Standards Capacity Building for the Caribbean
Day 1

UN-GGIM Americas

August 2nd and 3rd

New York, NY, USA

UN-GGIM:Américas
COMITÉ REGIONAL DE LAS NACIONES UNIDAS SOBRE LA GESTIÓN GLOBAL DE INFORMACIÓN GEOESPACIAL PARA LAS AMÉRICAS

ACS AEC
Association of Caribbean States
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Workshop Goals

- Introduction to OGC and International Geospatial Standards
- Presentation of the UN-GGIM Core Standards Guide
  - What are the standards associated with each level and what do they do?
  - What are the key applications/use cases for my country?
  - What level of capacity does my country have?
  - What level of capacity does my country want?
- Discussion amongst delegates on potential regional cooperative applications/use cases
- Maintain an open environment throughout intended to foster a vibrant discussion amongst delegates.

Non-technical (Mostly)!

Workshop Agenda

Date	Time	Topic
Sunday, August 2	1000-1200	Introduction to Standards
	1200-1300	Lunch
	1300-1430	Introduction to Standards (con't)
	1430-1500	Break
	1500-1600	The UN-GGIM Core Standards Guide
Monday, August 3	1000-1100	Review and Self-Evaluation
	1100-1200	Delegates to create presentations based on the Self Evaluation
	1200-1300	Lunch
	1300-1430	Presentation of Results
	1430-1500	Break
	1500-1600	Presentation of Results
	1600 +	Discussion on potential regional cooperative applications use case


introduce
yourself

Day 1 Agenda

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Sunday, August 2	1000-1200	Introduction to Standards
	1200-1300	Lunch
	1300-1430	Introduction to Standards (con't)
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	1500-1600	The UN-GGIM Core Standards Guide
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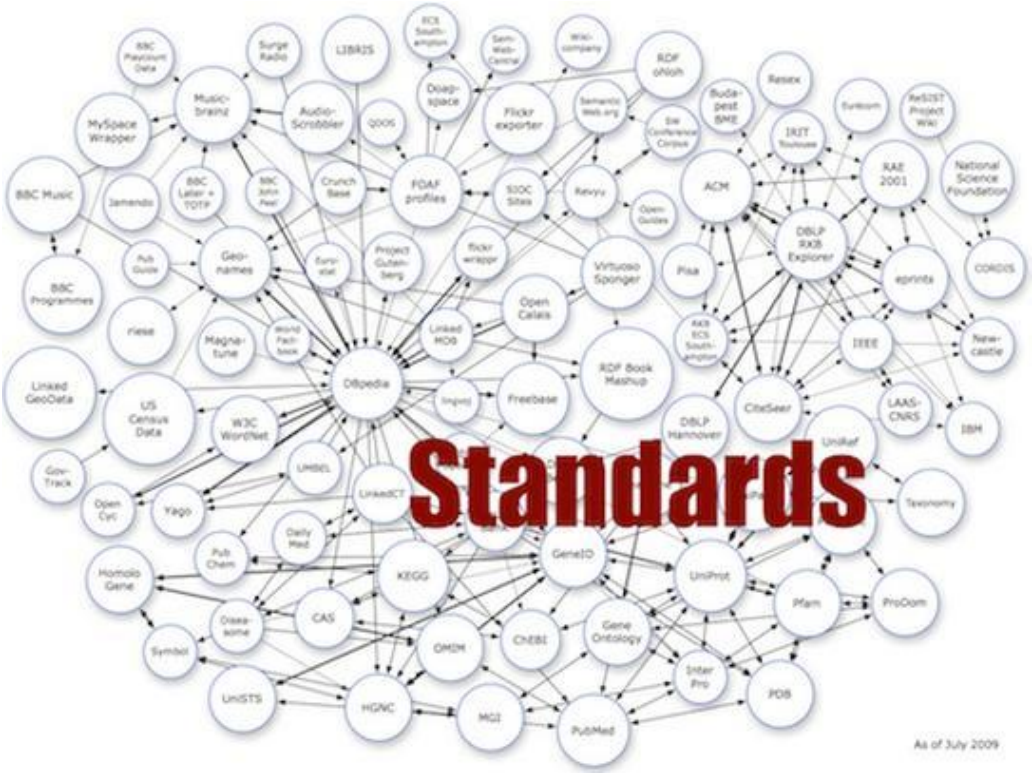
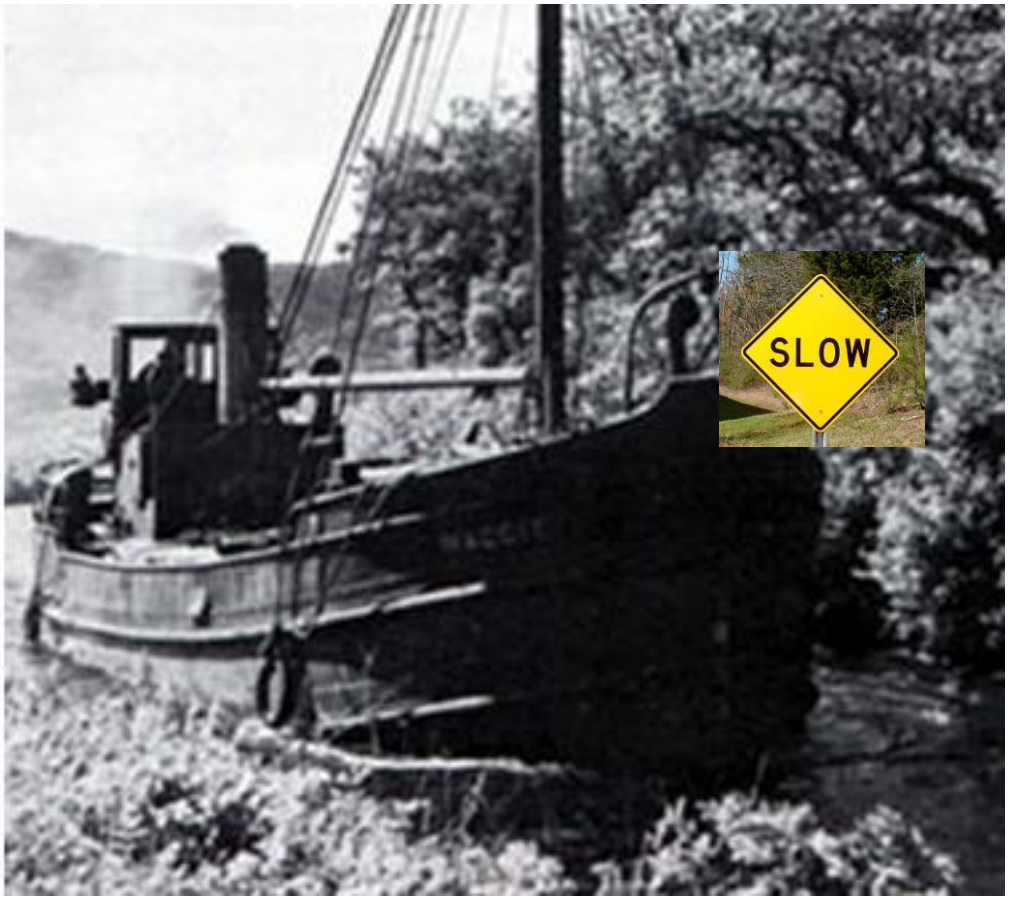
	1300-1430	Presentation of Results
	1430-1500	Break
	1500-1600	Presentation of Results
	1600 +	Discussion on potential regional cooperative applications use case

Introduction to Standards



http://www.parchment.com/blog/setting-the-standard/

What Some People Think About Standards



Why are Standards important?

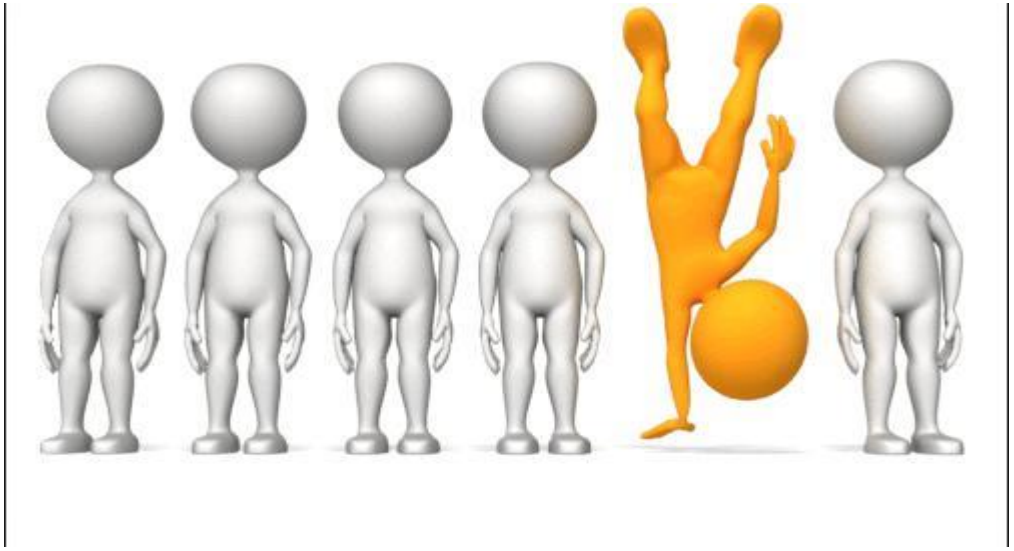
So that:

- A light bulb fits a socket
- Individuals can withdraw money from their bank accounts through any Automated Teller Machine anywhere in the world
- Mobile phones work across multiple countries around the world
- Latitude and Longitude provide a standard reference system for the Earth
- GPS coordinates are always provided in the same format

http://en.wikipedia.org/wiki/LED_lamp

What is a Standard?

"….a documented agreement between providers and consumers, established by consensus, that provides rules, guidelines, or characteristics ensuring materials, products, and services are fit for purpose."



The Process

- Standards development using a consensus process
- There are many different types of processes
- Not Easy!
- Must be Transparent and based on shared understanding
- OGC Process is based on a formal voting process – 1 vote per voting member, regardless of size of organization
- All “no” votes must be processed

The OGC Process – Consensus and Collaboration

Interoperability Requirements From members And Market

Requirements Documented as Part of OGC Interoperability Activity

Requirements used to Define new interface or Enhance existing Interface

Interface Implemented By Members, Tested And Documented

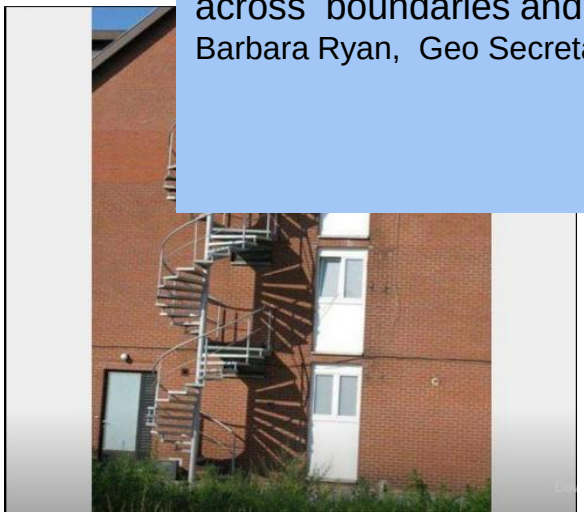
Members submit Interface for discussion And possible adoption Using OGC RFC/SWG processes

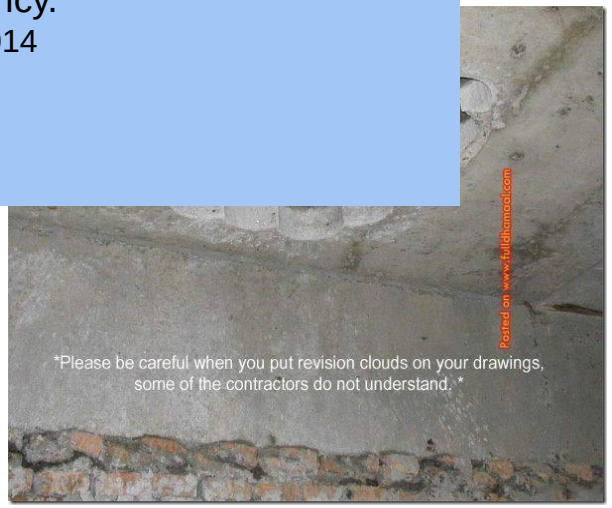
New or enhanced Interface provided to Community for Implementation

The Goal: Interoperability!

"Open Data , open standards and technologies that implement standards are all critical to the goals of GEO to "unleash the power of EO" for the greater benefit of society. A clear understanding about the relationship of these three elements. and how to implement on both the policy and technical level is critical to sharing information across boundaries and creating transparency.

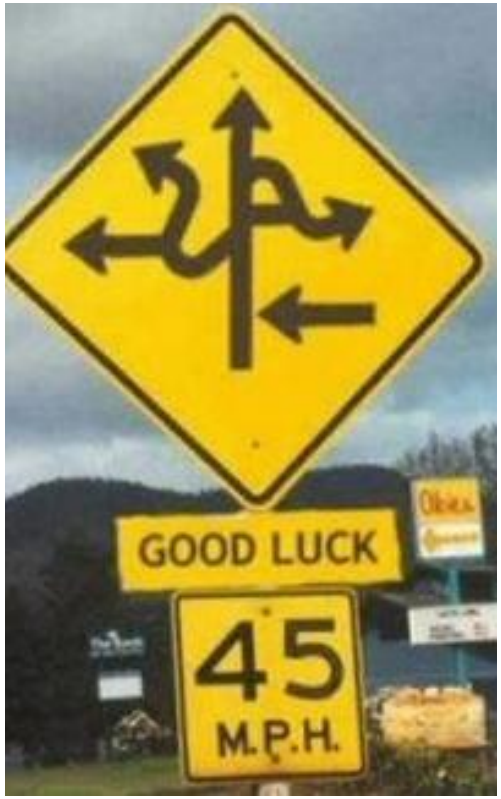
Barbara Ryan, Geo Secretariat Director, May , 2014





Open This, That and the Other Thing…

- **“Open” is Ubiquitous**
- **Open standards , open data, open and proprietary technologies all critical parts of successfully sharing geospatial information**
- **There is confusion amongst of the above terms!**
- **Technical, Policy and Legal Implications**



Open Standards

- What is an open Standard ?
  - **Freely and publicly available**; Unencumbered by patents and other intellectual property.
  - **Non discriminatory**; Available to anyone, any organization, any time, anywhere with no restrictions.
  - **No license fees** ; No charges at any time for their use.
  - **Vendor neutral and Data neutral**; independent of any data storage model or vendor technology.
  - **Defined, documented, and approved** by a formal consensus process. The consensus group remains in charge of changes and no single entity controls the standard.

Open Data

- Data that can be freely used, re-used and redistributed by anyone - subject only, at most, to the requirement to attribute and sharealike.
- To summarize the most important aspects:
  - **Availability and Access:** Must be available as a whole and at no more than a reasonable reproduction cost, preferably by downloading over the internet. The data must also be available in a convenient and modifiable form.
  - **Re-use and Redistribution**: Must be provided under terms that permit re-use and redistribution including the intermixing with other datasets.
  - **Universal Participation:** everyone must be able to use, re-use and redistribute with no discrimination. For example, 'non-commercial' restrictions that would prevent 'commercial' use, or restrictions of use for certain purposes (e.g. only in education), are not allowed.
  - **Default:** Open data should be the default position.

Source: http://data.gc.ca/eng/open-data-101

Open Data

- Open Data is a policy decision which results in changes to organizational behaviour
- Example Policies: USA

Data Policy Statements

Linking to Data.gov

Data.gov is the official portal for open data from the U.S. government. It is a public domain website, which means you may link to Data.gov at no cost. When you link to Data.gov, please do it in an appropriate context as a service to your customers when they need to find official U.S. government data. We encourage you to use our logo, which we've provided below. Placement of the Data.gov logo is to be used only as a marker to the home page and not as a form of endorsement or approval from Data.gov, the Office of Citizen Services and Innovative Technologies, the U.S. General Services Administration, or the U.S. Government.

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Use of Logo

- The image below is the official Data.gov logo.

Open Data

- Other Initiatives:
  - Canada
  - Australia
  - Japan
  - Korea
  - Taiwan
  - Global movement

"…. this policy means changing substantially how government is working, not just increasing the meaningless volume of open data….."

Source: http://2013.rigf.asia/workshop-proposal-24/, Jay Yoon

Open Data Day (全球開放資料日)

Open Data Day 是全球超過100個城市的程式設計師與市民的活動，各利益相關者齊聚一堂，使用各種資料，編寫出改善城市生活的應用系統、繪製城市脈動圖表，或是透過資料分析，找出城市發展的困境與解決方法。在2013年2月，Code for Tomorrow 響應，於臺北舉辦一場「程式馬拉松」(hackathon)，超過150人參加實作，讓開放資料在台灣獲得突破性發展。

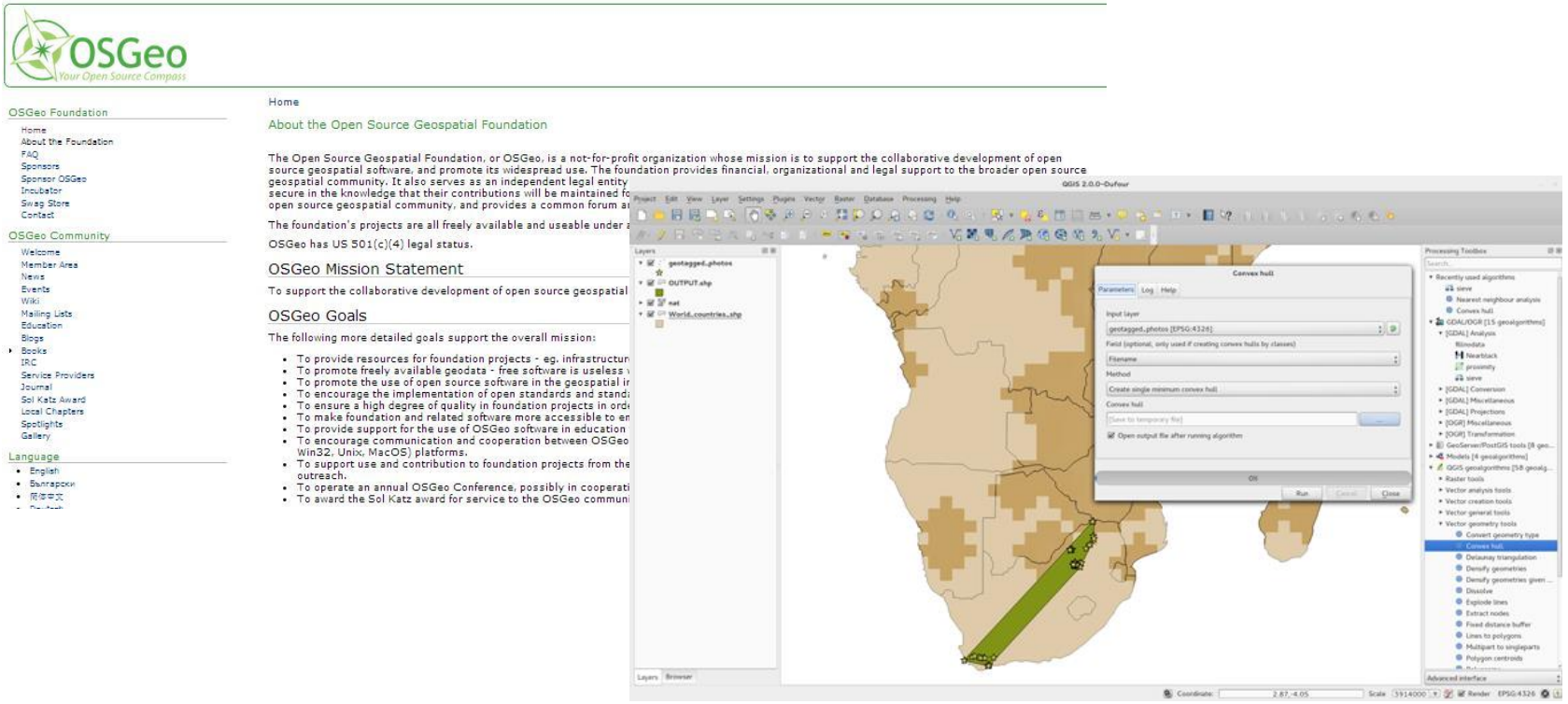
Source: TH Schee, Taiwan - Open Data in Taiwan

