of reliable and comparable data, to feed into their complex decision making processes. The emerging field of 'spatial finance' seeks to integrate location data and analysis into financial services, and has the potential to be a growth area for the UK.

A growing number of insurance providers are using location data combined with other insights to provide innovative products that more accurately reflect the underlying risk. For example, geological data can support ground risk analysis (such as landslides, sinkholes, or subsidence) to ensure consumers are charged the right premiums. Satellite tracking can enable real-time adjustment of insurance premiums, rewarding safe driving, or calculating a premium for a single drone flight.

There is increasing potential for spatial finance to forecast the effects of climate change on the financial performance of organisations and their assets. Earth Observation (EO) data can be used as a means of understanding the physical location of assets, and thus their exposure to climate-related risks. This, combined with the ability for geospatial data to aid in the monitoring of environmental change and its impact, shows how EO data can be a powerful tool to inform financial decision-making.

Six location data trends underpinning these opportunities.

Trend 1:
Real-time data

Real-time location data is increasingly available thanks to high levels of connectivity as well as the ability to store data in the cloud and access it through edge-computing. Real-time data has wide-ranging applications in areas such as research and commerce and it plays a large role in navigation too. Because it enables instant analysis and reaction to changes in the data, devices like sat navs, for example, are able to provide instant re-routing in case of a road closure or delay. Real-time data also enables the mapping of live traffic levels in cities.

By using machine-to-machine technologies and AI, real-time data can support decision-making and automation. Take, for instance, smart home systems where our smartphones can ‘talk’ via wifi to our lights and turn them on as we approach our front door.

Trend 2:
Sensors are everywhere

Due to the proliferation of smartphones and wearable technology, most of us carry a device which can collect data about our location at all times. Modern cars are not only GPS-enabled, but increasingly feature high-resolution object-scanning technology.

Geospatial technologies have seen significant decreases in cost and size and this has resulted in an abundance of earth-observing technologies such as drones, high-altitude satellites, and small satellites. We’re now able to deploy sensors more easily and in more locations, like railway stations, to monitor footfall and movement, or across whole cities to provide real-time monitoring of pollution levels.

Trend 3:
Artificial intelligence

Artificial intelligence (AI) and machine learning (ML) refer to systems or programmes that can complete tasks that would normally require human intelligence, such as data analysis, visual perception, speech recognition or decision-making. AI/ML is increasingly being used in the geospatial sector and is exciting because it can generate useful insights that we might not otherwise see from the manual processing of vast amounts of data.

For example, companies are using algorithms to detect patterns in satellite imagery to support better decisions, such as measuring the oil storage volume in ports or identifying suitable locations for sustainable farms.

Trend 4:
Cloud and edge-computing

With the rapid increase in our ability to generate vast amounts of data, there has been an equal rise in our ability to store, process, and analyse this data.

Cloud technology has brought about low-cost data storage, which is available at any time and anywhere. Storing a gigabyte of data cost £250,000 in 1980 and is just £0.01 today, meaning that users can now analyse vast datasets that were previously not viable for a business to store. Edge-computing promises the ability to process and store data faster, meaning that applications which demand real-time data and almost immediate processing are now possible.

Trend 5:
Connectivity and a 5G future

With an increasingly dense sensor blanket over the UK, the way that rich data is transmitted is important. Connectivity is a crucial enabler for geospatial technology as it permits more data to be transmitted more quickly in more locations. This is really important for certain technologies such as autonomous vehicles. The higher speeds and lower latency offered by 5G will allow data to be transferred more efficiently, cost-effectively and securely.

Trend 6:
Data visualisation

Location has always had a magical ability to bring instant clarity to complex data by displaying it on a map. New visualisation technologies enable real-time 3D imaging via immersive technologies to enhance decision-making across a breadth of sectors. For example, mixed reality products allow construction site workers to review their models by overlaying them in the context of the real world, saving time and money, and reducing health and safety risks.

02

Unlocking the power of location.

Four strategic missions.

The UK will need a coordinated approach to achieve the vision of a location-powered UK.

Our work to date has identified challenges that must be addressed to fully realise our vision. One of the challenges we’ve seen is the complex and fractured location data policy landscape in the UK. This incoherence is leading to market uncertainty that could constrain investment in the location data assets that the UK needs to support its critical national infrastructure. It could also limit the UK’s ability to anticipate and address future opportunities and risks in the rapidly changing digital environment.

This strategy sets out how to develop a national location data framework, that addresses these challenges, across four strategic missions:

Mission 1: Promote and safeguard the use of location data: We need to provide an evidenced view of the market value of location data, set clear guidelines on data access, privacy, ethics and security, and promote better use of location data.

Mission 2: Improve access to better location data: We will streamline, test and scale the development of new and existing location data ensuring it is findable, accessible, interoperable, reusable and of high quality.

Mission 3: Enhance capabilities, skills and awareness: To achieve our vision we must develop more people with the right skills and tools to work with location data, across organisations and sectors, to meet the UK’s future needs and support global development.

Mission 4: Enable innovation: We will maximise the commercial opportunities for innovation and promote market-wide adoption of high-value emerging location technologies.

Within each mission we have set out the key challenges, national objectives and the first actions that we will take to drive change.

Achieving our vision will require a collective and iterative effort. The Geospatial Commission's approach to delivery will be:

- **Use and value driven** – prioritising action in areas where there is evidence of greatest opportunity.
- **Iterative** – achieving our vision by adopting new ideas, learning though pilot projects, and monitoring innovation.
- **Whole system** – technology alone is not enough; leadership, governance, policies, organisations, legal frameworks and skills matter too.
- **Collaborative and open** – our missions will require collective effort, connecting data, people and systems. Organisations across the nations and regions of the UK, in public, private and third sectors, will play their part. We will learn from, and work with, other countries.

This strategy covers a five-year period from 2020/21 to 2024/25 and sets out the fundamental first steps. Technology is developing rapidly, so this is not a fixed plan or blueprint. Achieving our vision for the UK will require us to be alert to change, try new ideas, assess impact through pilots and continuously gather evidence of the latest innovations, including from overseas.

The Geospatial Commission will publish annual plans assessing progress and next steps towards implementation, and a mid-point refresh of this strategy. These will include an up-to-date perspective on the alignment of our six partner bodies (the Geo6), and the core location data they hold, with this strategy.

Realising the UK's national geospatial vision will require collective effort, connecting policy, data, people and systems. Organisations across the nations and regions of the UK, in both public and private sectors, will play their part. This strategy recognises and respects the devolution settlements of Scotland, Wales and Northern Ireland, and has been created in partnership with the devolved administrations.

The next steps recognise that the Geospatial Commission has different levers available to it in relation to the private sector, public sector, devolved and local government.

- **In the public sector** we will work directly to remove barriers and promote innovation.
- **Across devolved and local government** we will collaborate to develop principles, standards and guidance and advocate continuous improvement, while respecting local needs and decisions.
- **In the private sector** we will address market failures, review incentives, remove any barriers to sharing of location data, and use government procurement to influence beneficial outcomes.

