Cabinet Office

An Initial Analysis of the Potential Geospatial Economic Opportunity

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1. Introduction

1.1 Background and context

The government's manifesto committed to making better use of land data to *"digitise the planning process and help create the most comprehensive digital map of Britain to date. In doing so, it will support a vibrant and innovative digital economy, ranging from innovative tools to help people and developers build to virtual mapping of Britain for use in video games and virtual reality."*

To support the development of this commitment, the Prime Minister commissioned a cross-departmental working group to deliver a rapid assessment of the opportunities and options.

This document sets out the initial high level analysis on which these findings are based and which contributed to Government's announcement of the creation of a Geospatial Commission in Autumn Budget 2017.

This initial analysis highlighted three key points:

- we have world-class capability in geospatial data
- previous attempts to coordinate data policy have struggled
- while there were lots of ideas for using data better, we needed to evaluate properly the opportunities in the public and private sectors

It provides the findings on the potential size of the economic opportunity from better use of geospatial data. The purpose of this work was to provide a 'size of the prize' estimate and an understanding of the kinds of interventions government will need to consider in order to unlock value. It is not intended as a business case and further work and consultation with industry partners, government departments and arm's length bodies will be required to set priorities and build the case for specific government interventions.

This work was completed with consulting support from the Boston Consulting Group and with input from a range of government departments, arm's length bodies and external geospatial data users.

The Geospatial Commission is keen to refine and build on this initial analysis as part of our Call For Evidence which was launched alongside the publication of this document.

The government team involved with this analysis published their blog in March 2018[1].

2. Executive Summary

The geospatial data landscape is changing. Increasing amounts of geospatial data, coupled with a better understanding of how it can be used, present opportunities to drive economic growth. This work has examined the issue through two lenses – the potential to create value from known private sector and public sector use cases and the potential to enable an innovative geospatial ecosystem that unlocks further growth.

Analysis of private sector use cases suggests government could unlock up to £6-11 billion per year of economic value. Better use of geospatial data in the public sector (for example through better routing of Emergency Services) will create additional economic and social value, though this has not yet been sized. Beyond today's use cases, enabling a more innovative geospatial data ecosystem could unlock substantial value, though the exact size is harder to quantify.

This initial analysis suggests there is very significant opportunity to generate economic growth from geospatial data.

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[1]

https://quarterly.blog.gov.uk/2018/03/28/location-location-location-tapping-the-economic-potential-of-geospatial-data/

3. Methodology and Key Assumptions

Estimating the value of data is notoriously difficult given inherent uncertainty in the rate of development and diffusion of new technologies and their resulting impact. To provide Government with a potential "size of the prize" and an understanding of where in the economy this value might be realised, this analysis has taken a use case based approach. The analysis has focussed on the additional economic value that could be unlocked across the UK. In order to avoid double counting or economic transfers and to maintain consistency with HMT Green-book principles, the analysis focussed on productivity impacts:

- Labour / time savings – eg. reduced search time, reduced unplanned delay, process automation
- Fuel savings – eg. in route-optimisation
- Material savings – eg. reduced error rates in construction, avoided consumables

The analysis did not looked at the investment required or the funding model for these initiatives, this should be analysed with broader consultation of the public and private sector specific opportunities a future Commission or government agency might consider. These would be subject to individual business cases, regulatory assessments and other analysis as required. This analysis has used publicly available sources where possible. In particular, use has been made of three publicly available studies of the value of geospatial data in the New Zealand, Canada and Australia and the Shakespeare Report (2013) in the UK. While these studies had different purposes and were not necessarily focussed on how government might unlock additional value, they do provide useful input and context for this work.

In order to estimate the potential impact, a three step approach was used:

Identify use cases: A range of known use cases were identified. This was done through interviews with government agencies, delivery bodies, external experts and previous reports. Given the wide range of use cases an attempt was made to ensure that the set of case studies covered the widest possible range of sectors and focussed on areas that stakeholders perceived the most incremental value.

Estimate potential impact: For each of the use cases, the potential impact on GVA

in a given sector of the economy was estimated. This was done using case studies of typical savings that had been achieved derived from experts or industry interviews.

