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The Future Trends in Geospatial Information Management - Strategic Overview

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What is the Future Trends report?

The Future Trends report provides expert opinion on the mid to long term-developments in geospatial information and is a strategic insight document for all countries and the global geospatial information community.

It is broad in nature, looking at emerging trends in technology, legal and policy, skills and training, the private and non-governmental sectors, and in the role of government.

The third edition of the Future Trends report provides updates and includes key emerging trends not previously covered.

Setting the scene

"We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten."

Bill Gates (1990s)

- Global trends of expanding urbanisation, concerns about food production, climate change issues, the need for sustainable land management and development and growing inequality are putting the globe under stress.
- The way in which our society is organised amplifies the structural threats that climate change and the emergence of new infectious diseases have upon the world.
- Governments and institutions can make the necessary investments in the many components of preparedness - of which geospatial information is key.
- The report will complement the Integrated Geospatial Information Framework helping to ensure that the Framework integrates and takes advantage of the latest innovations and trends.

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The value of geospatial is accelerating

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Why was the report created?

At the first session of the Committee of Experts in 2011, the Committee decided that there was a need to document the thoughts of leaders in the geospatial world as to the future of the industry over the next five years and, looking further out, its development over the next ten years

The first edition of the report was endorsed by the Committee at its third session in July 2013.

Noting the benefits gained and the changing dynamic of geospatial information, the Future Trends report was revised in 2016.

At its eighth session in August 2018, the Committee of Experts requested that a third review be undertaken to understand the future trends that impact geospatial information management over the next five to ten years.

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How was the report created?

The third edition of the Future Trends report is being prepared in three phases:

1. Identify the priority themes on which to focus by considering the professional views from the UN-GGIM Bureau, Chairs of Regional Committees, and UN-GGIM technical and thematic groups;
2. Gather input on emerging trends through two discussion fora and an international consultation period; and,
3. Circulate the draft of the report for broad comment and launch the key findings through a global webinar, and then finalise based on this feedback.

It is expected that the final report will be presented to the Committee for adoption at its tenth session in August 2020.

A truly global collaborative effort

In 2019, an inclusive global engagement and consultative process was initiated that sought views on the future trends that will impact geospatial information management over the next five to ten years.

So far, 103 UN member states, organisations and relevant expert stakeholders from all over the world have contributed to this revision of the Future Trends reports.

We wish to thank all those who have contributed to the development of this report and provided their expertise and professional insights.

How to use the report

The report is broad in nature, looking at emerging trends in technology, legal and policy, skills and training, the private and non-governmental sectors, and in the role of government.

- The first chapter of the report provides a high-level analysis of the top global geospatial drivers and trends that are predicted to have the greatest impact on the geospatial industry over the next five to ten years.
- The chapters that follow provide updates, where relevant, on the trends identified in the previous two editions.
- Each chapter begins with a brief summary highlighting the key developments that are discussed in that section of the report.

Contents

2. The digital infrastructure of the future

The digital data infrastructure is becoming as relevant as the features of the physical environment, but it is the densely populated and resource intensive areas of cities where the greatest drive towards utilising this infrastructure can be experienced.

Highlights:

- The degree of maturity of technologies varies - some have been around for years and just starting to affect the geospatial industry, while others are maturing rapidly;
- Advances in next-generation mobile communication technology allow for speeds of up to one gigabyte per second, revolutionising data exchange;
- Digital twins and data exchange enhance and optimise the real-world by monitoring and simulating scenarios to mitigate risks and increase resilience, and may also allow real-time information intervention;
- Visualisations and immersive technology enhance the way in which people interact with the environment and will increasingly inform decision making alongside other use cases;
- Edge computing enables reliability, mitigates risk and facilitates situational awareness of autonomous systems;
- Data/semantic interoperability are key challenges to be overcome through the application of common standards.

What does the report say? (1 of 2)

The third edition highlights changes to the trends identified in the previous two reports, showing how geospatial information and technology underpin national governments, and documenting the increasing role that geospatial information will play as part of the 2030 Agenda for Sustainable Development.