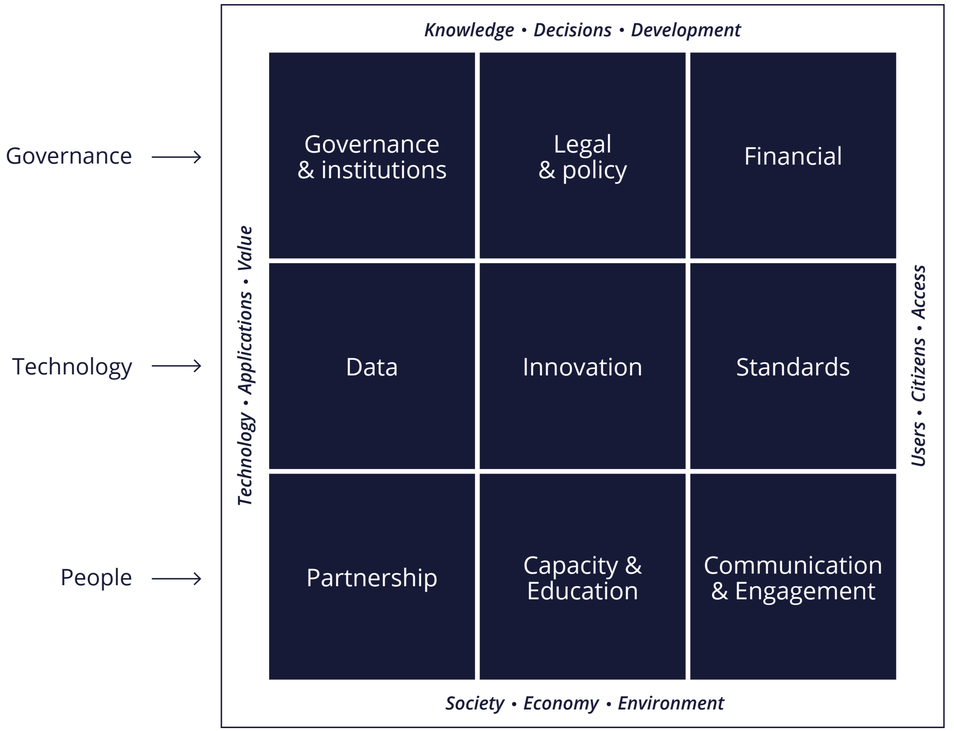
National location data framework.

A national location data framework describes all the elements – including data assets, standards and technologies, policies and guidance, people and organisations – that are required to unlock the power of location.

Many countries have adopted a 'national spatial data infrastructure'. The word infrastructure promotes the concept of a reliable, supporting environment. Location data can provide stability for the digital world in a similar way that a road network supports our physical world.

The UK has chosen to adopt the UN Integrated Geospatial Information Framework[17] (IGIF) by implementing a national location data framework that is consistent with the IGIF. The objectives and actions within this strategy set out the priority areas for the UK's focus at present.

We will continue to develop the UK's national location data framework in a way that recognises the need for compatibility with relevant international best practice and aligns with the government's wider data policy approach and priorities.



UN Integrated Geospatial Information Framework (IGIF)

Our six partner bodies: The Geo6.

A great deal of the UK's national location data framework exists within the Geospatial Commission's six partner bodies. Our partner bodies – The Geo6 – will be fundamental to the delivery of this strategy.

The British Geological Survey (BGS) provides impartial and independent geoscience advice and data to the UK government, industry, academia and the public. It holds over 400 geoscience datasets, making it the authoritative source of geological and geo-environmental data for the UK.

The Coal Authority manages the effects of past coal mining. It holds and updates authoritative data on over 170,000 mine entries, surface and underground mine workings that sit below 25% of all properties in Great Britain. Its data is used for property conveyancing, the management of land and infrastructure as well as development opportunities including low carbon heat energy from mine workings.

The UK Hydrographic Office (UKHO) provides geospatial information about the world's oceans. Its products include the charts and custom location datasets used by 90% of world shipping.

HM Land Registry (HMLR) records and guarantees the ownership of over 25 million properties across England and Wales, acting as the official record of all mortgages against property. The Land Register is essential for the ongoing operation of both the property and mortgage markets. The data held in the Register logs residential, commercial and agricultural properties making up some 87% of land in England and Wales, a number which continues to grow.
Ordnance Survey (OS) creates, maintains and distributes detailed location data for Great Britain, maintaining 500 million geospatial features in the MasterMap database with 20,000 changes each day.

The Valuation Office Agency (VOA) holds information to fulfil its statutory functions and provide the valuations and property advice needed to support taxation and benefits. This information underpins the collection of approximately £55 billion of revenue in non-domestic rates and council tax in England and Wales, which helps to fund essential public services. The VOA also helps to determine fair rents and housing allowances received, as well as undertaking property valuation for a range of public sector clients.

The Geospatial Commission's six partner bodies will individually and collectively play a key role in the delivery of the UK's strategy, not only through improving their own data and access to it, but also through their expertise.

With oversight from the Geospatial Commission, partner bodies will take a coordinated approach to meeting the priorities identified across the UK location data framework, ensuring that their own strategic plans are consistent with the national geospatial strategy. The Geospatial Commission will seek to maximise coherence across the geospatial elements of partner bodies' strategic plans, and periodically review steps that they have taken to improve quality, accessibility and interoperability of the location data that they hold[18].

The Geospatial Commission partner bodies in numbers.

150,000 BOREHOLE SCANS ACCESSED VIA THE BRITISH GEOLOGICAL SURVEY WEBSITE **/month**

173,500

RECORDED COAL MINE ENTRIES IN BRITAIN HELD ON THE COAL AUTHORITY MINING DATABASE

5K USERS OF THE PUBLIC SECTOR GEOSPATIAL AGREEMENT

20,000

DAILY UPDATES TO THE OS MASTERMAP, ON AVG.

26M

THE NO. OF DOMESTIC PROPERTIES WHICH THE VALUATION OFFICE AGENCY MAINTAINS LISTS OF COUNCIL TAX BANDS FOR.

8.5million

SEARCHES USING THE HM LAND REGISTRY FREE MAPSEARCH SERVICE IN 2019

Mission 1: Promote and safeguard the use of location data.

The UK has worked hard to be at the global forefront of geospatial capability. Our national location data ecosystem is therefore advanced, but also complex; institutional evolution, a legacy of different data models, the UK's devolved political landscape and the recent rapid growth in private sector data use has resulted in a decentralised, diverse system. Valuable location data is held by many different types of organisations from central to local government, private companies to academic and research organisations, charities and individuals.

The decentralised nature of location data in the UK is both a strength and a challenge. Data is often created and used by those closest to the problem it is there to solve, for a well defined purpose. Significant additional value could be unlocked if data could be combined across domains and reach a wider community of users who were able to experiment with it.

The UK needs to create the right market conditions and incentives for innovation, while safeguarding national security, intellectual property rights and individual privacy.

Mission overview.

Mission 1: Promote and safeguard the use of location data.

Objective
Provide an evidenced view of the market value of location data, set clear guidelines on data access, privacy, ethics and security, and promote better use of location data.

Initial key actions

- **Publish recommendations for policy interventions** to support growth, competition and innovation, based on our geospatial data market study, by the end of 2020.
- **Publish guidance for measuring** the economic, social and environmental value of location data by 2021.
- **Develop a set of harmonised and machine readable data licences** for the use of public sector location data by the end of 2021.
- **Take an active and considered role in identifying** the high-value opportunities, and corresponding barriers and incentives, to enable more private sector data to be shared to drive economic growth and improve services to citizens and consumers.
- **Provide guidance on how to unlock value from sensitive location data** while mitigating security, ethical and privacy risks.
- **Promote the success of organisations that use location data,** and champion the UK's geospatial interests overseas.