Estimate adoption rate: The level of adoption today was estimated and an assumption was then made about the incremental adoption that could be encouraged by government action was also made.

To promote consistency between the use cases, the assumption was made that the rate of adoption could be accelerated one category on the Rogers Curve (e.g. from early adopter to early majority). This approach is not exhaustive of all the potential use cases of geospatial data. In particular it is likely to understate the impact of use cases that have not yet been developed or that are not yet widely understood. Broader consultation than was possible during this work should help to surface further use cases.

At the same time the total impact on GVA in a given sector and the potential for increased adoption are inherently uncertain. Simplifying assumptions – such as the Rogers curve - were necessary in order to generate size of the prize estimates. As a result the values are presented in overall aggregate.

4. Private and Public Sector Use Cases

The Five Themes of Private Sector Use Cases

(i)   Sales and Marketing – better adoption of geospatial data for location-based advertising, optimising retail footprints and end-to-end supply chains could realise £1.1 - 2.2 billion.

(ii)   Property and land – geospatial data used to support e-conveyancing, provide greater value transparency, location aware insurance and digital surveying and could realise £1.5 - 2.5 billion.

(iii)   Infrastructure and construction – geospatial data used to support optimal route locations for new pipelines, generators or power lines or signal towers to reduce planning times and maximise return on investment, with an added value of between £2.2 - £4.6 billion.

(iv)   Mobility – Route optimisation using geospatial data, along with the use of unmanned drones could realise between £1.0 - 1.9 billion.

(v)   Natural resources – using geospatial data to support farming/automating farming equipment, precision agriculture, autonomous mining and exploration and remote monitoring could realise between £0.2 - £0.3 billion.

In addition, the work has identified significant second order effects that may be available in areas such as enabling Autonomous Vehicles or improving the competitiveness in property development, where the role of geospatial data or the role of government in unlocking value is less clear and geospatial data is likely necessary but not sufficient. These are areas where government will need to adapt as the evidence evolves.