Open Source

- Open source doesn't just mean access to the source code. The distribution terms of open-source software must comply with the following Sample criteria:
  - Free Redistribution
  - Includes Source Code and allows modification
  - Permits distribution of software built from modified source code.
  - No Discrimination Against Persons or Groups, or Fields of Endeavor.
  - Must Not Be Specific to a Product
  - May not restrict other software
  - Must Be Technology-Neutral

Source: http://opensource.org/docs/osd

Examples



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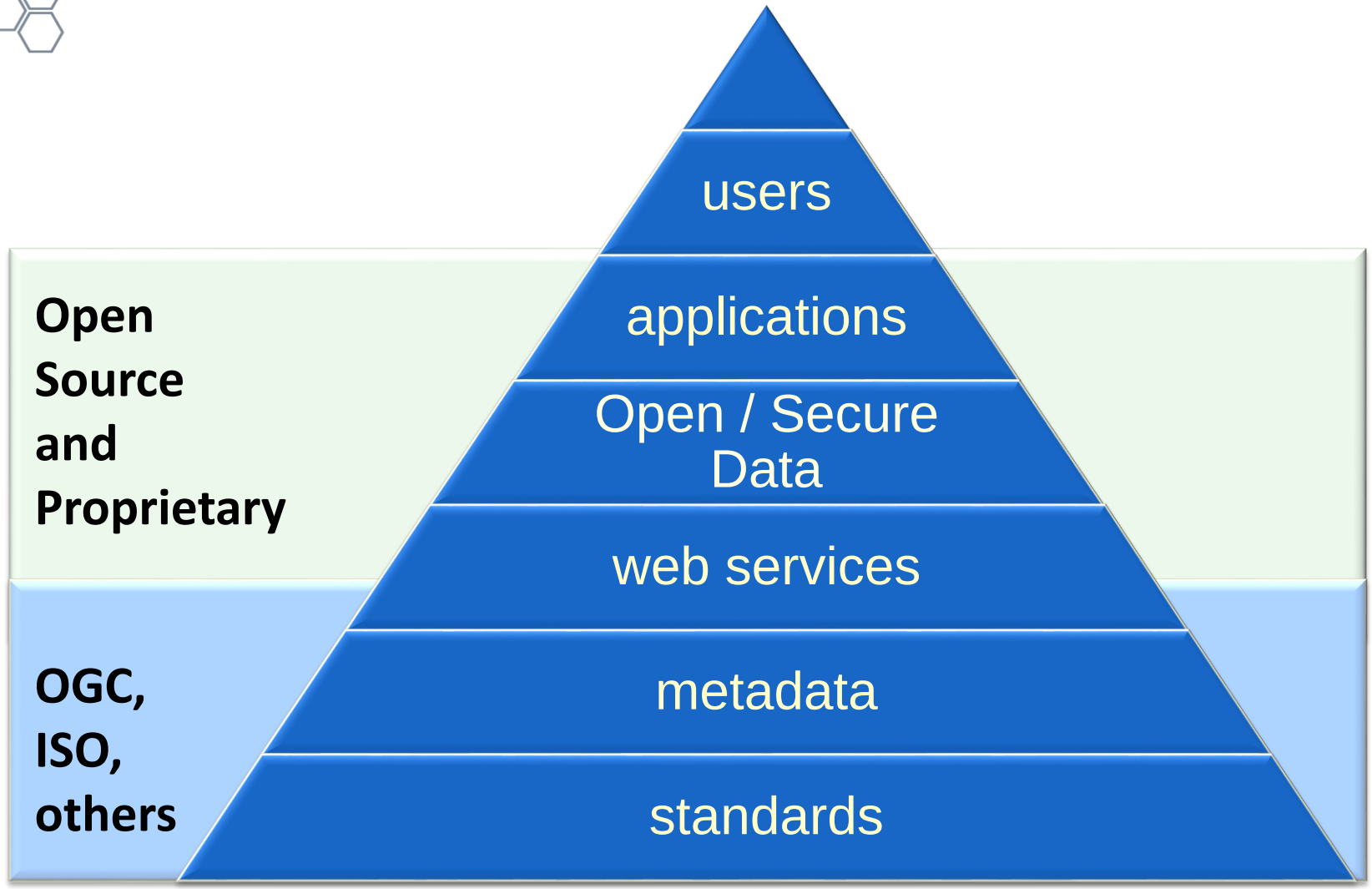
Proprietary Software

- Source code can not be viewed or changed
- Proprietary software is created by businesses who want to sell their software, but some programs that are free to use are still proprietary because the user is not allowed to change them.
- Even if the people who make the program give the source code to other people, the program will be proprietary if they do not allow :
  - Changing the code,
  - Giving the code to other people,
  - Use the code on a different computer,
  - Giving the license to another organization without permission.

- OGC vendor members support both Open Standards and Architecture to enable interoperability for their clients
- Approx. 40% of OGC members are commercial (200+)
- Full list: http://www.opengeospatial.org/ogc/members

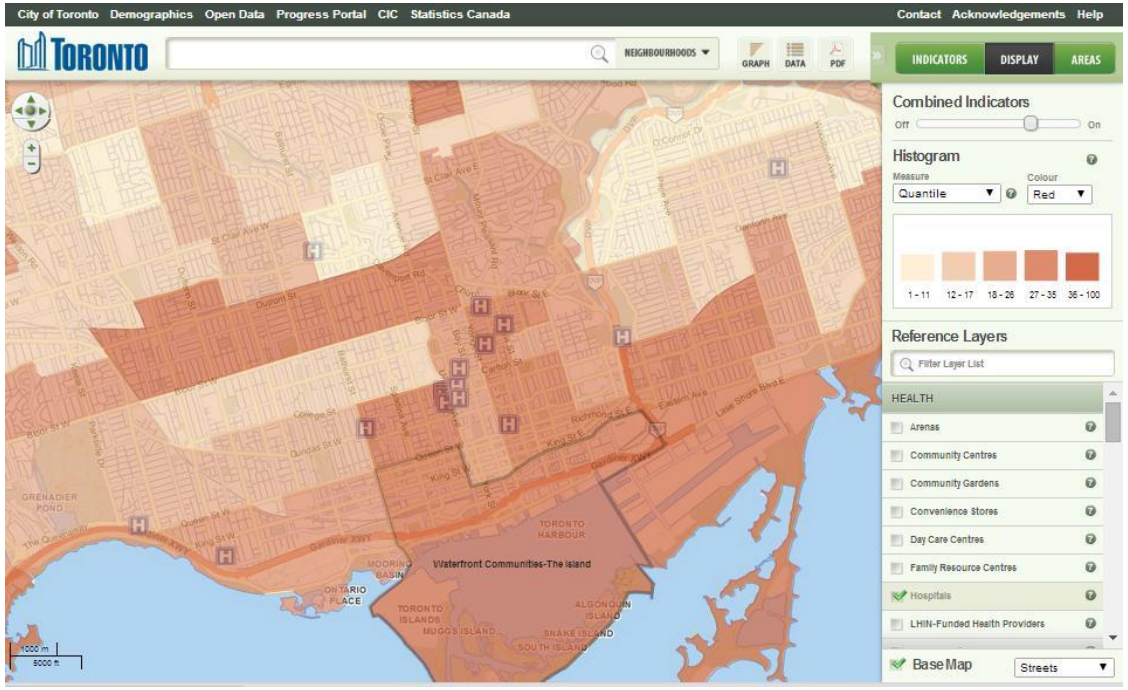
How does it all fit together ?



Example Implementation; Local

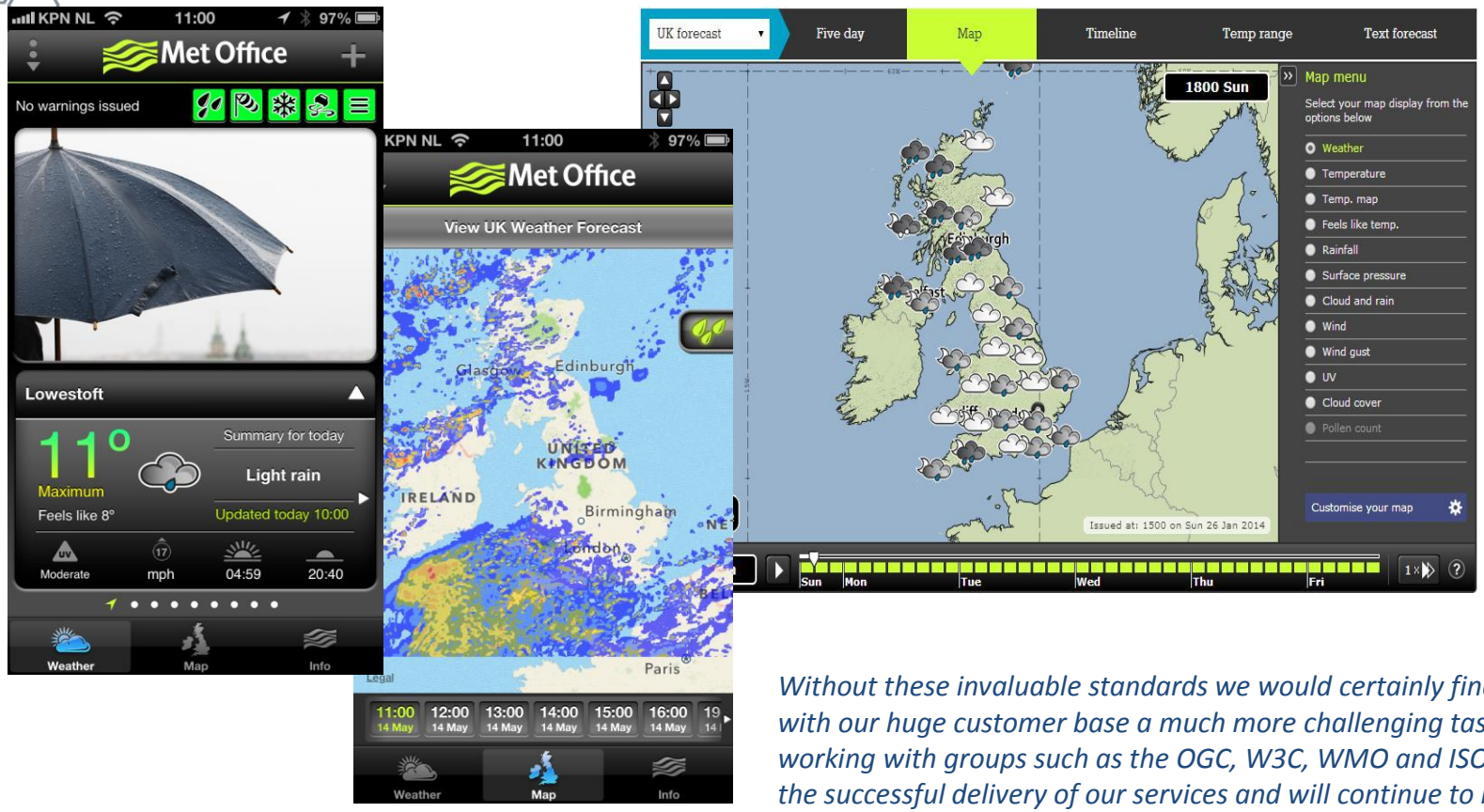
City of Toronto

- **Based on an Open Data Policy, all information from City departments is available**
- **Uses a combination of both proprietary and open Source technologies**
- **Interoperability enables through use of OGC standards**



City of Toronto Well Being Portal http://map.toronto.ca/wellbeing/

Example Implementation; National



Without these invaluable standards we would certainly find working with our huge customer base a much more challenging task. We see working with groups such as the OGC, W3C, WMO and ISO as key to the successful delivery of our services and will continue to invest in this important area."

Richard Carne – Head of Applications Development, Met Office, January 29, 2014

http://www.metoffice.gov.uk/

Example Implementation; Global

It’s a Big Tent – Room for all!

Khan Shatyr, billed as the world's biggest tent and built by Turkish hotelier and construction magnate Fettah Tamince and his partners, is seen after its opening in Astana July 6, 2010.
REUTERS/MUKHTAR KHOLDORBEKOV

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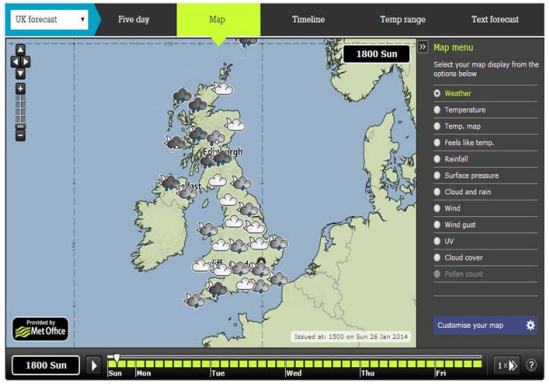
One More Aspect

- “Open” does not necessarily mean access to everyone!
- This is both a policy decision (for example, data considered private/sensitive) and an IT decision (e.g. Who has access to secure information/data)
- The Open Ecosystem can run behind a firewall , based on a private cloud , in a secure environment as well as one that is publically available, or both!

- Examples;
  - UK Met Office (Defense Weather)
  - NGA (US)

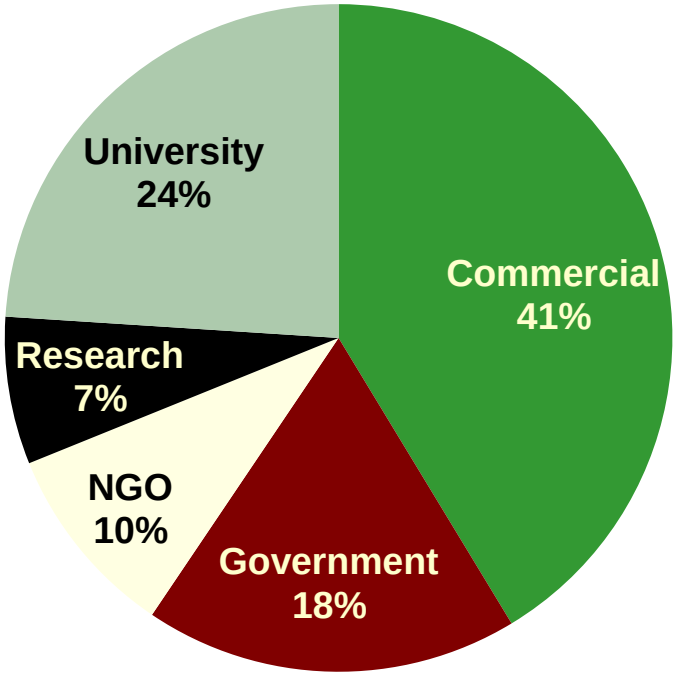


ANY QUESTIONS SO FAR?

The Open Geospatial Consortium

Not-for-profit, international voluntary consensus standards organization; leading development of geospatial standards

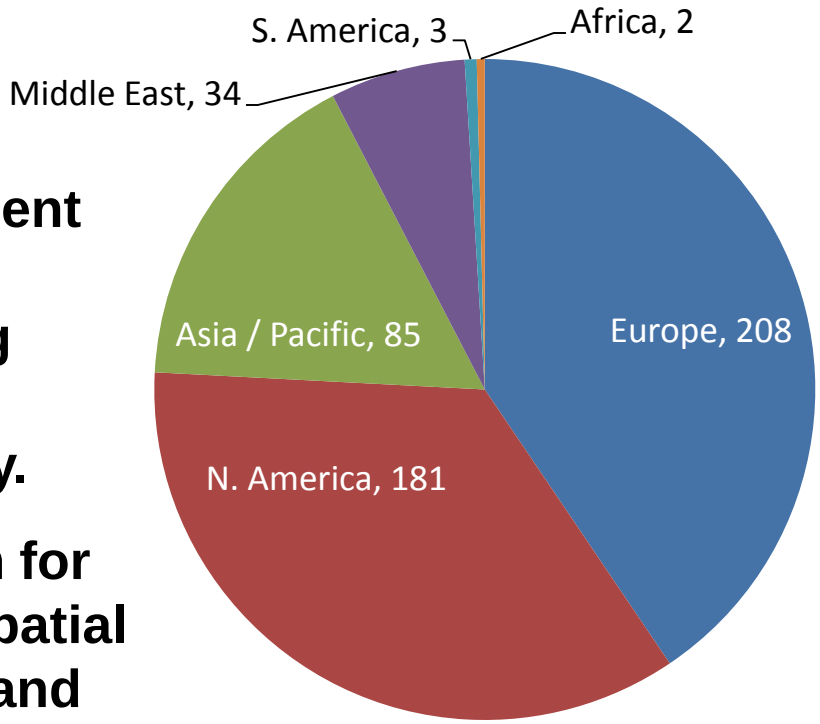
- Established 1994
- 515+ members worldwide
- 40+ standards
- Many profiles, schema and best practices
- Thousands of product implementations
- Broad user community implementation worldwide
- Alliances and collaborative activities with many other organizations



The OGC At A Glance

Vision: A world in which everyone benefits from the use of geospatial information and supporting technologies

- **Mission:**
  - **To advance the development and use of international standards and supporting services that provide geospatial interoperability.**
  - **Serve as the global forum for the collaboration of geospatial data / solution providers and users.**



http://www.opengeospatial.org/ogc/members

Example OGC Commercial Members

pitney bowes

DigitalGlobe

Google™

ESRI

ORACLE

LOCKHEED MARTIN

INTERGRAPH

AIRBUS DEFENCE & SPACE

BENTLEY

BAE SYSTEMS

Spacemetric

agi
Analysis software for land, sea, air, & space

VENCORE

ENVITIA
World Class Spatial Information Technologies

AUTODESK.

Trimble.

PCI Geomatics

NAVTEQ™

Microsoft

1Spatial

LUCIAD

Booz | Allen | Hamilton

ROLTA

Raytheon

galdos systems inc

Skyline®

Snowflake software

Leica Geosystems

wikitude

CubeWerx
Interoperable Services for the Geo-Spatial Web

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Example Government Members

- DSTL (UK) - DLR (Germany) - DIGO (Australia) - NGA (USA)
- NOAA (USA) - NASA (USA) - USGS (USA) - USACE / AGC
- DISA (US) - DGIWG (NATO) - EUSC (Europe) - USAF Weather Agency
- NR Canada - MET Offices - DHS (US) - PM-ISE ODNI (US)
- European Satellite Centre - Naval MET and Oceanography Command
- Abu Dhabi Police (UAE) - BRGM (France) - Ordnance Survey (UK)
- Norwegian Building Authority - Norkart - Dubai Municipality (UAE)
- Dept Science & Tech. (India) - European Space Agency
- Ministry of Land, Infrastructure and Transport (Korea) -Others…
- United Nations

- Over 100 Universities and Research institutes

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Alliance Partners: Critical Resource for Advancing Standards

… and others

http://www.opengeospatial.org/ogc/alliancepartners

OGC and ISO TC211

- ISO is a de-jure standards organization (by law).
- OGC community creates Ad-Hoc standards
- The OGC is a Class A Liaison member of TC 211. As such, and under the terms of the agreement with TC 211, the OGC can submit OGC standards for processing and approval as ISO Standards.

