



*NATURAL RESOURCES CANADA - INVENTIVE BY NATURE*

# **Canada Geospatial Data Infrastructure**

## **SDI implementation : creating economic and non-economic value for the country**

**Eric Loubier, Director**  
**Canada Centre for Mapping and Earth Observation**

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# Geography is important to Canada ...



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# Where? matters as much as the Who? What? Why? When? and How?

Where can we find more **resources**? Whose **property** is it? Which **communities, species** and **habitats** will be affected and how? Which areas are at risk of **flooding**? What's the fastest **transportation route for first responders**? How large is the **ore body**? What's the best site for locating **solar panel arrays**? How are our **forests** changing? How fast is **sea ice** melting? What area is affected by the **power outage**? Where are the best locations to deploy **vaccinations**? Which **populations** are most at risk? Have **Aboriginal communities** been consulted? Where are the most promising **markets**? Are there **health and safety** issues for field workers at this site? What **changes** are occurring?



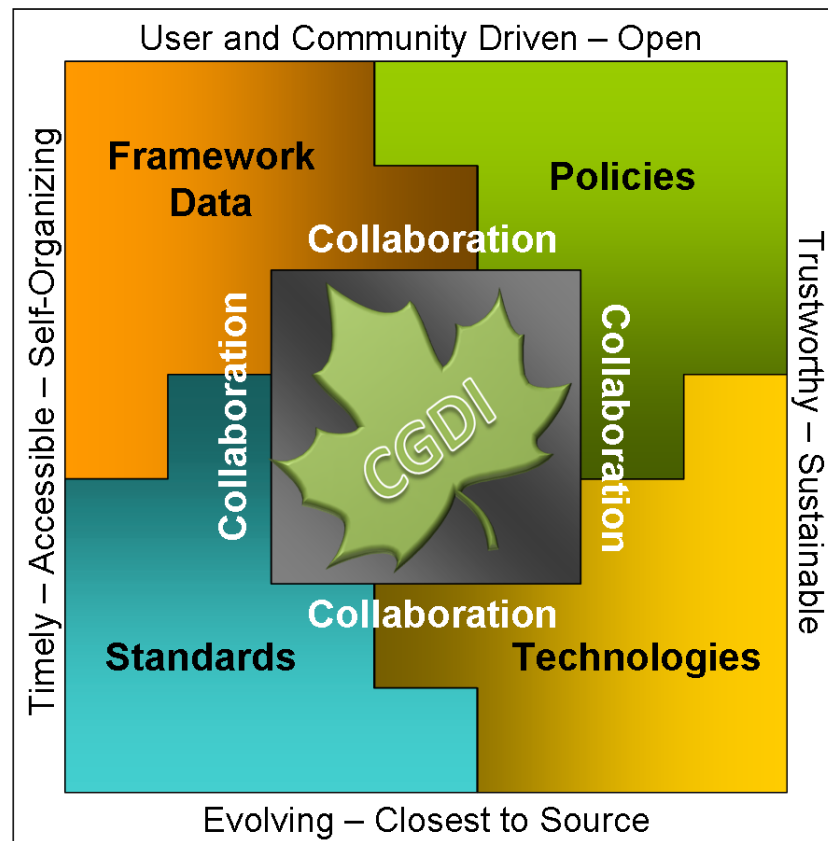
Geospatial is a strategic asset



# What is the CGDI?

- The CGDI is an **online network of resources** that improves the sharing, use and integration of information tied to geographic locations in Canada.
- In essence, via **collaboration**, the CGDI is the convergence of **policies, standards, technologies, and framework data** necessary to harmonize all of Canada's location-based information.
- Through the CGDI, **Canadians** can discover, access, visualize, integrate, apply and share quality location-based information. The CGDI allows citizens to **gain new perspectives** into social, economic, and environmental issues and make effective decisions.

## CGDI Components and Guiding Principles



Environmental

Social

Economic

CGDI – Overview; CGDI Vision, Mission and Roadmap:

<http://geoconnections.nrcan.gc.ca/18>



# What are Operational Policies?

- Address topics related to the lifecycle of data (i.e. collection, management, dissemination, use).
- Apply to the day-to-day business of organizations.
- Include guidelines, directives, procedures and manuals that help facilitate access to and use of information.
- Are distinct from Strategic Policies, which address high level strategic issues and set high level directions for organizations.



