



# Land Governance in an Interconnected World

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## MEASURING GEOSPATIAL MATURITY: A FIRST STEP TOWARDS SENSIBLE, SUSTAINABLE AND RESILIENT INVESTMENT

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## **Abstract**

Accessible, accurate and high quality geospatial data is a fundamental enabler to achieving the United Nations Sustainable Development Goals. Information about location and place enables a visual understanding of both the present and the future, providing officials with an accurate and reliable view of their world.

Increasingly seen as part of a nation's digital infrastructure, geospatial data is being viewed as 'infrastructure for infrastructure' - fundamental data underpinning government decision making, economic growth and the creation of citizen-centric services within more resilient communities.

Governments are therefore investing in geospatial data not simply to develop infrastructure and services but as a direct driver of economic growth and innovation. Growing this geospatial capability at both an agency and federal level has never been more important.

This paper introduces Ordnance Survey's geospatial maturity tool and the benefits it brings to governments seeking to deliver sustainable economic and societal outcomes for their nations.

## **Key Words:**

Geospatial, Maturity, Development, Investment, Sustainability.

## **Measuring Geospatial Maturity: A First Step Towards Sensible, Sustainable and Resilient Investment**

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The Information Age is resulting in greater understanding, better policy and decision making, improved economies and societal benefits. Paradoxically it also brings knowledge of disparity, be it between wealth and poverty or global opportunities and threats. Equally, disparity is evident in the availability of trusted data, particularly at a national scale, and in key data management organisations such as national geospatial, statistics and land administration agencies.

Geography and land information are key components of the data that feeds this information age and its associated technological revolution. Many nations and cities maintain large scale, attributed and accurate data, from addressing to topography, imagery to networks. Powerful decision making comes through aggregating digital data. In contrast, there are still many nations using analogue mapping from the last century. Much of this analogue mapping is 1:50,000 scale at best and is neither maintained nor available electronically.

Geospatial data is not the sole prerogative of national mapping agencies, but there will be many use-cases, from land administration to security where data from governments is preferred over other sources. This is not necessarily related to the quality or technical content of the data. Government-supplied, or at least government-endorsed data is seen as being definitive and authoritative and therefore, trusted.

In delivering the United Nations Sustainability Development Goals, good geospatial information is far more than a tool for measurement. It is fundamental to understanding the present, development planning, making sustainable decisions and the implementation of projects. It is part of a nation's digital infrastructure. In this sense, many nations are coming to view geospatial data as 'infrastructure for infrastructure'.

Improved availability of this fundamental geospatial data leads to opportunities for better government, greater transparency, more effective policy development and monitoring, citizen-centric service design and delivery, improved resilience, increased resource/asset and environmental management; and not least, new business opportunities. This combination of factors effectively underpins the key generic development goals of improved governance, social inclusiveness and economic growth. Around the world, many governments are following this agenda: targeting investment in geospatial data and land



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administration, not simply as a means to develop supporting infrastructure and services, but as a direct driver of economic growth and innovation.

Growing the economy, facilitating innovation and creating new trade and business opportunities is not simply a matter of macroeconomics. Innovation, change, improvement and increased tax-take provide a direct means by which government can reduce poverty and evoke change.

The need to answer specific questions and challenges is generating an appetite for greater and richer volumes of trusted, accurate and current fundamental geospatial data, as well as providing the need for new collection and management technologies. It is also driving both the public and private sector, in addition to development banks and international aid funded projects, to create data for specific use-cases. Unfortunately, the absence of overarching policies or control mechanisms at a national level very often results in an insular ‘create once, use once’ approach to data. A much better approach is to ‘create once, use many’. In order to be able to achieve this good, fast and equitable delivery at scale, nations need to formulate and deploy a robust national geospatial strategy that is both inclusive and expansionist.

The technical and organisational framework within which to deploy such a strategy is provided for by developing a National Spatial Data Infrastructure (NSDI).

NSDI comprises a number of tenets:

- Governance, organisation, policy and strategy
- Services, technology, infrastructure, GIS
- Content (data), both fundamental geospatial data and wider location data
- Internationally adopted standards
- People, innovation and education

The benefits of geospatial data can be partially realisable without creating a full-blown NSDI. The basic principles to enable a nation to benefit from its data are often simple: Suitable policy based upon the concepts of a ‘data commonwealth’; current, authoritative and sustainable content and trained people.