We have not included second order effects directly in our overall estimates. However, they do give additional confidence in the size of the prize that could be available from government intervention in this general purpose technology.
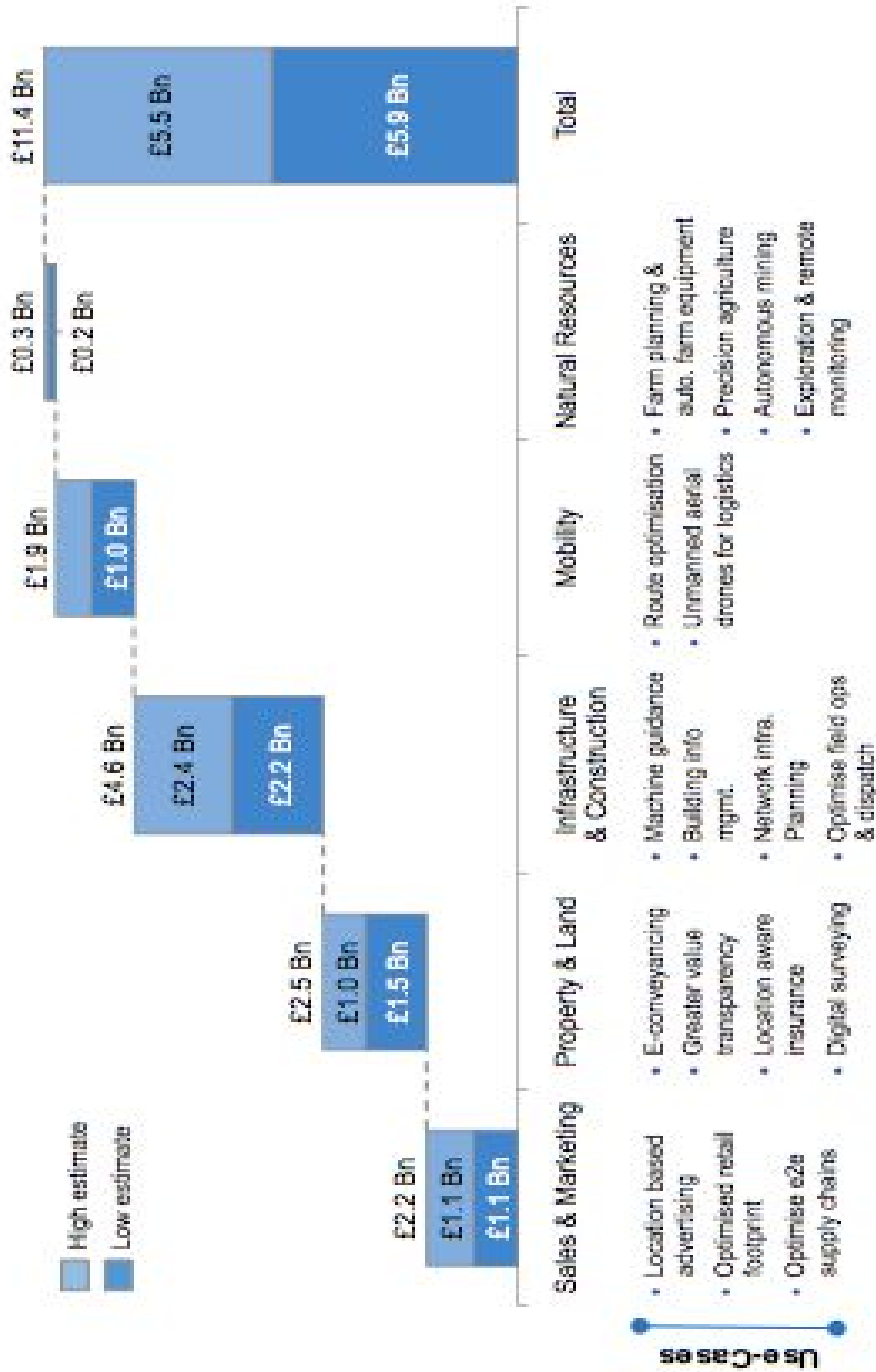
We have also examined high value use cases in the public sector, though we have not as yet ascribed a value.

The Five Themes of Public Sector Use Cases

(i) Housing, Land and Planning – e.g. Urban planners use rich land and housing data, and geo-demographic data to accurately forecast demand for public services, understand service demand drivers and identify the right response.

(ii) Security, Emergency Planning and Response – E.g. Emergency response agencies use rich property data (e.g. entry points) and basic occupancy information to plan tailored emergency response actions (e.g. for elderly or disabled persons).

(iii) Transport and logistics – E.g. Local authority use road maps, transport network data, demographics and school locations to plan safe routes to schools, balancing costs and service level commitments.

(iv) Environment – E.g. Rural payments agency uses accurate maps, agricultural yield data and dynamic visualisations to monitor and support management of their payments.

(v) Citizen engagement and service delivery – E.g. VOA use accurate, detailed and timely planning data to update property valuation models and business rate to simplify and improve the efficacy of tax collection.

Incremental value from private sector use-cases (£ billion per year.)

Legend:
- High estimate
- Low estimate

	Sales & Marketing	Property & Land	Infrastructure & Construction	Mobility	Natural Resources	Total
	£2.2 Bn	**£2.5 Bn**	**£4.6 Bn**	**£1.9 Bn**	**£0.3 Bn**	**£11.4 Bn**
High estimate	£1.1 Bn	£1.0 Bn	£2.4 Bn	£1.0 Bn	£0.2 Bn	£5.5 Bn
Low estimate	£1.1 Bn	£1.5 Bn	£2.2 Bn			£5.9 Bn

Use-Cases:

Sales & Marketing	Property & Land	Infrastructure & Construction	Mobility	Natural Resources
• Location based advertising	• E-conveyancing	• Machine guidance	• Route optimisation	• Farm planning & auto. farm equipment
• Optimised retail footprint	• Greater value transparency	• Building info mgmt.	• Unmanned aerial drones for logistics	• Precision agriculture
• Optimise e2e supply chains	• Location aware insurance	• Network infra. Planning		• Autonomous mining
	• Digital surveying	• Optimise field ops & dispatch		• Exploration & remote monitoring