Mission 1: Promote and safeguard the use of location data.

Nurturing the market to grow and adapt.

It is vital that the growing location data market is working well for current and future users of geospatial data and services, from large companies to smaller businesses, public sector users, and individual consumers of location-enabled products.

In some cases, evidence may indicate that direct intervention should be considered. The following principles will guide decisions about the government's approach to supporting the market. Any interventions should:

- **Make markets work more effectively,** promoting fair and effective competition between providers of geospatial data and services, and encouraging consumer choice.
- **Influence positive market outcomes,** addressing inefficiencies within the operation of the market, and maximising consumer benefit.

To develop this approach, the Geospatial Commission is undertaking a detailed examination of the UK's geospatial data market. The Geospatial Data Market Study[19] will explore recent developments and emerging trends in the market, assessing:

- **Barriers to entry in the provision of new and useful types of geospatial data,** and the existence of market features that could be preventing the development of new business models.
- **The levels of effective competition between providers of geospatial data products and services,** and the incentives for organisations within the market to be more efficient and innovative.
- **How growth and investment patterns in the geospatial data market differ across the UK,** and the opportunities for further uptake of location data services across key sectors.

Having investigated the structure of the geospatial data market and how it functions, the Geospatial Commission will publish recommendations for policy interventions to support growth, competition and innovation, by the end of 2020.

Improving access to public sector data.

The power of location data can increase when it is re-used by more people and businesses beyond its original purpose. Making data available to everyone as 'open data' without cost or restriction is regularly cited as the best way to do this, by reducing friction that can impede use and innovation. 'Open' can refer to different qualities of the data such as whether it:

- **is findable, accessible, interoperable and reusable** (FAIR) ;
- **is free** at the point of use; or
- **has clear licensing conditions** that do not restrict use.

The government has made a vast amount of data accessible and free to use in the past decade, and continues to do so. For instance, in January 2019 Ordnance Survey's Open Zoomstack was launched, which provides a single, customisable map of Great Britain. In April 2020, the Geospatial Commission announced the government would make a £1 billion investment to ensure that Britain's fundamental national location data continues to be world leading[20], and that:

- **Everyone can continue to have unlimited access** to Ordnance Survey Open Data.
- **More open data will be published,** including key identifiers such as Unique Property Reference Numbers (UPRNs), Unique Street Reference Numbers (USRNs) and Topographic Identifiers (TOIDs), with associated geometry.
- **Developers can have free access** to up to £1,000 a month of premium data.

To unlock the power of location, we need to take a balanced approach that considers the costs, value and sensitivity of different types of data:

- **Costs:** Some data costs little to produce or is a byproduct of business processes. Other data has a high upfront cost, for instance where there is a significant investment in technology. Ongoing costs for data stewardship – including quality assurance, processing, maintenance and user support – also vary significantly depending on the type of data.
- **Value:** Some data has very widespread economic, social, or environmental value, for example identifiers that provide a 'golden thread' to enable other datasets to be linked together. Other data has more specific value concentrated in a particular use or sector.
- **Sensitivity:** Data can contain sensitive information about citizens or businesses, or about our critical national infrastructure. Access may need to be restricted where legal safeguards do not already exist[21].

Deciding who should pay for public sector data is not always straightforward. Where there is a high cost of production, this means making a choice between charging users, or using general taxation. Considerations about who should pay for data fall into three broad categories:

- **Maximisation** of economic, social and environmental value.
- **Incentives to invest** in improving data quality and innovation.
- **Efficient and fair** use of public money.

It is important that decisions about the price of data are underpinned by evidence of value. The Geospatial Commission will publish guidance for measuring the economic, social and environmental value of location data in 2021, working with HM Treasury and ONS. This could be used to review other high value location datasets for whether they should be made free to use.

A significant barrier to use of data is the friction caused by inaccurate or inappropriate use of licences; for example, over-restrictive terms, inconsistent definitions, or incompatibility of different organisations' licences. The Geospatial Commission will work with its partner bodies to develop a set of harmonised and machine-readable data licences for the use of public sector location data by the end of 2021.

The Open Government Licence is a simple set of terms and conditions that facilitates the re-use of a wide range of public sector information free of charge.

The Data Exploration Licence allows anyone to freely access data held by the British Geological Survey, Coal Authority, HM Land Registry, Ordnance Survey and the UK Hydrographic Office, for research, development and innovation purposes.

Mission 1: Promote and safeguard the use of location data.

Supporting the private sector to share data for increased growth.

Businesses increasingly create and use location data and insights. For instance:

- **Ride sharing companies collect rich, real-time data** about passenger journeys and congestion as a byproduct of their service.
- **Utility companies are responsible for data about the location** and functioning of their networks.
- **Mobile network operators hold data about device locations** and usage from which other information can be derived, including daily population movements.
- **Large technology corporations combine data** about their users from a range of devices, activities and accounts linked within their ecosystem.

If shared, many of these datasets have the potential to drive economic growth and improve public services, but often data is not shared outside individual organisations.

The Geospatial Commission will take an active and considered role in identifying the high-value opportunities, and corresponding barriers and incentives, to enable more private sector data to be shared to drive economic growth and improve services to citizens and consumers. The Geospatial Commission will work with relevant businesses and industry representatives and government bodies.

As with public sector data access, the Geospatial Commission's decisions to intervene will be based on strong evidence, stakeholder engagement and the same tests of maximising economic, social and environmental value, while protecting private sector incentives to invest and innovate.

The Geospatial Commission will prioritise where there is a clear case for government intervention, for example:

- **Where the value from data sharing is dependent on the participation of others.** An example of this is the pilot of the National Underground Asset Register (NUAR) programme, as without near-universal participation in the scheme, the value to all participants would be significantly reduced.
- **Where sharing privately collected data can inform the creation of new ideas and products,** and potentially new opportunities for the data holder. For example, the sharing of data collected through testing of self driving vehicles is likely to provide knowledge that will enable the acceleration of this technology.
- **Where there is a wider public interest in access to the data.** For example, travel data can be analysed to identify patterns of accidents to inform improvements to transport interchanges.
- **Where data relates to individuals or is collected** as a result of a government enabler, like a licence or franchise such as with telecommunications data.

Promoting safe and ethical data use.

As location technology develops, so does its ability to gather more insights about us. The majority of people in the UK own a smartphone that tracks their location extensively and frequently. Wearable technology is able to monitor personal location 24 hours a day. There is a significant opportunity for citizens to benefit from the services that these technologies enable, but there are also new privacy, ethical and security considerations.

The UK needs to capitalise on the economic, social and environmental uses of location data, while mitigating risks and retaining the trust of its citizens.

There is an emerging debate about the ethical implications of new technology and data. In the UK, key organisations include:

- **The Information Commissioner's Office,** responsible for upholding information rights in the public interest, promoting openness by public bodies and data privacy for individuals.
- **The Centre for Data Ethics and Innovation,** which was established to identify how we can get the full benefits of data-driven technology within the ethical and social constraints of a liberal and democratic society.

Many of the ethical questions for location data will be the same as for other types of data and technology. But there may be some features of location data (such as its ubiquity, its level of detail, or its ability to put other data into context to provide new insight) or some applications (such as predictive crime mapping, or location informed advertising targeting) which raise new ethical questions.