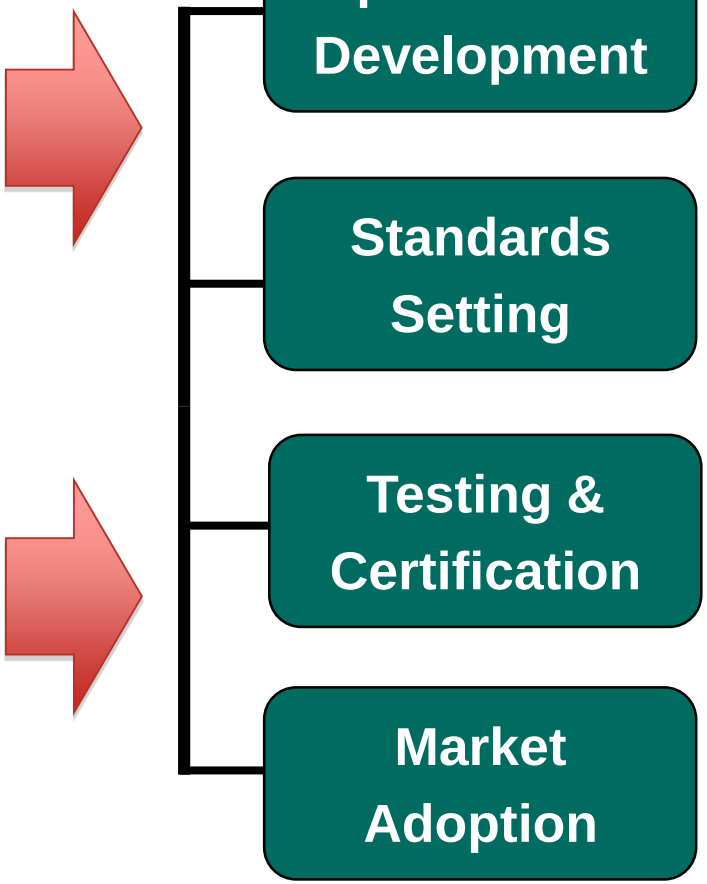
Example Joint Standards (Identical in Content);.

- Metadata
- Web Map Service (WMS)
- Web Feature Service (WFS)
- Geography Markup Language (GML)
- Web Coverage Service (WCS)
- Web Map Context
- Style Layer Descriptor (SLD)
- Catalogue (CSW)
- KML
- Web Processing Service (WPS)
- Content Domain standards (GML etc)

ISO/TC 211
Geographic information/Geomatics

OGC's Approach for Advancing Interoperability

- ***Interoperability Program*** **(IP)** - a global, innovative, hands-on rapid prototyping and testing program designed to unite users and industry in accelerating interface development and validation, and the delivery of interoperability to the market
- ***Specification Development Program*** **– Consensus standards process similar to other Industry consortia (World Wide Web Consortium, OMA etc.).**
- ***Compliance Testing and Certification Program*** **- allows organizations that implement an OGC standard to test their implementations with the mandatory elements of that standard**
- ***Marketing and Communications Program*** **– education and training, encourage take up of OGC specifications, business development, communications programs**



OGC Standards Baseline (Growing!)

Visualization / Decision Tools and Applications

GeoAPI

OpenLS

Data Models and Encodings

GML | IndoorGML | NetCDF | GMLJP2 | GeoSparql | SLD | KML | WMC

CityGML | WaterML | GeoXACML | FE | SE | OpenGeoSMS | GeoPackage

Other Services
Workflow, Alerts

Processing Services

TJS | WPS | WCPS | OpenMI

Discovery Services

CSW | OpenSearch Geo | ebRIM

Access Services

WFS | WMTS | Simple Features Access | WCS | WMS

Sensor Web Enablement

SPS | SensorML | O&M | SOS

Geospatially Enabled Metadata

Discover | Task | Access

Puck

Sensors

Geospatial Feature Data

Geospatial Browse/Maps

Geospatial Coverage Data

Other Data

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…..So who now feels like this ?

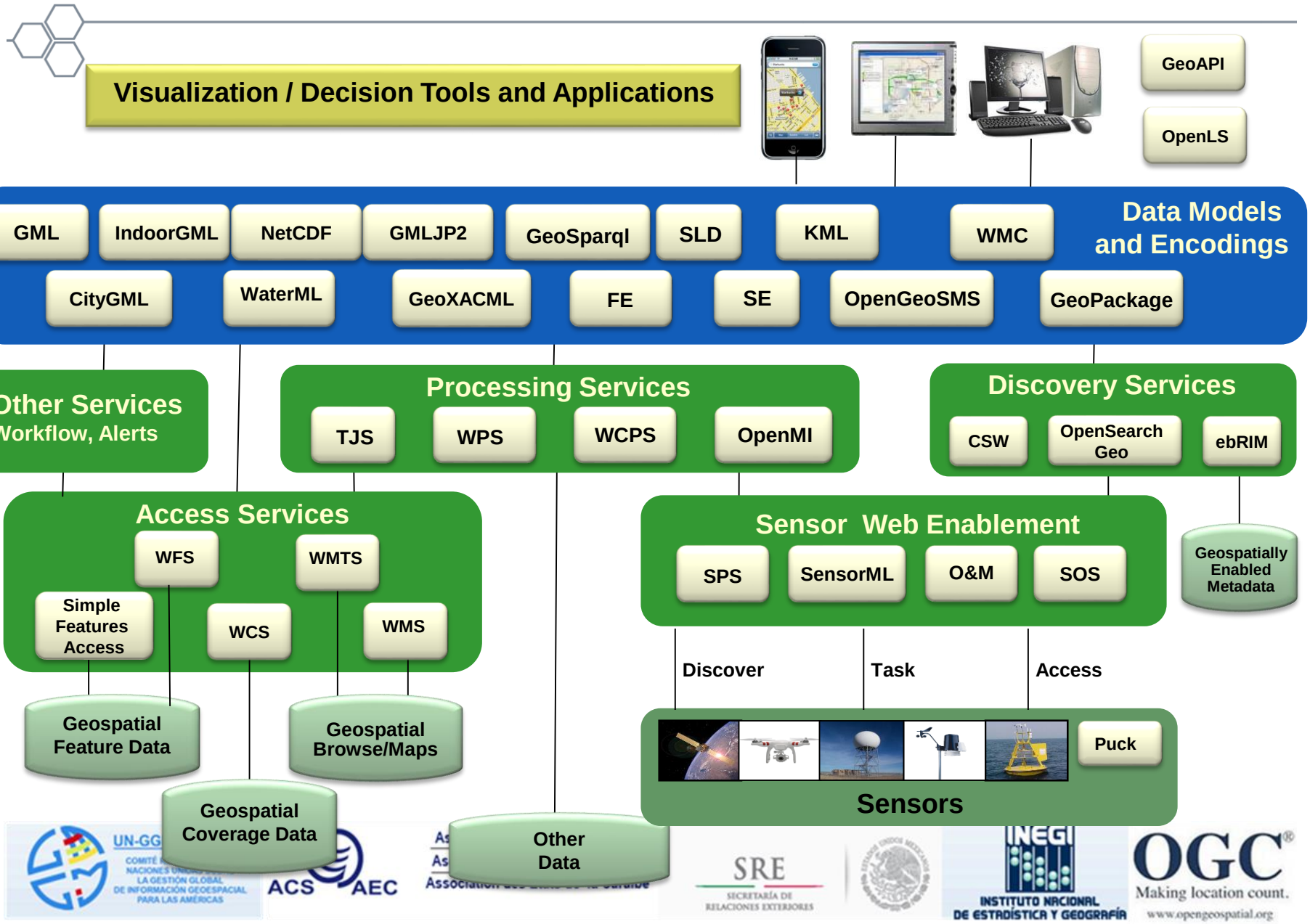
Questions ?

Breaking it down..

Defining the Standards is important, albeit a bit dry…

We will cover some of the basics.

OGC Baseline



Access Services

Standard	Purpose	Notes
Web Map Service (WMS), Web Map Tile Service	Defines an interface that allows a client to get maps of geospatial data information on specific features shown on the map. WMTS works with tiles, to improve performance.	• Produce a map – **as a picture**, as a series of graphical elements, or as a packaged set of geographic feature data; • Answer basic queries about the content of a map; and • Tell a client what maps it can produce and which of those can be queried further.
Web Feature Service (WFS)	Allows a client to perform data manipulation operations on one or more geographic features. Data manipulation operations include the ability to Get or Query features based on spatial and non-spatial constraints, Create a new feature, Modify a feature, or Delete a feature.	A feature access service that also includes elements of a feature type service, a coordinate conversion/transformation service and a geographic format conversion service. WFS does not confer administrative rights over the data to WFS clients. Clients can only retrieve or modify the data of the specific feature(s) they are seeking; they cannot retrieve the complete file or underlying data store containing the feature data.

Access Services (2)

Standard	Purpose	Notes
Web Coverage Service (WCS)	Defines an interface that allows a client to retrieve ungendered geospatial “coverages” from a server. A coverage contains digital geospatial information representing space-varying phenomena that are returned as grid values (e.g. as a GeoTIFF file). A WCS provides access to potentially detailed and rich sets of geospatial information in forms that are useful as multi-valued coverages, for client-side rendering and input into scientific models and other applications.	•Provides available data together with their detailed descriptions; •Defines a rich syntax for requests against these data; and •Returns data with its original semantics (instead of pictures) which may be interpreted, extrapolated, etc., and not just portrayed.
Simple Features Access	Specifies a common storage and access model of mostly two-dimensional geographical data (point, line, polygon, multi-point, multi-line, curve, etc.)	Both an Open Geospatial Consortium (OGC) and International Organization for Standardization (ISO) standard **ISO 19125**

Discovery Services

Standard	Purpose	Notes
Catalog Services for the Web (CSW)	Defines common interfaces to discover, browse, edit and query metadata about data, services, and other potential resources.	A way of creating an Inventory. **METADATA Standards!**
OpenSearch Geo	Specifies the Geo and Time extensions to the OpenSearch query protocol. OpenSearch is a collection of simple formats for the sharing of search results.	Based on OpenSearch – describes a search engine (e.g. supported by Internet Explorer, Chrome etc)
ebRIM	ebRIM Profile for the CSW	eBRIM is an OASIS standards, for example.

Processing Services

Standard	Purpose	Notes
Web Processing Service (WPS) Web Coverage Procesing Service (WCPS)	Provides rules for standardizing how inputs and outputs (requests and responses) for geospatial processing services, such as polygon overlay. Defines how a client can request the execution of a process, and how the output from the process is handled. Data can be delivered across a network or they can be available at the server.	Allows for algorithms to run on the Web, bot client and server side. WCPS allows for processing of coverages
Table Joining Service (TJS)	Defines a simple way to describe and exchange tabular data that contains information about geographic objects.	Connect non-spatial with spatial data (e.g. Demographics, Health information
Open Modelling Interface	Links together models of different processes from different suppliers to allow for easy process interaction,	Co-branded Standard with OpenMI
WCPS		

Sensor Web Enablement

Standard	Purpose	Notes
Sensor Planning Services (SPS)	defines interfaces for queries that provide information about the capabilities of a sensor and how to task the sensor.	designed to support queries that have the following purposes: to determine the feasibility of a sensor planning request; to submit and reserve/commit such a request; to inquire about the status of such a request; to update or cancel such a request; and to request information about other OGC Web services that provide access to the data collected by the requested task.
Sensor Mark Up language (SensorML)	Enable interoperability, first at the syntactic level and later at the semantic level, so that sensors and processes can be better understood by machines, utilized automatically in complex workflows, and easily shared between intelligent sensor web nodes.	Machine to Machine communication!
Observations and Measurements (O&M)	Defines schemas for observations, and for features involved in sampling when making observations.	These provide document models for the exchange of information describing observation acts and their results, both within and between different scientific and technical communities

Sensor Web Enablement (2)

Standard	Purpose	Notes
Sensor Observation Service (SOS)	Defines a Web service interface which allows querying observations, sensor metadata, representations of observed featuresas well as registering/removing new and exsiting sensors	
SensorThings API*	On-going	Connect to the Internet of Things

Data Models/Encodings (Selected)

Standard	Purpose	Notes
Geography Markup language (GML)	Geography Markup Language (GML) is an XML grammar for expressing geographical features. Serves as a modeling language for geographic systems as well as an open interchange format for geographic transactions on the Internet	Schemas; WaterML, IndoorML, CityGML, PipleneML and many others are all content “standards”
Keyhole Markup Language (KML)	Based on GML	Donated to OGC by Google
Open GeoSMS	Extention to Short Message Service (SMS) encoding and interface to facilitate communication of location content between different LBS (Location-Based Service) devices or applications.	e.g. Roadside assistance in Taiwan. Google Play: https://play.google.com/store/search?q=geosms
GeoPackage	An open, standards-based, platform-independent, portable, self-describing, compact format for transferring geospatial information.	Off and on-line – useful for field work, for example
Web Map Context (WMC)	Provides a ‘context document’ which specifies a fully configured service set which can be exchanged (with a consistent interpretation) among clients supporting the standard	Support use cases such as the distribution of search results, the exchange of a set of resources such as OGC WFS, ‘WMS,WMTS,WCS and others in a **common operating picture**

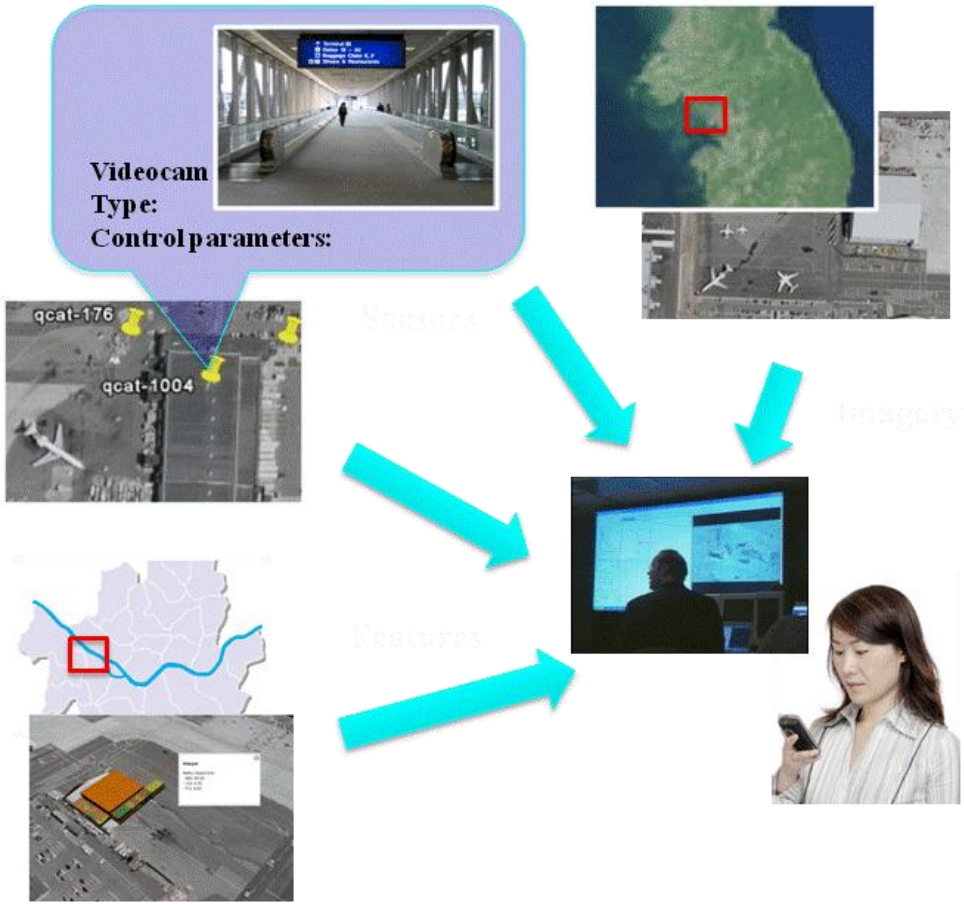
How Does it Work

A few examples

Plug and Play

Rapid discovery, access, fusion and application of location information for:

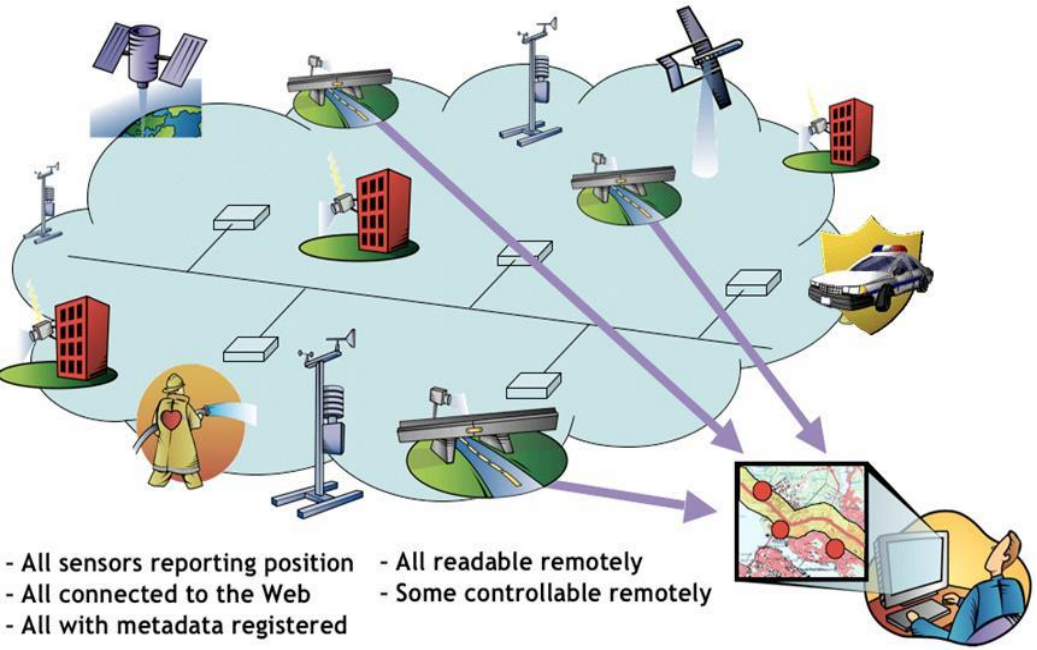
- Catalogue (CSW)
- Geography Markup Language (GML)
- KML
- OWS Context
- Styled Layer Descriptor (SLD)
- Web Coverage Service (WCS)
- Web Feature Service (WFS)
- Web Map Service (WMS)
- Web Map Tile Service (WMTS)
- Web Map Context (WMC)
- Web Processing Service (WPS)
- Others



Complete OGC Standards List: http://www.opengeospatial.org/standards

OGC Sensor Web Enablement Standards

Enables discovery and tasking of sensor assets, and the access and application of sensor observations for enhanced situational awareness



- ✓Sensor Model Language (SensorML)
- ✓Observations & Measurements (O&M)
- ✓Sensor Planning Service (SPS)
- ✓Sensor Observation Service (SOS)
- ✓Catalogue Service
- ✓Sensor Alert Service (SAS)
- ✓Plug and Work (PUCK)

