Land Governance in an Interconnected World

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
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Sharing Information to make better decisions about our World

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Abstract

Geospatial information and associated technologies are key to achieving resilience of local to national land management. The seamless ability to capture, visualize and manage land administration information relies on a level of interoperability that allows public and private sector information to be combined and organized efficiently for enhanced land management. New standardized ways to leverage, process, fuse and apply location data from imagery, drones/UAVs, mobile phones and a plethora of increasing inexpensive location-aware devices is changing the norm in ways that strengthen land governance, sustainable land use, and/or support land administration services in urban and/or rural settings.

Key Words: Geospatial Information, Standards, Harmonization, Collaboration

Introduction

In a world rapidly increasing in both population and natural disasters, there has never been as great a need to share information as that which we face today. Geospatial information and associated technologies are key to achieving resilience for local to national government's land management. Accessing the right information, at the right time and in the right way is still an elusive goal for many of the world's nations.

Alongside governments, the private sector, academics, and researchers, The Open Geospatial Consortium (OGC) has now been working on this challenge for over 20 years. Helping develop global best practices and define standards that enable the sharing of location data across multiple platforms and domains including water, climate, infrastructure, aviation, utilities, smart cities, agriculture and of course importantly land management. OGC works in collaboration with over 40 alliance partners to help develop these important standards and thus ensuring that the geospatial community's standards work not only within our community but with the many and varied communities outside the traditional geospatial domain.

Over the past decade, there has been good progress towards better land management through the development of standards such as the Land Administration Domain Model, the Social Tenure Domain Model, CityGML, Landinfra as well as our robust web services standards. A number of these have been built to serve GIS technologies that we have been working with for more than two decades, but what of the new technologies that innovation is making available? How do we integrate these into our existing geospatial infrastructures, standards and what new benefits will this bring? How appropriate are the technologies to meet regional variations and how do we harmonize multiple global efforts to implement and modernize existing standards? Regardless of the level of appropriate/fit for purpose technology, interoperability and standards will be key to maximizing these benefits.

Selected Evolving Technology Trends

There are many new and evolving technologies that the standards world is now seeking to connect with our traditional infrastructures, while ensuring requirement from a local to global scales are included in the process. A brief description of some of the key trends is described below.

Earth Observation Satellites

Cheaper, smaller satellites are bringing us more regular and higher resolution imagery allowing us to use earth observations in ways that were traditionally out of the reach of many except those with very large financial backing. How do we connect with this expanding data source and how do we harness its power to help us understand the world. Figure 1 below indicates the trend, estimated in 2015.
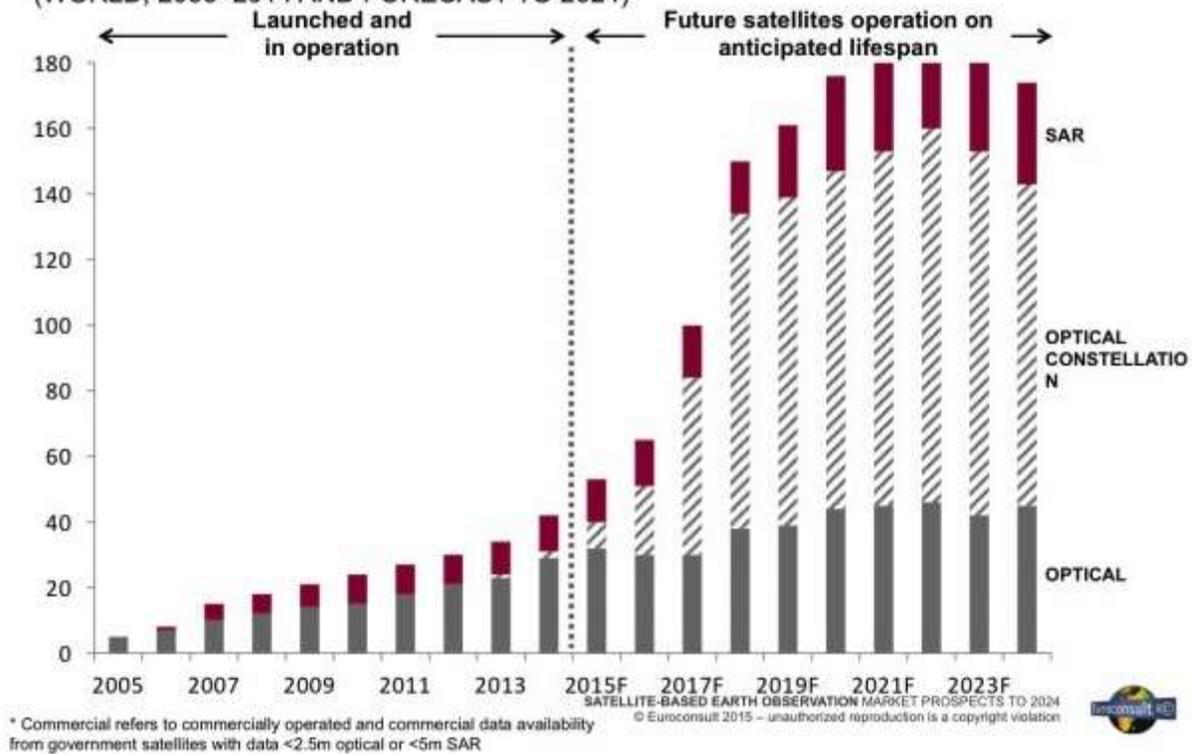
Figure 1; EO Satellite trends