Potential "second-round" effects[1]

- Potential for geospatial to help unlock autonomous vehicles

1. Potential sources of value where the role of government and of geospatial data in unlocking the value is less clear

	Major Use-Cases	Primary Value Levers
Sales & Marketing	Location based advertising	• Reduce ineffective marketing spend due to better targeting
	Optimise retail footprint & product mix	• Lower staff costs due to smaller store footprint
	Optimise end-to-end supply chain	• Reduce distribution costs due to better facility location
Property & Land	E-conveyancing	• Reduce conveyancing costs and time due to better searches and e-conveyancing
	Greater value transparency	• Reduce failed planning applications and application costs due to better information
	Location aware insurance	• Improved price-realisation due to precision understanding of location risk
		• Reduced costs in claims processing due to better understanding of location
Infrastructure & Construction	Network infrastructure planning	• Better, faster and cheaper planning from use of GIS-enabled tools
		• Reduced cost of unplanned delays and minimise rework in construction
	Machine guidance in construction	• Reduced labour costs from machine automation
		• Reduced waste materials and rework due to mistakes or imprecision
	Building information management	• Reduced labour costs due to better planning & scheduling
		• Reduced waste materials due to planning and scheduling errors
	Optimise field ops & dispatch	• Reduced travel time and fuel costs
		• Reduced time spent locating connections & assets in the field
Mobility	Route optimisation	• Reduce fuel costs
		• Increased driver productivity due to less idle time
	Unmanned aerial drones for logistics	• Reduced fuel and driver costs due to less vehicles on the road
Natural Resources	Precision agriculture	• Optimised farming inputs from machine automation & GIS land-planning
	Autonomous mining equipment	• Improved productivity of machinery from GIS precision & automation

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The previous table shows the major use cases and their respective value levers.

6. Fostering The Geospatial Ecosystem

Beyond today's use cases economic growth can be unlocked by fostering an innovative geospatial ecosystem of data producers and consumers that can identify and realise future use cases.

Government has an important role in supporting the development of the ecosystem through ensuring:

- **Geospatial data** is available on terms that maximise value to the UK. Interoperability, openness and accessibility of data, and a community of public and private sector bodies contributing to our national data infrastructure.
- A **regulatory environment** which stimulates growth and competition, and maintains fairness in the geospatial economy.
- The **resources** required by existing and new geospatial businesses to support their growth such as talent and capital are available.

In supporting an innovative geospatial ecosystem government needs to ensure that it takes into account:

- **Public and private fairness**: Ensuring that interventions do not simply involve a transfer of value from the taxpayer to a few large private companies.
- **Ability to maintain data**: Ensuring that interventions do not undermine the stable funding base of important national assets over the long-term.
- **Security and privacy**: Ensuring that interventions do not endanger the security or privacy of citizens.

Previous studies (such as Shakespeare, 2013) have attempted to estimate the economic value that might be unlocked from opening more government data and thereby fostering a more innovative ecosystem. Given the overlap with our productivity based estimates and the fact that opening more data is likely one of the interventions that will enable some of the value estimated there, we have not tried to separately model the value of opening data. That should be done on a case by case basis and in the context of a specific data

set, where elements like the elasticity of demand and the potential for indirect or second order benefits can be better understood.

6.1 Unlocking value will not be easy and it will take time

We have identified a range of actions required to maximise the value of geospatial data to the UK:

(i) **Improve accessibility, interoperability and quality of data:** This involves driving the use of common identifiers (e.g. UPRNS) to make data easier to link and locate, building APIs and platforms to improve the accessibility and interoperability of data, simplifying and standardising the licensing regime to make it easier to understand for entrepreneurs. This also involves creating critical new data sets for example around underground assets or the 3D built environment to support new use cases.

(ii) **Open more geospatial data:** This involves making the case to open new data sets according to a framework of value and other considerations. Having a single body where the difficult debates of value vs. considerations of public and private fairness, the ability to invest in data etc. can be resolved on an ongoing basis will be an important role of the Commission.