# What are Geospatial Standards?

- Support the understanding and usage of geographic information.
- Increase the availability, access, integration, and sharing of geographic information... and enable interoperability between geographic information systems.
- Ease the establishment of geospatial infrastructures on local, regional and global level
- Contribute to sustainable development



# ...“traditional” government roles remain essential bedrock on which to build and enhance geospatial value

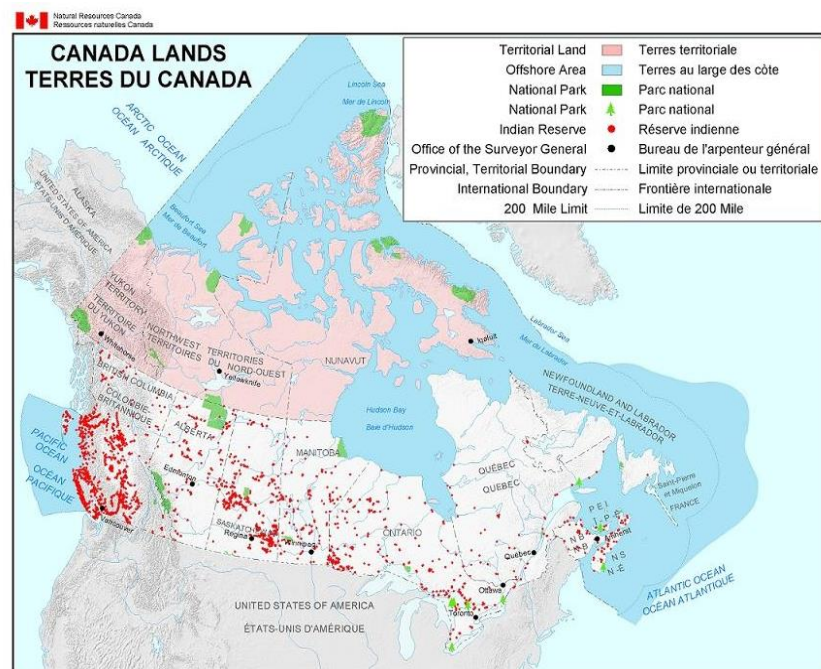
## Our “geospatial bedrock”...

- core framework & thematic data
- land parcel surveys and administration
- engineering and construction surveys
- international and national boundary definition
- electoral boundaries
- national parks
- treaty or land claim surveys

## ...is fundamental to governing and to creating value:

- land regimes for taxation
- secure property rights
- land use planning
- urban development
- infrastructure sighting
- resource exploration and monitoring
- public safety and human health
- navigation – safety and efficiency
- technological innovation

*NRCan is currently delivering on the largest land reform project in the history of Canada...*



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# Collaboration and Interoperability

- Collaboration, partnerships and a common way forward between federal, provincial, territorial and regional governments; the private sector; and academia ensure interoperability for the CGDI.

The image displays a collage of various Canadian government and regional web portals related to geomatics and land information. The portals include:

- Geomatics Yukon:** Home, Imagery & Data, Viewers & Maps, Projects & News, Support & Info.
- DataBC:** Data Catalogue, Apps & Services, Featured Applications (Discover Geographic Data, Address Lookup, etc.).
- GeoNOVA:** Geomatics Gateway to Nova Scotia.
- Manitoba Land Initiative:** A map-based portal for land information in Manitoba.
- Northwest Territories (NWT) Discovery Portal:** A repository of environmental monitoring knowledge.
- Land Information Ontario (LIO):** A portal for accessing and sharing geographic data in Ontario.
- AltaLIS:** Digital Mapping for Alberta.
- Information Corporation:** A portal for various services like Vital Statistics, Land Titles, and Personal Property.

- Interoperability is achieved by the convergence of **framework data, policies, standards and technologies** necessary to harmonize Canada's location-based information.



