UN-GGIM Future Trends report – Artificial Intelligence

4th February 2021
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.

Recognizing that disruption and change in the geospatial community are likely to occur as a result of the linking of multiple trends, the report explores a diverse set of emerging and developing trends. Among others, these include data privacy and ethics; Digital Twins; Artificial Intelligence and data analytics; and, capacity building.

The full Future Trends report can be accessed here.
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.
Five drivers will advance change in the global geospatial information management landscape over the next 5 to 10 years.
Structure

Artificial Intelligence and…

1. Geo Production
2. Geospatial Analytics
3. Ethics
Artificial Intelligence and Geo Production

- Relevance of data integration and interoperability increase
- Products and solutions produced from multiple data sources becoming the norm
- New opportunities for data gathering, i.e. autonomous vehicles
- Crowdsourcing and VGI become established ways of data collection
- High-resolution high-revisit Earth Observation data become valid alternative to aerial imagery
- Big Data processing has become a normal path of geospatial data processing
- Integration of multiple data sources requires licensing harmonisation
- Digital platforms provide access to data at scale
- Linked Data enables knowledge-on-demand

- Ubiquitous connectivity enables deployment of new tech
- Digital infrastructure through sensors and IoT
- Interconnecting modes of transport through intelligent mobility
- Digital Twins for modelling, simulation and prediction
- Wide uptake of edge computing to enable intelligent mobility, the IoT, and smart cities
- Visualisations and immersive technology widely used to enhance customer experience and decision making

**Machine learning, deep learning, and AI disrupt geospatial production**
- Data cubes can deliver analysis ready data
- Quantum computing enables intensive processing

- Rise of products and services specifically designed for the urban environment
- Demand for real-time information provision
- Digital divide and exclusion continue to hold back universal digital transformation
- Seamless experience between outdoor and indoor mapping becomes an expectation
- Viable integrated Smart City solutions becoming wide spread

- Increased diversity at work in technology, science, and innovation
- Talent and consumer shift - changing values and attitudes
- Incubator spaces enable innovation to enter markets swiftly
- Regeneration of business ecosystem through the rise of non-geospatial start-ups
- New collaboration agreements with industries outside of geospatial emerge

- Digital ethics and privacy addressed by national and international initiatives
- Cybersecurity conversations increase in tandem with increase in digital devices
- Pace of digital and tech change puts pressure on national institutions to address policy and legislative shortcomings
- Pressure on government institutions to be more tech and digital savvy

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Artificial Intelligence and Geo Production

• GeoAI extracts knowledge from spatial data.

• Continued developments in image recognition and feature extraction, coupled with reduced storage costs, will provide opportunities for faster data capture and maintenance of geospatial information, and will come closer in quality and usability to that which can be achieved by traditional survey methods.

• Increased automation and improvements in machine learning free up time-consuming and resource-intensive tasks leading to higher production efficiency.

• Big Data processing will be the norm as machine learning and deep learning mature and become established functions in geospatial production.
Facebook and OpenStreetMap

Map With AI started as a project to make OpenStreetMap easier to use.

OpenStreetMap has historically been updated manually with volunteers, but Facebook, which uses the open-map data, added tools such as AI to add more details.

Facebook uses OSM and its Map With AI service for Marketplace, Check-ins and Local.

By March 2020, mappers from 137 countries have used the tool and contributed more than 100,000 changesets to the map.
Artificial Intelligence and Geospatial Analytics

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

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Many forms of technological advancement highlighted in the Future Trends report will produce new streams of geolocated data.

For example, sensor data from smart buildings; road & vehicle state information from connected vehicles; other sensor data from the Internet of Things.

Automation will be needed to:

- Make sense of (summarise) these streams.
- Highlight important changes or activity (pattern finding & then exception finding).
- Integrate data between locations & domains.

The right features/attributes in NMCAs’ foundational geospatial data can greatly ease these analytics.
Courtesy of Tom Gilbert, Newcastle University

- Demand-supply analysis
  - Electrical energy losses
  - Water leakage detection
  - Load balancing
- Security/stability
  - Network resilience
    - Robust design
Artificial Intelligence and Ethics

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Machine learning, deep learning, and AI disrupt geospatial production
- Geographic information systems (GIS) become a critical component of AI
- Machine learning algorithms can predict and optimize various aspects of urban planning and management
- Deep learning in computer vision and image analysis enhances situational awareness in urban environments
- Artificial intelligence in decision support systems helps in making more informed urban policy decisions

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Artificial Intelligence and Ethics

OGC: ‘The development of technology poses risks to social trust.’

• Discrimination can be built into algorithms.
• Geography and the relationship between location, poverty, gender and race may result in trends and predictive models that discriminate against certain persons and populations in particular locations.
• Machine learning-based algorithms might have discriminatory outputs that would reinforce disparities in data collection/service allocation.
• International standards will ensure wide-spread interoperability and security benefits to lead to the ethical and responsible use of AI technologies in geospatial applications.
The Locus Charter

The *Locus Charter* is an international set of principles and guidance for the ethical and good practice in using location data.

**Vision** - *A world where location data is utilized for the betterment of the world and all species that live in it.*

The Charter is aimed at practitioners using location data and also policy and decision makers responsible for activities that create, collect, analyse and store location data.

After a series of workshops throughout 2020, undertaken by Benchmark Initiative and EthicalGEO the Locus Charter draft has now been revised to Version 2.

**Locus Charter v2.0** is based on 10 principles.

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**Selected principles of the Locus Charter**

**Principle Four:** The same rights that people have in the physical world must be protected in the digital world.

**Principle Six:** Care should be taken to understand bias in the data that is collected.

**Principle Seven:** The more context data that is combined with location data the more powerful. Measures should be put in place to prevent identification of a person's location.
Thank you

Questions?