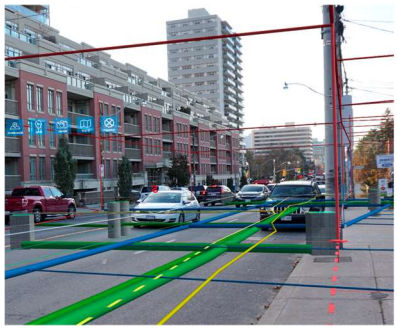
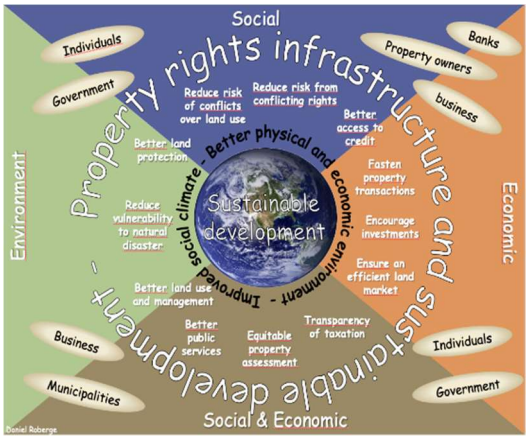
Technology



Society and the Professions

Governance and Policy



Responding to Change

Proceedings

The Evolving Boundaries of Practice Workshop

National Surveyors Conference

May 01, 2019 Halifax Nova Scotia

Compiled by:

Hal Janes,
Peter Sullivan

Natural Resources Canada | Ressources naturelles Canada
ACLS-AATC
PROFESSIONAL SURVEYORS CANADA
GÉOMÈTRES PROFESSIONNELS DU CANADA

Contents

Executive Summary – The Evolving Boundaries of Practice Workshop

Overview:

Land administration systems and their management are undergoing significant change in Canada and around the world. The drivers of that change are many and powerful. How each country adapts will impact their ability to compete and succeed in the emerging digital world. These changes include the rapid advance of location-based technology, implementation of on-line systems and an evolving public perception of expertise and a seemingly continual scrutinization of authoritative institutions including the traditional professions such as land surveying.

Professional Surveyors Canada, the Association of Canada Lands Surveyors, Natural Resources Canada, with input from the Canadian Council on Geomatics Cadastral Forum, have just completed several months of related research that culminated in the *Evolving Boundaries of Practice* workshop, held on May 01, 2019 at the National Surveyors Conference in Halifax, Nova Scotia.

Working groups were assembled early in 2019 to discuss the key changes flowing from technology, society and governance and policy that are impacting the land surveying profession and the delivery of land survey systems in Canada. The workshop presented the results of these discussions and research along with an overview of international developments. Discussion groups at the workshop had the opportunity to consider follow-up questions as well as think about how each theme interacts to produce the change challenges that the profession must address to meet society's standard for professions going forward.

The primary goal for the workshop was to provide a first step towards the development of a national strategy that would help position the land surveying profession and survey systems for the future. The ultimate objective would be to open a *pan-Canadian* dialogue on how land and geodetic survey systems must evolve to provide the digital infrastructure that will underpin and enable effective and responsive land information management for Canadians.

The Drivers of Change:

Technology – It is said that the world is currently experiencing the most rapid and impactful advance in technology in the history of recorded civilization. The Fourth **Industrial Revolution (4IR)** is characterized by a fusion of technologies that is blurring the lines between the physical and digital worlds.

Among this flurry of technological changes there are several trends that will have a fundamental impact on the way in which cadastral information is acquired, managed and disseminated.

Real-time high precision GNSS networks, 5G digital mobile communications, artificial intelligence, blockchain transaction management, and high-resolution imaging systems, all delivered by a pervasive global internet, will drive the demand for a digitally delivered cadastre supporting and enabling an integrated and intelligent land information management and regulatory infrastructure.

Real-time high precision GNSS position and location services implemented on a national scale will also enable the efficient coordination of our physically defined boundary systems and provide the geodetic framework for the realization of an authoritative digital representation of the cadastre.

Digital transaction technologies like blockchain and smart contracts will enable secure, decentralized and near-real time property transaction execution and will greatly reduce the need for institutional (registries) oversight.

The internet of things will evolve to include an internet of inter-connected and linked registry, regulatory, asset management and land management information bases across which update information is shared between linked bases automatically and in near real-time.

High resolution satellite, aerial (UAV) and surface-based mobile imaging systems will enable the near continuous monitoring and virtual representation of our physical environment.

Adaptation in this period of rapid technological change will be a challenge, but if done successfully and with foresight and care, will open tremendous opportunities to improve the effectiveness of the cadastre and advance the profile and reputation of the land survey profession.

Governance and Policy – Cadastral systems and their management are undergoing significant change in Canada and around the globe. Increasingly the land surveyor's role as the authoritative source for cadastral information will be linked and inter-twined with a broader land information management community.

Today's land administrative systems are built to handle records – titles, deeds, dispositions – whether paper or electronic. For reasons of cost, security, privacy and risk, there will be a movement towards managing data rather than records. Future land administration systems will be parcel focused, with location and geometry treated as attributes. The emphasis on cadastral information management will move beyond the traditional recording of ownership and rights transactions to increasingly focus on the responsibilities and restrictions imposed by society governing responsible land use and environmental stewardship.

To optimize investment and efficiency, government-industry collaborations such as crown corporations and public private partnerships will become the norm for operations. There will be a growing demand for cadastral information in a standardized, easily integrated form that is

accessible, comprehensive, complete and current, to support smart cities digital infrastructure, effective disaster response, the digital economy, and effective land management and environmental stewardship.