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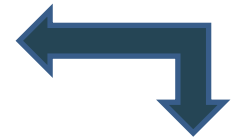
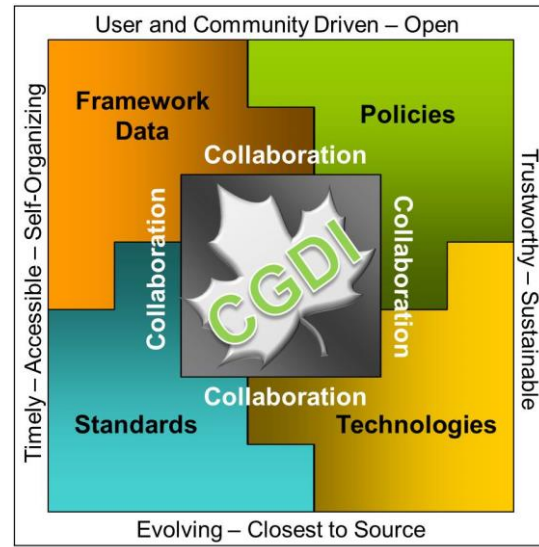
# Canada's Geospatial Governance and Institutional Arrangements ...



**Federal Committee on Geomatics and Earth Observation** establishing strategic direction on federal policy, interoperability, and infrastructure relating to geomatics and Earth observation.



**Geographical Names Board of Canada** provincial, territorial and federal National coordination providing authoritative, standardized geographical names.



**Canadian GeoAlliance Community** Multi-stakeholder engagement for the development and implementation of a Pan-Canadian Geomatics Strategy.



**Canadian Council on Geomatics** federal, provincial, territorial cooperation to facilitate data collection, interoperability and integration between jurisdictions.



*... fostering innovation through collaboration of 21 federal departments, 13 provincial and territorial partners, private and academic sector partners*

# The Importance of Geospatial Data...

## Canada

- Estimated contribution of **\$20.7B** to GDP annually
- Open geospatial data has stimulated **\$600M** in productivity improvements

## Around The World

- England & Wales: Estimated £320M impact to public service delivery in 2008-09
- New Zealand: \$1.2B (NZ) increase in productivity in 2008
- Australia: Estimated impact between \$6.43B to 12.6B (AUS) in 2006-07
- Global Geo Services estimated to be larger than video game industry
- GEO Key to unlocking resource potential in the oceans and on the land...

“...countries with the best data will win...” Kevin Lynch

“Data is Canada’s new natural resource”...

Treasury Board Minister, Tony Clement, July 2012



## Oceans Management Areas

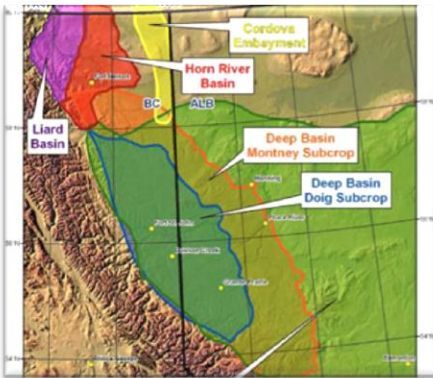


...and ensuring the government’s geospatial data is managed effectively is essential to decision-making, innovation, and productivity



# Vertical sectors that integrate geospatial in operations are experiencing significant productivity gains...

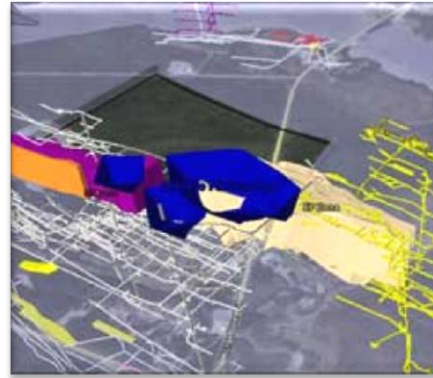
## oil and gas



Distinct competitive advantage promotes rapid and extensive adoption

Productivity impacts ~ 6 to 7%

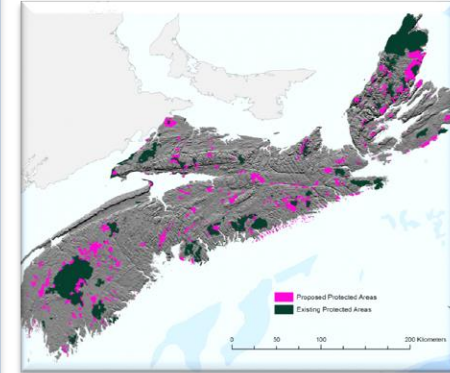
## mining



GIS permits better modelling of ore bodies and more efficient extraction; improves safety