Arguably, of foremost importance is developing the concept of a ‘data commonwealth’. This is where all data, of whatever nature, is collected on the basis that it will be shared with other users (unless there are specific reasons not to do so, for example state security). Data is literally created and held as common-



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wealth. When a specific use case appears, or is developed within an insular paradigm, the first recourse is usually to commission data collection based around a very specific and ultimately restricted, specification. Once data is collected, it is used for the purpose of the use case and may never be used again. Thus, capture once use once. This often leads to restricted and non-repeating benefits. However, for a use case within a data commonwealth paradigm, the first recourse is to search for existing data that may be available from other collaborating entities that can either be re-applied or reprocessed to meet the new need. This type of ‘data recycling’ is obviously far more cost effective than commissioning a new data collection programme. Similarly, where no suitable data exists, again within a data commonwealth, multiple use case owners may work together to create a combined specification and operate a data capture mission. In this way, costs and risks are shared and the resulting data has multiple uses. Both of these situations adhere to the concept of capture once use many.

Of course, it is generally easier at first to facilitate a data commonwealth approach within the public sector, where in general, competition and commercial advantage are less important behavioural drivers. However, including the private sector within the paradigm is proven to enable innovation, reduce waste and drive economic growth – aspects from which the whole country will ultimately benefit.

Without first establishing a data commonwealth paradigm, the other elements of an NSDI become largely superfluous.

There is therefore a conundrum faced by Governments that recognise the importance of geospatial data; specifically, where and how to invest, and for what specific benefit?

Is commencing the immediate design and commissioning of a full blown NSDI the answer, or should that be considered a longer-term goal?

The United Nations Statistics Division and World Bank are working together, supported by individual nations, to help governments answer that question, including building an internationally recognised and endorsed framework.

This framework and subsequent national action plans will include elements such as the economic impact and value of geospatial information systems, investment needs and associated tools, guides, and good



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practices. This will enable individual governments to create actions plans against a recognised framework and commit funds to implement national systems tailored to their own situations.

Creating functioning fundamental geospatial data hubs, or agencies, will be a leading component in any action plan. In trying to achieve scale, there is a strong argument to succeed with the basics and build on success.

For most public-sector organisations, funding is a precious commodity. Geospatial organisations, in particular, have to compete for government finance alongside many other essential services as well as other ‘good causes’. The transformation of a region or country that can be enabled through geospatial data use must be articulated.

Almost every organisation in the modern world operates within an ‘ecosystem’ of related stakeholders. Organisations within these systems are both suppliers and customers; in this context, the concept of a ‘customer’ is a second separate entity that takes either a product or service from the first entity, regardless of whether there is a directly linked financial transaction. In this sense the terms customer and stakeholder become synonymous.

Within this linked eco-system, whether public or private sector, or increasingly hybridised combinations of both, continued existence is ultimately dependent in some shape or form upon the value that products and services provide to stakeholders. Stakeholders can include consumers, innovators, other government departments (who are themselves increasingly using geospatial data to underpin their own operations); telecommunications companies, the energy and infrastructure sector, banking and finance institutions etc. Stakeholders across all sectors are continually looking for better value from each of their suppliers.

Competition in the market place provides powerful drivers and incentives to continually improve products and services and to drive internal efficiencies. This condition is not just limited to private sector organisations generating commercial revenues from data. It can be argued that public sector organisations in general, and national geospatial organisations in particular, are exposed to lower levels of commercial competition and therefore do not necessarily find themselves compelled to commit to the same levels of investment in continuous development and improvement. However, as the value of geospatial is emerging



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and is intrinsically linked to many levels of service delivery, the traditional role of government in provided data is being challenged

Furthermore, whether individual entities within the stakeholder community pay for geospatial products and services or they are provided free of charge, it makes little difference to what ‘customers’ require and expect from the services they consume. If a service exists at all today, consumers expect to receive accuracy and value every time they use it. Total satisfaction in today’s consumer is delivered by a service which is perfect, now and free.

The target of perfect now and free provides multiple challenges for data producers. Perfect requires quality and content to precisely meet the needs of multiple use cases. This means producing data sets which are increasingly content-rich and built on technology that allows multiple configurations by the user. To be available now, technical systems and architecture have to be built upon current (maintained) technology which is accessible, reliable and resilient. But it is perhaps the free element that provides the greatest challenges of all.