(iii) **Improve capabilities and resources**: This will involve investing to ensure users and potential users understand where to find data, how to access it and what conditions are attached to that access. This will necessarily involve communicating the terms of a licence in a more concise way. It will also involve extending support to start-ups in the geospatial domain, building on the success of Geovation Hub and helping to ensure that companies operating in the UK (including start-ups) have access to highly skilled talent.

(iv) **Set regulation and policy**: This will involve fostering a regulatory environment that stimulates growth and competition in the geospatial economy. The

Geospatial Unit will be a clear point of contact for geospatial regulation, dedicated government resources to assisting companies navigating complex regulation.

In the table below we have provided a starting point, based on our discussions with relevant government departments, arms length bodies and industry interviews, for the initiatives required to unlock the substantial economic opportunity presented by geospatial data. Further consultation will be required in order to turn this into a programme of work and this should be one of the first priorities of the new Commission once established.

Table 1: 21 Initiatives for further consideration

	Fix "no regrets" issues Set policy, standards, and build UK geospatial organisational infrastructure	Invest to unlock value Build the business case and invest to unlock value; shape the ecosystem for the future	Place bets Make select investments; role of government in unlocking unclear or value uncertain
Improve accessibility, interoperability and quality of data	1 Enforce common standards, schema, metadata and use of geospatial identifiers 2 Create open APIs and simplify web access 3 Create support service directory to signpost government geospatial resources 4 Simplify and digitise commercial licences for using, merging and publishing government data sets	10 Provide a platform for access/ analysis of geospatial data from core geospatial bodies 11 Enable creation of georeferenced platforms • Housing, Land and Planning (DCLG) • Infrastructure and Construction (BEIS) 12 Improve feedback mechanisms and incorporate user generated data where appropriate	17 Selective lighthouses to prove the business case for intervention, e.g.: • Autonomous vehicles • 5G • Further under-sea mapping
Open more geospatial data	5 Set principles for opening more government geospatial data	13 Review remaining shared datasets for opportunities to open	
Improve capabilities and resources	6 Governance and communications: better co-ordinate existing activity across bodies (e.g. transformation, sea surveying) 7 Build geospatial data community & 'Centre of Excellence' to develop & transfer skills expertise, systems and tools in the public sector 8 Consider expansion of accelerator model (e.g. Geovation) outside London	14 Ensure geospatial technologies embedded within current diffusion methods, e.g. catapults for the private sector 15 Ensure highly skilled talent is available, including from EU	18 Develop and grow geospatial clusters in specific locations across UK and encourage large tech corps to open UK offices 19 Co-ordinate delivery body activity in building AI/ML capability 20 Financially support start ups with loans and gov contracts
Set policy and regulation	9 Help start-ups navigate regulation with resources and a clear point of contact	16 Consider & set principles for where gov will intervene/ encourage sharing private data	21 Influence regulatory response on future geospatial use cases (e.g. AV, drones)

These initiatives will require investment as well as contributions and co-ordination from a range of government bodies and will require business cases before funds are committed.

Some of these such as underground assets are already being considered or actively pursued by delivery bodies who see the imperative for making change and the potential value delivered. The Commission will have an important role in highlighting, championing and supporting these existing initiatives and bringing them together into a coherent programme.

Table 2: 21 Initiatives for further consideration

	Initiative	Definition
1	Enforce common standards, schema, metadata and use of geospatial identifiers	Consider a review of high value "foundational" identifiers and standards for geo-data, and publish a document outlining the government's preferred standards and identifiers Consider writing policy and implementing spend controls to mandate adoption of these standards in the public sector (e.g., UPRNs in addressing)
2	Create open APIs and simplify web access	Consider removing complexity and barriers from APIs wherever possible Consider re-framing API access as a data delivery mechanism, rather than value-added service
3	Create support service directory to signpost government geospatial resources	Consider creating a simple website and signposting to explain what geospatial data resources are available • Data (highlighting what is free and where developer licenses exist), computing infrastructure around the UK, incubator/ accelerators, and funding programs
4	Simplify and digitise commercial licences for using, merging and publishing government data sets	Consider creating a baseline of licensing arrangements in use for public sector geospatial data, and standardise and streamline where