The value from the location element of data is now widely recognised, with geospatial data increasingly being accepted as just one type of 'data' by many stakeholders responsible for policy, analysis and data governance.

Industry structural shift

- Expertise in consolidating large numbers of data sources, understanding of mapping requirements, and new toolsets developed for automate map creation will be critical for the future.
- Automation and Artificial Intelligence applications will enable employees to be freed up from monotonous tasks.

User requirements

- The internet, mobile devices and the growing number of location-based services means that an increasing number of users have constant and direct contact with geospatial information.
- Demand for near real-time data is driven by the expectation of instant and frictionless access to information on mobile devices.

Policy and legal

- Cybersecurity, data privacy, ethics, trust and licensing will increase in relevance as interdisciplinary collaborations are now at the forefront.
- Government-led geospatial infrastructures will need to take account of and consider responses to these emerging legal and policy top trends.

What does the report say? (2 of 2)

Technological advancements

- The speed at which innovation occurs represents great opportunities and challenges to those trying to prioritise efforts.
- Technological disruption in the geospatial industry is driven by automation, Artificial Intelligence, sensor technology, and the Internet of Things. In addition, advances in technology such as high-performance cloud computing, ubiquitous high-speed connectivity, new sensor networks and sensor platforms, geospatial analytics, and autonomous smart machines have created a shift towards a more machine centric world.
- These developments have fuelled and will continue to fuel an explosion in the volume and currency of data, driving down the cost of data capture

Rise of new data sources & analytical methods

- The volume, size, speed, diversity and complexity in which geospatial data is generated requires change: to the processes currently used by governments and businesses across the world, and to workforces that are capable of searching, analysing and merging these large amounts of data.
- It is anticipated that mobile data collection, crowdsourcing, and social media are likely to have the greatest impact over the coming decade.
- These forms of data collection will enable accurate, (near) real-time applications that are increasingly demanded by various users of geospatial data.

There is general consensus that disruption and change does not come form a single technology or organisation, but from the linking of multiple trends.

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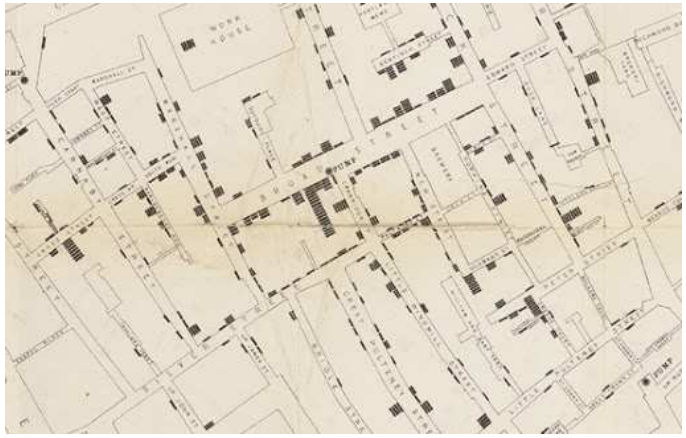
Mapping diseases – The case of COVID-19

In 1854, John Snow demonstrated the clear value of location to epidemiological science – mapping the clusters of cholera deaths in the London epidemic and tracing an important source of the outbreak.

Today, the COVID-19 pandemic has highlighted again how geospatial infrastructures have become an essential component of disease prediction, prevention, and response:

- Spatial Big Data, such as from smartphones, social media and wearable devices, are being analysed to trace people's movements;
- Predictions on people's behaviour are made by using contextualized data, digital maps and technologies including geofencing, GPS trackers and sensors;
- Visualizations make data more easily accessible highlighting where people are affected and where clusters are emerging – both locally, nationally, and globally; and,
- Machine Learning techniques using aerial and satellite data help assess how environmental changes may impact infectious disease transmission.