--Complementary Standards--

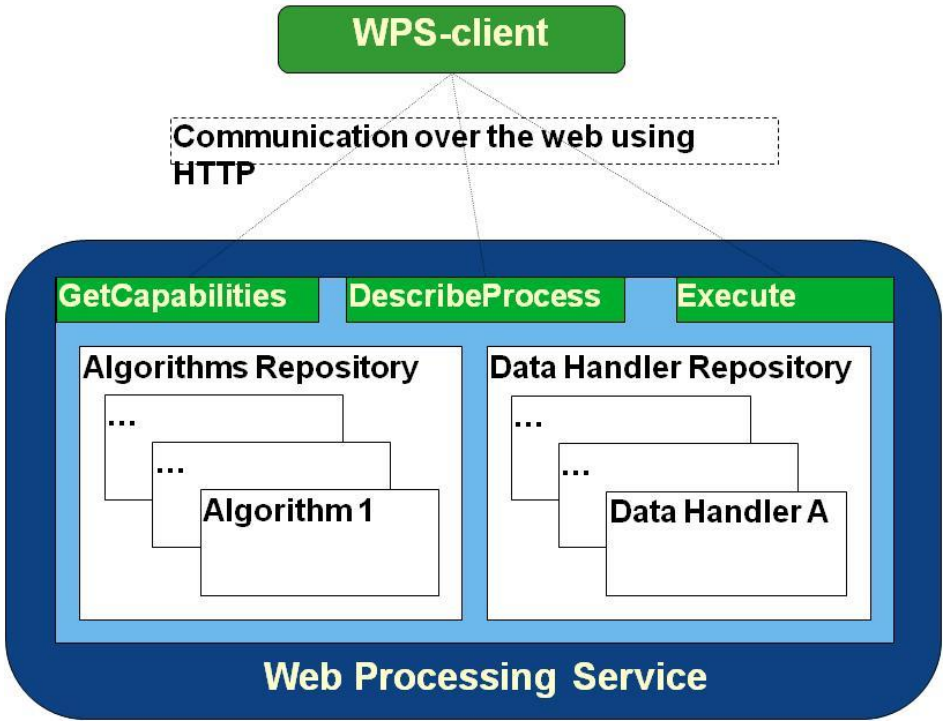
- ✓OASIS (alert) standards

http://www.opengeospatial.org/projects/groups/sensorwebdwg

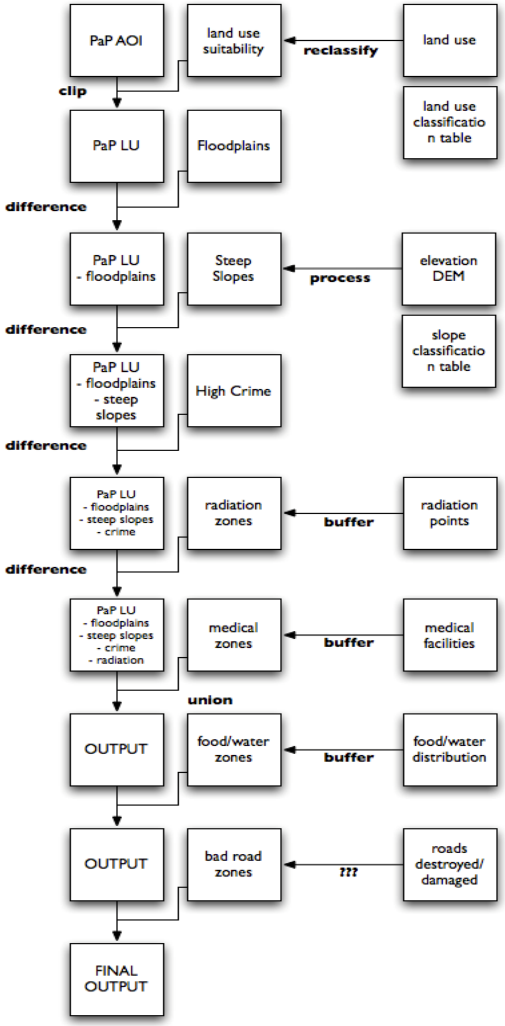
Geospatial Processing, Analysis, Workflow

Web Processing Service – WPS

- OGC Web Service access to algorithms
- Change detection, coordinate transformation, modeling and simulation…



Geoprocessing Workflow



Location Enabling SMS Messaging: OGC Open GeoSMS

- Significant potential for many applications
- Characteristics
  - Multilingual
  - Multi-device
  - Harmonized with many existing applications
  - Incorporates relevant ISO standards
- Adopted in 2011
- Submitted to International Telecommunications Union

Emergency Real-time Alert or Update

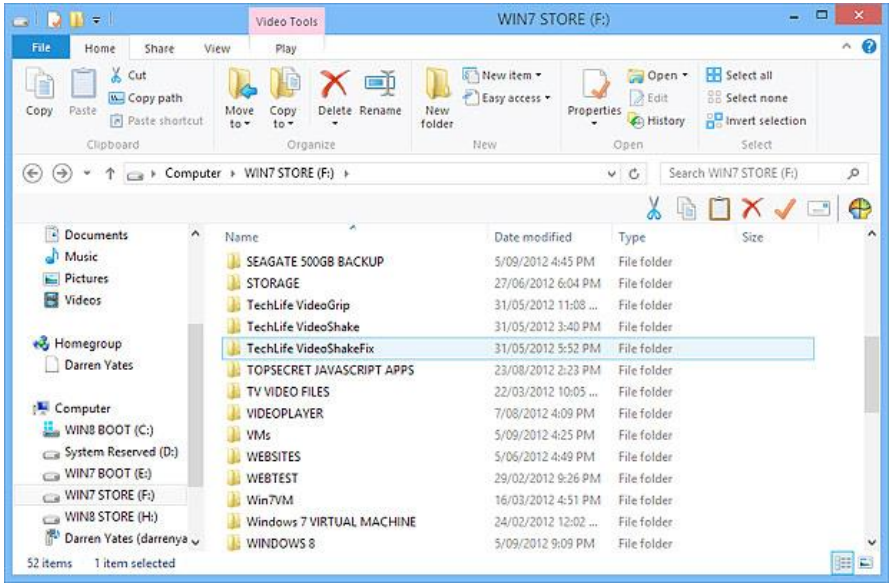
Advancing Mobility - OGC GeoPackage

- The OGC GeoPackage standard is a universal file format for geodata.
  - open, standards-based, application and platform independent, and self-describing.
  - Works on any desktop or mobile OS
  - For use in a connected / disconnected environment

- GeoPackage - the modern alternative to formats like GeoTIFF, SDTS and vendor specific
- *Experience it here:* *http://www.ogcnetwork.net/geopackage*

What does GeoPackage make easier?

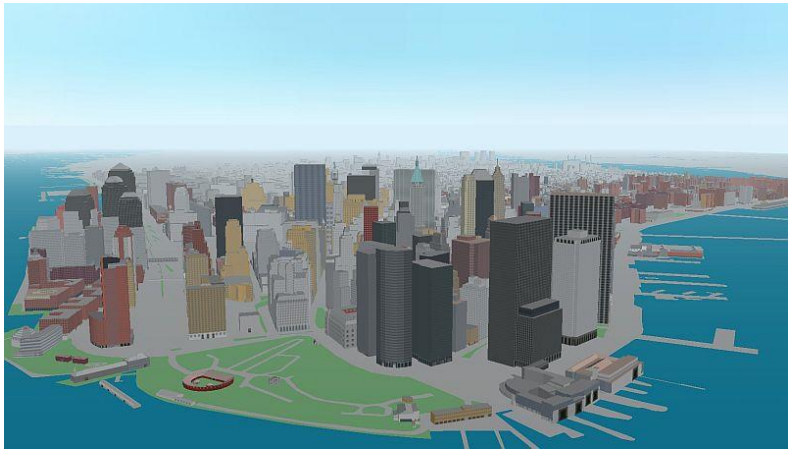
- emailing data
- web site publishing
- sharing data on a USB stick
- mobile apps
- file-based access



CityGML - 3D Urban Models

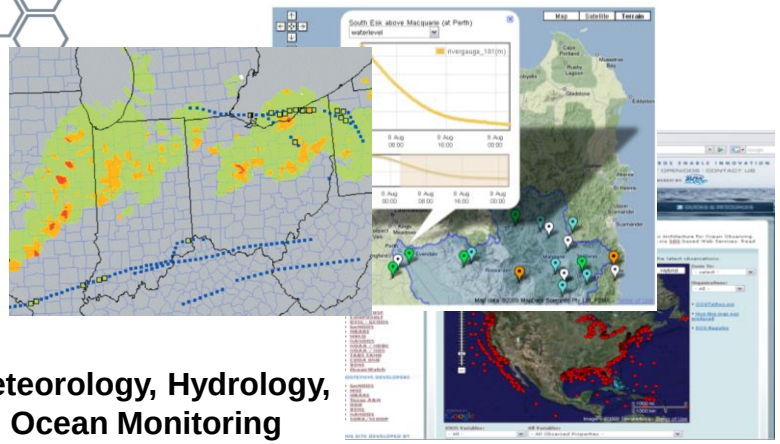
- Urban Planning / Operations
- Emergency Mgt / Response
- Public Safety
- Transportation / Routing / Logistics
- Indoor navigation
- Retail Site analysis
- Sustainable / Green Communities
- City Services Management
- Noise abatement
- Telecommunications placement
- Many other uses…

Source; Thomas Kolbe, Berlin TU

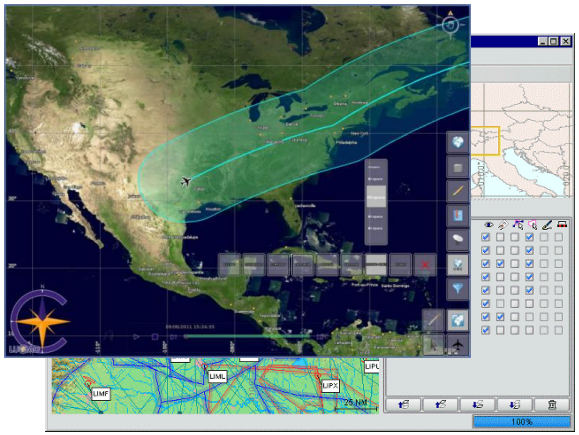


Source: GTA Geoinformatik GmbH, www.gta-geo.de

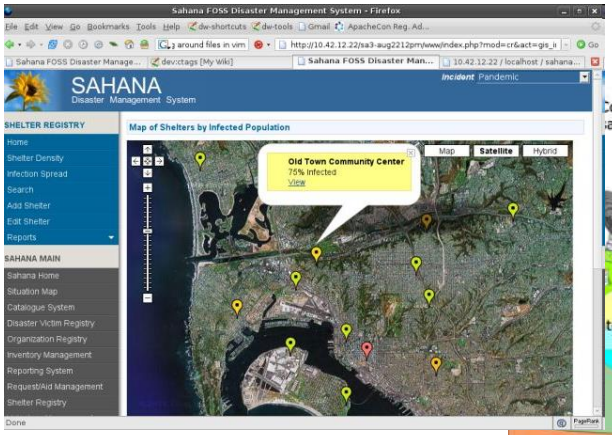
Geospatial Information and Technologies Inform and Enhance Decision Making

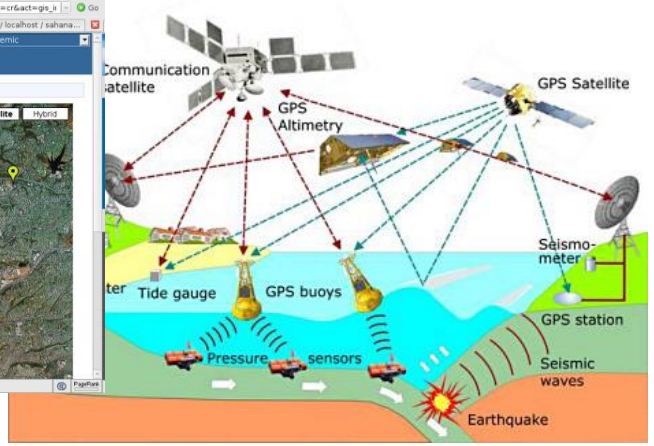


Meteorology, Hydrology, Ocean Monitoring



Aviation Flight Information / Safety





Emergency / Disaster Management

Source: DigitalGlobe

Geo-data Generation, Management, Distribution

From the few to the many…

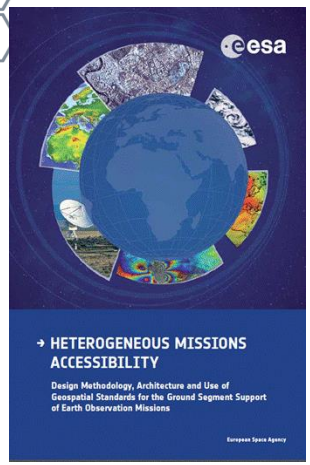
Cross-Boundary Information Sharing...

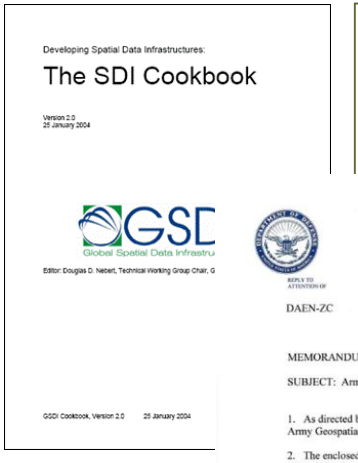
……. continues to be one of our biggest challenges!

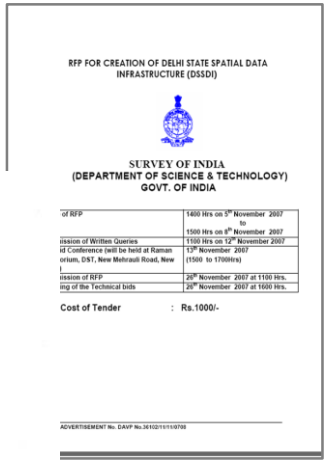
Source: David Rydevik, Thailand Tsunami, 2004

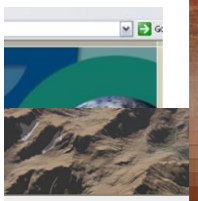
The ability to access, fuse and apply diverse data sources is critical to situational awareness.

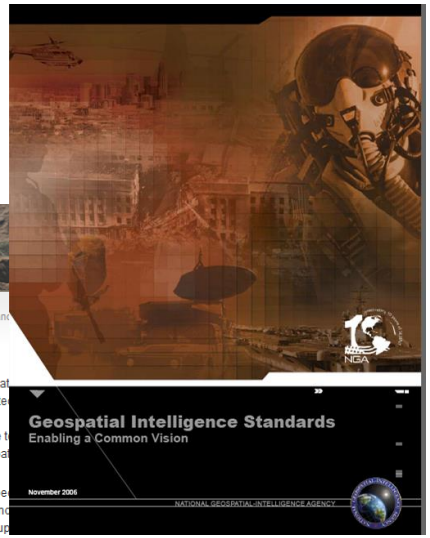
Geospatial Standards Policy











DI standards

Including the various standards that sit within informat
identified that can be considered as part of the archite

Moving too swiftly into the selection of an appropriate t
of standards were to occur this could lead to incompat

The GSDI Cookbook (a resource collectively develope
that the "... definition of a relatively small suite of stan
environment, with provision for identifying optional sup

remote sensing, aerial surveys, and year-round in-situ measurements scientists followed trails of frozen methane bubbles and placed traps

Geospatial Technology Trends

- **The Power of Location**
  - Location for predicting intent
  - Location data quality
- **Policy implementation**
  - Uncertainty inhibiting growth
  - Implement licenses; privacy
- **Mobile First**
  - 1 GB/user/day, Mobile first
  - LBS DWG, Geopackage
- **Internet of Things**
  - Reached “Apple II” stage
  - Opportunistic sensing/SWE
- **Geospatial Processing**
  - Analytics, Cloud, models,
  - WPS Profiles, Provenance
- **Indoor Frontier**
  - Human scale geo
  - Indoor maps, IndoorGML
- **Cartographers of future**
  - Maps became personal
  - AR, Semantics
- **Smart Cities**
  - Urban Scale geo
  - Spatial intelligence of cities

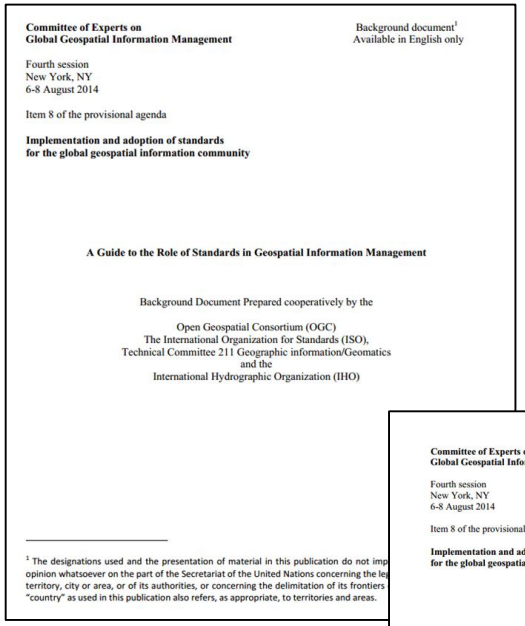
See G. Percivall’s Blog: http://www.opengeospatial.org/blog/1814

Questions ?

Core Standards Guide - Background

- **2013 UNGGIM Secretariat request OGC, ISO & IHO to create a non-technical guide explaining the role and importance of open geospatial standards.**

- **The Result:**
  - **The Guide to the Role of Standards in Geospatial Information Management**
  - **A Companion Document on Standards by Tier**



Committee of Experts on
Global Geospatial Information Management

Background document[1]
Available in English only

Fourth session
New York, NY
6-8 August 2014

Item 8 of the provisional agenda

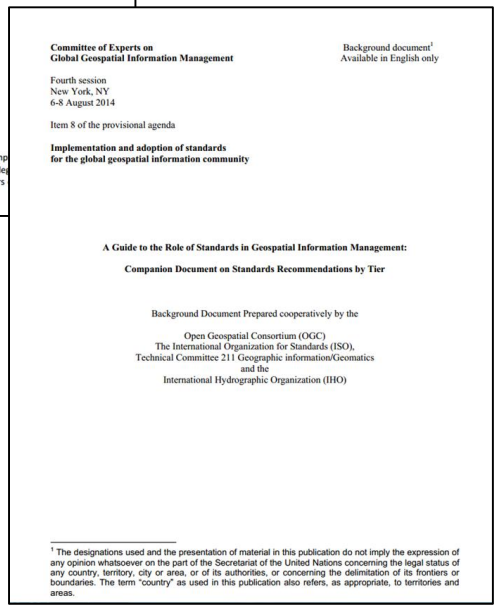
Implementation and adoption of standards for the global geospatial information community

A Guide to the Role of Standards in Geospatial Information Management

Background Document Prepared cooperatively by the

Open Geospatial Consortium (OGC)
The International Organization for Standards (ISO),
Technical Committee 211 Geographic information/Geomatics
and the
International Hydrographic Organization (IHO)

[1] The designations used and the presentation of material in this publication do not imp
opinion whatsoever on the part of the Secretariat of the United Nations concerning the le
territory, city or area, or of its authorities, or concerning the delimitation of its frontiers
"country" as used in this publication also refers, as appropriate, to territories and areas.



