

A close-up portrait of a woman wearing a red hijab and glasses, smiling. The background is blurred, and there is a faint network diagram overlay on the left side of the image.

# SEE YOUR CITY SMILE

How geospatial data can  
help you build a smart,  
citizen-centred city

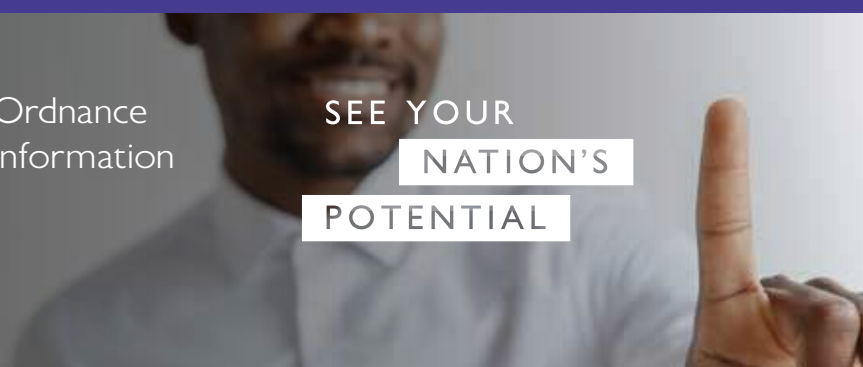
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This report is part of a series from Ordnance Survey to help you apply geospatial information to realise your nation's potential.

Read more at: [os.uk/theysee](https://os.uk/theysee)

SEE YOUR  
NATION'S  
POTENTIAL



# INTRODUCTION





Citizens' happiness in a city is founded on their ability to see it as their home for decades to come. Humans seek to establish roots that allow us to connect to those around us we care about. It helps us lead fulfilling lives, physically, psychologically, and socially. We want a good quality of life, which means one that is healthy and attractive to us.

To ensure people feel their city is a long-term home, it's important to nurture the experience that the surrounding infrastructure is centred on them, that it recognises and supports their needs, helps them flourish, helps them engage with everything the world has to offer, and ultimately, makes them happy.

For policymakers, citizen happiness and quality of life has become paramount, to the extent that it is being written specifically as a policy goal, as in Saudi Arabia's 'Vision 2030'<sup>1</sup>, and used as a measurement of prosperity rather than GDP, as in Dubai's 'Happiness Index'<sup>2</sup>.

What this means in practice for those designing cities is removing the obstacles in citizens' lives; from needless paperwork for minor and trivial events, putting both essential and non-essential services at

the touch of a button; having predictive infrastructure built with its users in mind; and providing a safe and secure environment

To create the environments in which happiness and quality of life are significantly elevated necessitates smoother running services, more efficient information flow, and greater connectivity, all of which help unlock better decision making through optimised collection and use of data.

Achieving the desired outcomes both for citizens and policymakers requires the building of a citizen-centred society; where the places in which people live and work, and the infrastructure and services on which people depend, are designed to serve, not to obstruct. And where the collection and provision of this requisite data is smooth, secure, and obstacle-free for all parties.

Geospatial data is one of the fundamental elements of these achievements, which helps authorities deliver the critical services that enable people to call a city home, and one in which they are happy – from waste management, to school routes, functional utilities, and highspeed communications.

1. <https://www.vision2030.gov.sa/v2030/overview/vibrant-society/>

2. <https://u.ae/en/about-the-uae/the-uae-government/government-of-future/happiness#:~:text=Abu%20Dhabi%20and%20Dubai%20are,Read%20related%20coverage%20on%20WAM&text=According%20to%20UN%20World%20Happiness,one%20rank%20from%20last%20year.>

The ubiquity of digital connectivity affords urban planners, administrators, and its citizens an opportunity like never before to deliver true citizen-centred cities, and to make real the factors which define a truly global city<sup>3</sup>.

## 01

### **Urban value creation –**

How a city creates value for its residents, businesses, and communities.

## 02

### **Global connectedness –**

How well a city secures global flows of trade, investment, and ideas.

## 03

### **The transformation of urban space –**

Making your city more sustainable, resilient, and inclusive.

Behind the solutions that realise such ambitions lies geospatial data. It is one of the most significant single tools in gaining the requisite insight and information needed to create simultaneously happy and global cities which will best exhibit your nation to the world. In the UK, for example, the average citizen interacts with geospatial data more than 40 times a day<sup>4</sup> representing an immense treasure trove of insights, that can be used to improve citizen wellbeing, productivity and happiness.



3. Kearney, '2020 Global Cities Index: New priorities for a new world.' - <https://www.kenney.com/global-cities/2020>

4. <https://www.youtube.com/watch?v=EvVy-V5hYHs&t=3s>

# What is geospatial information?

‘Geospatial information’, also referred to as ‘geospatial data’, or ‘location data’, is information about location. Geographers and cartographers have worked with geospatial information for centuries, plotting maps and charts to represent the world around us, underpinning decisions made by policymakers, industry, and citizens alike.

In the 21st century, digital geospatial information is generated constantly, from locations derived from our mobile connections, to remote sensing of the Earth’s surface from space, to global navigation satellite systems (GNSS) like GPS.

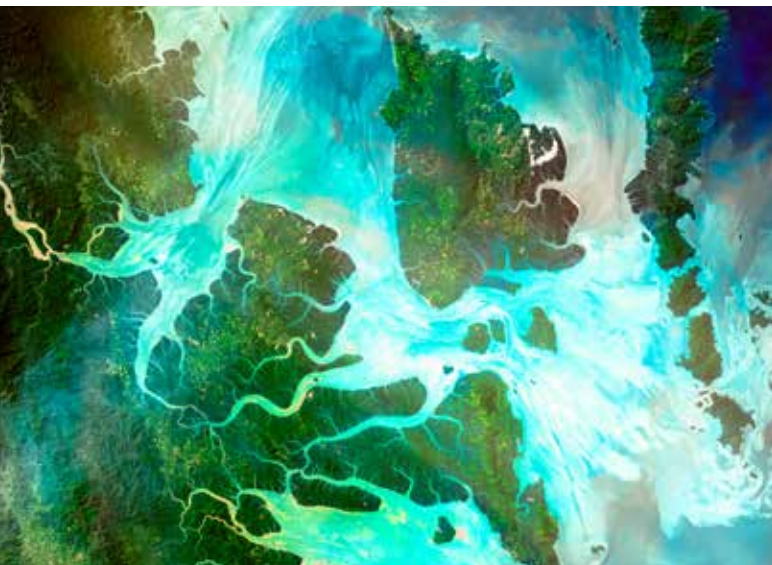
Geospatial information serves an important role in linking different data sets that would be otherwise unconnected, through their shared location and place. A ‘spatially-enabled’ society is one that benefits from a wide array of spatial data and services<sup>5</sup>. A ‘Spatially Enabled Government’ uses evidence

based policy by linking government data using location, ensuring data and decisions are spatially enabled.