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Reviewing the three Future Trends reports

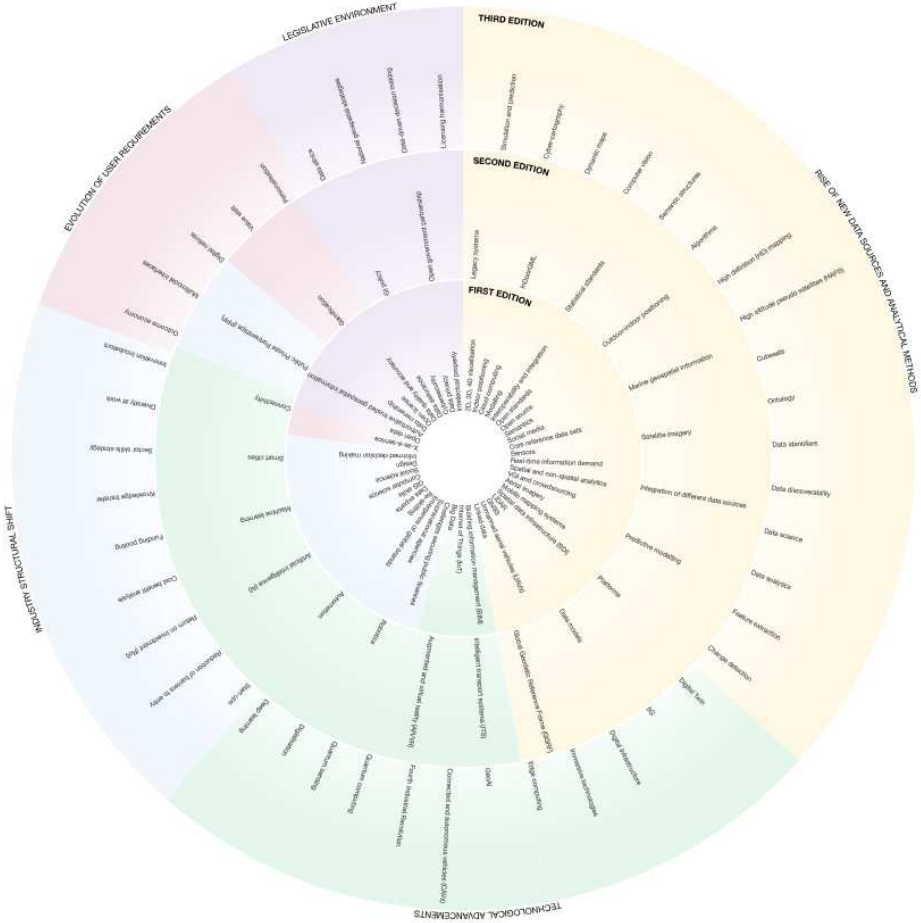
The report does not simply focus on what is ‘new’ but provides an overview of how previous trends have developed over time and how the direction of the geospatial industry is likely to evolve.

What has changed?