Society and the Professions – Society has dramatically changed its perspectives of the professions over the last two decades. A do-it-yourself culture, access to seemingly unlimited information at the click of a mouse, and a growing scepticism of all authoritative institutions is changing the public perception of the professions. Assertions of expertise are widely viewed as elitist, authoritarian, anti-democratic, and driven by self-interest. The distinctions between information, knowledge, and opinion are increasingly blurred.

Public skepticism about the value to society of professional self-regulation is reflected in legislation enacted in the last decade in many Canadian jurisdictions to increase government oversight, reduce barriers to entrance and mobility, and ensure transparency and accountability in regulatory functions such as practice review, professional competency standards, and the administration of complaints and discipline. While thus far such legislation has not been directly targeted at the land survey profession, the land surveying associations are nevertheless affected and should take careful notice of the societal trends toward increasing scrutiny and meta-regulation (regulating the regulators).

In a recent BC presentation James Casey of Field Law noted these key trends in Canadian Law governing the regulation of professions:

> *"It is no longer a self-evident truth to those outside of the professions that self-regulation of the professions is in the public interest.*
>
> *Currently, skepticism about the societal value of self-regulation is very strong. Professional organizations are under increased scrutiny by government, the public, media, and consumer groups.*
>
> *Governments view exclusive scopes of practice as being too restrictive, and in some cases anti-competitive."*

Casey's key messages are that if the public trust of self-regulation is to be maintained the professions must be transparent and diligent in meeting their regulatory obligations, they must have a clear focus on accountability, and they must effectively communicate their purpose and public protection role.

> *"Regulatory organizations need to get their message out. "We protect and promote the public interest in all of our regulatory activities."*
>
> *Who is your organization accountable to? How do you demonstrate that accountability? How can you increase accountability? "*

The small size, age demographics and segmented jurisdictional structure of the land surveying profession in Canada present unique challenges to ensuring self regulation will meet public scrutiny. This is particularly the case for professional associations with fewer than 100 members where the costs of effective continuing professional development, practice review and the administration of complaints and discipline are challenging, and where the small member base renders an "arms-length" complaints and discipline process problematic.

Summary:

These proceedings present a detailed assessment of the change drivers that are having an impact on the management of the cadastre and the profession of land surveying in Canada. It is important to note that these change drivers are already in motion and their influence is already being felt today.

The following strategic objectives have emerged as priorities to ensure the future effectiveness of the land surveying profession and encourage collaboration throughout the land administration community in Canada to meet the needs of society in the emerging digital world:

1. Build a land administration community for the digital society;
2. Develop consensus on a precise, real-time positioning service for Canada;
3. Ensure the most effective and efficient self-regulating structure for the land surveying profession in Canada;
4. Communicate the role of the land surveying profession in Canadian society; and
5. Ensure that the competency profile of the land surveying professional in Canada continues to meet the evolving needs of society.

Recommendations and Next Steps:

1. **That a national task force be struck to develop a strategic roadmap for the realization of the next generation of integrated digital land survey and registry systems infrastructure that will be required to underpin and enable effective and responsive land information management in support of Canada's evolving social, environmental and economic priorities and the needs of society in the emerging digital world.**

Context - Building a land administration community for the digital society. The ultimate goal of this recommendation is to initiate a collaboration across the broader land administration community in Canada, leading to the articulation of a cohesive vision for the next generation of integrated digital land information management systems and infrastructure. This recommendation envisions a national dialogue sponsored by Natural Resources Canada and bringing together the survey, registry, planning and geo-spatial information communities to develop a high-level conceptual design and implementation roadmap for a national land information management infrastructure that can effectively leverage the digital revolution to support Canada's priorities and social needs. This framework should be developed such that an

overview of the Canadian model can be presented at the National Surveyors Conference / International land Administration Conference in Mont Tremblant in 2020.

2. **That Professional Surveyors Canada on behalf of the land surveying community request the federal Positioning, Navigation and Timing Board to create a working group to develop a Canadian model for a national civilian service to deliver authoritative real-time, high precision, Position, Navigation and Timing (PNT).**

Context – Developing consensus on a real-time PNT service for Canada. Real-time precise positioning at the one to three-centimetre level, is required by Canadian users to support land development, engineering and scientific applications, as well as stimulate location-based innovation. Precise timing is required for numerous applications including managing banking transactions and the nation's energy grids. This service is essential in large municipalities to support smart cities development, in agricultural and natural resource development regions to support effective land management, for major infrastructure development projects such as highways and railroads, and to support civilian emergency response. While Professional Surveyors Canada would initiate the request, the proposed working group is to be representative of key users of the proposed civilian service and will bring together government regulators with industry service providers and technical end-users from the survey, geomatics, engineering and scientific/academic communities. A principal goal is to develop a sustainable delivery model for a real-time, high precision enhanced GNSS civilian positioning service across Canada.

3. **That Canadian land surveying regulatory professional associations assemble a professional self-regulation task force with representatives from each jurisdiction to review the status of land surveying professional regulation across the country with a view to improve sustainability, effectiveness and efficiency.**

Context – Ensuring the most effective and efficient self-regulating structure for the land surveying profession in Canada. A key goal of this recommendation is to enhance existing collaborative initiatives among the land surveying associations within the mandate of self regulation encompassing such activities as professional registration, continuing professional development, practice review, and complaints and discipline. As a first step, the proposed task force will review the possibilities of levering the existing national initiatives that are in place as well as opportunities for regional collaboration. All with a view to sustainably provide and communicate transparent, fair and optimized approaches to regulating the profession with the ultimate goals of delivering land tenure security and protection for the Canadian public.