Enhancing and linking other data-driven initiatives, geospatial information is a critical enabler for nations seeking to grow their economies, drive sustainable development, support evidence-based decision making and policy setting, and enable new and innovative uses of government data to solve problems and provide new services.

Every country is at a different stage of implementation in their approach to managing geospatial information. ‘Geospatial maturity’ is a term used to describe the level of sophistication that a country has in its use of geospatial information and technology, and the value derived from it. A geospatial maturity assessment is a tool that can help organisations objectively understand how mature their geospatial capabilities are.

5. <https://www.fig.net/resources/publications/figpub/pub58/figpub58.pdf>



The global market in geospatial information is measured in billions of US dollars, and is set to increase.



PART ONE:  
INFRASTRUCTURE

2





Infrastructure is the backbone of a city. It is the foundation upon which everything else can be built, and so should be resilient, adaptable, and supportive, yet unintrusive. In this way it delivers not only the physical nuts and bolts required for a city to thrive, but it inspires and fulfils the aspirations of its citizens. When a city is built to serve, its inhabitants are able to stand on its shoulders so as to get the best possible view of what they can achieve.

Infrastructure has a dual function – to meet present moment concerns, required for the day-to-day functioning and wellbeing of its citizens, covering fundamental elements such as roads, waste, water, power and communications. Its second but equally important role is forward-looking, planning for the sustainable city of tomorrow, today. Improvement and development of new infrastructure must consider how citizens want to interact with their city, what future technologies should a city integrate into its design, and how a city can continue to reinvent and revitalise itself.

A more considered, well-built city today is best placed to deliver a smarter, more digitised one tomorrow.

# Establishing a strong framework

The foundations of any urban environment are transport, waste, water, power and communications; without them, cities simply grind to a halt. Rapid urbanisation, however, has raised questions around such key infrastructure like never before. Half the world's population live in cities today and this is set to increase to two thirds by 2050<sup>6</sup>, with people driven by the employment opportunities, living standards, and access to services afforded by urban living.

Having a planned infrastructure – pre-emptively installed during housing construction – is up to three times less expensive than a retrospective one, where it is required to work around or demolish existing infrastructure first<sup>7</sup>. Importantly, it enables a city to best meet twenty first century needs head on, rather than seeking compromises. A considered, connected infrastructure, that recognises and caters for the likes of new demands on mobility, such as electric vehicles, sustainable transport, the reduction of air pollution and carbon efficiency, also doesn't go unnoticed by residents or visitors.

Location data has an important role to play in a city's evolution. Accurate information will help prioritise your city's objectives, particularly when it comes to basic service provision. Geospatial data informed the creation of the arteries that flow through and sustain a city, and underpin ambitious infrastructure plans.

With location data, it is now possible to build a digital base map of your city in a

fraction of the time previously. Artificial intelligence and aerial or satellite imagery are used to automate base map generation, helping you to create a customisable base map, or development of a 'digital twin' that fits your city's specific requirements. With such information at your disposal, you can see in an instant how your city is used, make informed decisions about improvements, and demonstrate the results of those decisions to your citizens and investors. These powerful technological interventions, when grounded in good governance and collaboration, can create fair, prosperous, sustainable, and crucially happy cities that work for citizen and country alike.



6. <https://ourworldindata.org/urbanization#what-share-of-people-will-live-in-urban-areas-in-the-future>

7. <https://www.theigc.org/reader/making-urban-land/land-policy-needed-coordinate-investment-settlement-private-sector-cannot-alone/>

# Digital Twins

Location really matters if you have a vision to create a healthier, happier, more productive country and are planning and managing projects or infrastructure, because the location of physical factors is fundamental to achieving successful outcomes and to understanding the cost of your asset over its lifetime. A digital twin provides a clear picture of it all.

## What is a digital twin?

It is a realistic, digital or virtual representation of an asset, its processes and systems. Unlike tools that simplify reality, a digital twin is as detailed and dynamic as the built and natural environment it represents. It is a near real-time digital model of your city which can be tested against various scenarios and remodelled ad infinitum.

A digital twin is the most cost effective and accurate means by which infrastructure alterations can be developed and tested, with potential issues identified and remediated before any physical work is undertaken.

Transport links to communications networks, energy grids to power stations, hospitals to health centres: whatever your focus, you can combine data to plan and model your project across its entire life cycle all with pixel perfect precision.

Location data enables digital twins to be consistent and compatible. It is the binding element in every asset, helping to create a more inclusive, prosperous, and sustainable future. A digital twin relies on location data that's clear, trusted, and true.



# Infrastructure and urban planning



Coping with rapid urbanisation requires integrated city development, and this is not possible without access to reliable geospatial information. Developing national infrastructure assets also benefits from an integrated application of geospatial information. This approach allows governments to better optimise existing assets, increase efficiency, and plan new projects.

Precision GNSS technology can be used to accurately locate and map infrastructure assets such as pipelines, stormwater drains and underground cables. This is particularly

useful for local government councils and utilities that manage large networks of infrastructure assets.

It can result in cost savings when undertaking the mapping task and also improves the efficiency of asset maintenance. For example, utility operators use geospatial information systems (GIS) to plan the optimal network including the best possible location for smart grid components such as smart meters, sensors, and cell relays. A GIS can also help identify vulnerabilities, weigh asset investments, and gauge customer responses to a smart grid implementation<sup>8</sup>.