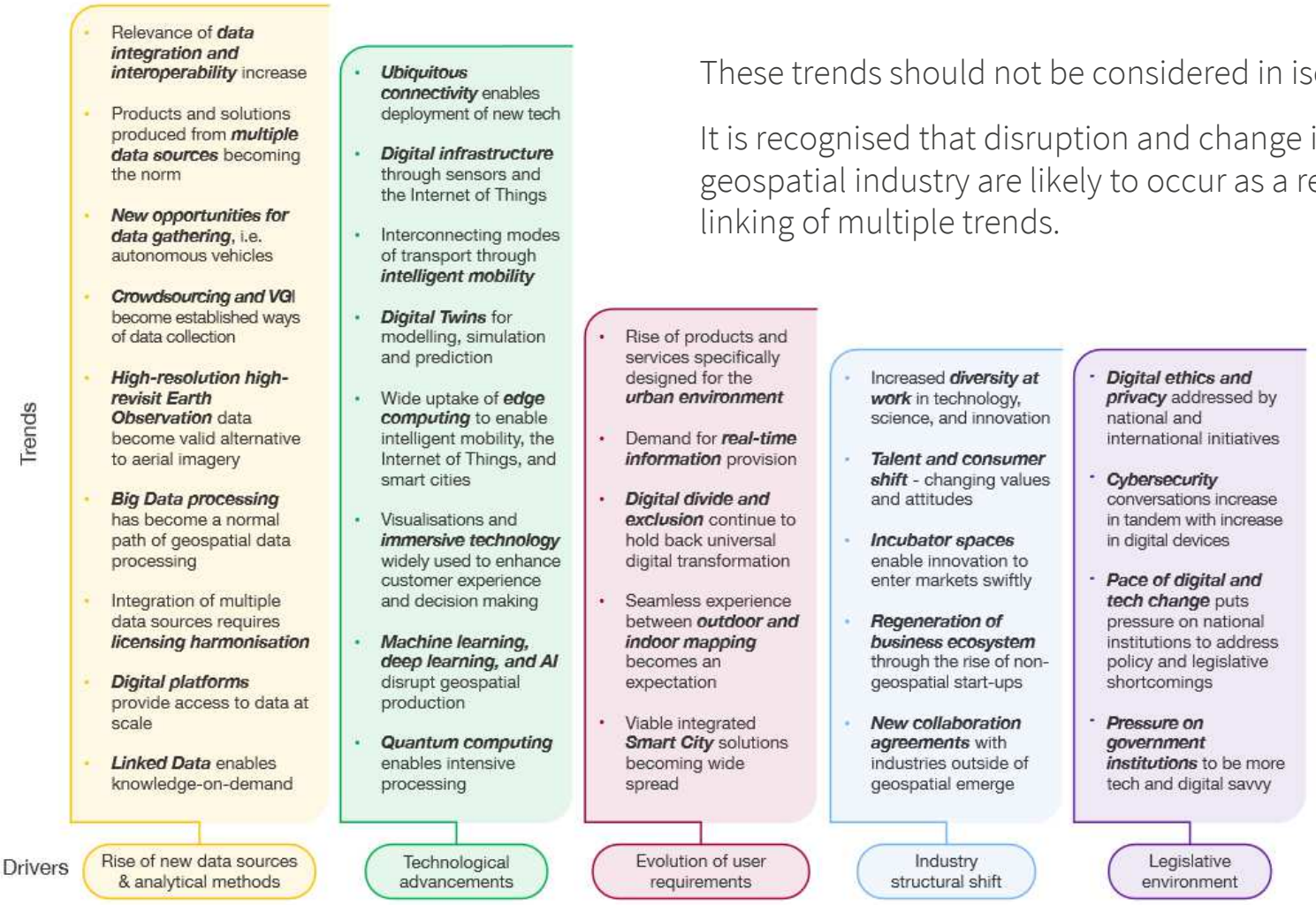
1. Explicit recognition of data and data technology compared to ‘pure’ IT technology.
2. User requirements are increasingly at the forefront.
3. Partnerships and collaborations across the industry (government – private sector – academia) more prominent.

What has remained the same?

1. Policy and legal developments continue to greatly influence how the industry changes.
2. Acceptance that technological innovation drives much of the disruption today.
3. Governments continue to remain highly relevant in the geospatial industry.



The nature of disruption



These trends should not be considered in isolation.

It is recognised that disruption and change in the geospatial industry are likely to occur as a result of the linking of multiple trends.

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Geospatial drivers and trends

- The information received throughout the global consultation process and the views expressed during the discussion fora in 2019, have helped identify the top trends that are likely to affect the geospatial industry over the upcoming decade.
- Based on this prioritisation exercise, these trends have been divided into five overarching industry drivers and presented to forecast how these drivers are likely evolve over the next five to ten years.
- Nonetheless, the top geospatial trends and drivers highlighted in the table and graphic are not exhaustive. The individual chapters of the report provide more detail and highlight further industry developments not shown in these diagrams.
- To illustrate the different levels of impact the trends are likely to have, each trend has been 'mapped' on a matrix to provide an overview of its effect on the geospatial industry.