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- Standards Guide
- Companion Document

UN-GGIM:Américas
COMITÉ REGIONAL DE LAS NACIONES UNIDAS SOBRE LA GESTIÓN GLOBAL DE INFORMACIÓN GEOESPACIAL PARA LAS AMÉRICAS

ACS AEC
Association of Caribbean States
Asociación de Estados del Caribe
Association des Etats de la Caraïbe

SRE
SECRETARÍA DE RELACIONES EXTERIORES

INEGI
INSTITUTO NACIONAL DE ESTADÍSTICA Y GEOGRAFÍA

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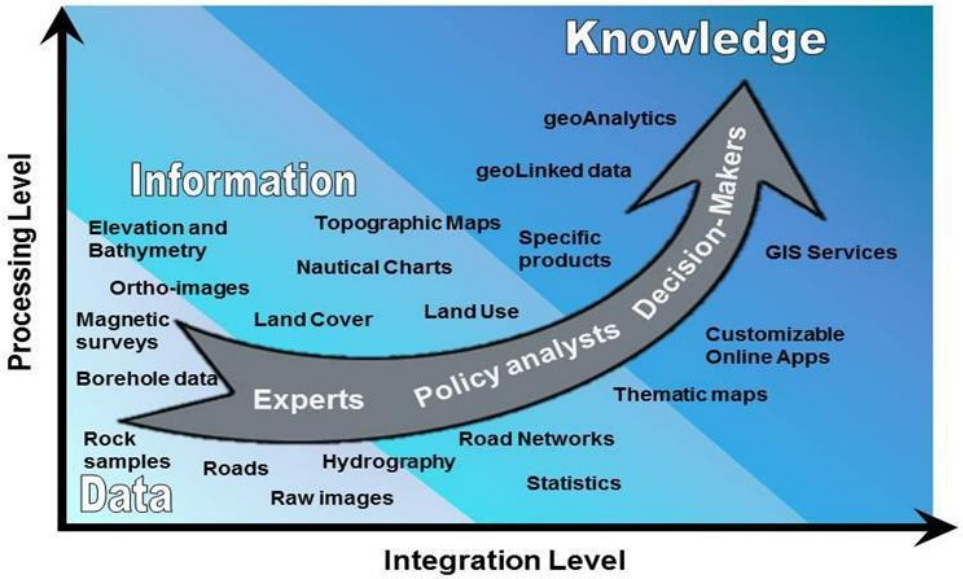
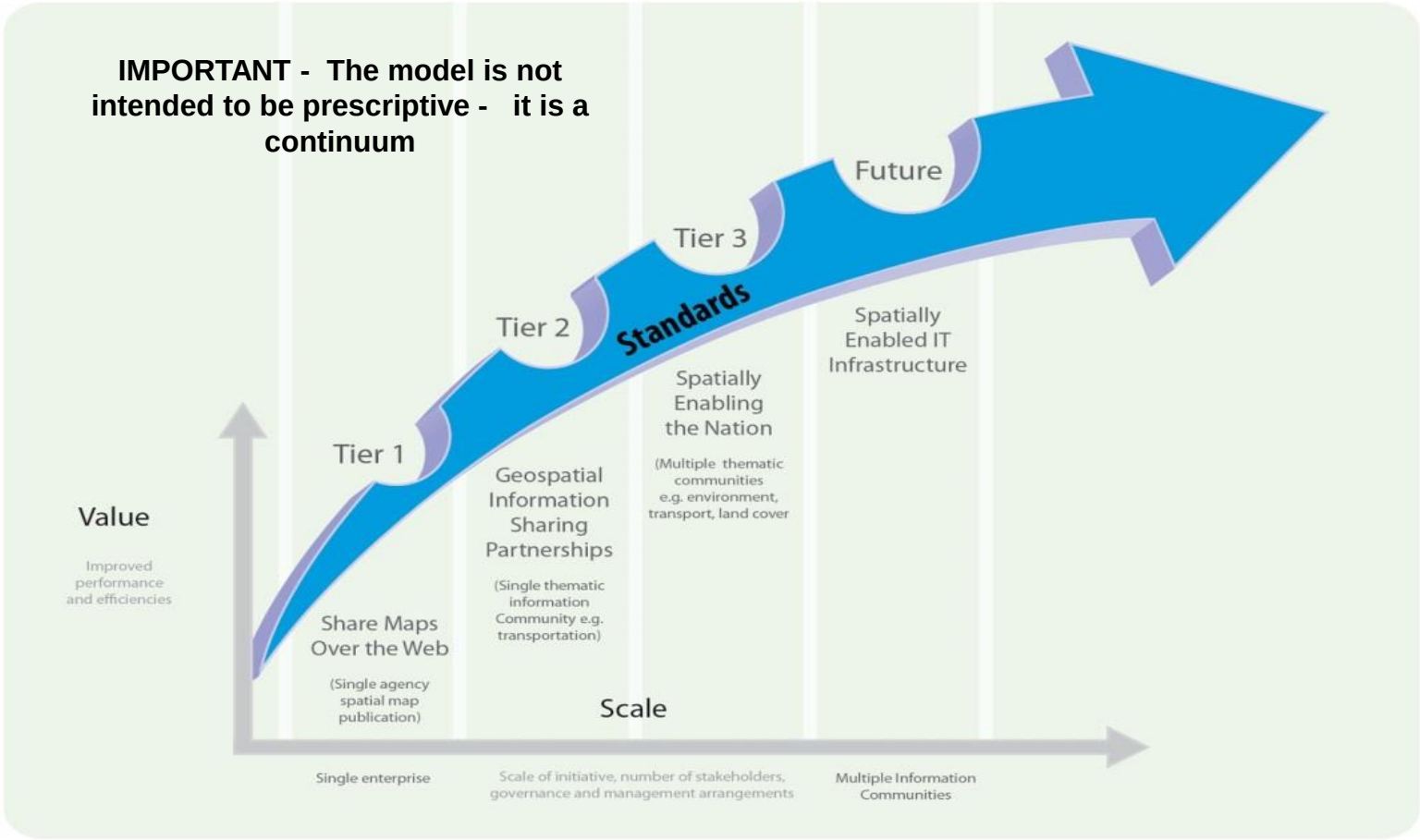
Geospatial Data to Knowledge

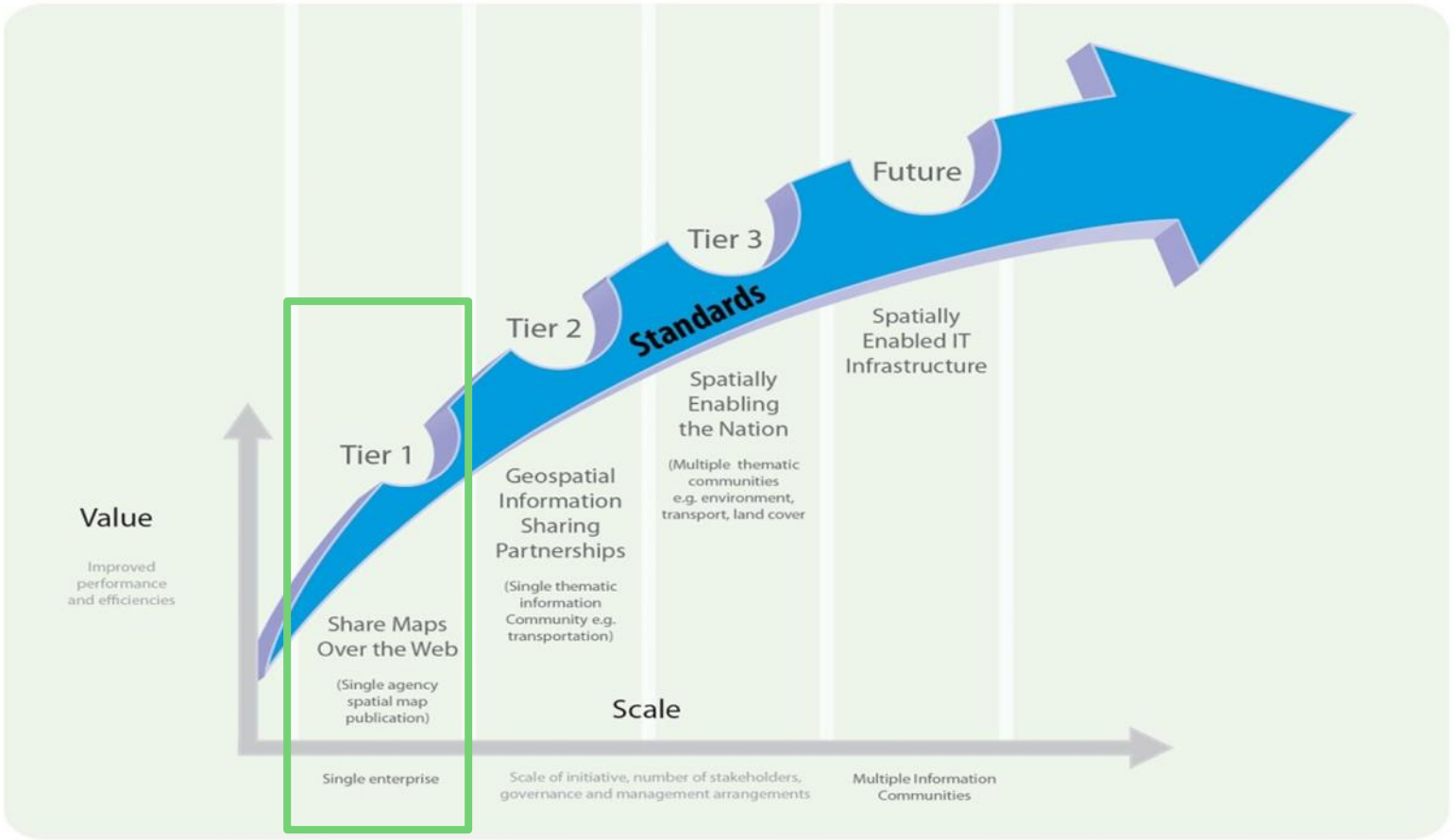


The trajectory from data to geospatial knowledge, enabled by standards

SDI Standardisation Maturity Model

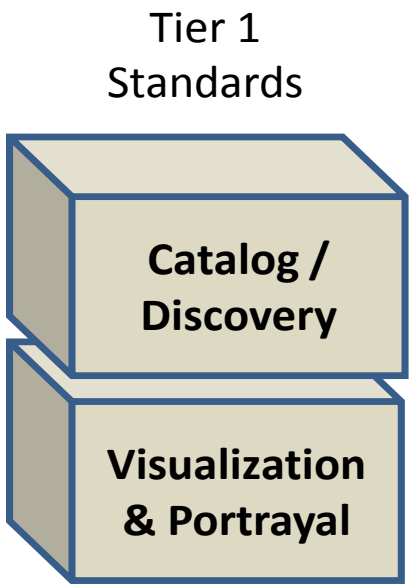


Tier 1


Future
Tier 3
Standards
Tier 2
Tier 1
Spatially Enabled IT Infrastructure
Spatially Enabling the Nation
(Multiple thematic communities e.g. environment, transport, land cover
Geospatial Information Sharing Partnerships
(Single thematic information Community e.g. transportation)
Share Maps Over the Web
(Single agency spatial map publication)
Value
Improved performance and efficiencies
Scale
Single enterprise
Scale of initiative, number of stakeholders, governance and management arrangements
Multiple Information Communities

Tier 1: Share maps over the web

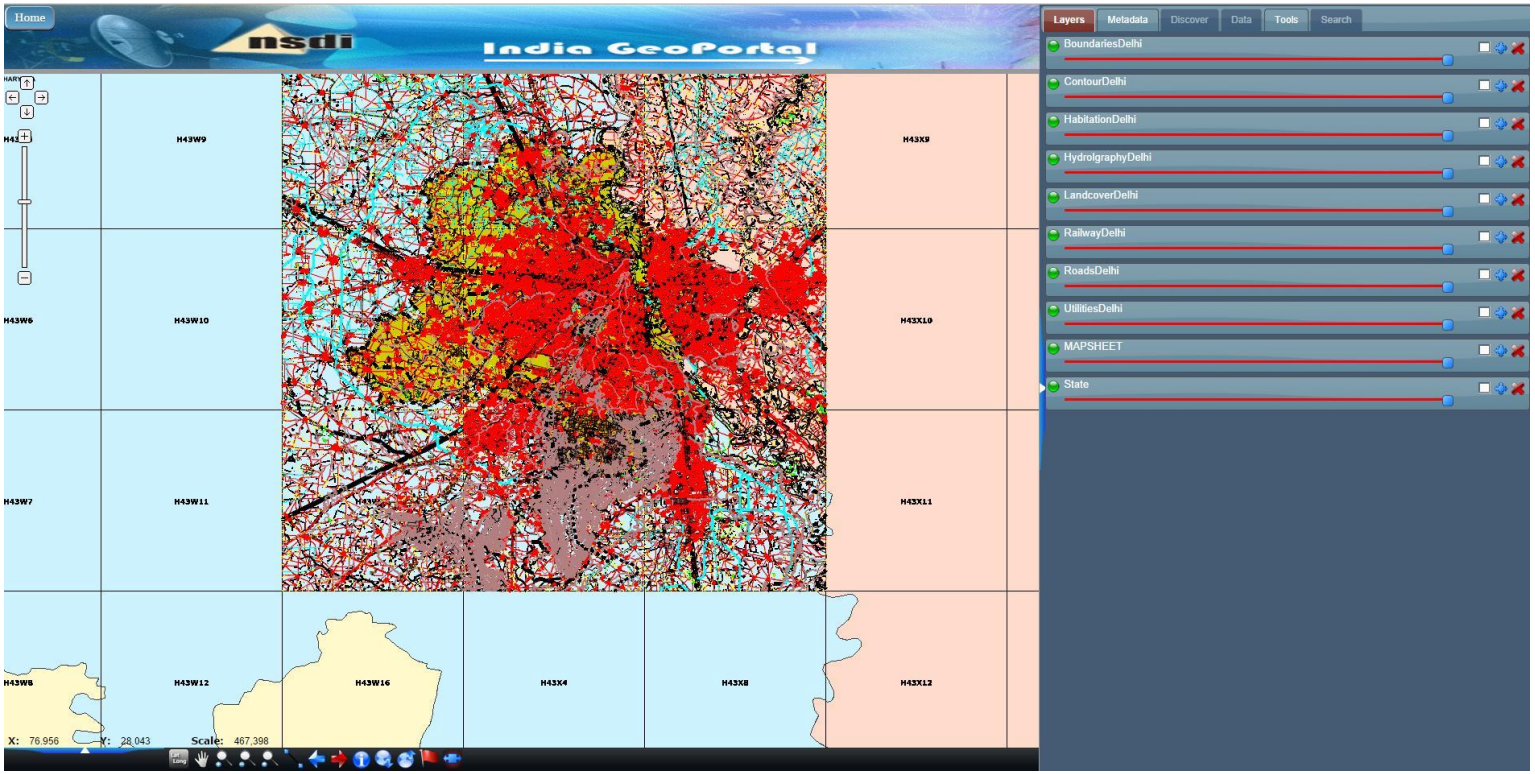
- Discover and view interactive maps on the Web.
- Organizations understand, describe, organize, collect and manage geospatial information.
- View and query geospatial information in client applications using a variety of devices such as a desktop, tablet, or other mobile devices.



Typical scenarios for Tier 1

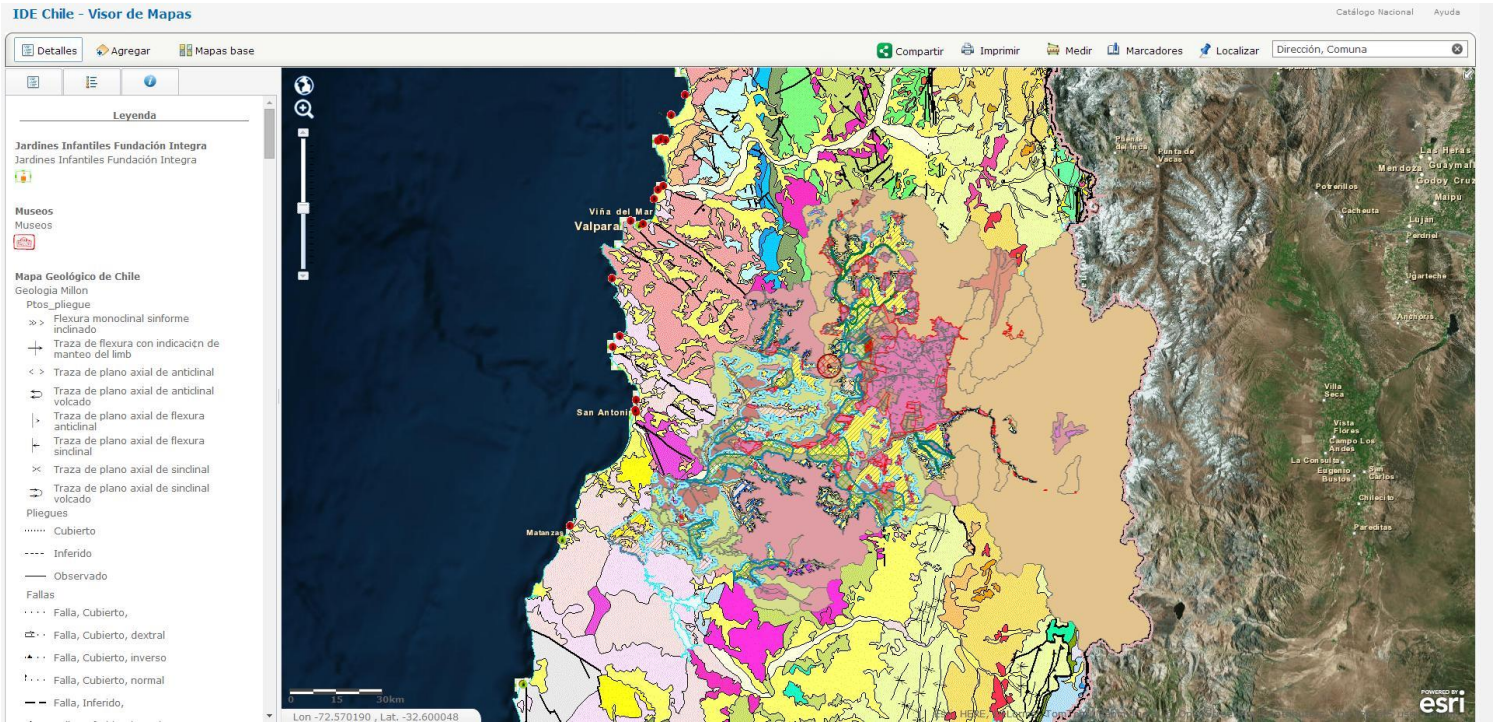
- **Simple, low cost** way to share geospatial information
- Information may be stored in more than one system **using different technology** and organizations do not have to standardize on a single technology platform
- information is stored in more than one format and the organization(s) **does not need to incur data conversion costs**
- Data remains with **the owner of the data** , increasing the likelihood of update
- **Publish maps** for government and citizen access;
- An organization is unable to distribute the data but is **willing share images of the data**
- Policy and governance related to geospatial information management and operations **may be informal**

Example: India Geoportal
(zoomed to New Dehli)



[Government of India: https://nsdiindia.gov.in/nsdi/nsdiportal/index.jsp](https://nsdiindia.gov.in/nsdi/nsdiportal/index.jsp)