The Geospatial Commission will develop and maintain guidance on how to unlock value from location data while mitigating ethical and privacy risks, ensuring compliance with legal principles and retaining the trust of citizens. The Geospatial Commission will work with the Centre for Data Ethics and Innovation, the Information Commissioner's Office and other key organisations.

Keeping sensitive data secure.

As we increase access to public and private sector location data, a key risk is accidental or malicious exposure of sensitive information about individual citizens, businesses or facilities. For instance, data about the location and structure of the Critical National Infrastructure upon which daily life depends (such as civil nuclear facilities, defence, emergency services, energy, transport and water) needs to be appropriately protected.

The Geospatial Commission's NUAR pilots provided an opportunity to explore many common security challenges. Data can be made more accessible while mitigating security risks by:

- **Ensuring that the appropriate people see the right data** through role-based access controls aligned to a clear purpose.
- **Building a resilient secure platform** that protects against malicious use (e.g. via audit trails).
- **Identifying the specific concerns of the data owners** and mitigating these through adopting a 'secure by design' approach from the start of the project.

By understanding the sensitivity of a dataset and facilitating a proportionate amount of data sharing within a secure platform, wider benefits can be unlocked while balancing security risks. Working with the Centre for the Protection of National Infrastructure (CPNI) and others, the Geospatial Commission will develop and maintain guidance on how to unlock value from sensitive location data while mitigating the risk of accidental or malicious exposure.

Mission 1: Promote and safeguard the use of location data.

Championing our capability at home and overseas.

The government will advocate the important role location data has to play in tackling challenges across the economy, society and environment.

Building on the strong foundations of our six partner bodies, we will promote the success of organisations that use location data, championing their role in government, society and on the international stage.

With an increasing focus on global challenges and the cross-border exchange of data, an international focus is critical. The Geospatial Commission's role is to promote the UK's geospatial interests overseas by coordinating across government. This will ensure that the UK economy benefits from the best ideas from overseas; that international policy and standards are set in the UK's interests; that other nations embed location data in their digital economies; and that international markets develop for the UK's geospatial products and services.

Our work will be in support of the UN-GGIM and will be delivered through the Geospatial Commission's six partner bodies, in alignment with the government's GREAT campaign, Department for International Trade (DIT), Foreign and Commonwealth Office (FCO), Department for Business, Energy and Industrial Strategy (BEIS), Department for International Development (DfID), Department for Digital, Culture, Media and Sport (DCMS) and the Office for National Statistics (ONS). The UK's geospatial expertise will continue to actively support the UN Sustainable Development Goals.

Mission 2: Improve access to better location data.

The value of data is realised when it is used to support decision-making and drive action. Its value to the economy and society can increase when:

- **It is used** by more people and businesses.
- **It is used** to solve problems beyond its original purpose.
- **It is combined** with other data.
- **Its quality** improves.

As a data-rich country, the UK can unlock significant public and private value through greater sharing and integration of high-quality data. If supported, advances in how data is collected, processed, stored, accessed and used will ensure the UK remains at the forefront of the location data revolution. The UK will need to be ready to play a leading role in new technologies that rely on the rapidly increasing volume, pace and precision of data, with the ability to work in four dimensions, and in real-time.

The UK needs to better manage its location data, to make sure that it is high quality and FAIR (Findable, Accessible, Interoperable and Reusable).

Quality

Quality means that data is fit for its intended purpose, is based on appropriate methods, and is not materially misleading. There are many ways to measure quality: for example accuracy, precision, timeliness, coherence and completeness. That's why it is important to understand user requirements, make sure that data is fit for purpose and communicate its limitations.

FAIR

The FAIR principles[22] for scientific data management and stewardship were proposed in March 2016 by a consortium of scientists and organisations, aimed at increasing the ease with which data can be processed by machine. The four principles are:

1. The most basic need is to **find** what data is available.
2. Having found data, it must be **accessible** for it to be useful.
3. Many uses of data require it to be joined with other data so **interoperability** adds significant value to data.
4. Finally, if data is fit for many purposes, value is earned every time data is **reused**.

Mission overview.

Mission 2: Improve access to better location data.

Objective
Streamline, test and scale the development of new and existing location data ensuring it is findable, accessible, interoperable, reusable and of high quality.

Initial key actions

- **Prepare for a national roll-out** of a National Underground Assets Register (NUAR), which will build on our successful pilots in the North East and London to bring together industry utility data, starting with a regional platform.
- **Improve access to better data** from 2020 that enables house building and improves the house buying and selling process across the UK.
- **Assess how location data can support the future of mobility** and next-generation transport networks.
- **Identify how improved access to better location data** can support environmental outcomes.
- **Identify a targeted approach,** such as pilots, to support delivery of a national land use framework.
- **Explore ways to rationalise the public sector's procurement** of Earth Observation data and services.
- **Work with partners to invest further in location data quality** and access improvements across the public sector.

Underground assets.

The economic cost of accidental strikes on underground pipes and cables is estimated to be £1.2 billion each year. Additionally, workers who strike gas pipes and electricity cables by mistake are at risk of injury or death.

The lack of accurate, accessible data about buried asset locations is a leading cause of problems. Data is held by more than 700 separate asset owners or search providers across the UK. This results in many inefficiencies in accessing relevant data when it's required.

As the UK does not have a uniform process for asset owners to share their data, prior to excavating a site operators must go through a laborious, bureaucratic process to access the information they need, costing businesses money and making error more likely.

The Geospatial Commission will prepare for a national roll-out of a National Underground Assets Register (NUAR), which will build on our successful pilots in the North East and London to bring together industry utility data, starting with a regional platform.

Housing.

The government has set a goal to build at least a million more homes, of all tenures, in the areas that really need them over the next parliamentary term.

Location data-driven innovation has the potential to boost productivity in the housing market, whether through helping to identify locations for development, reducing failure rates in the conveyancing process or improving the process to develop and use local plans.

The Geospatial Commission will improve access to better data from 2020 that enables house building and improves the house buying and selling process across the UK. This will support work led by the Ministry of Housing Communities and Local Government (MHCLG) in England. Our first steps will be to investigate:

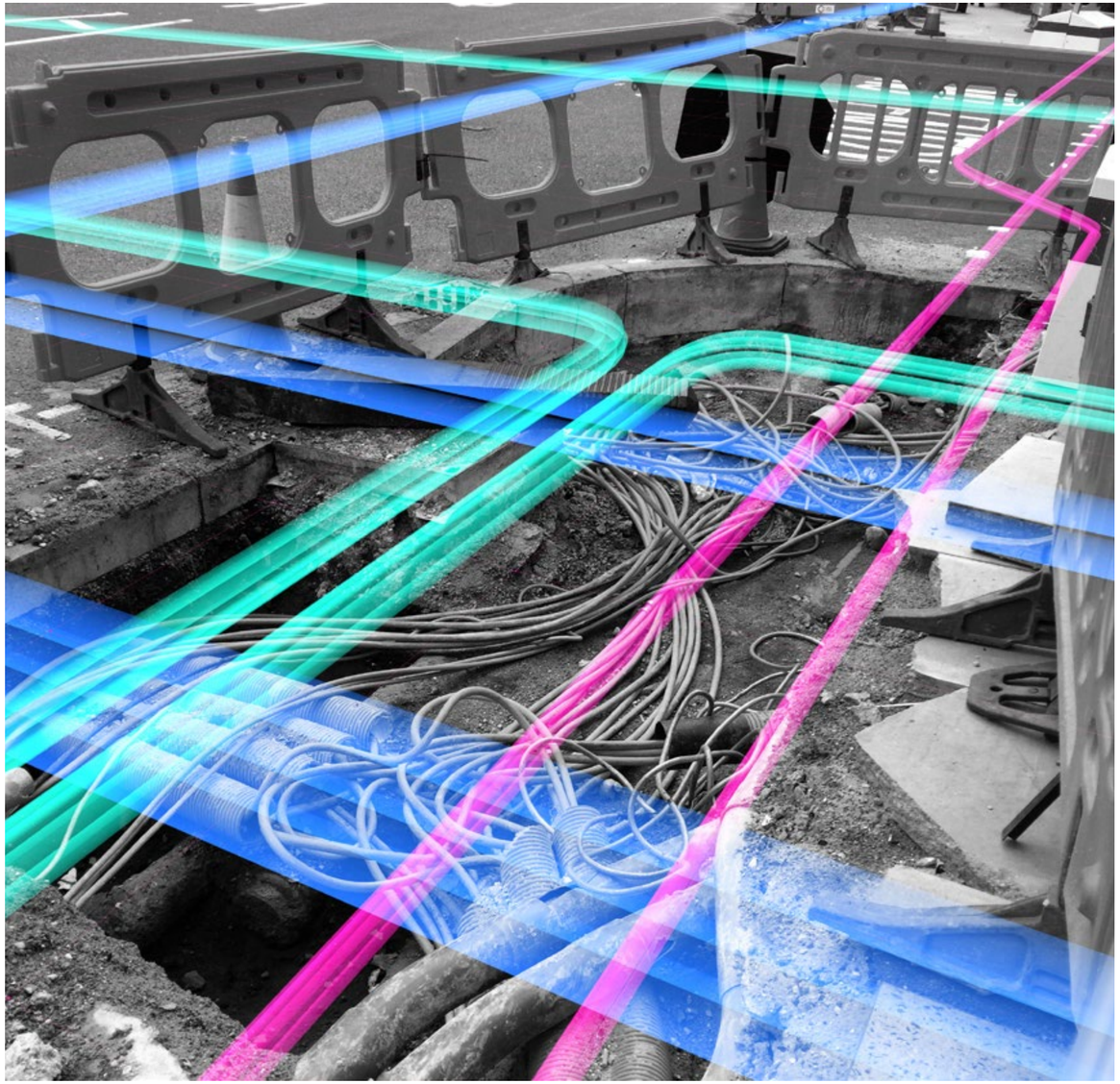
- **The geospatial data requirements** necessary for the development of digital Property Log Books.
- **The UK's critical location datasets** and ways to improve their accessibility and quality.
- **An approach to standardising** the location data input to local plans.

The Geospatial Commission will work with the MHCLG, local government, Homes England, HM Land Registry, equivalent programmes in the devolved administrations, and key partners in the housing industry.

Transport.

Location data is increasingly helping the UK to plan and operate our transport and infrastructure networks more efficiently and effectively. For instance, high quality data empowers citizens by updating commuters about when the next bus is arriving, helping to avoid road congestion, and routing a delivery to exactly where we are.

The Geospatial Commission will assess how location data can support the future of mobility and next generation transport networks. The Department for Transport will publish a Transport Data Strategy this year, covering a series of measures to make transport data more findable, interoperable, accessible and high-quality. The Geospatial Commission will work with the Department for Transport, devolved administrations, local transport authorities and the transport industry.



CASE STUDY

Mapping the underground.

In 2019, the Geospatial Commission committed £3.9 million for two pilots (one led by the Greater London Authority in London, the other by Ordnance Survey in the North East). These test schemes looked at creating a national data sharing platform on the location and condition of buried pipes, ducts and cables to be used by asset owners and their operators. All major asset owners across gas, water, electricity, telecommunications, transport and local authorities shared data through a test platform, and took part in use case testing, including live testing of the digital tool at excavation sites.

Working closely with asset owners and the Open Geospatial Consortium, a common data model was agreed upon. This model allows data from various sources and in different scales and formats to be transformed and displayed in a single digital map.

Feedback from use case testing was universally positive, with operators eager to use the tool in the field. The Geospatial Commission is now progressing plans to build a national platform.

The environment and land use.

The world faces significant challenges to protect our environment for future generations. This includes reducing disruption from flooding, mitigating the risks of climate change, and improving biodiversity and habitat enhancement. Environmental data is essential to monitor and protect our environment, helping us achieve net zero greenhouse emissions by 2050 and adapt to climate change.

The UK has a long history of collecting environmental information. However, continued investment is needed as the data has become old, or is not compatible with remotely acquired data enabled by new technologies. Examples include the location and condition of freshwater, marine and terrestrial ecosystems including soils, forest assets, ground and estuarine waters and peatlands. Securing location data at a resolution sufficient to enable local delivery and assessment will be essential to meet the government's ambitions on environmental improvement and community leadership, as well as to develop green finance markets. Improving the quality of information available will enable companies and financial institutions to embed natural capital considerations into their decision-making processes and encourage business practices and investments that contribute to protecting and enhancing natural capital assets.

The Geospatial Commission will identify how improved access to better location data can support environmental outcomes, working with Defra and its agencies, BEIS, our partner bodies, ONS, the devolved administrations and other key stakeholders.

Land is the UK's most valuable asset, worth £5.4 trillion in 2017. It is a finite resource that is critical to many policy areas from housing and infrastructure to sustainable development, farming, carbon sequestration, and habitat creation. The value of land is spatially dependent, affected for example by air quality or local economic activity.

However, there is no single dataset that tracks land use change, and the key land datasets are of varying quality, held across multiple organisations and difficult to bring together.

The Geospatial Commission will work with key stakeholders to identify a targeted approach, such as pilots, to support delivery of a national land use framework. We will work with the Food, Farming and Countryside Commission (FFCC), Defra, MHCLG, BEIS and the devolved administrations. The framework could provide a basis for a better-integrated and long-term strategy for land use.

Public sector procurement.

We announced in April that the Geospatial Commission has negotiated a £1 billion investment over 10 years to ensure that Britain's fundamental national location data continues to be world leading. This Public Sector Geospatial Agreement (PSGA) will give more than 5,000 public sector organisations unlimited access to Ordnance Survey data, provide developers with up to £1,000 a month of premium data for free, and allow everyone unlimited access to Ordnance Survey Open Data.

The Geospatial Commission will build on the success of the 'buy once, use many times' approach where the public sector acts as an intelligent customer of core geospatial data and services. We will explore ways to rationalise the public sector's procurement of Earth Observation data and services.

This data is valuable for a range of use cases including emergency planning and response, flood management, international development and environmental monitoring. Working with departments, including Defra, DFID, Home Office and the Ministry of Defence (MOD), we will undertake an options appraisal.

Foundational data.

The Geospatial Commission will invest further in data improvement across the public sector, devolved administrations and other agencies that hold valuable geospatial datasets to ensure that they are easily findable, accessible, interoperable and reusable. In the coming year we will build on what we have achieved with our partners, with further work on:

- **Harmonising** licences.
- **Improving** data catalogues.
- **Improving** platforms for dissemination of the UK's publicly-held location data, learning from geospatial data portals in the devolved administrations and globally.
- **Considering** how information can efficiently be extracted from analogue, unstructured and hand written documents.
- **Publishing** guidance on implementing standardised services for data and correlation relationships.