4. **That Professional Surveyors Canada lead the development of a comprehensive communications and advocacy plan, to communicate the importance of maintaining and evolving our national land survey infrastructure as a foundation for effective land information management supporting the social, environmental, and economic priorities of Canadians at all levels of government, and to communicate the legislated role of the land surveying profession in managing that infrastructure and in providing authoritative survey and land information administration services to the public.**

Context – Communicating the role of the land surveying profession in Canadian society: Canada's survey infrastructure and boundary fabric are foundational to our system of property rights and land tenure, and fundamental to our ability to manage restrictions and responsibilities relating to land use and stewardship. Canada's land survey professions have been assigned key responsibilities under legislation for the management of our survey systems and for the delivery of effective and reliable survey related services, on behalf of, and for the benefit of, the public.

Currently, the land survey profession may be the only major profession that has not created an arms length body to advocate to government on matters of policy within their professional scope and legislated responsibility to the public.

Advocacy by the land surveying profession is intended to do two things –

(i) to promote the effective and sustainable management of our national survey and registry systems in the best interest of the public, and

(ii) to communicate to all levels of government the role and responsibility that the land survey profession has under legislation to maintain an effective and publicly accessible survey infrastructure, and to deliver authoritative survey products and information to the public.

Our responsibility to advocate is essential to enabling effective decision making at all levels of government, by providing a clear view of the land surveyor's role and how the profession supports the objectives of Canadian society. Examples range from the profession's contribution to reconciliation with Canada's Indigenous peoples, to the sustainable development of land and natural resources, to including sub-surface utility information in the public survey record, to supporting natural hazard mitigation and emergency response, and to how these activities link to addressing climate change, public safety and economic development and many other challenges facing Canadian society.

As most professions have noted, advocacy communications are best conducted at arms length from our legislated professional bodies, whose principal role is to regulate the profession and practice of land surveying. In this respect, Professional Surveyors Canada has no formal connection to any of the legislated professional regulatory bodies in Canada and is well suited to this role. Rather, PSC is a not-for-profit association representing individual land surveyors across Canada and was created to raise awareness across government and the public, of the fundamental importance of Canada's survey systems and land survey profession to protecting property rights and ensuring effective land administration.

5. **This recommendation has the following two components, flowing from the working group research and the discussion groups at the National Surveyor's Conference:**

i) That the Canadian Board of Examiners for Professional Surveyors (CBEPS) lead the development of a competency profile for the future professional land surveyor in Canada, based on the evolving needs of society and the profession's key role in facilitating land administration and geospatial knowledge management; and

ii) That based on this future profile that the syllabus for candidates be reviewed and re-designed to ensure that land surveying professionals have the ability to effectively meet the needs of society going forward. The re-design is not to add more material or create barriers to enter the profession, but is to re-balance the content and academic requirements based on the domestic and global, technical and societal, context of the profession.

Ideally, CBEPS would Investigate the appropriate balance of conventional and on-line course delivery combining the best available content from academic institutions across Canada.

Context - Ensuring that the competency profile of the land surveying professional in Canada continues to meet the evolving needs of society.

Maintaining competency is a fundamental component of change management for all professions. All must adapt to maintain relevance in an environment where rapid and disruptive change is the norm.

Land surveying professionals are well positioned to provide the connection from the virtual to the ground where human activity and interaction takes place. Understanding a jurisdiction's history, jurisprudence, statutory and administrative frameworks provides essential local knowledge for land development projects. Further, as recognized experts in geospatial data management combined with practical and common-sense approaches to delivery, society has traditionally had trust in the land surveyor's ability to deliver technical excellence and legal boundary certainty.

It is expected that the traditional perception of the land surveyor as a measurement and boundary definition expert will continue to expand to encompass land administration and spatial data and knowledge management. Society will continue to recognize the land surveyor as a land administration professional that will guide clients through all facets of the land and resource development process, while protecting the public rights in land (ownership, use as well as environmental, cultural and indigenous considerations).

Success as a profession will depend on our response to society's demands for authoritative information and advice on how land can be used, developed and protected. In other words, how the rights, responsibilities and restrictions on land are managed. The land surveyor's quasi-legal role as a boundary and survey law expert will expand to encompass all aspects of the property and land use regulatory framework in Canadian jurisdictions.

As summarized by Izaak de Rijcke after the morning sessions:

“1) Competency profiles will change as a result of technology but the question is how? This challenge is answered by not only focusing on competency in the sciences. With respect our profile will increasingly include history, sociology, law and people skills.

2) Maintaining competency levels and topical areas that are public needs.”

Further, from the discussion groups: “A national group should be empowered to find commonality of the competency profile for the future surveyor, connect with regional groups, communicate a future vision to the land administration community and use this as a base to attract people to the profession.

Resources need to be pooled to have the most impact, and there is a need to learn from other professions. There needs to be consistency and reciprocity between jurisdictions and practice review should focus on education. Innovative methods such as using crowdsourcing should be considered for assessing and developing competency needs.”

There is therefore a need to develop the future competency profile of the land surveying professional as a means to continue to effectively serve society, to attract new members to the profession and ensure that continuing professional development efforts are well-aligned and effectively support change management and continuing relevance for the profession.

1.0 Introduction

Land administration systems and their management are undergoing significant change in Canada and around the world. The drivers of that change are many and powerful. How each country adapts will impact their ability to compete and succeed in the emerging digital world. These changes include the rapid advance of location-based technology, implementation of on-line systems and an evolving public perception of expertise and a seemingly continual scrutinization of authoritative institutions including the traditional professions such as land surveying.