As government, the private sector and even whole economies become ever more reliant upon accurate and reliable data, data creators and suppliers find themselves under increasing pressure to create more value. Yet, it is not enough to look simply to increased investment as the solution to these pressures. To be successful, data providers also have to build resilience and sustainability into their strategy and operations.

The two fundamental measures of performance, for any organisation where continued existence is dependent upon producing value for stakeholders, are the twin concepts of effectiveness and efficiency. Often misunderstood, misconstrued and or poorly defined: ‘effectiveness’ measures how well products and services meet the expectations of stakeholders; ‘efficiency’ measures sustainability. Effectiveness is an external measure. Efficiency is an internal measure. Both are of equal importance.

Effectiveness (ultimate stakeholder satisfaction) delivered ‘at all costs’ is unlikely to be sustainable for any organisation in the long(er) term. Similarly, concentrating upon internal efficiencies might provide some level of short term sustainability, but a failure to maintain focus on delivering effective services risks becoming irrelevant, and thus provides an equal existential threat. Temporal, and often cyclic, shifts



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in strategy can also be observed: Too many organisations still place a focus on improving effectiveness only when they are under relatively low financial pressure, and instigate ‘efficiency’ programmes almost as a first recourse when financial and other pressures grow. Such a ‘flip-flop’ approach to development is reactionary at best, and can often be an indicator of relatively low levels of maturity in strategic thinking.

Organisations which understand the need to maintain an equilibrium between effectiveness and efficiency throughout the execution of their strategy often display characteristics of relatively high strategic maturity.

An organisation that makes its existing data accessible is taking a first step towards developing its maturity. Creating new or enhanced-value data, or maintaining data sustainably, is the next big step. Leveraging partners, including the ‘open’ community, requires a level of maturity of thought, planning and action. But to take steps forward it is important to understand the present and what a sustainable and sought ‘to be’, or future state would look like. Simply put, to invest wisely a Government needs to know the current and the target geospatial maturity for its geospatial data agency(ies), linkages to other data suppliers, their technology platforms and architecture, and, not least, the data that they produce.

In scaling up, sustainable solutions are imperative. To give this due weight, a geospatial organisation’s current and target maturity needs to be considered across both geospatial and operational aspects of the business, as it is invariably the operational changes that take longer to embed. The organisation must also consider their role in the wider data ecosystem.

Geospatial maturity considers the familiar functions of data capture and maintenance processes, data management, approach to data sharing, use of geospatial technology and use of standards. But to be sustainable it will also consider the approach to building its product and services portfolio, licensing, product and service creation and quality management. A relatively mature organisation will continuously review their progress against and relativity of goals in the context of evolving stakeholder needs.

Operational maturity looks at the constitution, strength and ultimately, the resilience of an organisation. Sustainability is dependent upon these factors. Maturity needs also to be considered across corporate



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governance, corporate strategy, approach to investment portfolio management as well as the approach to stakeholder engagement.

A resilient geospatial organisation will be able to have the financial and human resources to deliver its strategy throughout economic and financial cycles, and it will configure and manage its operations and supply chain effectively. Crossing both geospatial and operational maturity is the need to consider the value generated for the nation, including those all-important opportunities to innovate, improve and create new economic and business opportunities.

Based on experience gleaned in delivering geospatial maturity assessments globally, Ordnance Survey's Geospatial Maturity Assessment (GMA) provides an 'as is', or current state view of geospatial maturity. It also looks at the 'to be', or future state, where it may be necessary to build a roadmap and guide subsequent investment decisions based on stakeholder requirements. The GMA is a transformation enabler.

What should the future state be based upon, should it be global best practice? And, are we trying to build a world-class or the best-of-the-best solution, simply because that is the ultimate achievable goal?

To both questions, Ordnance Survey argues not.

Fundamentally, by definition, maturity is not a fixed concept. The idea of 'ultimate maturity' exists only in theory as natural and man-made change all drive the need for continuous evolution. Simply being at the current zenith of technical evolution is not necessarily the same thing as possessing a relatively high level of maturity if, at the same time, the organisation is not meeting stakeholder needs effectively.