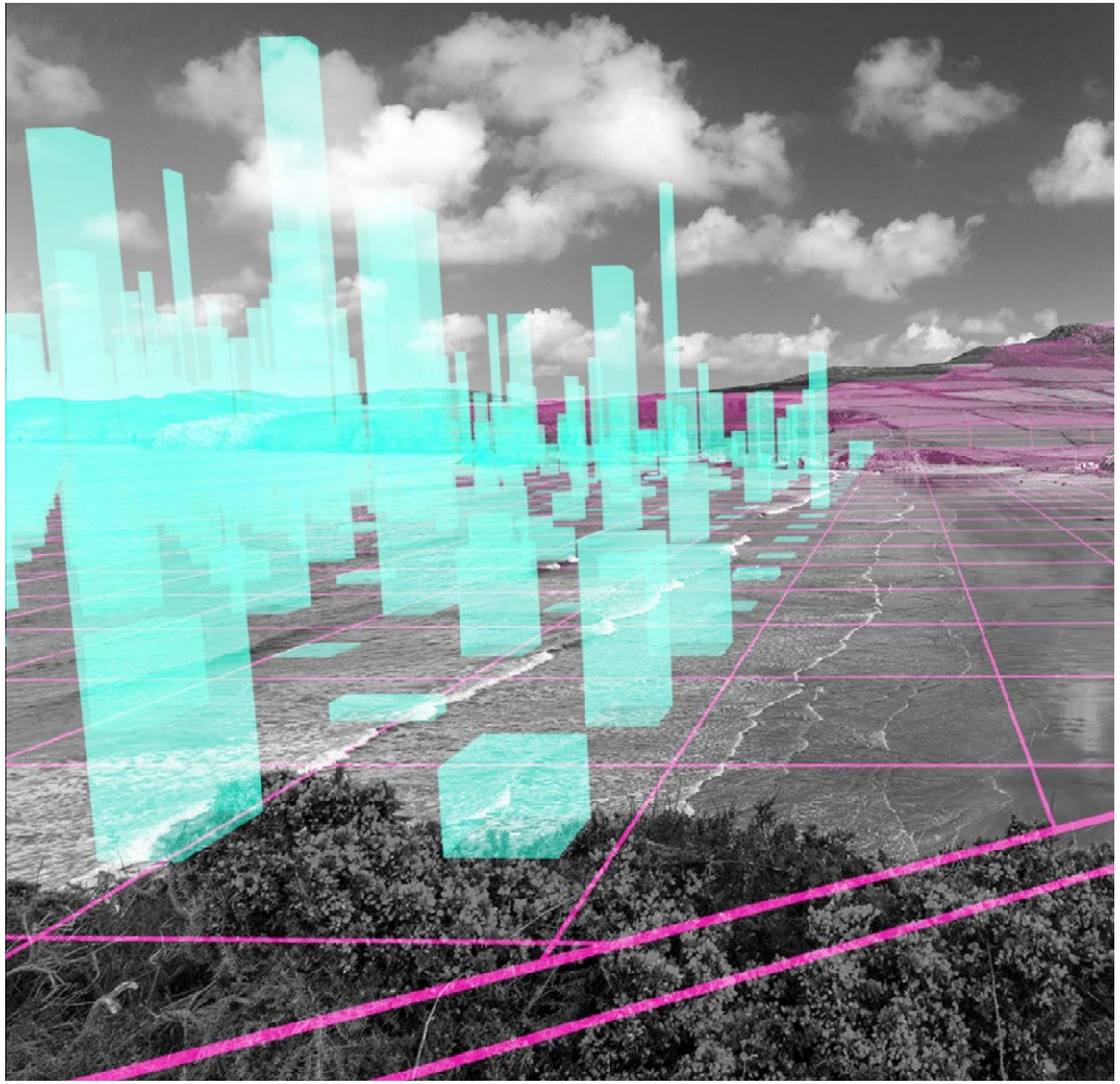
Achieving net zero – Mapping low and zero carbon heat sources across the UK.

CASE STUDY

Reducing emissions

Heating buildings causes a third of the UK's carbon emissions[23]. Across the UK there are a number of low and zero carbon heat sources which, through heat networks, could be utilised to serve nearby heat demands in homes, businesses, schools, and hospitals. These heat sources include water source, deep geothermal, ground source, waste heat, solar thermal and bioenergy. To understand the potential of these opportunities, BEIS is mapping where the low and zero carbon heat sources are, as well as national heat demands.

A key challenge is the availability of data. Where data for a particular sector or technology is available, it is often spread over several platforms. This project aims to improve the accuracy and usability of data to help identify areas where low and zero carbon heat sources could meet the demand for heat, and help us meet our climate targets.



CASE STUDY

Storing carbon in seagrass.

Seagrass helps mitigate the effects of global warming by acting as a carbon sink, absorbing carbon dioxide and producing oxygen. It can capture carbon from the atmosphere up to 35 times faster than tropical rainforests. Despite only taking up 0.2% of the sea floor, seagrass accounts for 10% of annual ocean carbon storage globally. It stabilises the seabed, protecting coastlines from erosion and storm damage, and partly mitigates rising sea levels.

Geospatial data has the power to give the UK a greater understanding of the health of its seagrass beds and implement ways to protect the marine environment. The UK Hydrographic Office is in the early stages of investigating the feasibility of expanding their seabed mapping programme to enable us to make the most of our oceans in smarter, more sustainable ways. Separately, Sky Ocean Rescue, World Wide Fund for Nature (WWF), and Swansea University have marked a major milestone in the biggest seagrass restoration project ever undertaken in the UK – planting over 750,000 seagrass seeds in Pembrokeshire.

Mission 2: Improve access to better location data.

Data Improvement Programme.

The Geospatial Commission, its six partner bodies (The Geo6) and other public sector data partners are working together in a £5 million programme to improve the findability, accessibility, interoperability, re-usability and quality of public sector geospatial datasets. To date the programme has delivered:

- **Comprehensive catalogues** of the data held by the Geo6.
- **A harmonised Data Exploration Licence** to allow R&D with Geo6 data.
- **Best practice guides** on linked identifiers (common labels that support the creation of links to other data) and search engine optimisation.
- **A glossary** of geospatial data terms.
- **Recommendations for** the improvement of data.gov.uk as a search portal for geospatial data based on user research.
- **A tool** for assessing the true risks of releasing a dataset with a view to encouraging more data to be shared.
- **A tool** for assessing the authority of a dataset.

Data standards.

In a world where data is collected for specific purposes and exists in various formats, data interoperability won't happen on its own. It requires common standards to allow data to be seamlessly transferred to other areas for which it wasn't originally intended.

What are standards? Simply put, they are agreed ways of doing things. For instance, the UK has a common standard for electrical plugs and sockets, which enables all electrical appliances to be connected to almost any power socket in the UK.

Making data standards work is a challenge. The different purposes that data can be used for are many and complex, there are often no natural incentives for compliance, and standards can sometimes become a hindrance to innovation through inflexibility.