Internationally, the impact of these drivers of change has led to a strategic re-envisioning of the management and delivery of cadastral systems and the evolving role of government, professional bodies, and the geo-spatial industry. Within Canada, a diverse range of change initiatives are underway reflecting the regional nature of our property rights legislation, land survey systems and registration regimes. What appears to be lacking is a national collaborative dialogue. A dialogue that engages the community of professionals involved in delivering the cadastre in Canada in a discussion of how best to work together to ensure that our cadastral systems evolve to meet the challenge of change.

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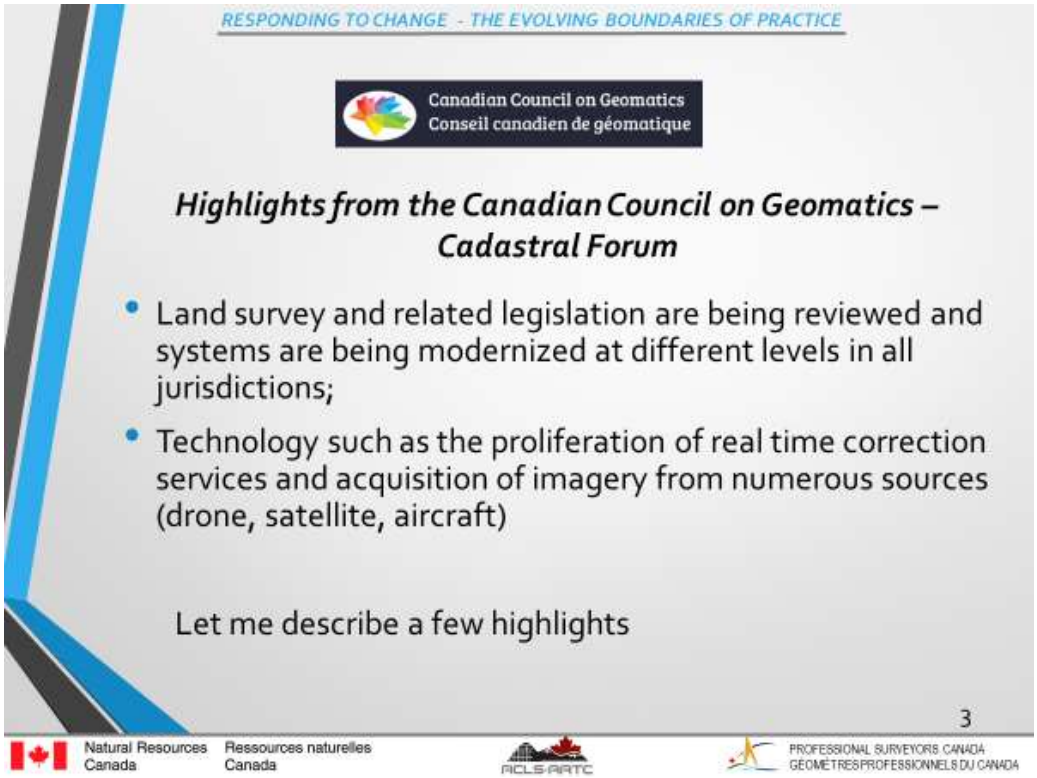
Working groups were assembled early in 2019 to discuss the key changes flowing from technology, society and governance that are impacting the land surveying profession and the delivery of cadastral systems in Canada. The workshop presented the results of these discussions and research along with an overview of international developments.

The primary goal for the workshop was to provide a first step towards development of a national strategy that would help position the land surveying profession for the future. The ultimate objective would be to open a national and *pan-land administration community* dialogue on the future land survey systems that will most effectively support modern land administration regimes.