Example: Chile



Ministerio de Bienes Nacionales

IDE CHILE
Infraestructura de Datos Geoespaciales

http://www.geoportal.cl/Visor/

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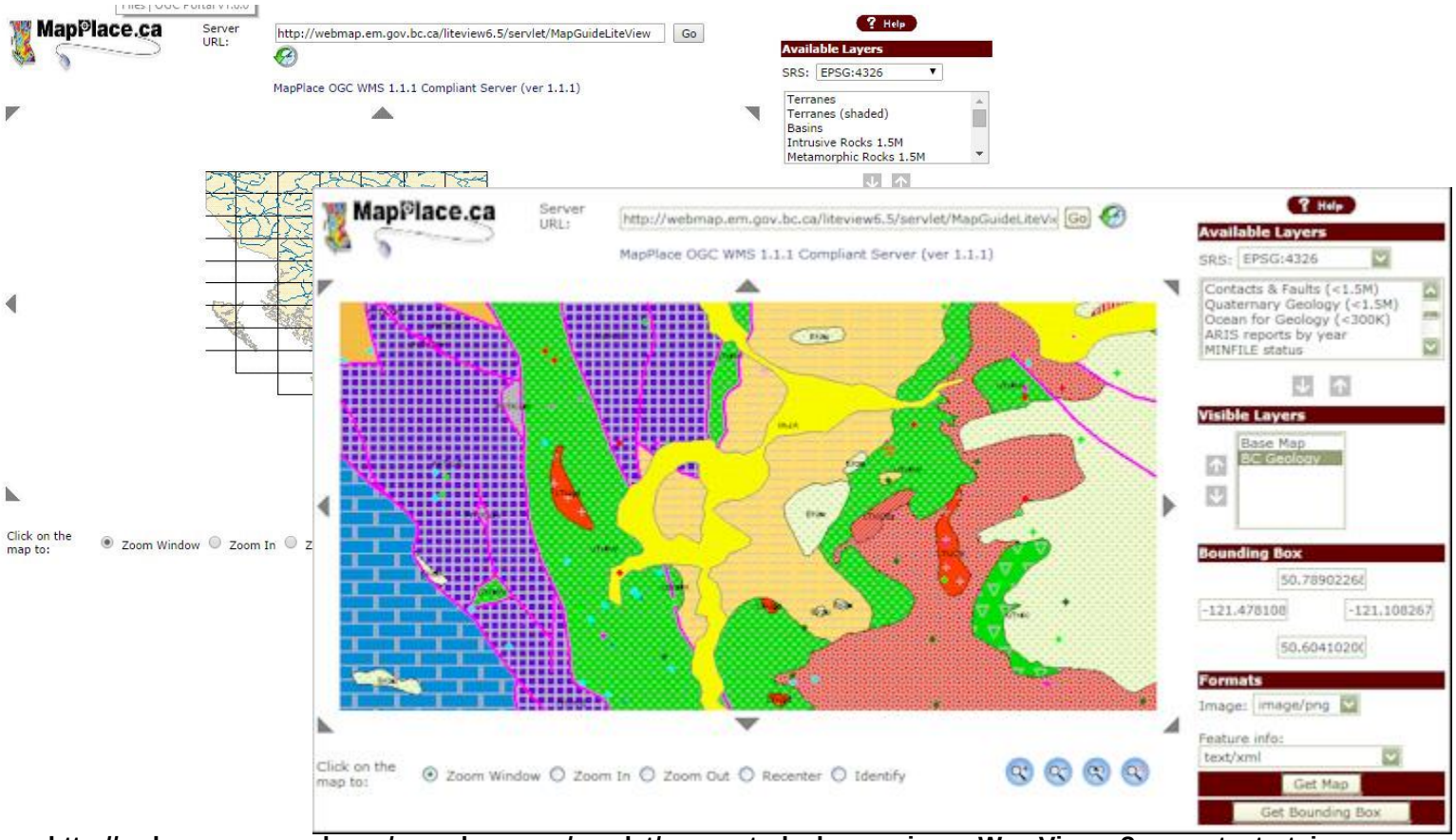
Example: Ministry of Energy and Mines, British Columbia



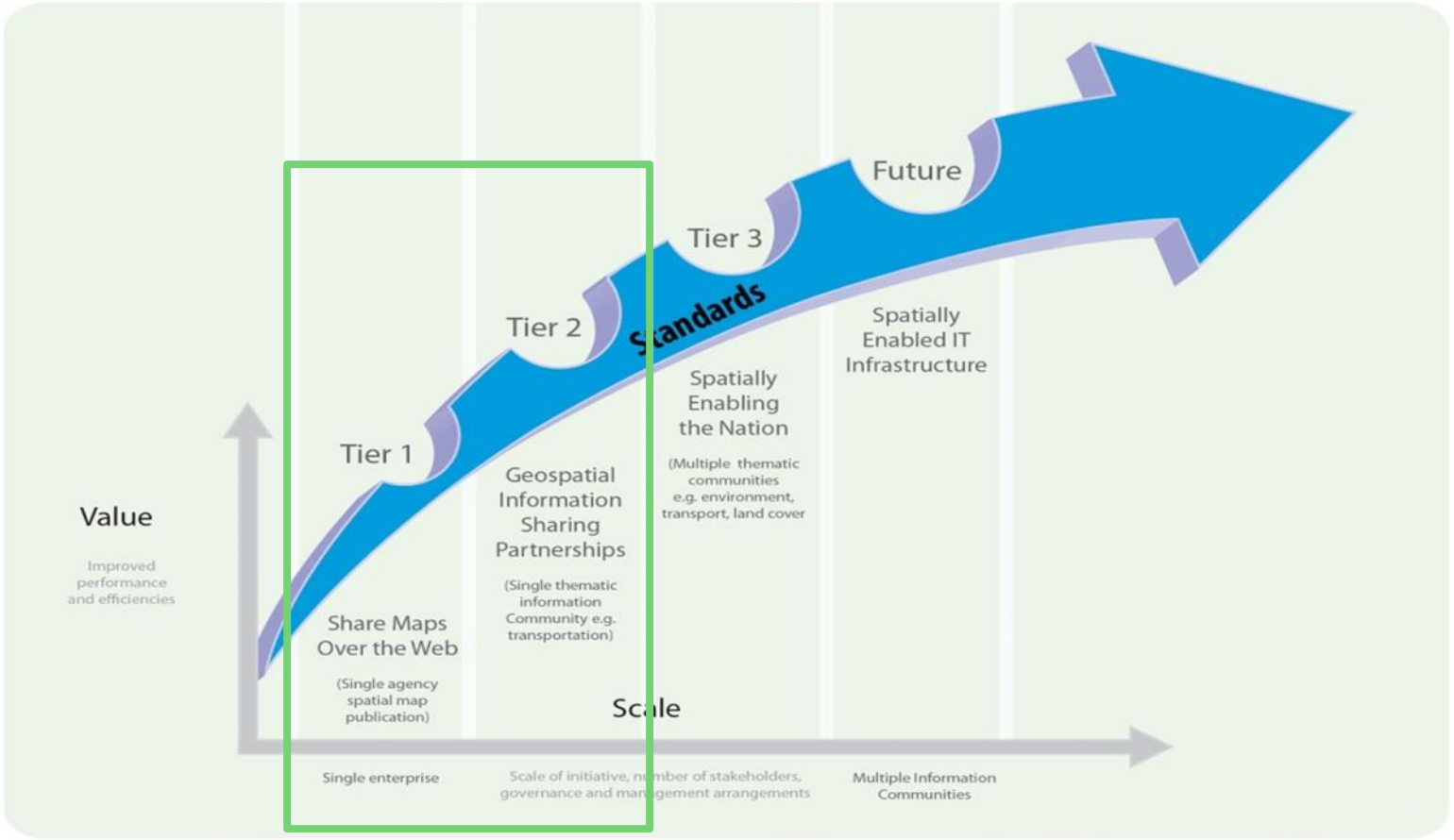
http://webmap.em.gov.bc.ca/mapplacewms/servlet/com.autodesk.wmsviewer.WmsViewer?request=startviewer

Tier 1 – Standards List

- **Visualisation & Portrayal**
  - OGC/ISO2 19128 Web Map Service (WMS)
  - OGC Web Map Tile Service (WMTS) 1.0
  - OGC Styled Layer Descriptor 1.1 (SLD)
  - OGC Web Map Context 1.1 (WMC)
  - OGC KML 2.2

- **Catalogue & Discovery**
  - ISO 19115, Geographic information – Metadata
  - OGC Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile
  - OGC I15 (ISO19115 Metadata) Extension Package of CS-W ebRIM4 Profile 1.0

Tier 2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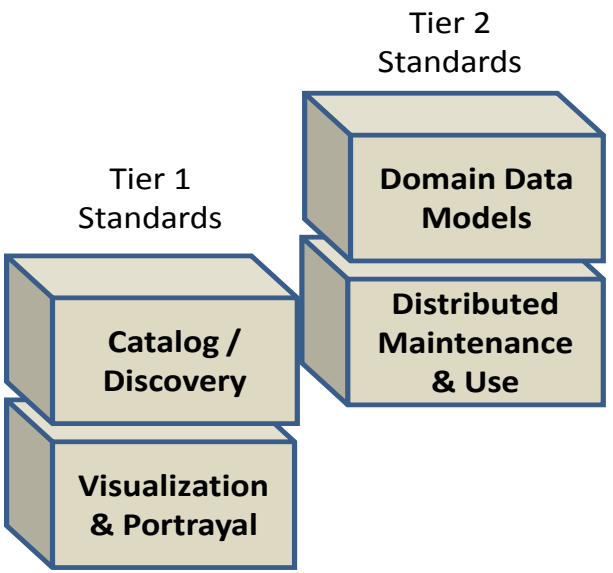
Tier 2: Geospatial Information Sharing Partnerships

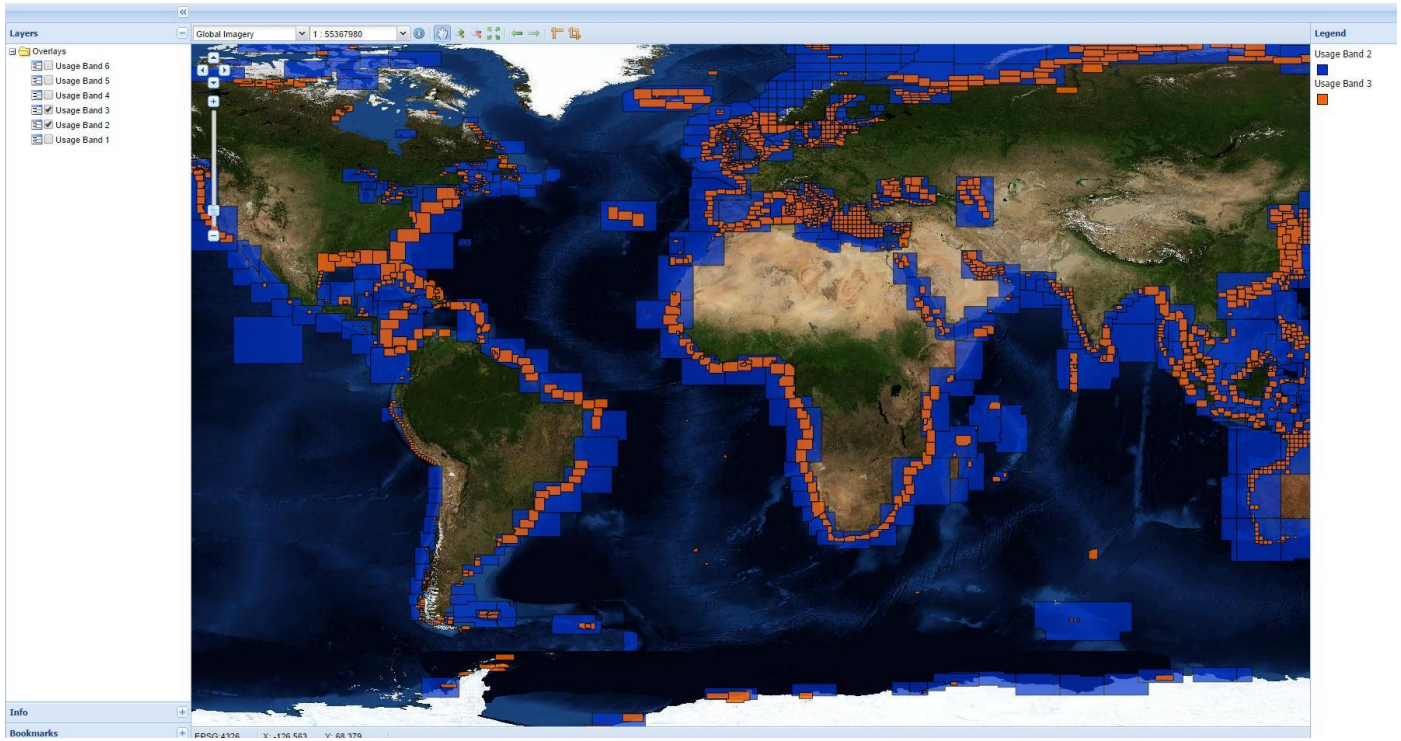
- Publish their geospatial information on the web.
- A “community” builds, shares, and uses datasets that provide a common view of important issues (e.g. navigation, flood control, road maintenance, disaster management)
- Data providers do not need to adopt the same technology solutions or change their database structures provided that they conform to agreed upon data models.
- Provides access to view, distribute, or share geospatial information that conforms to these agreed upon standards-based data models



Typical scenarios Tier 2

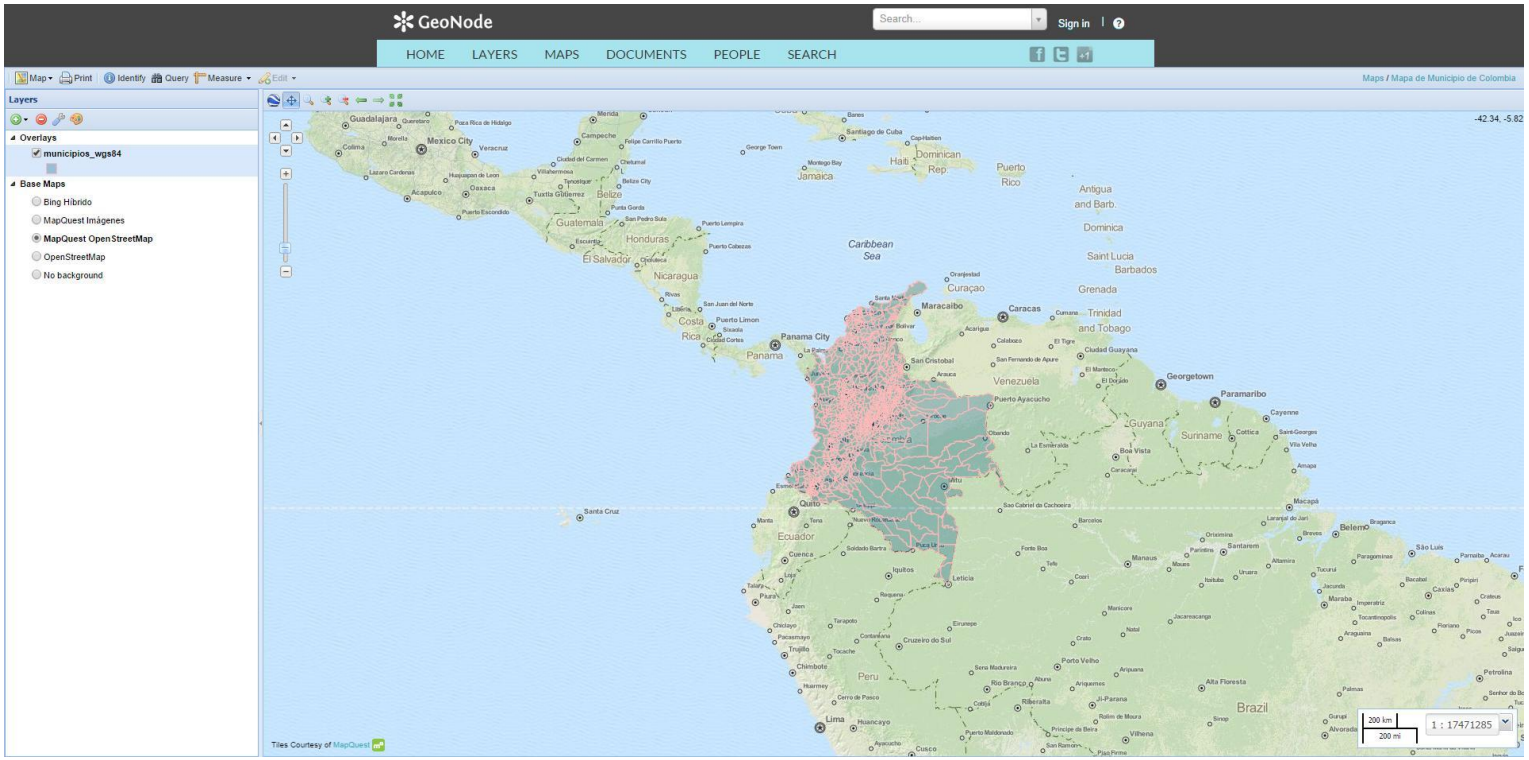
- **Accessible** over the web for use online or for download and offline use;
- **Improve efficiency** of an information community with identified common information needs (e.g. organizations in neighboring jurisdictions that wish to share consistent thematic data such as nautical charting, roads or forest cover and data models to support easy geospatial information exchange between cooperating organizations and jurisdictions
- Users from **different organizations are able to query, exchange and interact** with similar geospatial datasets in a consistent way (e.g. road networks) forming an aggregated view;
- **Provide information (by way of metadata) about the context** in which geospatial data has been collected and used. This provenance and data quality information is critical in allowing users to determine fitness for use of geospatial information within a given application
- **More formal geospatial policies and practices** have been adopted, agreed upon data models have been established, and information sharing agreements have been established between cooperating organizations.