8. <https://www.esri.com/content/dam/esrisites/sitecore-archive/Files/Pdfs/library/brochures/pdfs/gis-for-smart-grid.pdf>

Ordnance Survey works with government agencies internationally to carry out geospatial maturity assessments and build bespoke geospatial data solutions to address countries' data needs. In Singapore, OS worked with the Government Technology Agency (GovTech), to build a 3D model of the city. The team identified suitable data capture tools and created a multi-staged process to capture and process data to a very high standard, in a dense, mid-rise urban area with complex building shapes as well as a significant transport infrastructure.

This digital twin of the city allows for more predictive infrastructure planning – GovTech can better support innovation in clean energy, eMobility and autonomous vehicles by improving decision making on, for example, where to place solar panels calculating how much sunlight particular faces of buildings receive. The 3D model allows for sophisticated simulations of how the city's infrastructure works with technological developments, as it has rich semantic data covering everything from traffic information, building use to construction materials, to population data and environmental conditions.

In this way, geospatial data helps not only optimise and best manage existing infrastructure as urbanisation continues at pace, but it also guarantees city growth and expansion can be proactive at every stage. It enables not just enhanced visualisation and better ideation of smart cities, but it

tests them so as to ensure they will not only succeed, but that they also easily adopt new technologies coming down the line. Technologies such as autonomous vehicles, electric vehicles, single-login applications for numerous municipal and private services, urban drones, smart streets, and more.

To unlock this potential, strong foundations in geospatial data coverage, currency and data quality are essential.



## The self-driven future

Self-driving cars are expected to be a major driver of economic growth in the data economy over the next decade, and hold the potential for much greater citizen safety, particularly in busy urban centres.

Self-driven, or ‘connected autonomous vehicles’ (CAV) rely heavily on geospatial data in both their operation on the roads, and the planned digital infrastructure required to support their usage. Ordnance Survey used its geospatial expertise to facilitate their wider adoption more quickly and helping to build common data standards for the exchange of location data between vehicles and connected infrastructure through the E-CAVE project, an Industrial Strategy Challenge Funded (ISCF) research and development initiative. OS was a partner body of the OmniCAV consortium, which enabled testing of autonomous vehicles and connected infrastructure in a virtual environment.

While CAV technology is yet to find a dominant design and scalable business model, it is worth noting that technology uptake is much faster than it was in the 20th Century. According to the most ambitious predictions, our cities are poised on the brink of mass adoption of CAVs with an estimated global market capitalisation of more than \$1 trillion\* by 2035<sup>9</sup>.

Regardless of the precise timeline of mass adoption of CAVs, governments around the world need to prepare for it as the testing

phase of CAVs gathers pace. To capture the economic and social benefits of this global mobility revolution, it is vital to establish the physical and digital infrastructure necessary to support emerging mobility technologies.

It is Ordnance Survey’s world-leading ability to accurately map areas at speed, particularly in urban areas, as well as easily share that geospatial data that will significantly accelerate the ability of cities to adopt self-driving vehicles within their conurbations, leading to more efficient transport networks, safer roads, greener environments, and ultimately, happier citizens.



9. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/642813/IS780\\_TSC\\_Market\\_Forecast\\_for\\_CAV\\_Report\\_FINAL.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/642813/IS780_TSC_Market_Forecast_for_CAV_Report_FINAL.pdf)

\* \$ references throughout this report are USD.

# The case for geospatial data in infrastructure

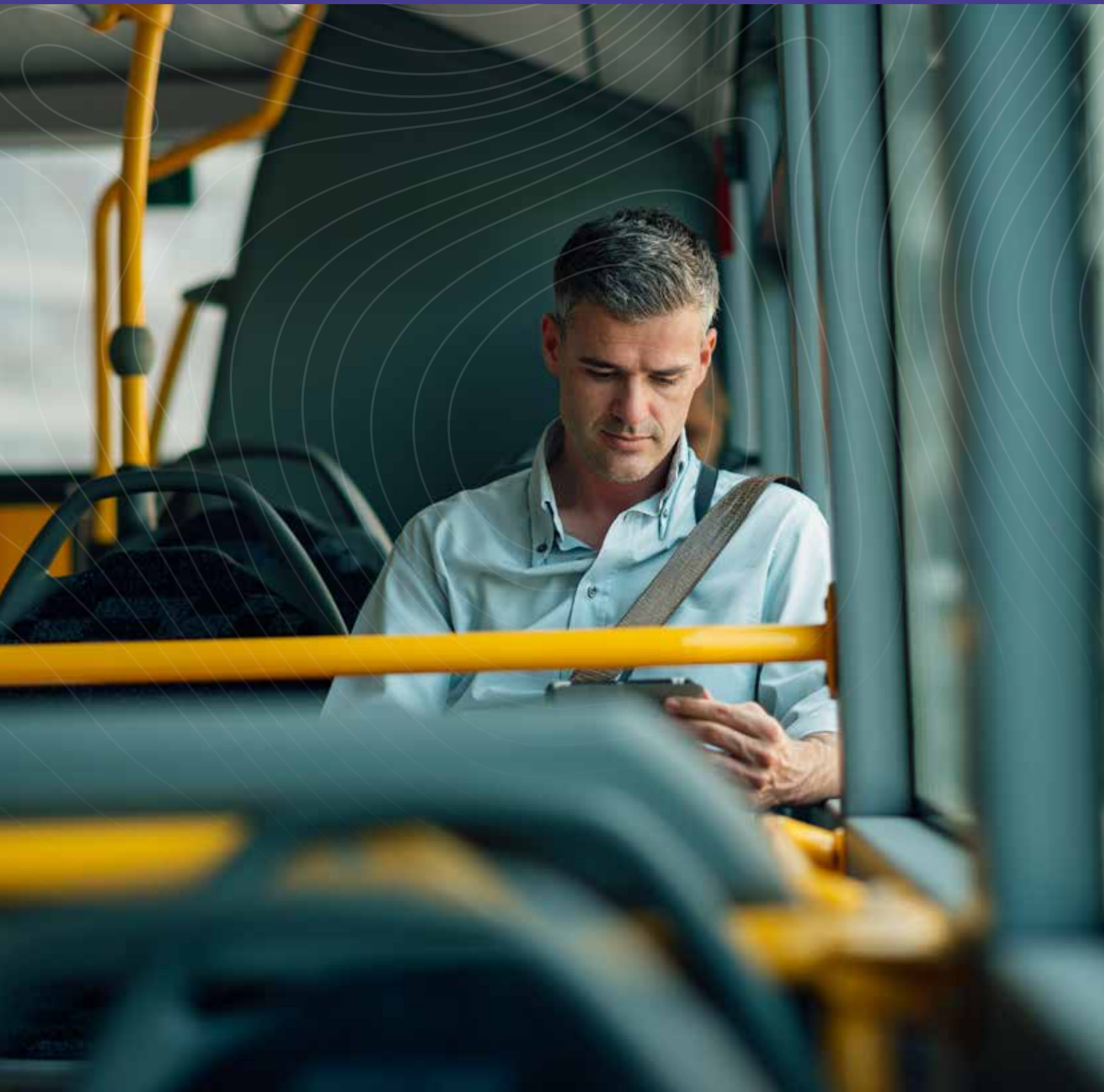
Geospatial data's use in creating optimal urban environments in which citizens' needs are met is twofold. Its very nature is one of precisely locating existing infrastructure, demographics, and services. With this accurate picture of a city's layout and resources, planners are empowered to achieve more reasoned conclusions as to what currently works for a populace, and, perhaps more importantly, what can be improved and what is required for a more sustainable future.