2.0 Canadian Scan – Jean Gagnon, Surveyor General of Canada Lands



Some highlights from the Canadian Council on Geomatics – Cadastral Forum

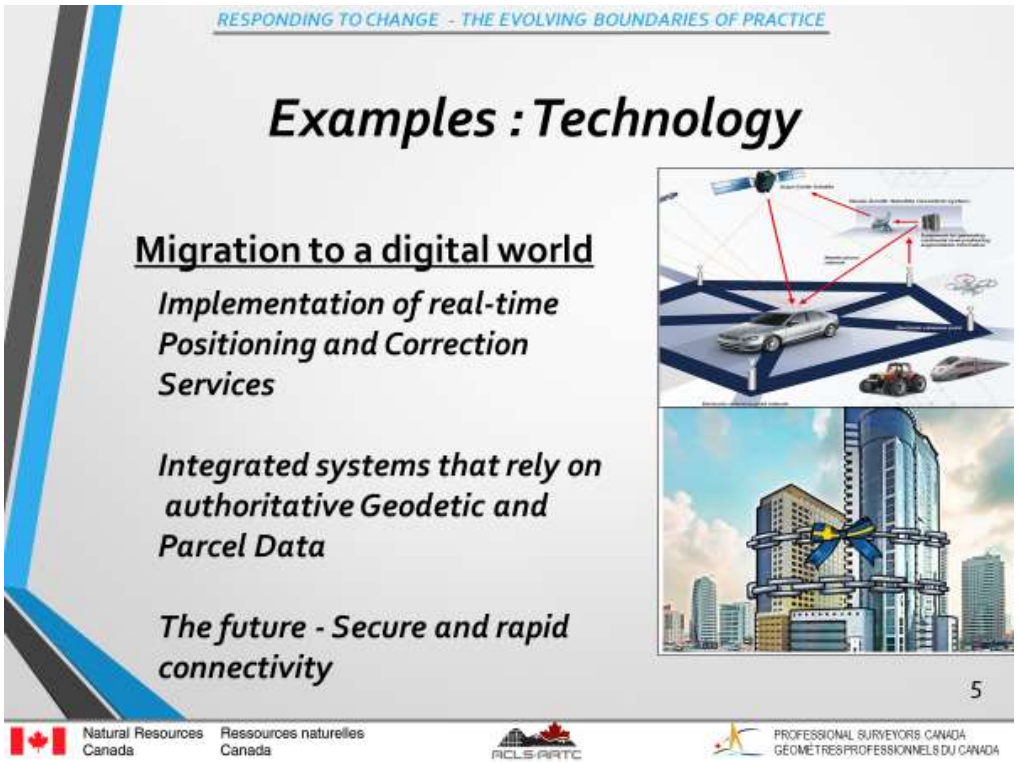
Newfoundland and Labrador – implementation on Land Gazette as a mandatory land survey information system;
Nova Scotia and PEI – Operation of province wide Active control systems;
New Brunswick – Exploring a public private partnership for location-based services;
Maritimes - Using drones to monitor coastal erosion, monitoring construction projects and numerous other applications;
Quebec – Completing the cadastral modernization, positioning the province and the profession for the future;
Ontario- expanded uses of imagery including LIDAR for boundary determination. Exploring licensing for practitioners in the expanded profession;
Manitoba – Exploring innovative ways to survey Crown lands;
Saskatchewan- Implementing on-line plan submission and georeferencing;
Alberta – Implementing a hybrid (coordinates/monuments) cadastre for public lands;
BC – Continuous improvements to ParcelMap BC and modernizing Survey Plan Services;
Nunavut – Implementing location-based map staking;
Yukon – Supporting land titles modernization;
NWT – Making thematic digital tools available to the general public.

In Canada we are seeing an explosion in the application of location-based technologies, driven by innovations such as autonomous vehicles, drone-based imagery and delivery systems, and advances in spatial data management.

Examples include: on-line service offerings for land transactions and land administration, implementation of real-time precise positioning infrastructure and a whole new industry providing photogrammetry from drone platforms.

Society: It is imperative that the land surveying profession maintain and build trust in the public if we are to succeed going forward.

Governance and Policy: The land surveying profession must evolve to support emerging systems and support government and society as they strive to address the challenges facing Canadians.



Active Control Systems

Nova-Scotia/ PEI/New Brunswick and many others are under development, particularly in major urban centres. But the data may or may not be considered authoritative and acceptable for cadastral or other applications that rely on common standards and reliability.

The future of integrated systems, particularly smart cities will require an authoritative digital cadastre, based on a reliable and consistent geodetic foundation.

Authoritative Parcel Data Sets

Canada Lands/Quebec/Ontario /Saskatchewan/British Columbia/
Alberta and the major municipalities….
But is there a consistent framework to integrate land surveyors work
to continually improve the data set?

On-Line Service Delivery

On-line service delivery through various forms of organizational and corporate structures are being implemented in almost all jurisdictions with a continuing need to improve the timeliness of transactions.

Examples: Society

Is there a trend towards more government participation in regulation of the professions?

For example: British Columbia introduced the - **Professional Governance Act**

Goal: "Qualified professional legislation to restore public trust in natural-resource decision-making"

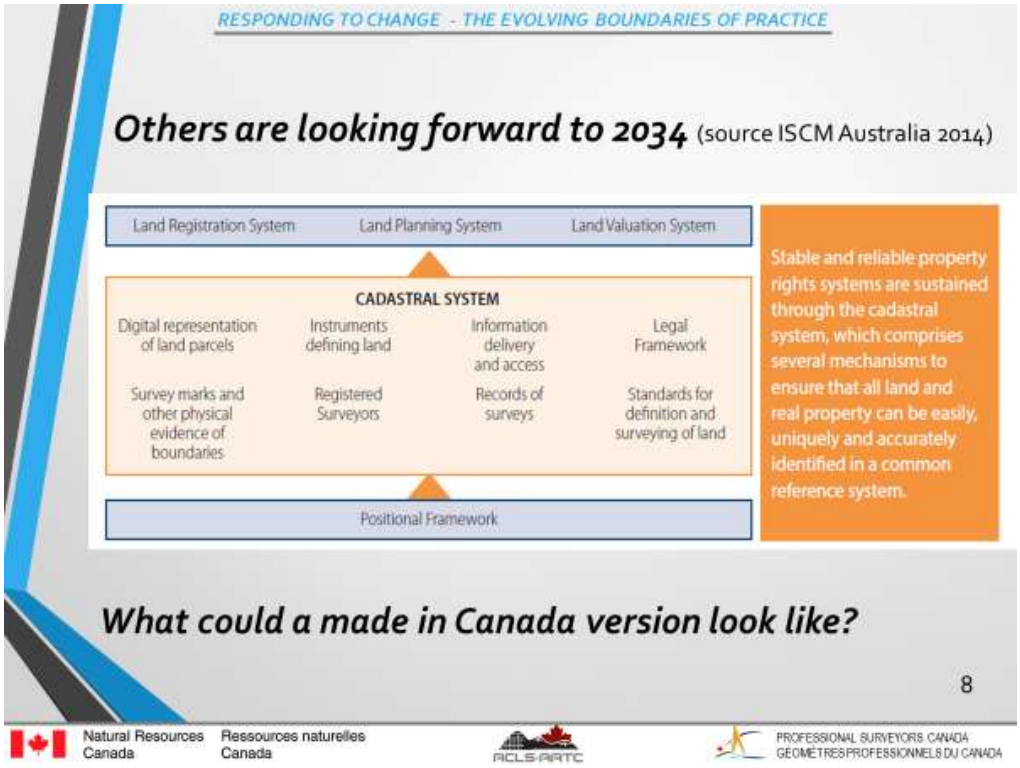
https://news.gov.bc.ca/releases/2018ENV0078-002045

Examples: Society and Governance

Technological advances and changes in society's needs and perspectives will inform changes to legislation.