Example: IHO Worldwide Electronic Navigational Chart Database



http://www.iho-wms.net/encat/

Example: GeoNode

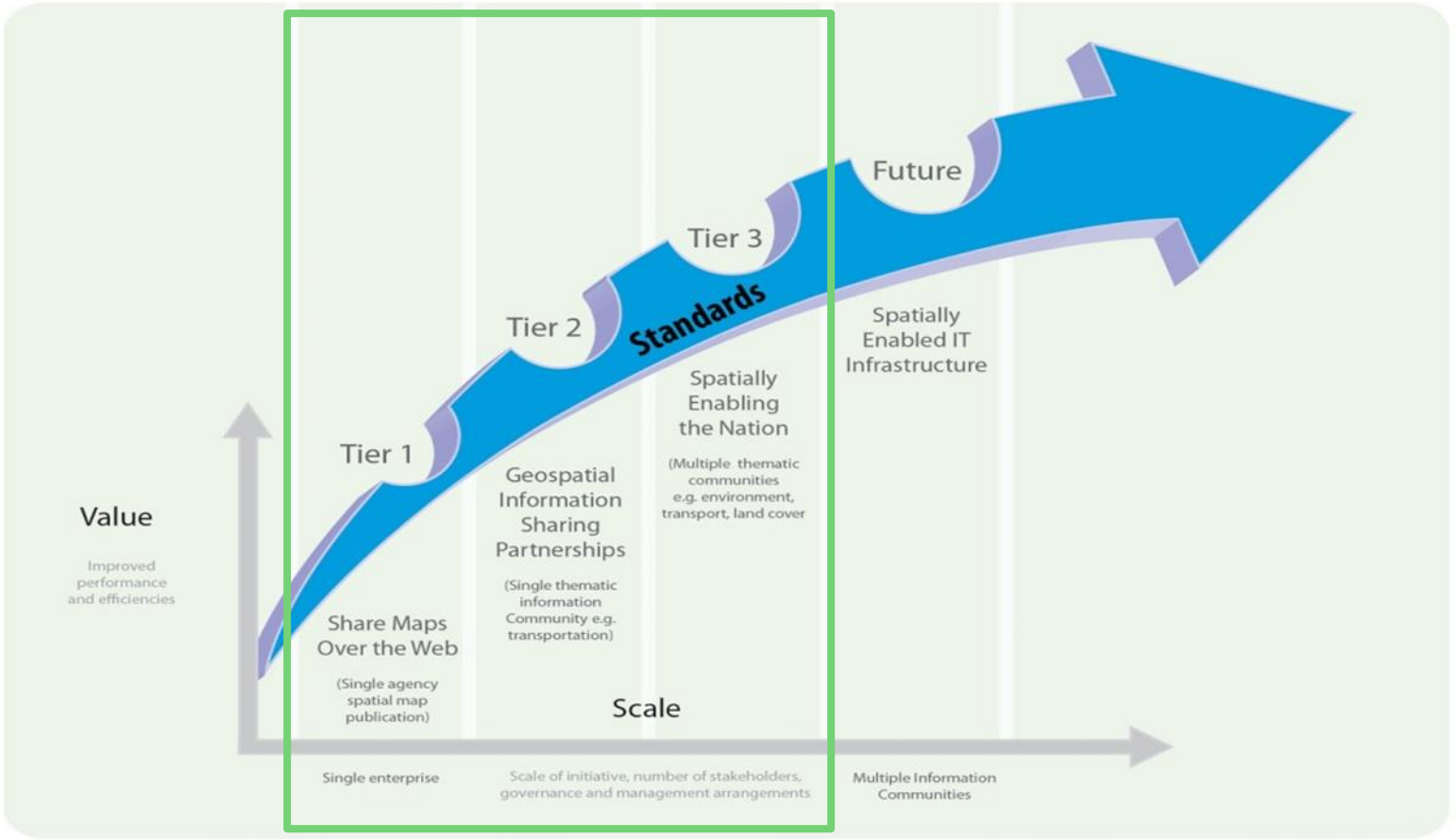


geonode.org

Tier 2 – Standards List

- **Distributed Maintenance & Use (Technology)**
  - OGC/ISO 19136 Geography Markup Language (GML)
  - OGC/ISO 19142 Web Feature Service 2.0
  - OGC/ISO 19143 Filter Encoding 2.0
  - OGC Web Coverage Service (WCS) 2.0
- **Domain Model standards (Content)**
  - OGC CityGML
  - ISO 19144, Geographic information -- Classification systems
  - ISO 19152, Geographic information -- Land Administration Domain Model (LADM)
  - GeoSciML – Geological structure and bore holes
  - OGC WaterML 2.0 - Sharing in-situ sensor water observations
  - S-57 - IHO Transfer Standard for Digital Hydrographic Data

Tier 3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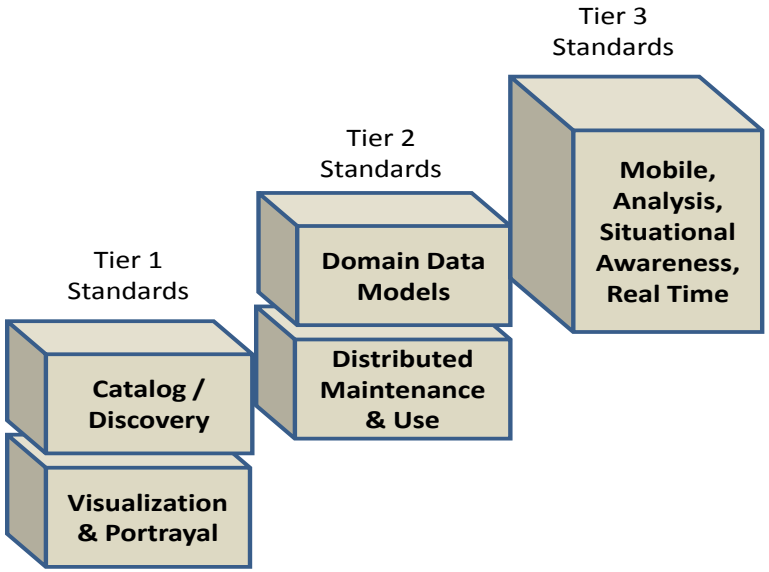
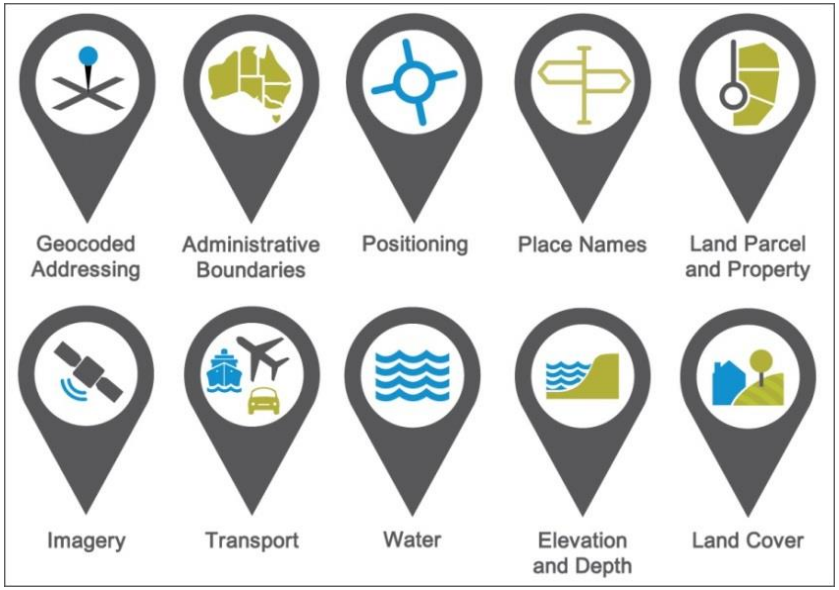
Tier 3:Spatially Enabling the Nation/Region

- Multiple organizations in share **<u>foundational geospatial information</u>** and services with each other and the broader community
- Improves knowledge and understanding, contributing to evidence-based decision making, situational awareness, and improved societal outcomes
- Multiplies the value of their geospatial information assets by sharing these assets with others
- Groups in different application domains
  - Share their data, discover and access data produced by others,
  - Benefit from improved understanding and knowledge
  - e.g. The same geospatial information needed for land use planning may also have value for flood prevention



What is Foundational Data?

- The development and publication of “foundation” or “framework” spatial data such as imagery, transportation, administrative boundaries, using content and technology standards and best practices enable geospatial data from different providers to be easily integrated and used across multiple applications domains,
- Decision making is based upon a common understanding.
- **These foundation themes have known accuracy and currency so that other geospatial data can be consistently integrated.**

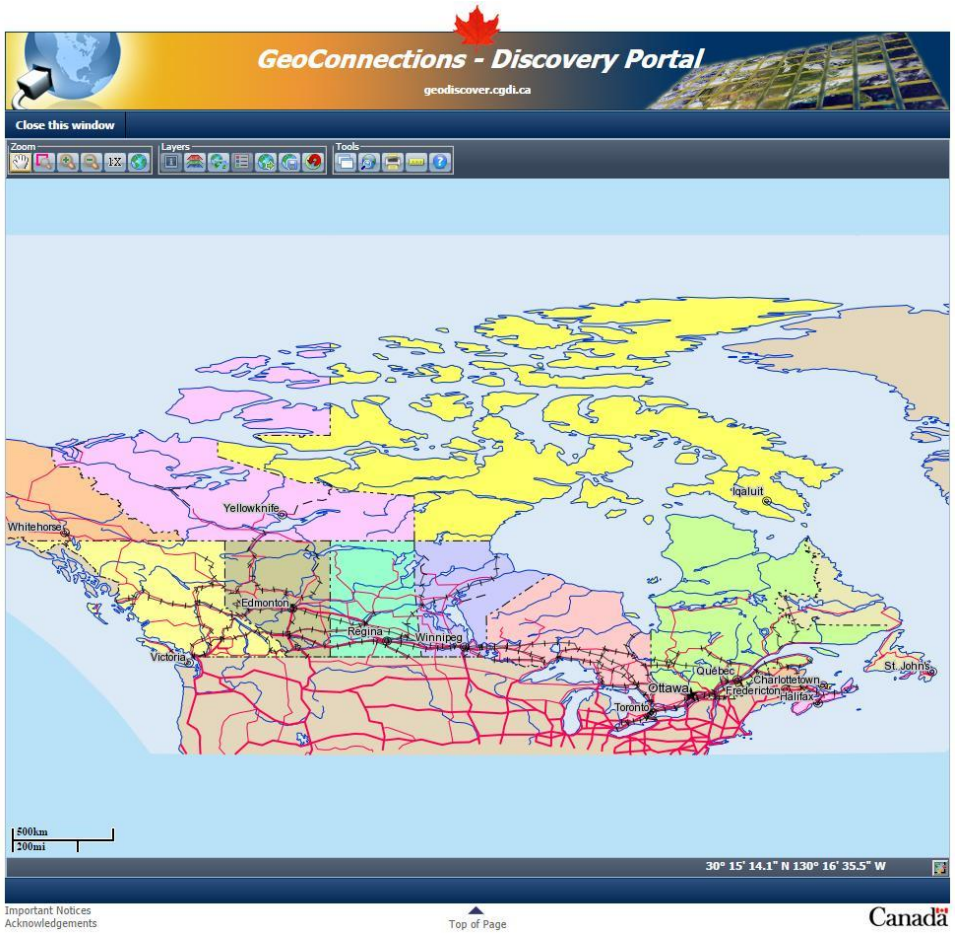


Example: Foundation geospatial information layers (Source, ANZLIC)

Typical scenarios for Tier 3

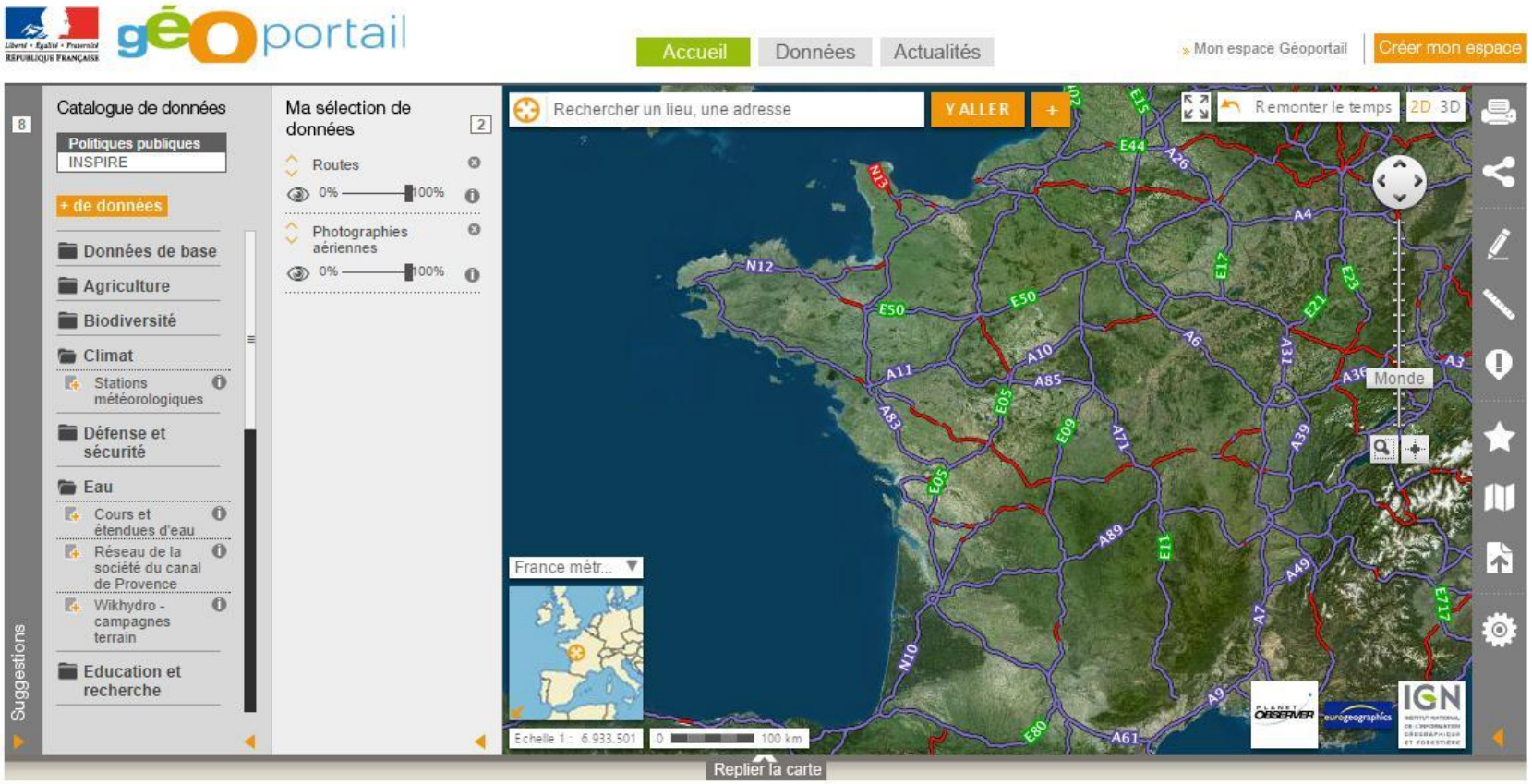
- A nation begins the implementation of **a National SDI** to deliver foundational or framework geospatial data for the nation.
- May be an effort that starts from scratch or **builds on domain specific activities** characterized in Tier 2;
- **Geoprocessing** over the web;
- **Delivery to multiple platforms** including desktop and mobile;
- **Real time data** from a variety of sensors is incorporated;
- Account for **data sovereignty**.
- A **robust framework of** policies has been established for organizations operating from the local to national level.
- Well defined geospatial data themes, content models, policies and service level agreements between organizations and governments for operations and **cooperative maintenance of data themes** are in place.

Example: Canadian Geospatial Data Infrastructure (CGDI)