Unmanned Systems

Unmanned Vehicles are simply changing the way we do so many activities. Farmers are using them to inspect flocks and their barbed wire fences, courier companies for delivery and surveyors for mapping lands far beyond their usual reach. The Unmanned Systems community (inclusive of terrestrial and marine technologies) is fragmented, with one measure being simply the large number of community events occurring in 2018, yet UAVs are showing promise to multiple areas relevant the Land and Poverty. Table 1 below provides a list of planned and scheduled events in 2018.

Region	Number of Events (2018)
EMEA	55
North America	44
APAC	21
Rest of World	12

Table 1; Number of Events planned or scheduled for 2018 , Globally The number of events is larger, since the count excludes Events of local relevance, Events focused solely on Defense and Security, Events focused on military applications of drone technologies, Events focused on the aviation industry (such as the Bahrain International Airshow), unless they host a prominent section of international or national relevance on drones, Events mostly dedicated to other emerging technologies, if they just have a minor focus on drones, Drone racing only events, and events related to the maritime domain

Mobile and Crowdsourcing

In 2014 we crossed the divide and now have more mobile devices on the planet than there are people. This presents an incredible opportunity for harnessing the world's population in generating, contributing to and interacting with data that is massive and challenging and high-velocity. How do we access this power and connect the citizens of the world to the potential benefits of crowdsourcing? Of note, the use of Mobile data vastly outstrips the use of voice on mobile devices (see figure 2 below). The explosion of portable and fixed in-situ devices everywhere must be considered.
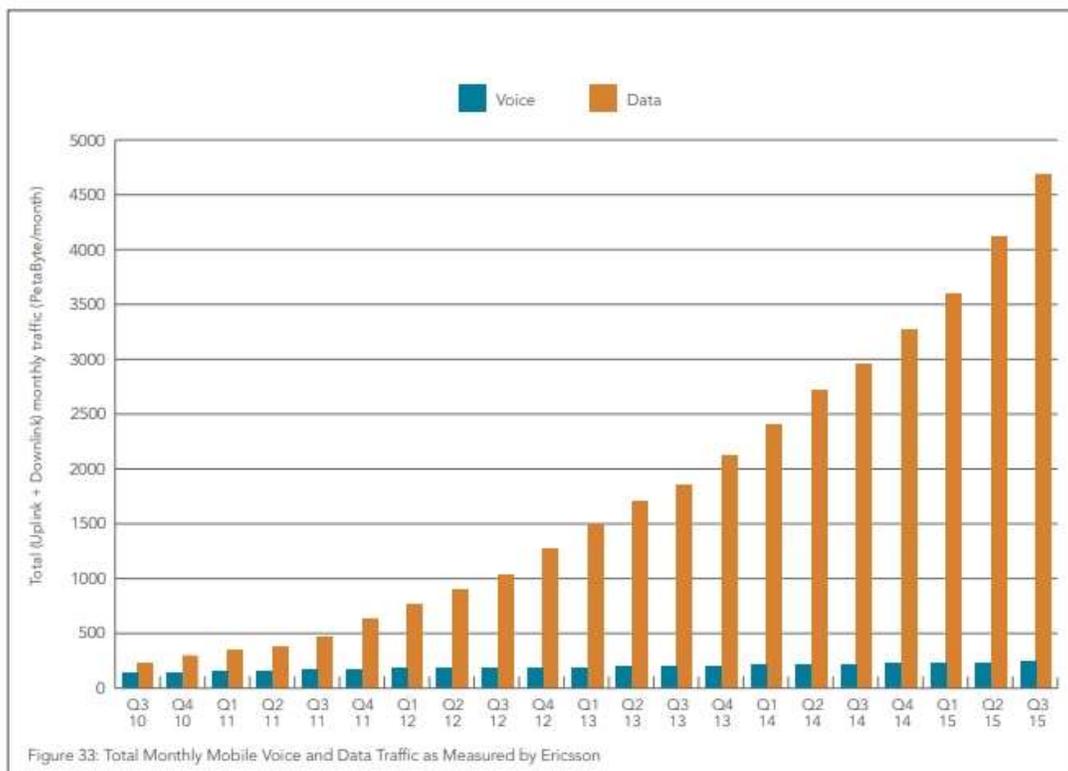