Work to introduce common standards for geospatial data within the UK and Europe began several decades ago. For example, the 2009 UK INSPIRE regulations established a basic and flexible spatial data infrastructure using common standards for geospatial data so it can easily be found, viewed and downloaded. The main purpose of INSPIRE data is environmental reporting and the regulations cover a comprehensive list of 34 data themes. The Geospatial Commission's partner bodies play a key role, alongside organisations such as the Association for Geographic Information (AGI) and the British Standards Institution (BSI). Internationally, bodies such as the International Organisation for Standardization (ISO) and the Open Geospatial Consortium (OGC) have a key role, and data standards are an important theme in the UN's Integrated Geospatial Information Framework (IGIF).

The Geospatial Commission is committed to the development and improvement of standards that enable maximum value to be derived from location data. We will consider the direction that the UK should take on standards for location data that promote both interoperability and innovation, working with Department for Digital, Culture, Media and Sport (DCMS), the Government Digital Service (GDS), Defra and ONS to ensure that appropriate governance of data standards is in place.

CASE STUDY

Unique Reference Numbers.

Just as everyone has a National Insurance number and every vehicle has a number plate, every address has a Unique Property Reference Number (UPRN) and every street has its own Unique Street Reference Number (USRN).

As well as now being available on an Open Government Licence, UPRNs and USRNs are now a mandated standard across the public sector. By promoting wider use of UPRNs and USRNs, we will significantly improve the interoperability and reusability of data.

UPRNs offer significant value across a range of applications, supporting a variety of (often unexpected) use cases. Following the Covid-19 outbreak in 2020, the Welsh Government used UPRNs to coordinate its response for its most vulnerable citizens.

To combine datasets from NHS, local authorities and government, UPRNs were used as the key point of reference. This enabled the 22 local authorities in Wales to begin preparations to support individuals, with geospatial data at the heart of their response.

Mission 3: Enhance capabilities, skills and awareness.

Unlocking the value of location data requires people with the right skills.

Improving the overall skills base of the UK is an on-going government priority due to its critical role in increasing prosperity and economic growth across the country. As the digital and data revolution transforms the economy and society, data skills are in increasingly high demand across all sectors. Recognising this, the government has committed to establish 20 Institutes of Technology, delivering higher technical education in science, technology, engineering and maths (STEM) and helping to increase the supply of in-demand skills.

The Geospatial Commission's Call for Evidence and engagement with industry has raised some key skills challenges:

- **Meeting increased demand.** With a rapidly changing technological environment, the demand for the intelligent use of location data will only increase.

- **Putting location analytics into the mainstream.** We expect that an increasing number of people will need to use location data as part of their role. This will include data scientists outside the traditional geospatial industry who are increasingly applying geospatial thinking to provide insights to their analysis. Tools and techniques that used to be the domain of geospatial specialists are now becoming more accessible to non-experts. There is evidence of a need to increase the integration of geospatial skills alongside other data, digital and specific sector expertise, enabling all data users to benefit from the insight gained by applying geospatial thinking to analysis of data.

- **Keeping pace with technological advances.** While location data will be used more widely by a general audience, there will still be demand for people with very specialised geospatial skills, who provide professional geospatial insight every day. We need to support the development of this specialised skills base to anticipate the changing skills requirements of the future.

The UK has globally recognised geospatial expertise, and is independently ranked second in the world for 'geospatial readiness'[24]. As part of this, we have world-class partner bodies, some of the best geospatial data producers, world-leading universities, professional and academic associations, and a thriving private sector. However, we must not be complacent, particularly with the opportunity the UK now has to forge a new productive relationship with international partners.

Mission overview.

Mission 3: Enhance capabilities, skills and awareness.

Objective
Develop more people with the right skills and tools to work with location data, across organisations and sectors, to meet the UK's future needs and support global development.

Initial key actions

- **Produce a skills demand study** in 2020 to pinpoint specific sectors and roles that need geospatial skills now and in the future.
- **Convene a skills forum** during 2020 to bring together the full range of relevant industry and public sector actors and tackle specific skills challenges in a coordinated way.
- **Develop geospatial apprenticeships** for the public and private sectors by 2021, working with employers and professional associations to draw together geospatial, data science, digital and sector expertise.
- **Pilot an International Geospatial Service** in 2021, to showcase and export UK expertise across the world.

Mission 3: Enhance capabilities, skills and awareness.

Understanding the geospatial skills market.

The Geospatial Commission's 2018 Call for Evidence and subsequent engagement with industry has raised broad challenges that have informed the first actions set out below. To develop long term economy-wide initiatives, we need to understand the dynamics of a fast-changing labour market and the interactions between geospatial skills and other STEM, data and digital skills. The Geospatial Commission will produce a Geospatial Skills Demand Study in 2020 which will:

- **Pinpoint the specific sectors and roles** that need geospatial skills.
- **Chart recent changes** in the demand for geospatial skills.
- **Anticipate the likely future evolution** of skills requirements.

Bringing people together and raising awareness.

In order to maximise the economic, social and environmental opportunities, a whole range of sectors need to be aware of the benefits of location data and to play their part to tackle the skills challenges.

The Geospatial Commission will convene a geospatial skills forum, bringing industry, professional bodies, the government professions, academic institutions and key government departments together to tackle specific skills challenges in a coordinated way.

The skills forum will:

- **Identify the best options** to tackle key skills challenges.
- **Connect geospatial experts and students** with prospective employers.
- **Advocate for the value** of geospatial skills across sectors.
- **Identify approaches to embed geospatial skills** into the wider data and digital skills landscape, and coordinate action to implement this.
- **Evaluate diversity within the geospatial workforce** and address under representation.

Across the public sector, the Geospatial Commission will work to raise the profile of geospatial skills, highlighting the potential value to organisations from better creation, curation, exploitation and release of location data.

Mission 3: Enhance capabilities, skills and awareness.

Developing geospatial apprenticeships.

While our Geospatial Skills Study will help us target future intervention, we have identified an immediate need for better geospatial apprenticeships.

The government has made significant investment in technical qualifications and apprenticeships, with 4.2 million apprenticeships created since 2010 in England[25]. Apprenticeships combine practical training in a job with study, designed around specific occupations. We want to ensure there are sufficient geospatial apprenticeships that are geared towards teaching geospatial skills alongside other data, digital or specific sector expertise.

The Geospatial Commission will work with our partners to develop geospatial apprenticeships for the public and private sectors by 2021, working with employers and professional associations to draw together geospatial, data science, digital and sector expertise.

Exporting our expertise on the global stage.

The international landscape for digital technology is rapidly evolving and many nations are embedding location data as a core part of national capabilities. Through our partner bodies, academia and industry, the UK is well placed to support international capacity building and skills development.

The Geospatial Commission will pilot an International Geospatial Service in 2021, to showcase and export UK expertise across the world.

CASE STUDY

Data capability in government.

The UK Civil Service is made up of a wide range of professionals – from engineers, to commercial managers and lawyers. The Government Analysis Function integrates analytical professionals and scientific methods into government to help achieve better outcomes for decision makers, and the public.

Geospatial data and skills are used throughout all the government analytical professions. For instance, statisticians use location data to create local estimates of the population and the labour market, and are finding new ways to use location as a reference point to combine disparate datasets. Economists use location data to model the impact of infrastructure projects or the effect of national policy on different regions. A new Government Geography Profession was established in 2018 to attract fresh talent and place geography as an integral part of decision-making and delivery across government.

Volunteers support teachers to use geospatial techniques in the classroom and act as career role models to the next generation.

CASE STUDY

Inspiring the next generation

With the use of Geographical Information Systems (GIS) now a requirement in schools, geospatial skills programmes are being delivered by the public and private sector.