http://geodiscover.cgdi.ca/web/guest/home

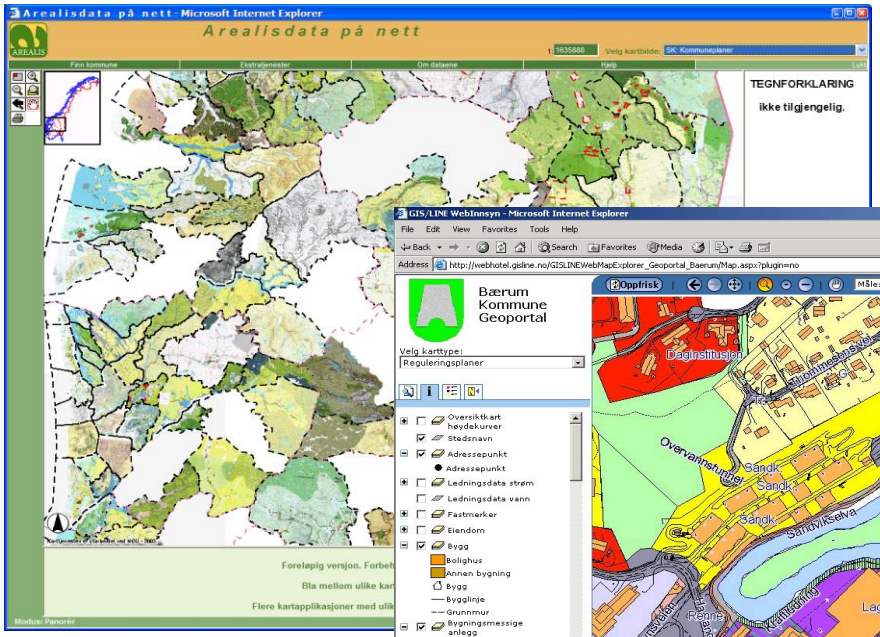
Example: France Geoportal

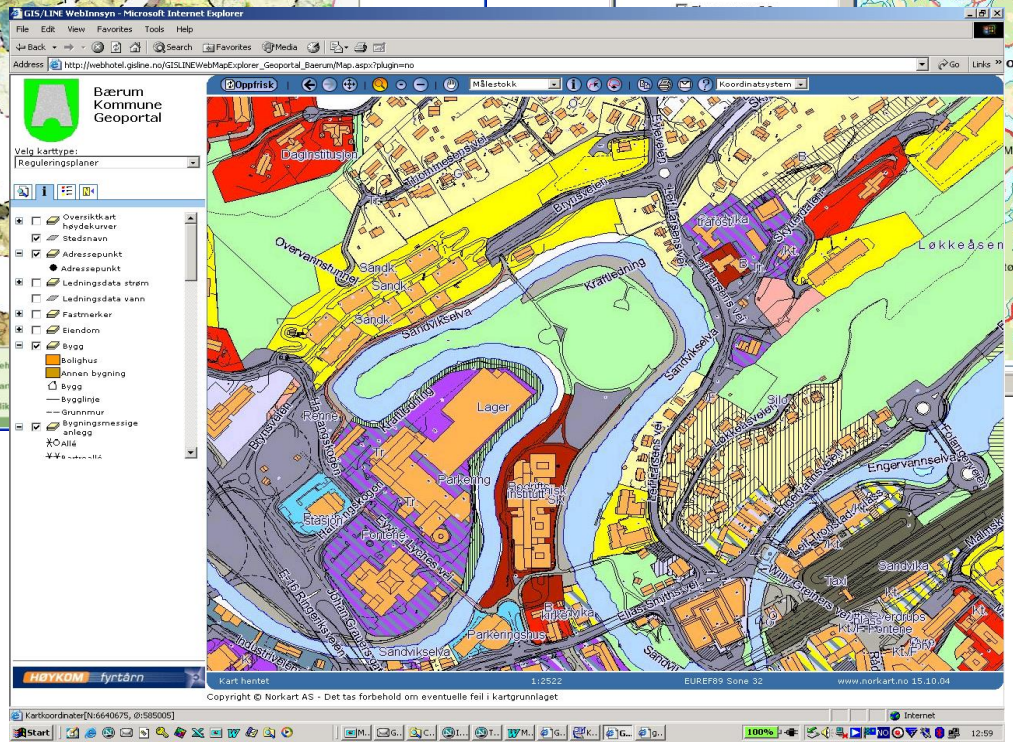


http://www.geoportail.gouv.fr/accueil

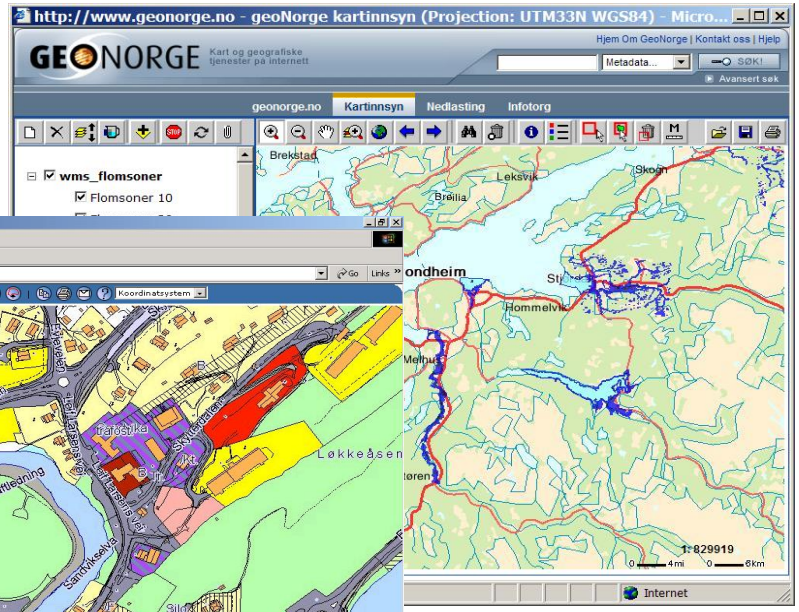
Example; Norway Digital

Municipal Areas





Flood Risk Areas

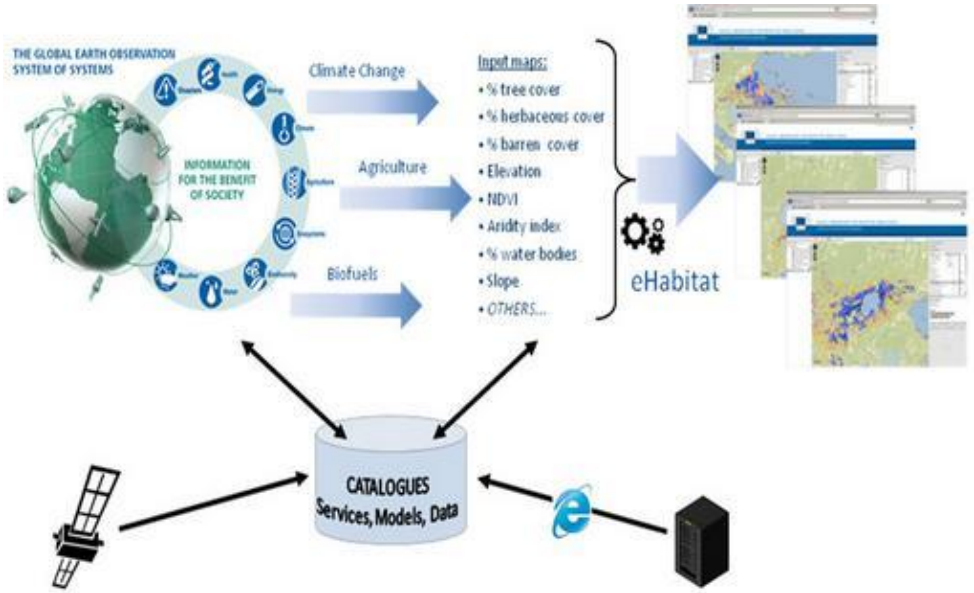


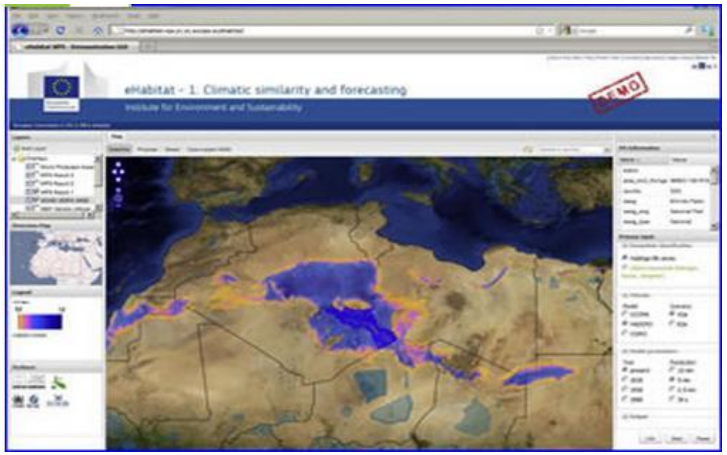
- Fisheries
- Waste Water Outflow
- Water Supply

- Demography
- Biodiversity
- Agriculture and Forestry

Land Use

Example: Web processing Service





[eHabitat](), a multi-purpose Web Processing service for ecological modelling

European Commission - Joint Research Centre - Institute for Environment and Sustainability

Example: Debris Flow Monitoring (Taiwan)

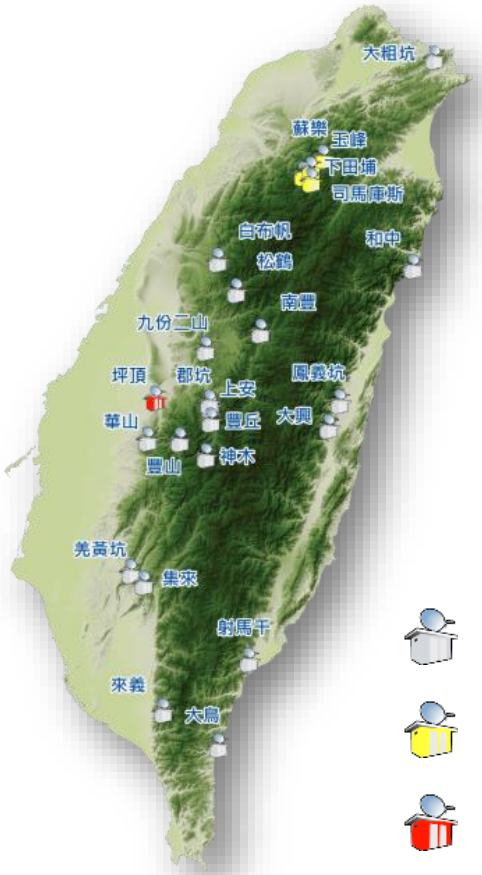
GIS.FCU
GIS RESEARCH CENTER, FCU

http://www.gis.tw/

Establishment
2002

Mobile Stations
2003

Portable Units
R&D
2010



Debris Flow

Sedi ment

Land slide

On-Site ×24

Mobile×3

Portable Units×14

UN-GGIM:AMERICAS
COMITÉ REGIONAL DE LAS NACIONES UNIDAS SOBRE LA GESTIÓN GLOBAL DE INFORMACIÓN GEOESPACIAL PARA LAS AMÉRICAS

ACS AEC
Association of Caribbean States
Asociación de Estados del Caribe
Association des Etats de la Caraïbe

SRE
SECRETARÍA DE RELACIONES EXTERIORES

INEGI
INSTITUTO NACIONAL DE ESTADÍSTICA Y GEOGRAFÍA

OGC
Making location count.
www.opengeospatial.org

Example; Mobile

Report Emergency Status with OGC Standard

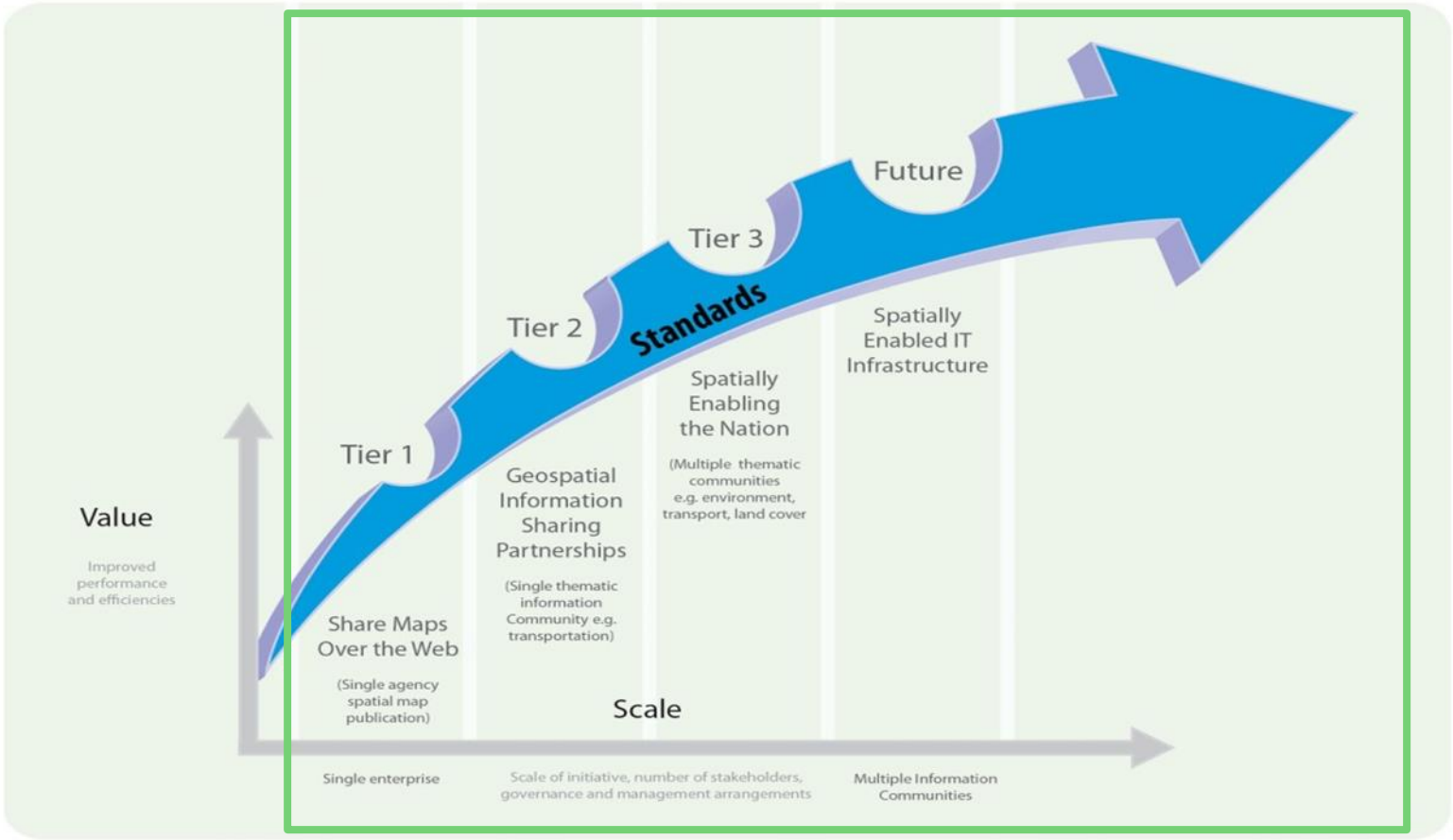
With iHelp, the OGC Open GeoSMS enabled App
People who cannot speak & listen, can still help on disaster reduction

http://geothings.tw/

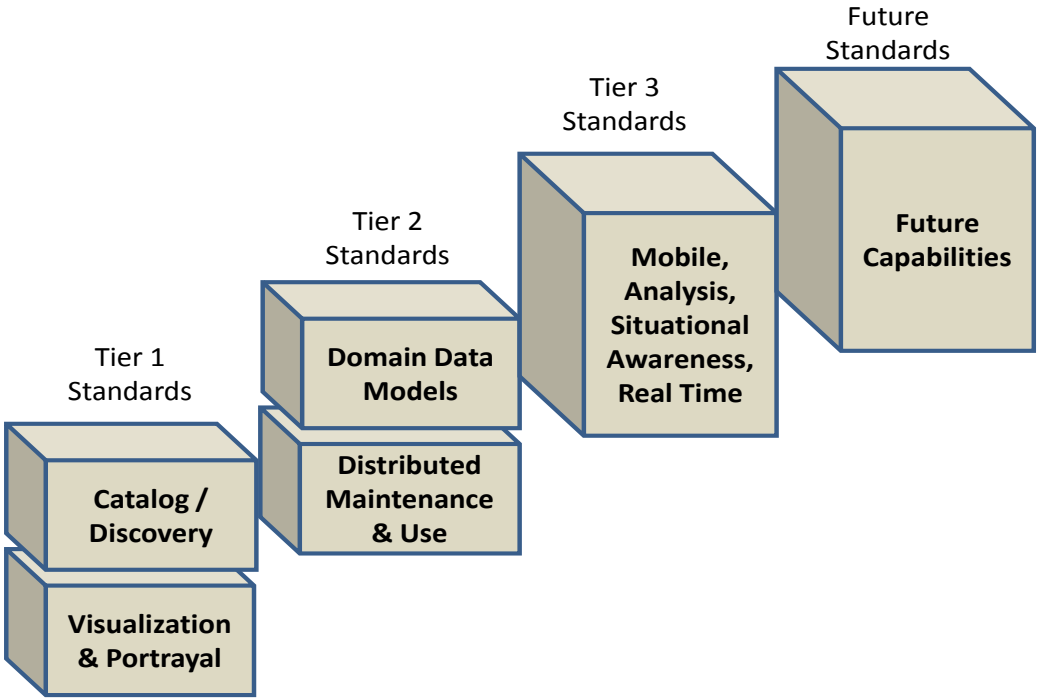
Tier 3 – Standards List

- **Geospatial Processing**
  - OGC Web Processing Service (WPS)
- **Mobile Devices**
  - OGC Open GeoSMS
  - OGC GeoPackage
- **Real Time**
  - OGC/ISO Observations & Measurements Schema (O&M) / ISO 19156
  - OGC Observations and Measurements XML (OMXML)
  - OGC Sensor Model Language (SensorML)
  - OGC Sensor Observations Service (SOS)
  - OGC Sensor Planning Service (SPS)
- **Geosemantics**
  - ISO 19150 Geographic information – Ontology

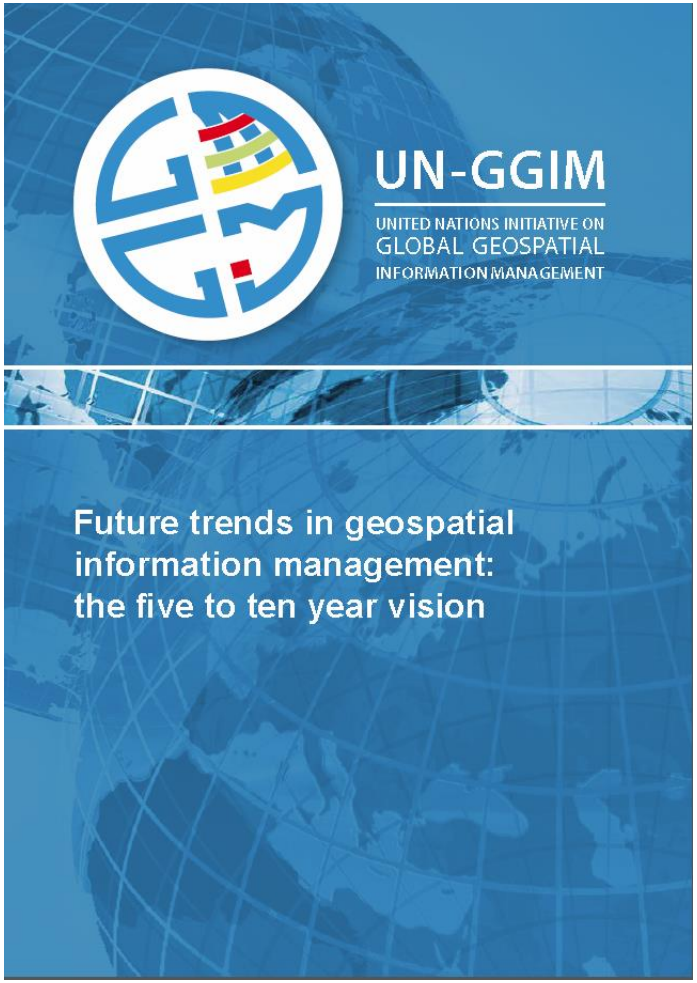
Tier 4


Future
Tier 3
Tier 2
Standards
Tier 1
Spatially Enabled IT Infrastructure
Spatially Enabling the Nation
(Multiple thematic communities e.g. environment, transport, land cover
Geospatial Information Sharing Partnerships
(Single thematic information Community e.g. transportation)
Share Maps Over the Web
(Single agency spatial map publication)
Value
Improved performance and efficiencies
Scale
Single enterprise
Scale of initiative, number of stakeholders, governance and management arrangements
Multiple Information Communities

The Future; Spatially Enabled IT infrastructure



- Cloud Computing
- Linked Data
- Big Data Analytics
- Semantic web portals
- Mobile devices
- New and dynamic geospatial data collectors
- Social Media / Volunteered Geospatial Information
- Emerging Standards, Best Practices & Trends



United Nations Global Geographic Information Management

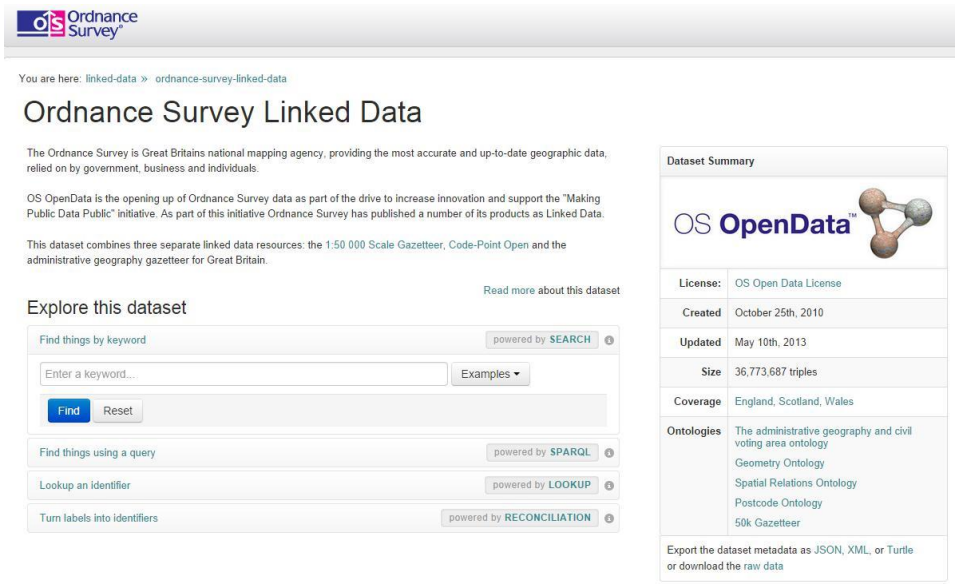
Future Trends: 5 – 10 Year Vision

- **Key trends**
  - **Cloud computing**
  - **Linked data**
  - **Internet of Things**
  - **New data creation**
  - **Volunteered Geographic Information**
  - **Open Standards**
  - **Open Source**
  - **Legal and Policy**
  - **Data standards and policy**
  - **Coordination and collaboration**
  - **Skills and Training**

http://ggim.un.org/docs/meetings/3rd%20UNCE/UN-GGIM-Future-trends.pdf

Example: Linked Data

- Linked data leverages a way to interconnect related data resident on the web, and deliver it in a more effective manner
- The resulting "Web of data" has recently started being populated with geospatial data.
- Ordnance Survey (OS) is the first national mapping agency that has made various kinds of geospatial data from Great Britain available as open linked data.
- OS OpenData is the opening up of Ordnance Survey data as part of the drive to increase innovation and support the "Making Public Data Public" initiative.



http://data.ordnancesurvey.co.uk/datasets/os-linked-data

To make this work:

- Organizations must agree & commit to use standards in their SDI
- Make clear statements in policy
- Use procurement language that requires vendors to offer standards-based solutions

Final thoughts…..

- Standardization is the reason for the success of the Internet, the World Wide Web, e-commerce, and the emerging wireless revolution
- Advances in technology change organizational structures, workflows and business models
- The pace of change requires **new** thinking about national SDI roles and investments, and a commitment to interoperability based on open standards is essential in dealing with this transition

"*Interoperability seems to be about the integration of information. What it's really about is the coordination of organizational behavior*."

David Schell
Chairman (Emeritus)
and Founder OGC