Productivity impacts ~ 5%

## forestry



Differences in practices between small and large producers affect adoption

Productivity impacts ~ 4% to 7%

**Productivity improvements from use of geospatial to the Canadian economy contribute:**

**C\$20.7 billion in GDP**



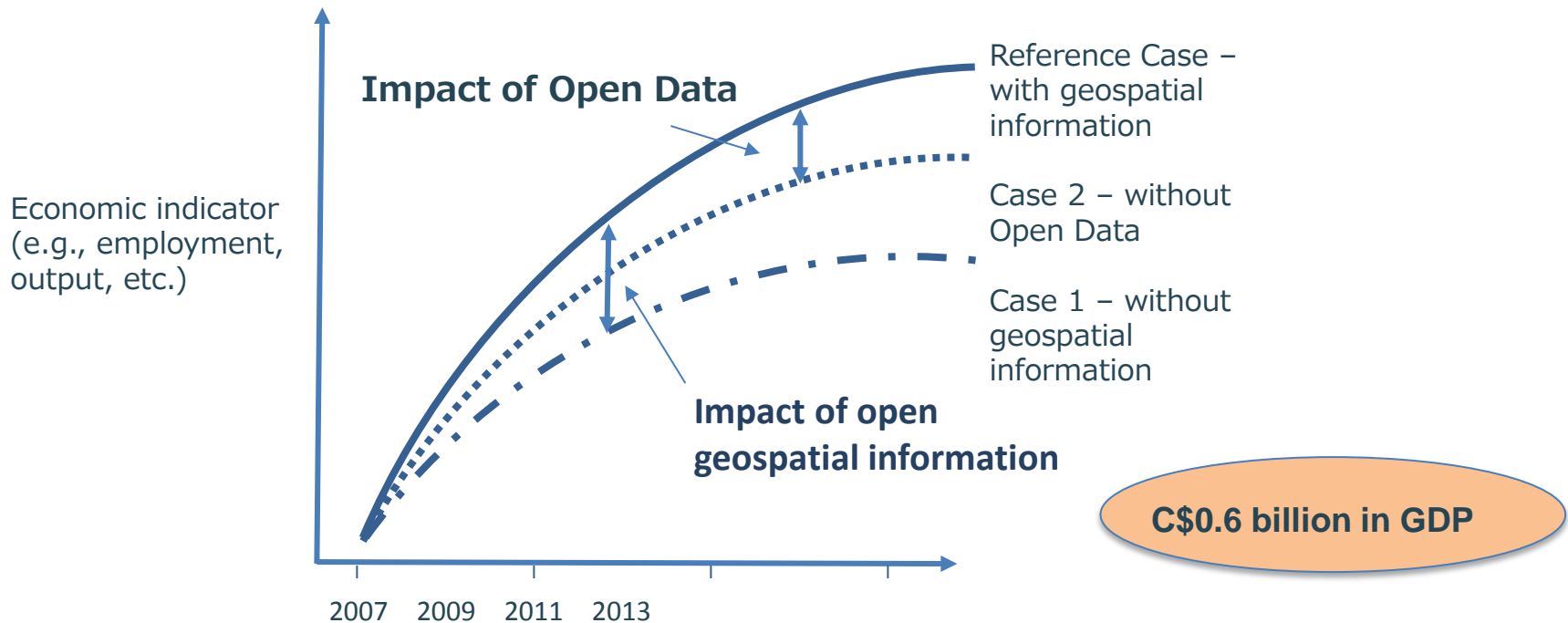
# ...and a host of other non-economic benefits:

## Summary of Value Study Case Studies

Sector	Organization	Productivity Impacts	Other Benefits
<b>Environment/ Conservation</b>	Ducks Unlimited Canada (not-for-profit)	\$1.7 million annual savings due to reduced travel and staff costs	<ul style="list-style-type: none"> <li>• Ecosystem benefits</li> <li>• Improved eco-literacy</li> </ul>
<b>Resource Development</b>	Canadian Forest Products Ltd. (private sector)	~\$3.75 million annual savings due to standardized geospatial information products and processes (represents cost reduction of ~60%)	<ul style="list-style-type: none"> <li>• Ecosystem benefits</li> <li>• Protection of market share</li> <li>• Contribution to Open Data</li> </ul>
<b>Engineering / Construction</b>	Golder Associates Ltd. (private sector)	20-30% increase in productivity due to use of geospatial information and technologies and more enhanced service offerings	<ul style="list-style-type: none"> <li>• Decision-making</li> <li>• Protection of market share</li> <li>• Health and safety</li> </ul>
<b>Public Health</b>	BC Centre for Disease Control (government)	lives saved and impact of reducing the severity of a disease outbreak due to e.g. location allocation for clinics for targeted disease prevention	<ul style="list-style-type: none"> <li>• Reduced public health risk</li> <li>• Better decision-making</li> <li>• Accountability/reporting</li> </ul>
<b>Government (Asset Management)</b>	City of Ottawa (government)	reduced asset management costs and citizen inconvenience	<ul style="list-style-type: none"> <li>• Enhanced collaboration &amp; planning</li> <li>• Safety and social benefits</li> </ul>
<b>Real Estate</b>	Altus Group (private sector)	savings as appraisals now done for \$15-\$20 using spatially-enabled tools vs. \$250-\$400 without	<ul style="list-style-type: none"> <li>• Social benefits (enhanced city design)</li> <li>• Decision-making</li> </ul>
<b>Insurance</b>	RSA Group (private sector)	“significantly faster” development of insurance premium quotes due to use of automated geospatial tools in analysis	<ul style="list-style-type: none"> <li>• Better risk assessment</li> <li>• Protection of market share</li> </ul>



# Geospatial data – especially “open” geospatial data – is proving to be transformative...that’s why it is so valuable



*“...the federal government's geospatial data is some of the most valuable information available on Canada's Open Data portal, data.gc.ca”*

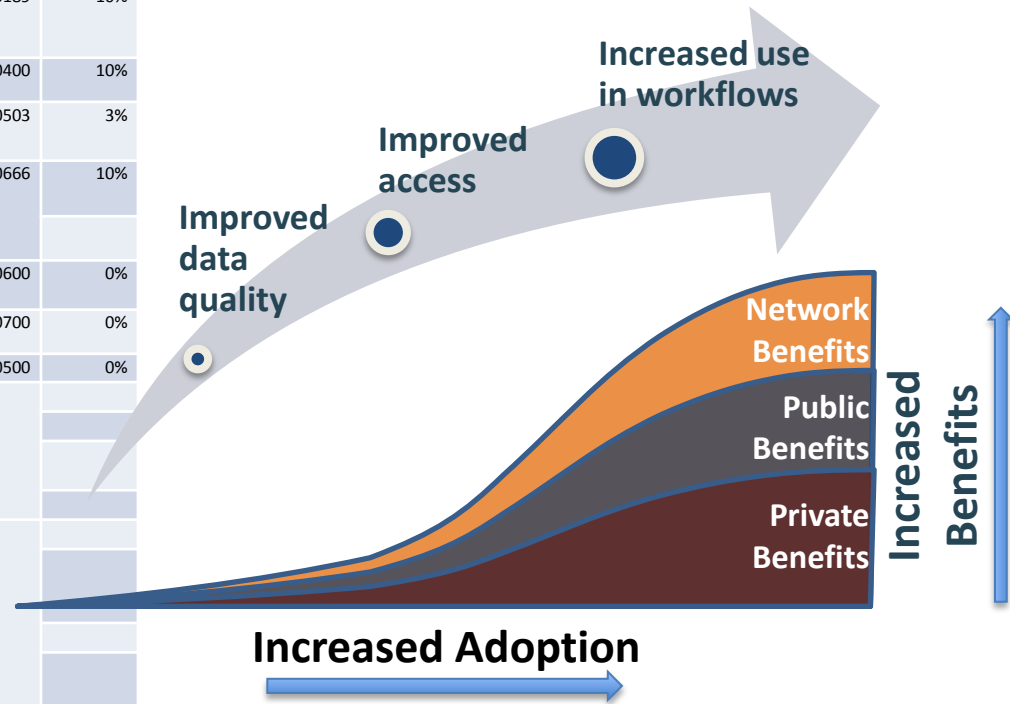
*– Honourable Tony Clement, President of the Treasury Board cited in 2013 Press Release*