Does the role of the land surveying profession in government and in the land administration regime need to be redefined to reflect the changing needs of society?

To meet these needs, what would the future competency profile for the professional land surveyor look like?



A number of countries are using the FIG models to develop strategic plans for modern and competitive land administration systems. All are based on a sound positional framework and authoritative cadastral data. Perhaps its time for Canada to start thinking about a national approach to the development of the land survey foundation of cadastral systems?


RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Some key considerations for the workshop
1) Precise positioning and authoritative parcel data will be the foundation for the future digital land administration world.
2) For professions to remain effective, they will need to build and maintain the trust of Canadian society.
3) How can the profession effectively collaborate with our colleagues in the land administration community (industry, academia, government) to collectively develop and communicate a compelling vision for the future?
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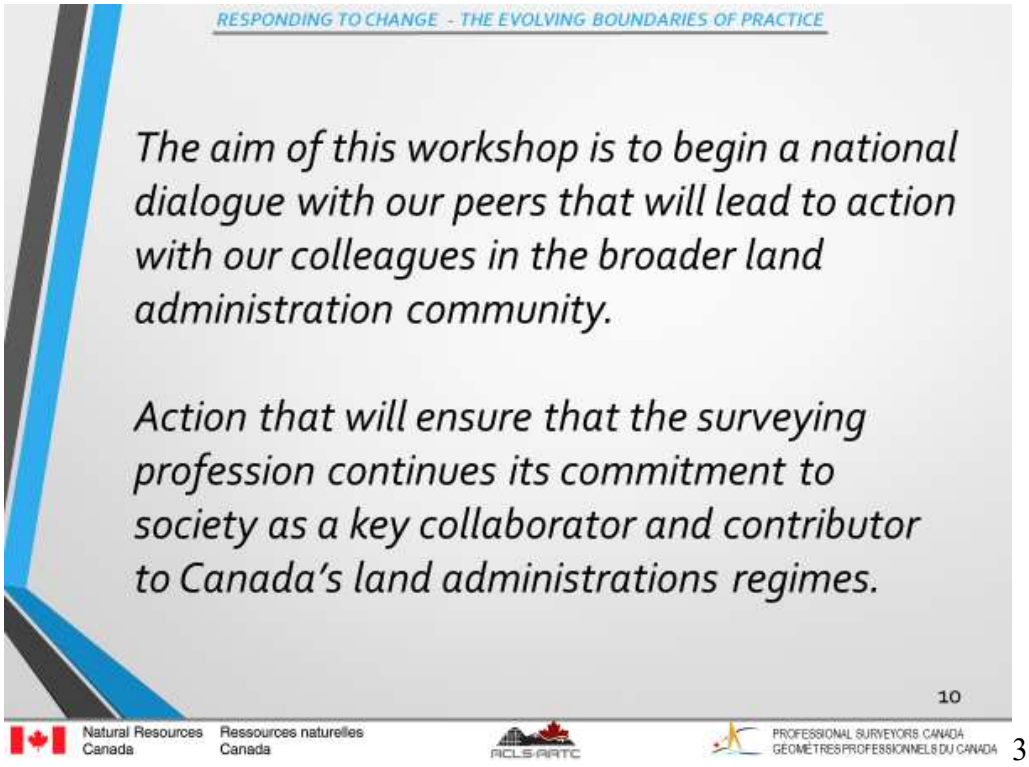
RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
The aim of this workshop is to begin a national dialogue with our peers that will lead to action with our colleagues in the broader land administration community.
Action that will ensure that the surveying profession continues its commitment to society as a key collaborator and contributor to Canada's land administrations regimes.
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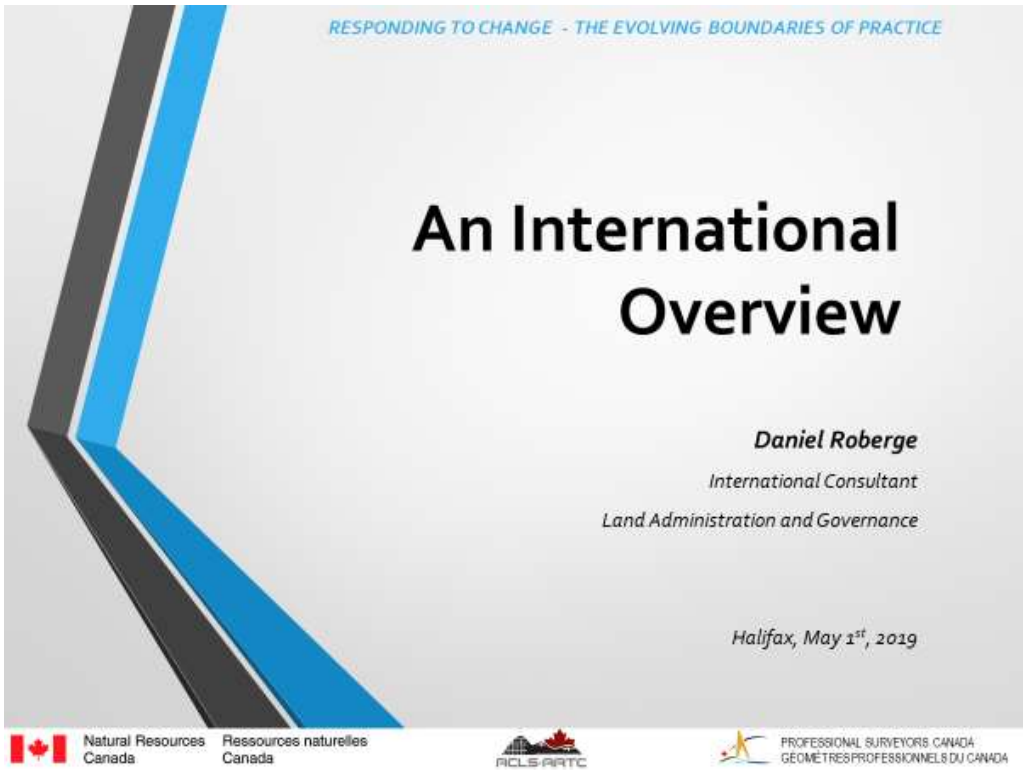
3.0