Good planning is contingent on access to reliable geospatial information. By knowing what assets exist in precise detail, in relation to the citizens, businesses or governments it serves, geospatial is an exceptionally powerful resource in building urban environments at lower cost, greater efficiency, lower waste, and with much greater happiness to its inhabitants.



PART TWO:  
SERVICES

3



If infrastructure is the backbone of a city, its services are its beating heart. They provide the lifeblood of a city to its residents, making their movements and interactions seamless and effortless. For services to work effectively, they must sustain the body of people within an urban environment without getting in their way, and must make their lives healthy, easy, and thus, happy.

We can speak of services as the 'user experience' of a city, most notably for its residents, but no doubt they can and should also touch upon the experience of visitors in a positive way. With services that provide

a great user experience, citizens are free to grow in their lives, to innovate, to socialise, to raise their families, to be happy in their environment and to want to show it off.

Location data represents a significant opportunity to ensure services are delivered to people in both timely and accessible ways, delivering the frictionless experience residents and visitors alike want; creating a spatially enabled society.



# Convenience is paramount

In the modern city, convenient, seamless access to a citizen's needs and wants is paramount. Geospatial data underpins much of the technology and digital services that power nations' digital economies. It's a core component of what some people call the fourth industrial revolution, providing the digital information that fuels some of the biggest economic success stories of the last decade, including on-demand ride-hailing apps and delivery services like Grab, Gojek, Uber and Deliveroo. Looking to the future, geospatial data is a key enabler of emerging technologies that citizens demand which are making lives easier, for example, allowing delivery drones to reach their targets and underpinning the roll-out of self-driving cars.

While modern applications go a long way towards achieving this, the plurality of such applications remains a sticking point for many. Users require multiple logins and multiple interfaces to access numerous services, often from the same, or at least, connected service providers. This inevitably leads to user frustration and time wasted.

A unified interface for as many services as possible clearly removes many of the frustrations citizens encounter, particularly with regards to government services. Equipped with a single ID that allows users to register, update, and maintain their residency status, accounts, car parking, tax returns, health records – in short, any touchpoint they may have with the local municipality – personal admin is taken care of swiftly and easily, and citizens are given time back to enjoy their lives.



This approach is being seen in the 'Services 360' policy of Dubai which is dedicated to unifying work streams across Dubai's government entities. Its 'digital-first' methodology gives citizens a digital identity (UAE Pass), and thus a unified government interface with which they can interact swiftly and seamlessly, making for a great user experience. Through making services available '360' and 24/7 in this way, Dubai is eliminating 9 million visits to service centres, and saving more than 300,000 annual working hours in its government<sup>10</sup> – hugely significant savings in improving the lives and happiness of both Dubai's citizens and employees simultaneously.

Singapore has also developed a world-leading 'master app' along this vein, which combines more than 70 government services in one place – from work and employment, to driving and transport, to housing and property exchange. LifeSG is part of the Smart Nation Initiative of Singapore, and is used by hundreds of thousands of people in Singapore every day<sup>11</sup>.

The user experience of a city quickly becomes simple and effortless, as it should be. And by ensuring location-based data provides a link to statistics, (and vice-versa) it enables evidence-based policy making, which streamlines key services further, benefitting both citizens and the municipal authorities.



10. The 'Services 360' policy of Dubai - <https://uae/en/about-the-uae/strategies-initiatives-and-awards/local-governments-strategies-and-plans/the-services-360-policy-of-dubai>

11. LifeSG <https://www.life.gov.sg/>

# The geospatial benefit to government

In addition to the everyday user experience of citizens, geospatial data has significant tangible benefits to a city's administrative authorities.

GIS technology and geospatial analytics have the capability to increase the speed, accuracy, and cost-effectiveness of a wide range of government activities. As a result, governments that effectively use geospatial information not only improve the services they deliver to the public, but also deliver them at lower cost. These are the successful signs of a spatially enabled government, using location to bring together datasets to inform evidence based decisions and achieve savings at the same time.

It is estimated that public sector productivity savings derived by using geospatial information in Ireland, for example, ranges from 0.2-0.5%<sup>12</sup>. According to ConsultingWhere, the value of local government output in England and Wales increased by over approximately \$313 million per annum in 2008/09, as a result of geospatial data productivity benefits<sup>13</sup>.

A significant portion of these public sector savings derives from time and fuel. Effectively using geospatial information can help services run far more efficiently; geospatial information can be used to improve waste collection routes through route optimisation, for example.

Globally, the time benefits associated with geospatial information are estimated to be circa \$17.3 billion, varying widely by individual country. The increased efficiency leads to fuel savings derived from the use of accurate and precise navigation systems. Such global public sector fuel savings, have been estimated to be around \$4.9 billion<sup>14</sup>.

Fuel savings also contribute to meeting government environmental and carbon reduction targets, and in urban areas will help improve health.



12. Indecon International Economic Consultants, Assessment of the Economic Value of the Geospatial Information Industry in Ireland, Published 12 February 2014.

13. ConsultingWhere, The value of Geospatial Information in local public service delivery in England and Wales, Published 22 July 2010.