# Transformation is accompanying adoption – it’s still early days for many sectors

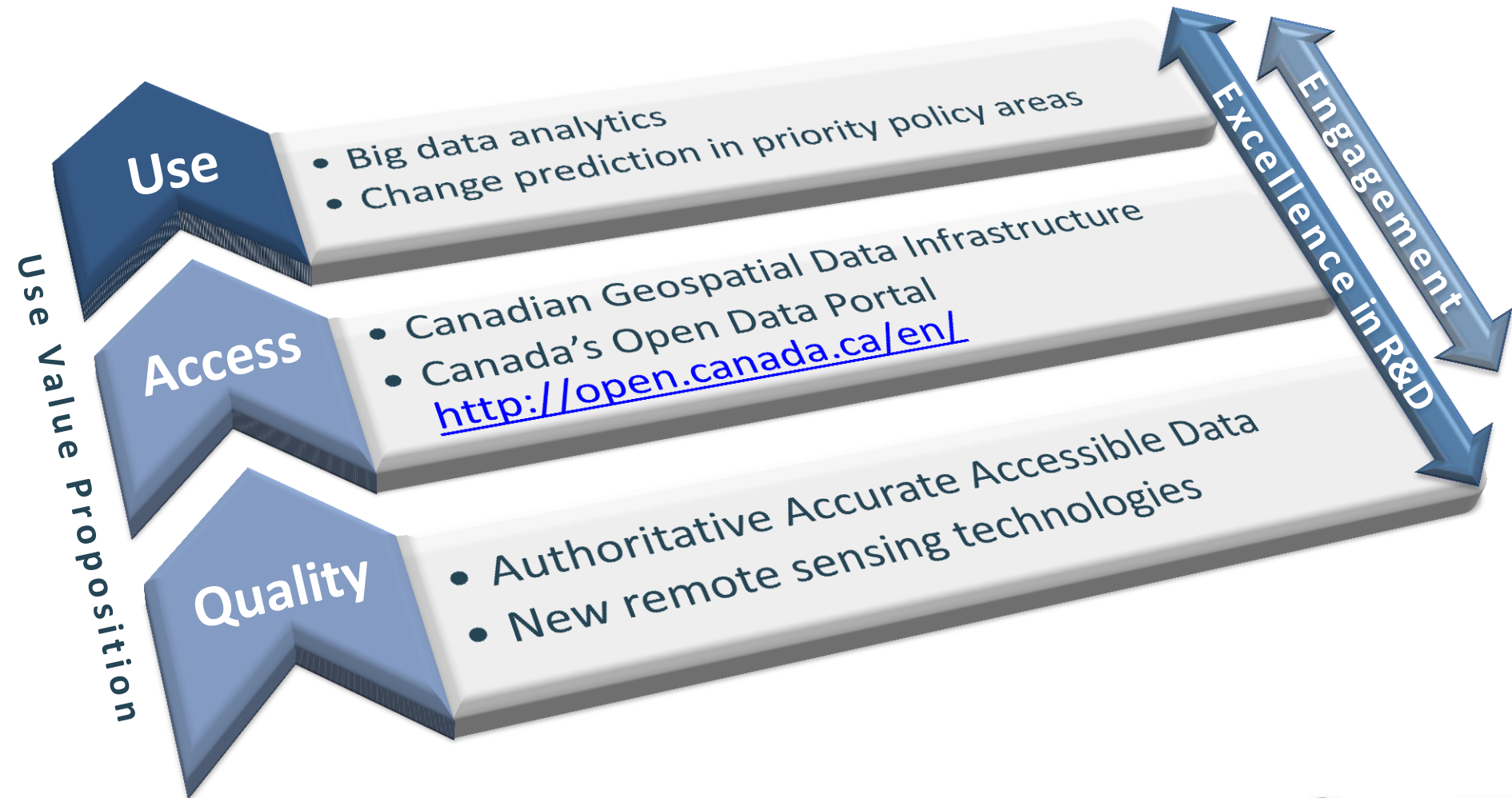
Sector	Productivity Improvement			Industry Applicability	Impact Factor	Open Data
	Early Adopters	Majority	Laggards			
Crop production (except greenhouse, nursery and floriculture production)	0.1	0.06	0.02	32%	0.0189	10%
Forestry and logging	0.07	0.04	0.01	100%	0.0400	10%
Fishing, hunting and trapping	0.1	0.05	0.01	97%	0.0503	3%
Support activities for crop and animal production	0.1	0.08	0.06	83%	0.0666	10%
Support activities for forestry						
Conventional oil and gas extraction	0.06	0.06	0.06	100%	0.0600	0%
Non-conventional oil extraction	0.07	0.07	0.07	100%	0.0700	0%
Coal mining	0.1	0.05	0	100%	0.0500	0%
Iron ore mining						
Gold and silver ore mining						
Copper, nickel, lead and zinc ore mining						
Other metal ore mining						
Stone mining and quarrying						
Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying						
Diamond mining						
Other non-metallic mineral mining and quarrying (except diamond and potash)						
Potash mining						
Support activities for oil and gas	0.06	0.06	0.06	100%	0.06	0%
Support activities for mining						
Electric power generation, transmission and distribution	0.013	0.013	0.013	100%	0.0130	10%

Table continues...