It is the nature of maturity, based upon knowledge and information, good governance and sustainable policies, that allows organisations, and indeed nations, to evaluate their current and future capabilities and to make an informed choice as to where on the evolutionary spectrum they need to be. Maturity is essentially having the capability to evaluate options fully and to make the right decision in the true interests of the organisation.



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Sometimes, the correct decision may be to deliberately choose not to be an early adopter of technology if institutional capability or capacity to operate it is not available or achievable.

Some highly-mature organisations that Ordnance Survey has worked with have a deliberate strategy that states that they will always seek to operate technology and systems based upon a policy of ‘always running on version X-1’. However, such a policy in itself, and taken in isolation, is not an automatic indicator of maturity. V.X-1, for example, may not incorporate the latest available security features, and so no one single policy, factor or practice can be an indicator of maturity.

Maturity should be measured against the needs of the key stakeholders within the eco-system in which the organisation operates. It can be cognisant of, but it is not synonymous with, best practice. This enables a ‘fit for purpose’ approach to creating, maintaining and supplying geospatial data, not a ‘one-size fits all’ that meet stakeholder requirements.

A nation thence knows the current and desired maturity of its national geospatial organisation(s), across the many different components of geospatial and operational maturity (Ordnance Survey lists 24 of them in total). Some components will need significant investment to reach desired maturity, others will not require anything other than maintenance-investment and other elements can actually be wound back because they are at a level of maturity that significantly exceeds the demands that stakeholders are, and will, place on the organisation in the foreseeable future.

Ordnance Survey has worked with many organisations around the world and, importantly, also with their stakeholders, to collect empirical and objective data on current and future state requirements.

From these many interactions, we have built a Global Geospatial Maturity Model. The model is designed to provide a framework against which current and future maturity can be assessed. It also enables us to continually track and record new and emerging strategy, technology and global best practices. By tracking global geospatial and data services trends we are able to continually revise our model and inform our assessments such that the theoretical maximum maturity indicators are constantly evolving.



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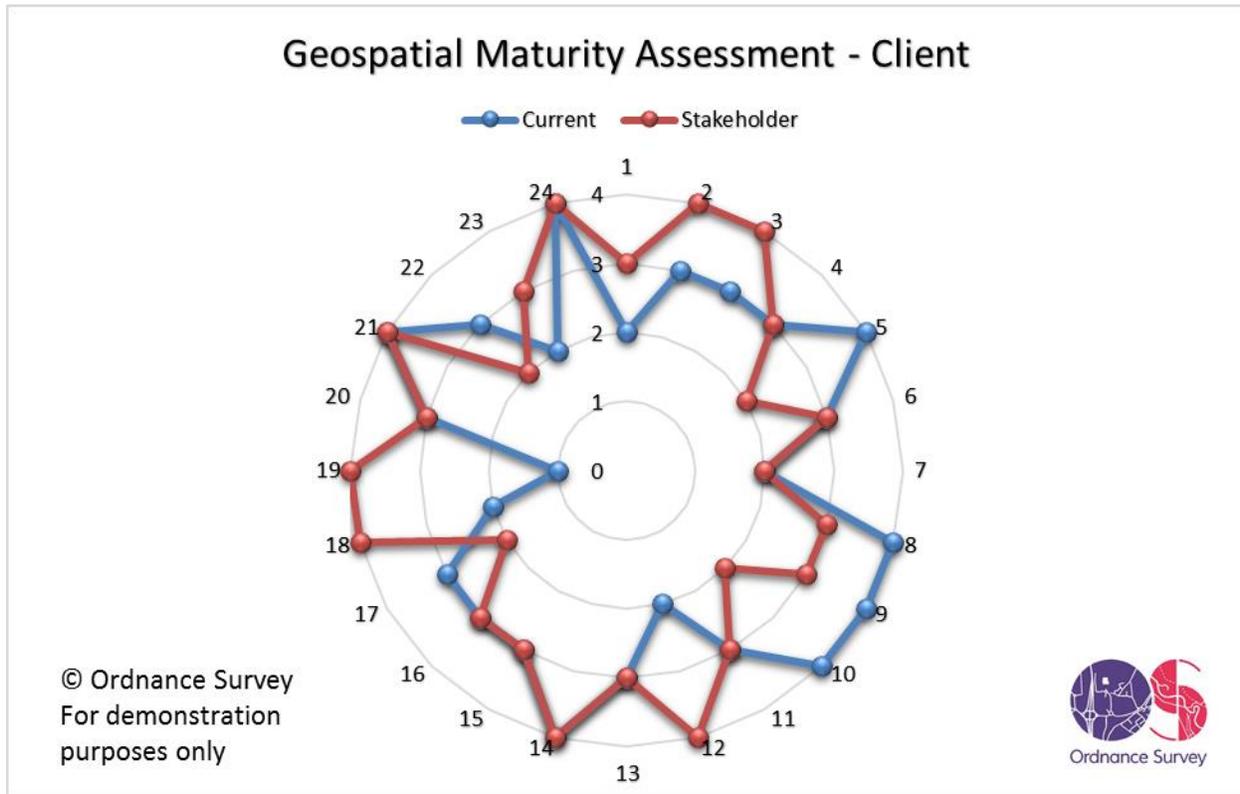