Figure 33: Total Monthly Mobile Voice and Data Traffic as Measured by Ericsson

Figure 2- The Rise of Mobile data,

Sensors

Few people in urban environments, for example, realize just how many sensors there are around them collecting information, for example, on temperature, movement, humidity, electricity and water flow. Never in history have we had such power to understand our world in real and near-real time. This should mean we are making better evidence-based decisions, but without good open standards and best practices we are challenged to realize the full potential that a world of sensors can achieve. Given there will be over 20 billion connected devices by 2020 (see table 2), then this is another key aspect to be considered in the standards process.

Category	2016	2017	2018	2020
Consumer	3,963.0	5,244.3	7,036.3	12,863.0
Business: Cross-Industry	1,102.1	1,501.0	2,132.6	4,381.4
Business: Vertical-Specific	1,316.6	1,635.4	2,027.7	3,171.0
Grand Total	6,381.8	8,380.6	11,196.6	20,415.4

Source: Gartner (January 2017)

Table 2: IoT Units Installed Base by Category (Millions of Units)

Big Data

To get some context of what we mean by **Big Data**, an IBM study suggests that 90% of the data on the internet today has been created since 2016. Figure 3 provides one estimate of the overall size of the "digital universe" and industry mentions of AI.
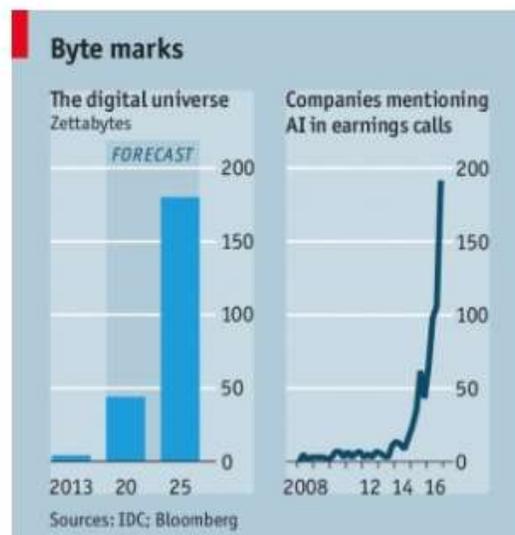
Figure 3: The Growth of Big Data

Imagine the opportunity but also the challenge if we continue to create data at this ever-increasing pace. To make sense of information at this size and scale we will need to find new ways of analyzing and processing data, inclusive of new emerging artificial intelligence technologies at the early stages of showing how beneficial it will be to us all making sense of Big Data and enhancing our understanding of the world.

Bandwidth

Access to the Internet and mobile bandwidth continues to increase in the developed countries, while regions of the world that have demonstrated urgent needs to better manage land continue to have challenges. Figure 4 below show's estimated aggregated internet connection speeds around the world in 2015. Significantly, connectivity and bandwidth is a challenge for larger countries' rural areas. Canada, for example, has excellent connectivity in Urban areas, but rural and northern areas, which comprise the majority of Canada's territory, have no or limited access.
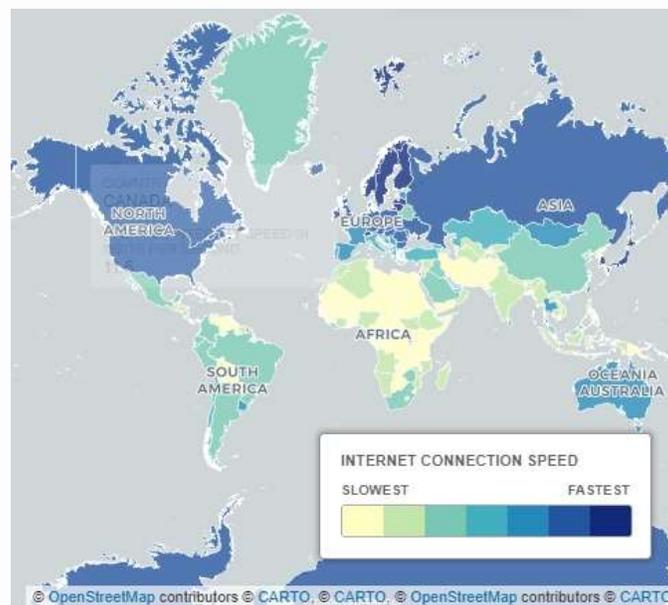

Figure 4: Internet Connections Speeds 2015, Oliver Smith, The Telegraph, April 9, 2017,

This bandwidth challenge needs to be considered when it comes to revising standards to meet varying global requirements.