**Key question: How can GI adoption be encouraged?**

# We need an integrated policy response to support and increase GI adoption for productivity, innovation and social benefit



# Public sector **use** of geospatial to inform policy priorities is increasing, but lagging the private sector...

- Change detection for environmental assessment and adaptation
- Remote predictive mapping & multi-criteria decision support for responsible resource development
- Near real-time emergency geomatics services

Oil & gas exploration in Canada's high arctic with high resolution elevation data

Ice breakup monitoring,  
Peace River, Alberta (2014)

Note: Field validation photo courtesy of Parks Canada.



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# Early adopters in vertical sectors have experienced significant productivity gains & non-economic benefits by **integrating GI** in their workflows and operations...

- National scale productivity impact estimates attributed to the use of geospatial information (measured by percentage change in industry output) are most significant (>1.0%) for the following sectors:
  - mining, quarrying, oil and gas extraction (4.54%)
  - transportation and warehousing (1.64%)
  - utilities (1.58%)
  - public administration (1.51%)
  - construction (1.23%)
  - agriculture, forestry, fishing and hunting (1.22%)
  - management of companies and enterprises (1.08%)

**Mine design and  
environmental studies, Golder  
Associates**



# By using GIS in the office before going to the field, foresters can be much more productive

## Key benefits:

- **Ecosystem benefits:** forest impact and wildlife analyses; assessment of regulatory targets
- **Protection of Market Share:** essential data for 3<sup>rd</sup> party certification
- **Open geospatial Data:** company data contributes to update provincial forest cover
- **Savings and Efficiencies:** process automation and ability to undertake basic planning in the office prior to field verification

*“Canfor has standardized every geospatial information product and process to work with every operation and automate a lot of tasks, producing major productivity improvements.”*

*- Jordan Kirk, Woodlands Information Management Coordinator*

By 2013, this standardization reduced the cost of GI use by nearly 60%, for estimated annual savings of \$3.75 million.



## *“Geographic knowledge plays a role in nearly every decision we make at Ducks Unlimited Canada (DUC).”*

*“...GIS has become a valuable conservation tool...[a]nd, on top of this, it’s also a powerful storyteller.”*

### Key benefits:

- **Ecosystem benefits:** Targeted wetland protection for flood prevention, water filtration, purification, replenishment, groundwater storage, reduced erosions and shoreline protection
- **Eco-literacy:** Mapping tools show the importance of wetland conservation to supporters, donors and the public
- **Savings and Efficiencies:** Staff can quickly screen out reconnaissance trips that will have no project potential:

*“Reducing travel and staff costs contributes to an annual savings of approximately \$1.7 million.”*

*- Brian Kazmerik, Director of Information Systems and GIS*



## *“Through the use of GI, Golder [Associates] is competitive in the market...”*

*“The use of geospatial information and technologies increases our productivity by 20-30%. We are able to offer more enhanced services...and do it a lot more efficiently.”*

*- Robert Murdoch, GIS & IM Manager*

Key benefits:

- **Enhanced Decision-making:** for infrastructure projects, geotechnical investigations and environmental assessment
- **Protection of Market Share:** ability to provide more complex analyses and visualization capabilities to stay competitive
- **Savings and Efficiencies:** desktop studies and preliminary site analysis before going in the field
- **Health and Safety:** knowledge of field conditions decreases risk



# Ensuring the usability of our geospatial information to better support decision-making...

## UN-GGIM



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## UN-GGIM Americas



## Arctic SDI



...will require inter-jurisdictional collaboration, co-operation and innovation



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## For more information...

- Canadian Geomatics Environmental Scan and Value Study Summary Report  
<http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/cgdi-initiatives/canadian-geomatics>
- Eric Loubier, Director,  
Canada Centre for Mapping and Earth Observation  
[eric.loubier@canada.ca](mailto:eric.loubier@canada.ca)