14. Oxera, What is the economic impact of Geo services?, Published January 2013. [https://www.oxera.com/wp-content/uploads/2018/03/What-is-the-economic-impact-of-Geo-services\\_I-I.pdf](https://www.oxera.com/wp-content/uploads/2018/03/What-is-the-economic-impact-of-Geo-services_I-I.pdf)

# The 'always-on' society

If geospatial data is evident in helping deliver light-touch government services to individuals, it is equally relevant in delivering services to live by; those services around which modern urban existence is built.

The ubiquity of the internet is such that citizens simply cannot escape the necessity of always-on connectivity. It is now difficult to think of any activity within an urban environment that does not or cannot utilise an internet connection. From the obvious examples of remote working and paying for goods, to the less obvious perhaps of environmental monitoring of one's home and targeted street advertising.

This necessity in connectivity inevitably leads to higher usage, typically followed by an increased appetite for ever-faster speeds. While businesses have long been at the forefront of largescale, reliable connectivity, and are often able to pay what it takes to achieve it, for a resident of a city, their connectivity must extend far beyond their working hours and office if they are to thrive and make use of the riches their city affords them.

## CASE STUDY

### Faster, better internet

In 2020, the broadband Universal Service Obligation (USO) was launched. Its aim is to give every home and business in the UK the right to request a good quality, affordable internet connection.

The Office of Communication (Ofcom) is the government-approved broadcasting regulatory and competition authority responsible for rolling out of the project. To achieve the project's aim, Ofcom needed to gather address-level information to identify properties without a good internet connection, as well as develop a standard definition of properties to define the scope of the scheme.

To gain the requisite level of insight, Ofcom used Ordnance Survey's (OS) AddressBase Premium , and AddressBase Islands to ensure a consistent



approach to the property information it was collecting across the entire UK.

Thanks to the comprehensive, reliable data on UK properties, Ofcom has been able to successfully roll out the USO and help deliver good quality internet connections to more of the UK than ever before. As a result, it supports greater quantities and quality of online work and study, as well as access to essential services for citizens, including healthcare, banking, shopping, and socialising.

# Achieving a user-centric transport network



In the same way that citizens want a simple, seamless experience with services applications, urban transport affords a great opportunity for the same easy, intuitive use by the populace, by putting users at the very centre of its focus.

User-centricity means a transport network that puts the experience of those crossing the city ahead of all other concerns, whether financial, or otherwise. In practice this means integrating the various modes of transport available to citizens. For example, a user pays once for a trip from one point in the city to another, the most efficient route is calculated using whatever means necessary, whether train, bus, scooter hire, taxi, etc., and at that particular time in order that they both avoid and prevent causing traffic. In this way, not only are a user's administrative touchpoints for their journey minimised, but the city as a whole becomes smarter, with geospatial data providing the vital real time insight into

how to keep the highways and byways of the city flowing.

In Los Angeles, United States, an open source data framework has been created to share the location of micro mobility solutions (including scooters and bikes), show which vehicles are in use at any time, and help enable fairer distribution. Not only does this help create a more accessible service for citizens, but it helps to plan for service expansion and future investment in charging infrastructure and public transport routes<sup>15</sup>.

15. <https://www.accenture.com/gb-en/blogs/voices-public-service/geospatial-data-innovation-for-our-future-cities-and-infrastructure>

## Mobility-as-a-Service



Since 2016, Helsinki has been utilising Whim, a Mobility-as-a-Service (MaaS) app developed by MaaS Global and subsidised by the Finnish state. Subscriptions to Whim provide citizens with full access to Helsinki's transport networks, including public transport, e-scooters, public bike rentals, taxis, and car hire all through a single app.

It offers a genuine alternative to private vehicle ownership for citizens by providing wide-ranging, highly available transport options more suited to city life. The app's business model is based on taking a commission of the fees it charges, and it negotiates deals with mobility providers individually. Whim provides customer service as part of the offer to help out when issues arise.

Whim has been described as the "Netflix for transportation"<sup>16</sup>, and has attracted major investment: its November 2019 round of

funding attracted, €29.5m, including from the likes of Mitsubishi, making a compelling case for the MaaS business model. Whim's success has also seen the app reach beyond just Helsinki into numerous territories, including Switzerland, the UK, and even the Greater Tokyo area of Japan.

The highly positive impact of MaaS services such as Whim is the ease with which they enable citizens to move around their cities. Through accurate, reliable pinpointing of both individuals and the transport assets they are seeking to access, the likes of Whim empower frictionless movement of people, and by extension, create a greener urban environment. To achieve this, MaaS apps depend on the ability to connect to multiple data sources and share geospatial data.

16. [www.forbes.com/sites/carltonreid/2019/03/28/netflix-of-transportation-app-reduces-car-use-and-boosts-bike-and-bus-use-finds-maas-data-crunch/#2d52aa954923](https://www.forbes.com/sites/carltonreid/2019/03/28/netflix-of-transportation-app-reduces-car-use-and-boosts-bike-and-bus-use-finds-maas-data-crunch/#2d52aa954923)



## A happy population is a healthy population

Vital to the sustained happiness of citizens is their continued health and wellbeing, and again, geospatial data can serve a central role in ensuring this.

Achieving a healthy populace relies on more than just good materials and the latest diagnostic and treatment equipment. Questions must be asked around whether it truly meets the needs of those it is built to serve. Is it accessible? Does it offer the right treatments for the demographics that make up its patient base? What extra can it bring to a region's medical offering?

When researching the most suitable locations, there are multiple factors to consider, including population density, proximity to other hospitals, and proximity to sources of air pollution, which can be

supported through geospatial data analysis. By grading different potential locations on specific selection criteria, such as those above, and by using statistical methods to evaluate how the criteria affect one another, planners are able to use GIS software to determine the best place to build a new hospital.

By using quantitative information about population and qualitative answers from health experts and policy makers to grade the criteria, planning in this way builds upon an earlier study in Taiwan<sup>17</sup> that used a mathematical model called an Analytic Hierarchy Process to make decisions about hospital locations, and shows the power of geospatial tools in navigating complex urban planning decision-making.

17. <https://isiarticles.com/bundles/Article/pre/pdf/25914.pdf>



Applying this work and methodology more broadly, it is easy to see the wide-ranging applications accurate geospatial data on demographics, population densities and proximities, along with environmental factors can have on planning the likes of schools, police stations, fire services, and more.