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Graphic 1.

Five drivers will advance change in the global geospatial information management landscape over the next 5 to 10 years

Five prevailing drivers and an underlying set of trends

- Technological advancements
- Rise of new data sources & analytical methods
- Industry structural shift
- Evolution of user requirements
- Legislative environment

Future Trends – IGIF Pathways impact assessment

- The table cross-references the top trends against the nine strategic pathways of the IGIF. Based on the distribution and crossovers, it can be determined that attention has to be paid to those pathways that are likely to see the greatest amount of flux.
- All trends relate in some way to each of the individual pathways.
- The *Innovation*, *Data*, and *Standards* pathways, have received most of the coverage in the impact assessment table.
- Decision makers, institutions, and organisations working on a national approach will need to pay attention to these dynamic developments.
- As we start to develop National Action Plans, it will be crucial to ensure that the Framework integrates and takes advantage of the latest innovations and trends.

Table 2. Trends - IGIF Pathways impact assessment

Key Trends	IGIF Pathways: Governance & Institutions	Policy & Legal	Financial	Data	Innovation	Standards	Partnerships	Capacity & Education	Communication & Engagement
Technological advancements									
Ubiquitous connectivity enables deployment of new tech				●	●				
Digital infrastructure through sensors and the IoT	○			●	●	●			
Interconnecting transport through ***intelligent mobility***				●	●	●			
Digital Twins for modelling, simulation and prediction				●	●	●			
Edge computing for intelligent mobility, IoT, smart cities		●		●	●	●			
Immersive technology to enhance CX and decision making				●	●				
Machine & deep learning, AI disrupt geospatial production				●	●	●		○	
Quantum computing enables intensive processing				●	●	●		○	
Rise of new data sources & analytical methods									
Relevance of ***data integration and interoperability*** increase	○			●		●			●
Products/solutions from ***multiple data sources*** the norm		○		●		●			
New opportunities for data gathering; autonomous vehicles				●	●	●	●		
Crowdsourcing and VGI become ways of data collection	○			●	●		●		
High-res-revisit Earth Obs data valid alt to aerial imagery				●	●				
Big Data processing normal for geospatial data processing				●	●	○			
Integration multi data sources needs ***licensing harmonisation***		●		●		○			
Digital platforms provide access to data at scale		●		●	●		●		
Linked Data enables knowledge-on-demand	●	●		●	●	●			
Industry structural shift									
Increased ***diversity at work*** in STEM								○	●
Talent and consumer shift - changing values and attitudes					○			●	○
Incubator spaces enable innovation to enter markets swiftly			○	○	○		●		
Regen of business ecosystem; rise non-geospatial start-ups					●		●		
New collab agreements industries non-geospatial emerge							●		○
Evolution of user requirements									
Rise of products/services designed for ***urban environment***			○	○	○				
Demand for ***real-time information*** provision		○		●	●	●	○		
Digital divide/exclusion slows universal digital transformation	○				○				
Seamless experience between ***out/indoor mapping*** expected				●	●	●			
Viable integrated ***Smart City*** solutions become widely spread			○		●		○		
Legislative environment									
Digital ethics/privacy fixed by nat/international initiatives	○	●		○	○		○	○	○
Cybersecurity/digital devices conversations increase in tandem		●							
Digital/tech change; address policy/legislative shortcomings		●			●				
Government institutions to be more tech/digital savvy	●	●	○		●			○	○

● Major level of impact ○ Minor level of impact

What happens next?

Global consultation -

The Secretariat has initiated a broad global consultation process on the draft Future Trends report (third edition) involving Member States and relevant stakeholders.

Please provide your contributions to the Secretariat no later than 26 June 2020.

Virtual High-Level Forum event -

Future Trends in Geospatial Information Management: Five to Ten-year Vision, the relevance and application to national priorities and action plans

Tuesday, 9 June 2020, 11:00 hrs (UTC)

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