Geospatial Distributed Ledgers

The rise of block -chain has direct relevance to the Land Administration community, since the use of secure location services that are independent of external centralized sources offers to add a trustless independent, open and accountable services.)

The OGC community is beginning to address this, with an ad hoc meeting scheduled for the OGC TC/PC meetings in March 2018 in Orleans, France.

The Role of Standards and Harmonization

Clearly, the international community, inclusive of the International Standard Organization (ISO), the Open Geospatial Consortium (OGC), the International Federation of Surveyors (FIG), the UN-GGIM, UN-GLTN , the World Bank and more recently the International Hydrographic Organization (IHO, for Marine Cadastre) , along with alliance partners (e.g. W3C, OASIS, and others) have made significant progress in planning harmonization activities as it relates to the landscape of standards requiring modernization.   A partial list of standards, encodings, and registries, to be included in the process is listed below.

- LADM
- LandInfra
- CityGML
- GML -
- LandXML
- BIM/IFC/3D Cadastre
- Distributed Ledgers – Cryptolocation
- RDF/Linked Data
- GeoJSON
- Code List Management

Broad consultation and collaboration is required to ensure success, as outlined in the forthcoming joint World Bank / OGC Whitepaper on Land Administration, being (editors: Christiaan Lemmen, Kadaster and University of Twente , the Netherlands , Peter van Oosterom, Delft University of Technology, The Netherlands, Mohsen Kalantari ,University of Melbourne, Australia, Eva-Maria Unger and Cornelis de Zeeuw , Kadaster, The Netherlands).

The white paper is the final stages of approval and is expected to be available in the first half of 2018 and provides details on the practical planned next steps as well as much more detail.

Conclusion   and Call to Action

Updating and modernizing standards, encodings, and best practices, and harmonizing existing efforts is complex and requires strong collaboration amongst standards development organizations, associations, and societies. The forthcoming white paper provides excellent background, a list of issues and a recommended plan to help the overall standards community move closer to providing standards-based best practices, that are appropriate and support land rights, which cross-cuts multiple UN Sustainable Develop Goals including but not limited to;

- GOAL 1: No Poverty
- GOAL 4: Quality Education
- GOAL 5: Gender Equality
- GOAL 6: Clean Water and Sanitation
- GOAL 9: Industry, Innovation, and Infrastructure
- GOAL 10: Reduced Inequality

- GOAL 11: Sustainable Cities and Communities
- GOAL 16: Peace and Justice Strong Institutions
- GOAL 17: Partnerships to achieve the Goal

The role of the user/implementor of the standards should not be overlooked, and it is recommended that as part of the process the international community considers sponsoring a project, using OGC's proven, efficient and effective process to bring together users, implementors, sponsors and interested parties representing regional and global needs to test real-world use cases against the developing requirements, best practices and existing and emerging standards and technologies.

References

From an IBM report on big data, July 19, 2017

[1]https://public.dhe.ibm.com/common/ssi/ecm/wr/en/wrl12345usen/watson-customer-engagement-watson-marketing-wr-other-papers-and-reports-wrl12345usen-20170719.pdf).

"CRTC rules high-speed Internet a basic service, sets targets", Globe and Mail, December 21, 2016, updated April 10th, 2017, https://www.theglobeandmail.com/report-on-business/crtc-rules-high-speed-internet-a-basic-telecom-service/article33405960/ , polled , February 10, 2018

"Introduction to Proof of Location -the Case for Alternate Locations Systems", Ryan John King, https://blog.foam.space/ blog polled February 14th, 2018,

Tables

1 - Number of Events planned or scheduled for 2018, Globally, from https://skytango.com/top-commercial-drone-events-2018-2/ , polled on February 13th, 2018

2 - IoT Units Installed Base by Category (Millions of Units), Gartner Inc, January 2017

Figures

1 – Optical and Commercial High Resolution Operational Satellites Based on Anticipated Lifespans (World, 2055 to 2014 and Forecast to 2024), Euroconsult, 2015

2 - The Rise of Mobile data, "Akamai's State of the Internet", 3rd Quarter, 2015, P 44

3 - The Growth of Big Data, the Economist Website, May 6, 2017, polled February 10, 2018

4 -Internet Connections Speeds 2015, Oliver Smith, The Telegraph website, April 9, 2017, polled February 4th, 2018