- **GeoMentor Programme –** Esri UK and the Royal Geographical Society (with the Institute of British Geographers) are working together to develop a UK network of GeoMentors. These are experts who volunteer to support teachers to use geospatial techniques in the classroom and act as career role models to the next generation.

- **Geography Ambassadors –** The Royal Geographical Society (with IBG) Geography Ambassadors schemes recruit and support university student geographers and professionals to make visits to schools and universities, to share and promote the benefits of studying geography. The scheme delivers roughly 1,000 sessions to young people annually.

- **EDINA –** Based at the University of Edinburgh, EDINA delivers digital products to all UK Higher and Further education establishments and over 3,000 schools. Digimap provides teachers and students with access to a number of key data collections, including Ordnance Survey, historical, geological, light detecting and ranging (LiDAR) and marine maps.

- **AGI Early Career Network –** Run by Association for Geographic Information (AGI) members to support early career professionals, and those moving into the geospatial community from other sectors. This includes career fairs, speaking at schools, promotion of graduate schemes, training webinars and networking events.

Mission 4: Enable innovation.

Innovation – the ability to develop new ideas and deploy them – is a fundamental driver of improved productivity and sustainable economic growth. In a modern digital economy, data is an increasingly essential ingredient for innovation.

The government is committed to the UK becoming a global science superpower. At the Spring Budget 2020, the Chancellor announced that government investment in Research and Development (R&D) will increase to £22 billion by 2024/25, putting the UK on track to reach 2.4% of GDP being spent on R&D across the UK economy by 2027. In addition, the Industrial Strategy sets out four Grand Challenges to put the UK at the forefront of the industries of the future focused on the global trends of artificial intelligence and data; an ageing society; clean growth and the future of mobility.

These national commitments lay the foundation for economic recovery and growth, building on the UK's world-class science, research and innovation. Location data will underpin innovation across the UK's many creative and innovative businesses from automotive, aerospace and maritime sectors to satellites and AI deployment.

Our initial analysis of the potential economic value of location data, between £6 billion to £11 billion per year [26], is likely an understatement - not least because future innovative uses of location data have not yet been developed and so could not be included in this evaluation.

The Geospatial Commission will focus on getting the basics right, creating the right conditions for innovation by taking the steps set out in this strategy, to enable others to develop innovative applications, and leveraging wider government initiatives to boost innovation.

Our approach will be informed by models for innovation across government to ensure it is grounded in experience of what works. We will evaluate each project to ensure learning is captured and incorporated into future projects.

CASE STUDY

Start-ups boost the location data market.

The Geospatial Commission has found evidence of an emerging community of high growth companies using location data in their core business offer. Focussing on start-ups, we identified a sample of over 400 location data businesses. Between 2011 and 2018, there was a year-on-year increase in the number of new location data companies, and equity funding rose by an average yearly rate of 68%. Although relatively small in number so far, this suggests a trend of increasing investment and innovation in the market.

Government support for innovation.

Mission 4: Enable innovation.

Science and innovation are at the heart of the government's economic plan, reflected in the 2020 Budget announcement that government investment in R&D will increase to £22 billion by 2024/25. This landmark investment is the largest and fastest ever expansion of support for basic research and innovation.

The UK has a strong innovation framework, providing generous support through the tax system for companies undertaking R&D, and programmes to help businesses transform new ideas into new products and services. As part of this, there is strong support to help the dissemination of new knowledge and technologies:

- **United Kingdom Research and Innovation** (UKRI) is the public body responsible for research and innovation funding, working with universities, research organisations, businesses, charities, and government to create the best possible environment for research and innovation to flourish.

- **Innovate UK,** funded by UKRI, drives productivity and economic growth by supporting businesses to develop and realise the potential of new ideas.

- **Many government programmes** seek to match public sector challenges with innovative market solutions. For instance, the Govtech catalyst is a £20 million fund used to seek tech sector solutions to government policy challenges.

- **Accelerators, including Geovation,** enable programmes of work to secure seed funding and external equity in order to address social, environmental and economic challenges.

- **The network of Catapult centres** are environments established to coordinate and support businesses to identify innovative solutions to policy and public sector challenges, providing the best facilities and talent nationally to give businesses access to technologies and innovation with global market potential.

- **The Government Technology Innovation Strategy** sets out ambitious proposals to update processes, eliminate legacy systems, and embrace emerging technologies.

- **Ploughshare Innovations** commercialises technologies generated from government, including the Defence Science and Technology Laboratory (Dstl), the Atomic Weapons Establishment (AWE Plc), Ministry of Defence (MOD), and others.

Mission overview.

Objectives: Maximise the commercial opportunities for innovation and promote market-wide adoption of high value emerging location technologies.

Initial key actions:

- Establish a Location Data Innovation Programme in 2020 to ensure that innovative uses of location data feed into existing innovation catalysts across the UK.
- **Support Scotland's first Geospatial Network Integrator** to accelerate the development of an emerging geospatial cluster from 2020, alongside the Scottish Government and Scottish Enterprise, with a view to future roll out in other regions.

Mission 4: Enable innovation.

Mission 4: Enable innovation.

An injection of innovation.

The Geospatial Commission will establish a Location Data Innovation Programme in 2020 to ensure that innovative uses of location data feed into existing innovation catalysts across the UK. The programme will include the following:

- **Joining problems together with innovators.** Setting challenges around development of public policy to which innovative solutions and resources (whether new technology, new methods or a new approach) can drive innovative activity.

- **Creating spaces and tools to encourage innovation.** Developing opportunities by:

  Convening data owners together with data scientists to develop innovative solutions to real-world problems.

  Creating sandbox (or 'safe') environments for exploring the use of data, and supporting companies to bring innovation to market safely and legally, while informing future regulatory change.

- **Supporting specific projects to drive investment and commercial activity.** These could include innovative projects to solve a policy challenge – such as a public health problem, or housing delivery incentive - that is not only deliverable but scalable on a national level. Although this could represent higher risk investment, scalability would enhance the economic and social benefits.

Collaboration and networking.

The Geospatial Commission will support Scotland's first Geospatial Network Integrator to accelerate the development of an emerging geospatial cluster from 2020, alongside the Scottish Government and Scottish Enterprise, with a view to future roll out in other regions.

The Geospatial Network Integrator will capitalise growth opportunities by establishing networks from the private and public sector, while also encouraging collaboration to allow the sector to access future market and funding opportunities. This will drive improvement in skills, and provide support for innovation on a national scale.

CASE STUDY

Releasing the power of location to start-ups.

Geovation is an accelerator and innovation hub for location data and property technology innovators. Geovation provides expertise, technical support, grant funding and mentorship to accelerate the development of innovative start-ups and technology companies.

As an initiative of Ordnance Survey in association with HM Land Registry and Registers of Scotland, it operates out of London and Edinburgh and provides supported access to public datasets – detailed maps and addressing, ownership information, valuations and more. Working with start-ups helps Geovation and its partners understand how to unlock greater value from these national data assets.

Companies supported by Geovation have raised more than £77 million in investment and created 484 new jobs. Skyscape is one of the companies involved, offering rooftop planning, management, and analysis services in dense, urban areas to facilitate vertical development, increase sustainability and maximise the use of otherwise limited urban space. Geovation provides a platform and model for the development of new and exciting applications of location data.

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