3.0 International Scan – Daniel Roberge



Society: Global Trends

- Poverty reduction
- Urbanization
- Population growth
- Rising Demand for Land
- Climate Change

= > Driving forces shaping the land agenda

RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE

Society: Global Trends – Poverty reduction

Since 1990, the number of poor people living on $1.25 per day was reduced by 700 million, mostly in China and Asia.

However, 1.2 billion people are still living in extreme poverty.

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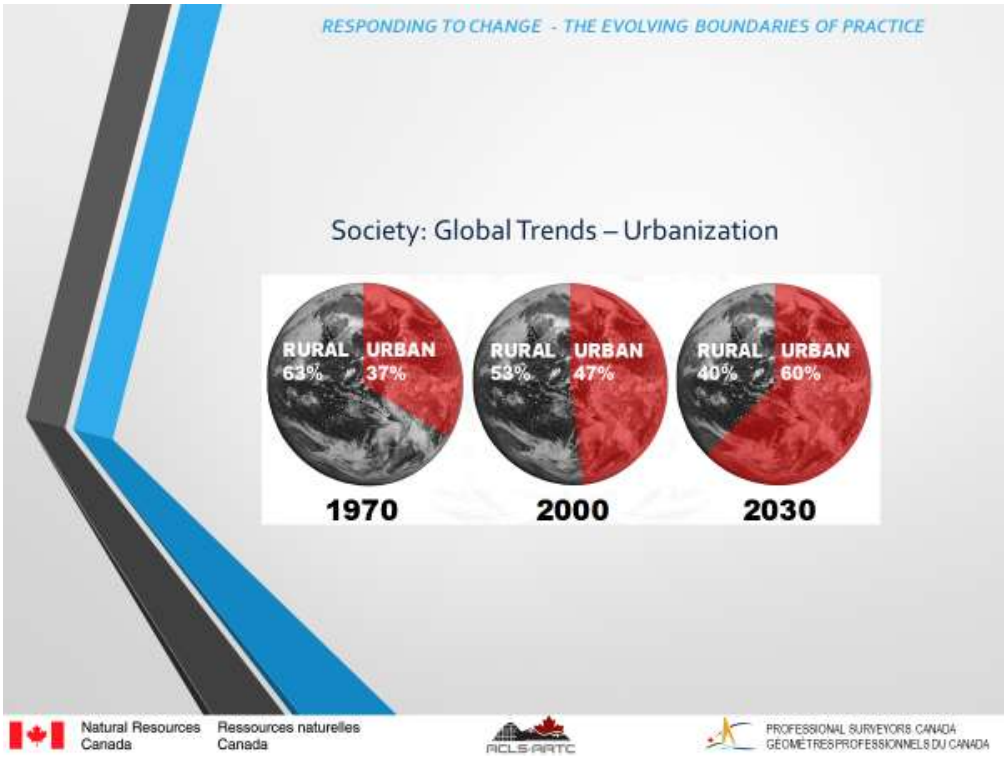
RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Society: Global Trends – Urbanization
RURAL 63% URBAN 37%
RURAL 53% URBAN 47%
RURAL 40% URBAN 60%
1970
2000
2030
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RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Society: Global Trends – Urbanization
80%
of global economic activity generated in cities – mostly in industry and services benefiting from density
2 billion
additional residents in cities between 2000-2030
1 billion
live in slums today to be near jobs and opportunity
1½ billion
exposed to cyclones and earthquakes in large cities by 2050 (up from 680 million 2000)
1.2 million km²
of new urban built up area by 2030—equivalent to a whole new world; rapid spatial expansion makes it difficult to provide services, houses, and transport
80%
of Greenhouse Gas emissions +
70%