		possible (e.g., reduce number of license types/charging models, align on use of OGL for any open data) Consider creating a digital licensing standard and implement across public sector to make licenses machine-readable and allow automated combination of licenses for companies using multiple datasets
5	Set principles for opening more government geospatial data	Set-up a framework for estimating the benefits and costs of opening datasets i.e. methodology for assessing primary direct economic benefits from opening and secondary benefits of opening methodology for assessing other considerations
6	Governance and communications: better co-ordinate existing activity across bodies (e.g. transformation, sea surveying)	Centrally align geospatial priorities across Whitehall, create a forum and provide leadership in resolution of issues
7	Build geospatial data community & 'Centre of Excellence' to develop & transfer skills expertise, systems and tools in the public sector	Champion geospatial capabilities across HMG Consider ways to improve understanding of geo-data at senior levels across public sector Consider a centre of excellence on geospatial analytics/ GIS tools, and advise public sector organisations on how they can best make use of, and procure this technology - E.g., routing optimization
8	Consider expansion of accelerator model (e.g. Geovation) outside London	Look at costs of creating other Geovation accelerators outside London, quantifying benefits of current London-based model, and targeting expansion in regions where geospatial start-ups would benefit from proximity to industry/feed into industrial strategy (e.g., Midlands)
9	Help start-ups navigate regulation with resources and a clear point of contact	Set responsibility for a team/individual within the Geospatial Unit to be the point of contact for geospatial regulations
10	Provide a platform for access/ analysis of geospatial data from core geospatial bodies	Consider a web-based platform for access to, and analysis of core geospatial data held by core geospatial bodies.
11	Enable creation of georeferenced platforms	Consider charging relevant Departments with the task of creating geospatial platforms required to unlock value and assure delivery. • E.g. online platform to access land titles, charges, planning information etc.

		• E.g. online platform to access information on the location of underground assets and BIM models of buildings and infrastructure
12	Improve feedback mechanisms and incorporate user generated data where appropriate	Explore opportunities to create better feedback loops between customers and data providers for government geospatial data sets. This should include making better use of open data to achieve this result
13	Review remaining shared datasets for opportunities to open	Analyse remaining government geo-data and conduct a cost/benefit analysis of opening this data
14	Ensure geospatial technologies embedded within current diffusion methods, e.g. catapults for the private sector	Consider using innovation policy centres with the role of advocating geospatial use cases, e.g., routing optimisation amongst SME logistics providers E.g., through catapults and test-beds
15	Ensure highly skilled talent is available, including from EU	Investigate policy interventions to clarify position for highly skilled tech workers from outside the UK and other means of assuring sufficient skills
16	Consider & set principles for where gov will intervene/ encourage sharing private data	Conduct a review of private sector data, highlighting potential datasets which have large economic value of being open Explore regulatory and licensing options to encourage/compel private companies to open this data
17	Selective lighthouses to prove the business case for intervention, e.g.: Autonomous vehicles, 5G, further under-sea mapping	Consider setting-up demonstrator initiatives like Bournemouth 5G modelling to test and prove value of opportunities with large potential pay-off but high costs
18	Develop and grow geospatial clusters in specific locations across UK and encourage large tech corps to open UK offices	Consider tax/IP incentives for large tech companies which set up offices in the UK, clarify position post-Brexit for international companies considering the UK as a European base
19	Co-ordinate delivery body activity in building AI/ML capability	Co-ordinate efforts by bodies to develop and test solutions to automate mapping production using AI/ML, cross-pollinate lessons and advances

20	Financially support start ups with loans and gov contracts	Examine ways to encourage more smaller companies/start-ups to bid for contracts.
		Consider allowing start-ups to run product tests with government depts/regional bodies (e.g., local gov. bodies in a region)
21	Influence regulatory response on future geospatial use cases (e.g. AV, drones)	Lead the regulatory policy debate in industries where geospatial data is a core input and champion solutions that maximise total economic value