Figure 1 Example RADAR Plot. Source: Ordnance Survey

Each of the ‘spokes’ in Figure 1 above represents each of the various 24 individual themes or components that Ordnance Survey has identified as collectively providing the most useful overall view of geospatial maturity. The stages of maturity progress from zero (immaturity) at the centre, to four (high maturity) on the outer ring.

Of the two plot lines, the blue line shows the currently assessed state of the organisation and the red line represents a consolidated view of where the stakeholder community needs the organisation to be in order to provide effective value to them and their operations.

The key information that this plot provides is to identify the differences, or deltas, that occur between stakeholder need and current organisational state, against each individual theme. Each delta forms the basis of an individual element of the strategic development roadmap.

Thus, the output is ultimately a future state map designed to close (increase or decrease) the performance gap between current and future state. The largest negative deltas (i.e. where current performance is two



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or more levels below stakeholder need) theoretically identify those areas requiring priority investment. Again, in theory, the positive deltas may identify those areas from where investment funding may be switched. The future state map can identify compromises needed to satisfy the majority of stakeholders.

In this way, the assessment tool also provides a means to prioritise and sequence an implementation plan. For example, in figure 1, it may be desirable to reduce funding (both Opex and Capex) immediately on themes 5, 8 and 10, and redirect resources into themes 12, 18 and 19, with 19 apparently requiring urgent attention.

Conducting a maturity assessment can encourage an environment of transformation. It can force an organisation to clarify the relevance of its goals by bringing stakeholder requirements centre stage. It can also help to identify where threats or opportunities may emerge and helps to reshape strategy.

Closing some of the gaps will be achievable through policy change, others through investment in people, practices and or technology. Critically the organisation, and in the case of a national geospatial agency, a nation is then in a position to have confidence in all aspects of the derived investment roadmap.

## **Conclusions**

Geospatial data is a critical component of the information age, underpinning economic, environmental and societal development.

The collection, generation and, in particular, the use of geospatial data is no longer the sole preserve of national mapping and cadastral agencies. It is becoming pervasive across government, the private sector and society in general.

Creating a national data commonwealth and identifying and harnessing the influence of an ecosystem of stakeholders, is key to extracting the full range of benefits from a nation's investment in geospatial data.

The requirement and use of geospatial data puts ever increasing demands on data suppliers, who need to engage, prioritise and deliver.



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Ordnance Survey’s Global Geospatial Maturity Assessment provides a tool to assess as-is, determine to-be and determine an investment plan for moving from one to the other.

Ordnance Survey’s GMA is a unique facility available to nations and every organisation that currently benefits, and or intends to benefit further, from investment in geospatial capability. The assessment is based on our global expertise and experience and is delivered by current practitioners (not consultants). The analysis, results and recommendations are provided independently of any third party, and cover strategic, geospatial and operational elements of data use.

There is a significant amount of evidence from across the world which demonstrates that geospatial information contributes to greater understanding, better decision making, effective delivery and more assured measurement. This applies at local level, city level, national level and regional level. Sustainable development requires data, including geospatial data, and the ability to maximise the benefits attainable. However, many organisations are not efficient or effective in delivering geospatial data. Whilst maturity assessments do not deliver strategy or costed business plans they do give an honest and open assessment of an organisation’s maturity. This enables better prioritisation and leads to targeted development plans. Equally, they provide the development community the opportunity to achieve most effect from investment and assurance through measurement that, over time, real impact is being achieved.

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