Beyond just the physical, geospatial data can also have a significant impact on stemming and preventing public health incidents.



One example is the well-known Covid-19 dashboards built using ArcGIS – the GIS software provided by the California-based software company, Esri. It was put together by The Center for Systems Science and Engineering (CSSE) at John Hopkins University. Plug-and-play GIS tools make it possible for anyone anywhere to build mapping and data dashboards, provided they have some data to work with. Such tools can clearly monitor the spread and impact of the disease and guides decision-making around changes in policy or guidance.

Location data intelligence is also a vital tool in ensuring the long-term sustainability of infrastructure – robust systems of data collection and application provide near real-time monitoring of the city. These are key to ensuring access to resources like water, in the face of environmental issues such as drought, and fully-informed planning for projects that may start and be completed in periods with different climates. Part of citizen happiness is the ability to see your city as home for decades to come.

# Empowering citizens with data

While the services explored so far have directly tangible benefits for users, in that a citizen can directly order an item, pay a bill, or utilise modes of transport, geospatial data also holds immense value in providing services that serve to indirectly increase

citizens' happiness and wellbeing. Geospatial data can be used to bring meaning to data that can equip individual citizens with the tools to make decisions about their day-to-day life – from picking the right route to work, to predicting the weather.

## CASE STUDY

### IBM GRAF – Locally relevant weather

Weather affects the decisions citizens and businesses make every day. It has the potential to take lives and cost businesses billions, so having accurate, reliable weather forecasts is increasingly important, especially as the number and intensity of severe weather events increases annually.

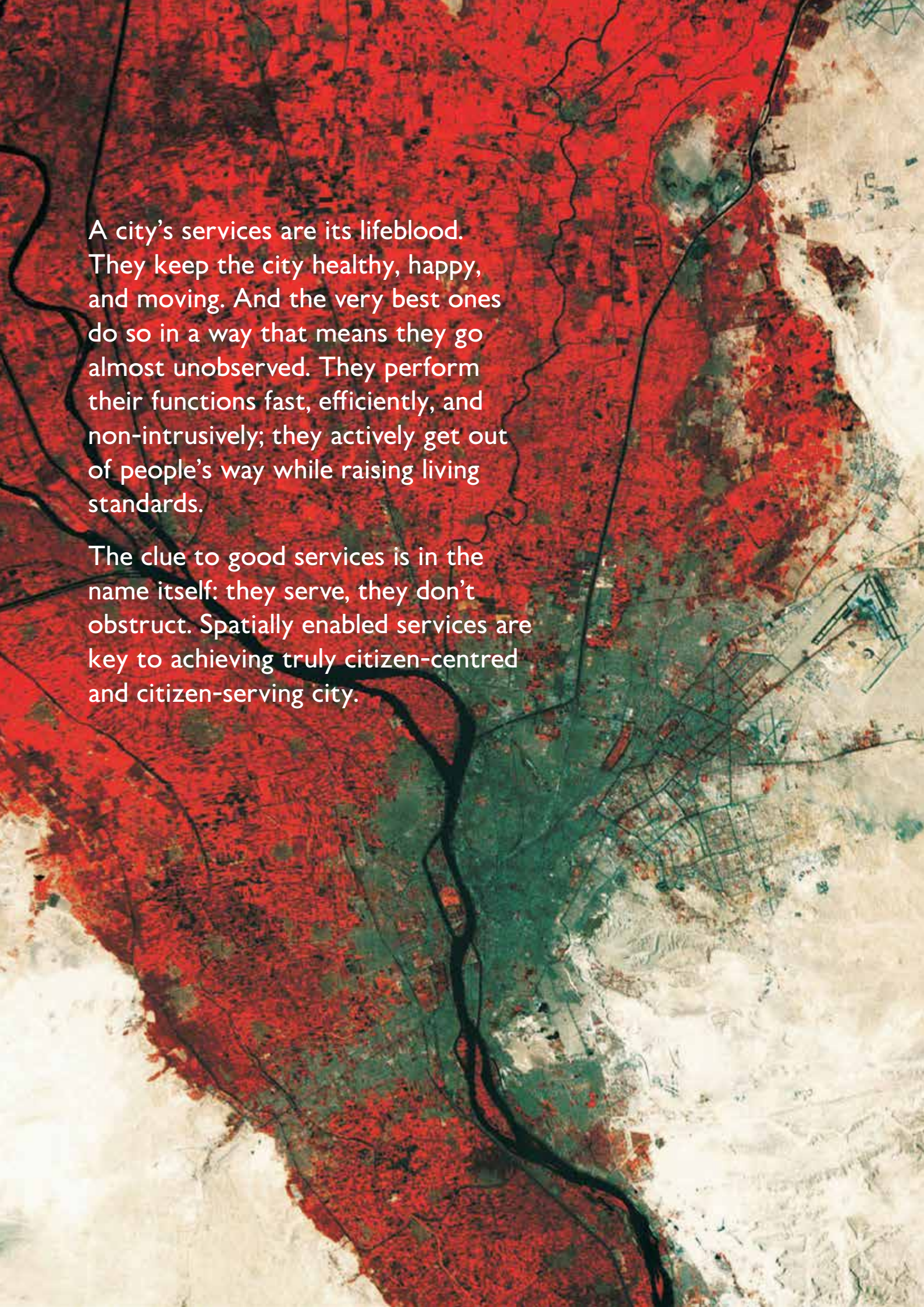
Preciseness and high geographic specificity in weather forecasting holds great potential for a wide range of disparate markets. For example, it enables those in agriculture and agri-finance to better plan ahead both crops and crop prices, de-risking their assets and exposure, as well as offering urban planners better insight into the likely success of projects in particular areas. These examples then have an impact on the happiness of citizens further along the line – better crop planning affects the availability and affordability of food for consumers, while urban developments away from weather-susceptible areas make for better living standards.

To deliver better weather forecasting, IBM Global High-Resolution Atmospheric Forecasting System (GRAF) is a high precision, rapidly updating global weather modal. It updates hourly and at a 3km



resolution to give one of the clearest pictures of weather activity anywhere on the planet. Such frequent accurate data also allows citizens to make decisions about their day-to-day activity, mobility and risk with confidence.

IBM GRAF achieves such high precision through its innovative use of previously less-utilised geospatial data sources, including airplane sensors, and, crucially, pressure sensor readings from consenting smartphone users. This has the specific benefit of providing highly localised weather data in places where there may be a current lack of specialised weather equipment – helping citizens make better decisions.

An aerial photograph of a city, likely London, showing a large river (the Thames) winding through the urban landscape. The image is heavily stylized with a red tint over most of the city area, while the river and surrounding green spaces are in their natural colors. The text is overlaid on the left side of the image.

A city's services are its lifeblood. They keep the city healthy, happy, and moving. And the very best ones do so in a way that means they go almost unobserved. They perform their functions fast, efficiently, and non-intrusively; they actively get out of people's way while raising living standards.

The clue to good services is in the name itself: they serve, they don't obstruct. Spatially enabled services are key to achieving truly citizen-centred and citizen-serving city.

PART 3:  
INNOVATION

# 4





The one constant about cities is that they are not static, they are vibrant, dynamic places for a nation's people to grow, share, and innovate, and to show off the very best in their nation to the wider world.

Enabling and encouraging innovation in a city unlocks wide ranging, benefits beyond the products and services ultimately created. Principally, it brings the international exposure and recognition of a city as a technology hub that will attract greater investment and talent. This will see more job and wealth creation, generating increased Return On Investment (ROI) as more businesses seek to enter the region and partner with government. The benefits also extend to citizens as they are provided with increased opportunities, and see a city that levels up before their own eyes.

Dubai, for example, is a city primed to be a cutting-edge innovator in the use

of geospatial data and has launched initiatives including the Projects for 50, and the Artificial Intelligence Office's National Programme for Coders, to rapidly expand the pool of technological talent and entrepreneurs that will be a crucial part of the drive for innovation and globally-disruptive businesses.

Geospatial data offers one of the strongest tools for unlocking a cohesive, connected city, and building a thriving economy on the foundations of location data and authoritative mapping.

As the UK's leading geospatial innovation hub, Geovation from Ordnance Survey was established to run market-leading Accelerator Programmes in Geotech and PropTech to support and nurture entrepreneurs and start-up solutions. Geovation gives the brightest minds access to public datasets – detailed maps and addressing, ownership information, valuations and much more –

to unlock greater value from these national data assets.

Since its inception in 2009 Geovation has become a leading proponent of the value of open innovation in the public sector and created an impact-driven, thriving ecosystem, with the unique advantage of Ordnance Survey's 200+ years of geospatial data knowledge. After opening its first space in summer 2015, Geovation has grown to support a community of more than 1,500 entrepreneurs, investors, developers, academics, students, and corporate innovators.

As these examples show, geospatial data has some of the widest use cases for any type of data. By establishing and maintaining high quality public geospatial datasets and supporting entrepreneurs, and innovators to use them, cities can unlock new products and services for their citizens as well as elevate their position on the world stage.

## Successful start-ups Geovation has supported include:



### WatchKeeper

As natural disasters, such as floods, droughts, tropical storms, and heatwaves increase both in frequency and severity, it's becoming critical to build better resilience in affected areas in the face of such events, not least in the most densely populated, and thus arguably most sensitive, parts of our planet: cities. WatchKeeper maps assets, people and critical business functions, alongside real-time risk feeds, empowering administrators with the insights they need to support rapid decision-making before, during and after a catastrophic event.

With open-source data layers from providers such as the National Weather Service and proprietary data providers like IBM Weather, analysts can visualize hurricane paths, active alert zones and storm impact areas, enabling proactive responses to major weather events and the maintenance of an accurate line of sight as they unfold. In this way, WatchKeeper helps to add to the digital twin knowledge and understanding of a city, ensuring its citizens remain safe and protected.

**[watchkeeper.com](https://watchkeeper.com)**



### Hammer

Hammer is the world's first 'adaptive' flight automation software for unmanned aerial vehicles, designed to aid drone surveys and inspections in capturing the best possible data. It is highly versatile in that it supports many different types of flight automation, and yet is extremely simple to use. Using artificial intelligence and modular software architecture, the software morphs itself based on the task at hand. It can be thought of as being along the lines of Microsoft Windows or Apple's OSX for drones. The precise data it acquires is then adaptable and applicable to much wider situations, with cities mapped quickly, and very easily for the likes of digital twinning.

**[hammermissions.com](https://hammermissions.com)**



## Combine AI

Emma.ai is an intelligent assistant developed by Combine AI that connects directly to individual's calendars and automates everything around their travel planning. It adds accurate travel time around appointments, with the option of adding travel buffer time if wanted/required. Emma.ai saves users admin time, travel time, fuel costs, and reduces the chance of making scheduling mistakes, freeing them up instead to get on with their day, whether that involves business, leisure, or socialising.

On average, Emma.ai customers benefit from...

- 200 minutes saved time arranging travel monthly
- 40% reduced travel planning costs
- 260 minutes saved time arranging meetings monthly

That's time back into individuals' hands offering the chance of greater productivity for them and their city.

**combine.ai**



## Podaris

Podaris is a real time collaboration platform for planners, engineers, policymakers, and public stakeholders. It delivers powerful tools for proposal development and feasibility studies, so as to enable much greater unified transport planning and decision-making in urban environments. In short, it empowers the kind of user-centric, seamless, integrated transport network as advocated for earlier in this report.

Collaborators can generate multi-modal transport network models so as to analyse their costs and benefits, gain an immediate understanding of travel-times and spatial connectivity, and test the performance of multiple scenarios. It is effectively a digital twin for a city's transport, and is particularly effective in understanding the impact and validity of new technologies such as hyperloops or driverless pods.

**podaris.com**

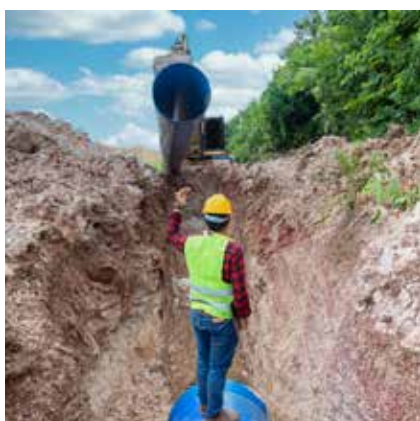


## Atmo Technology

Maintaining a healthy populace requires preserving good air quality, something Atmo Technology is seeking to make easier, and more transparent. Its solution collects high-spatial-resolution environmental data from sites, along with contextual data which helps determine causality. Through displaying the data in an intuitive portal, Atmo Technology is able to tell clients not just the quality of their air, but also the likely sources of any pollution, people who may be at risk of exposure, and why. Equipped with this information, those responsible for the sites are able to better solve their air quality problems.

By understanding air quality, there is significant opportunity to realise where efficiency gains can be found, reducing fuel, energy and water consumption in the process. Increased wellbeing of your people also delivers a return on investment—safer living and working conditions means a more productive populace, healthier citizens, and fewer health issues, shrinking the burden on city services in the long run.

**[atmotech.co.uk](https://atmotech.co.uk)**



## Utility Survey Exchange

Utility Survey Exchange help keep uncertainty and cost in construction projects to a minimum through their controlled circulation of high-accuracy survey data platform. It enables surveying companies to upload high quality data of buried assets, along with metadata relating to data quality and confidence, which can then be shared with the owners of the assets, and only with them.

The data is processed by Utility Survey Exchange, and separate streams are extracted based on content and quality. The result is controlled circulation of the latest high quality, high accuracy asset location data, reducing the risk of utility strikes during construction and maintenance, as well as the associated costs, and increasing the safety of both onsite workers, and members of the public, whether directly or indirectly.

**[utilitysurveyexchange.com](https://utilitysurveyexchange.com)**

GAIN AN  
ADVANTAGE

5



# The path to happy cities with geospatial information



Geospatial data offers above all else, opportunity. Specifically, the opportunity to build new kinds of cities; ones which are smart from planning through to execution and experience; ones which are not beholden to a particular mode of transport or previous planning regulation; ones which put the beating heart of them – their people – at their very centre.

Realising this new kind of city requires understanding what currently exists, what has previously worked (or otherwise), and what innovations can be achieved that improve on everything that has gone before. And in an increasingly fast paced world, it is critical that this data offers feedback loops in the milliseconds, making it real time, rather than months or years. With Ordnance Survey, we make this necessity a reality.

Geospatial data created by Ordnance Survey is comprehensive, precise, flexible, usable, and current. It is the geospatial data upon which

you can lay the strongest of foundations for your cities, and deliver the fulfilling, happy lives your citizens wish to live.

Investing in geospatial can help your city to:

- **Deliver infrastructure for up to one third of the cost due to better planning<sup>18</sup>**
- **Tap into global transport time savings of circa \$17.3 billion<sup>19</sup>**
- **Save more than 300,000 annual working hours in government<sup>20</sup>**

Ordnance Survey, is the collaborative partner to help you and your country to build a more prosperous, citizen-centred and productive future.

18. <https://www.theigc.org/reader/making-urban-land/land-policy-needed-coordinate-investment-settlement-private-sector-cannot-alone/>

19. Oxera, What is the economic impact of Geo services?, Published January 2013. [https://www.oxera.com/wp-content/uploads/2018/03/What-is-the-economic-impact-of-Geo-services\\_I-I.pdf](https://www.oxera.com/wp-content/uploads/2018/03/What-is-the-economic-impact-of-Geo-services_I-I.pdf)

20. The 'Services 360' policy of Dubai <https://uae/en/about-the-uae/strategies-initiatives-and-awards/local-governments-strategies-and-plans/the-services-360-policy-of-dubai>

## 5 steps towards happier citizens



### 01 Identify the unique opportunities for your city

Every city is unique. What are the opportunities you're looking to unlock with geospatial information?

### 02 Understand key policy drivers at a national and local level

What are the factors driving your decision making? For example, new services, innovation, health, transport, resilience?

### 03 Identify key stakeholders and users of geospatial information

Who is working with geospatial data in your city to provide for citizens? Which industries stand to benefit?

### 04 Work with them to understand their objectives

Establish how geospatial information can help them and how you can support this. Identify common pain points and best practice to look for opportunities to share data across government departments to meet common policy agendas.

### 05 Build infrastructure and services using data that help meet these challenges

What services would help to address your stakeholder requirements? How can efficiencies be made in data collection and dissemination. Identify duplication of efforts and encourage stakeholders to collect data once, but use many times.

**These steps will put you on a path to achieving a happier city.**

To start your journey, take our geospatial maturity assessment now [os.uk/gma](https://os.uk/gma)

# Gain an advantage with a geospatial maturity assessment

Geospatial data drives economic growth, creating value in the private and public sectors and enabling a geospatial ecosystem that unlocks further growth towards happier cities.

Geospatial information helps city administrators build prosperous, sustainable futures for their citizens by:

- Growing your economy
- Fuelling the data economy
- Predicting and preventing crises
- Responding to climate change
- Driving sustainable development
- Enhancing government efficiency
- Tackling the negative effects of urbanisation

Governments around the world face new challenges as we head towards 2030. Population growth, migration, climate change, and providing for an aging population are just some of the challenges faced. Geospatial information can help cities navigate these challenges while making progress towards the UN's 2030 Agenda.



Building digital basemaps is a core process in enabling your city's digital economy to flourish, but basemaps are also a fundamental enabler in providing the most basic of government services, including establishing property ownership, allocating resources and planning sustainable infrastructure.

The global economic value of geospatial services is roughly 0.2% of GDP.

In order to tap into this growing market, your city should consider a geospatial maturity assessment from an established mapping agency. This will help to identify how to upgrade your digital geospatial ecosystem in a way that maximises societal benefits and economic growth.

The return on investment on assessing and expanding a city's geospatial maturity reaches far beyond any cost-benefit analysis.

Ordnance Survey offers geospatial maturity assessments to all governments wherever they are on their geospatial journey. They take into account:

- Collecting and managing data
- Data quality and data governance
- Product and service development
- Corporate governance
- Stakeholder engagement
- Supply chain and operations management
- Using geospatial technologies

To find out more visit [os.uk/citysmile](https://os.uk/citysmile)



Take our free  
online assessment  
visit [os.uk/gma](https://os.uk/gma)

Ordnance Survey provides consultancy and managed technology services in a wide range of areas including basemap creation, landscape monitoring, data exchanges, geomaturity assessments, and land administration.

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