of energy consumption is attributable to cities.
THE EVIDENCE HIGHLIGHTS URGENCY FOR ACTION
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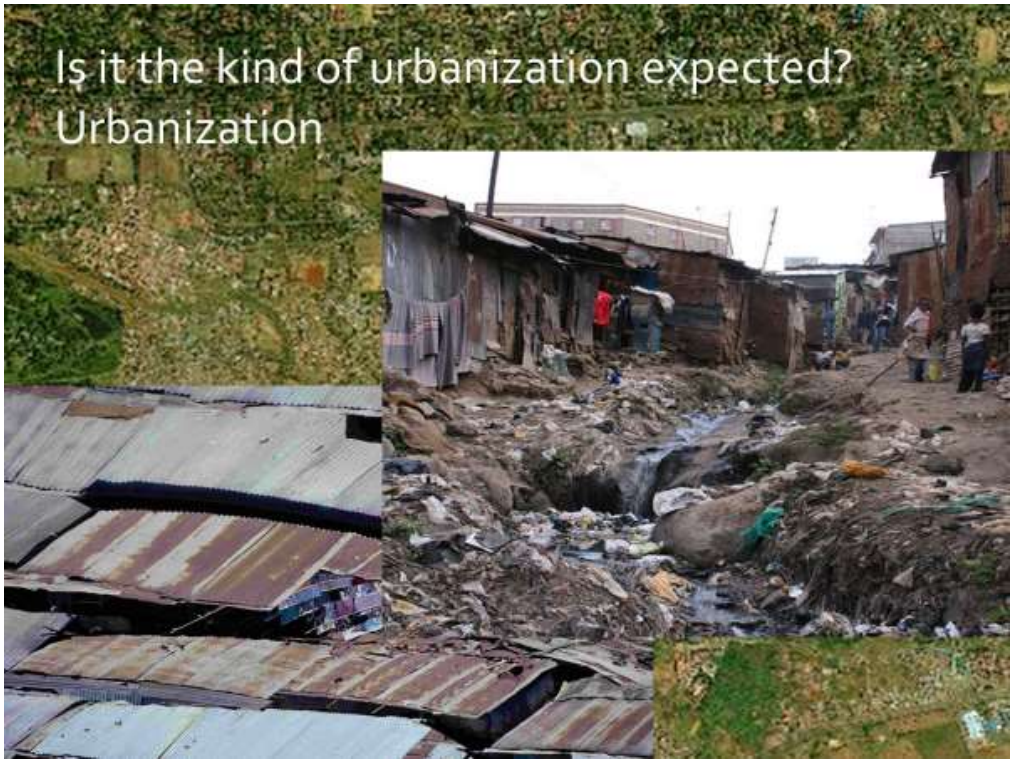
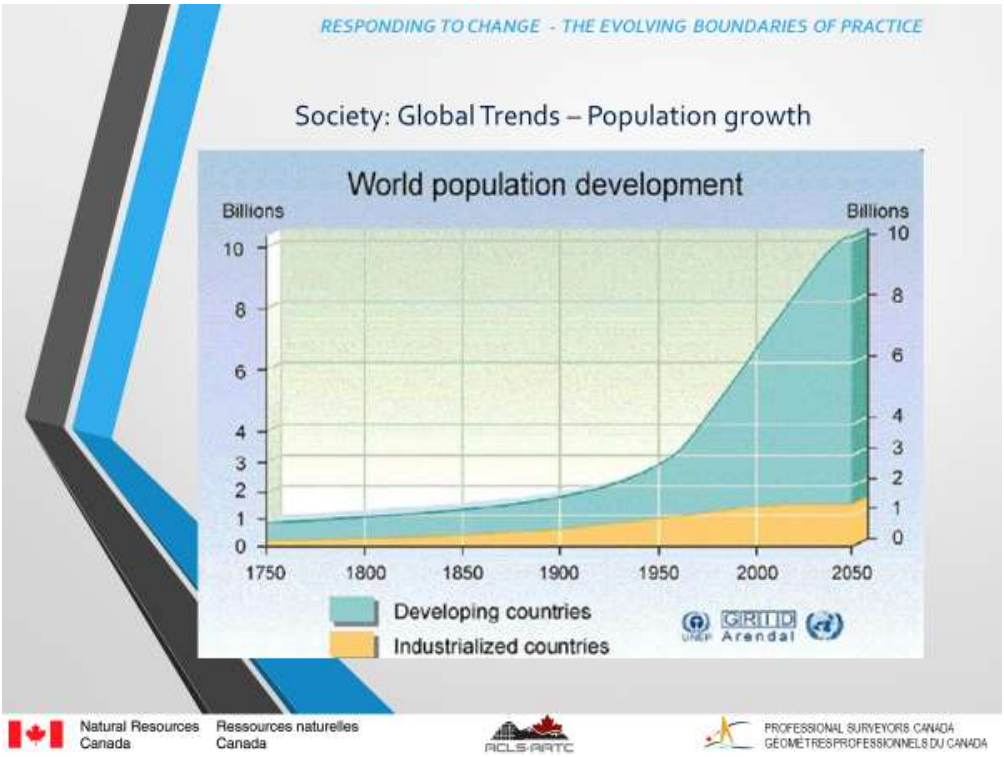

Is it the kind of urbanization expected?
Urbanization


RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Society: Global Trends – Population growth
World population development
Billions
Billions
10
8
6
4
3
2
1
0
1750
1800
1850
1900
1950
2000
2050
Developing countries
Industrialized countries
GRID Arendal
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Society: Global Trends – Population growth
=> raising demand for food

Population increase of 2 to 3 billion, changing diets and other uses means agriculture production must grow 60% by 2050

Need another 2 billion tons of cereals

Need another 200 million tons of meat

Need another 130 million tons of oilseeds

RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE

Society: Global Trends – Population growth
⇒ raising demand for food
⇒ raising demand for land

High food prices associated with **rising demand for land**

Provides opportunities for increased investment, but also **"land grabbing"**

Secure tenure is critical

But the **governance of land tenure is often weak,** the land sector being the 3rd most corrupted after police and tribunals (Transparency International)

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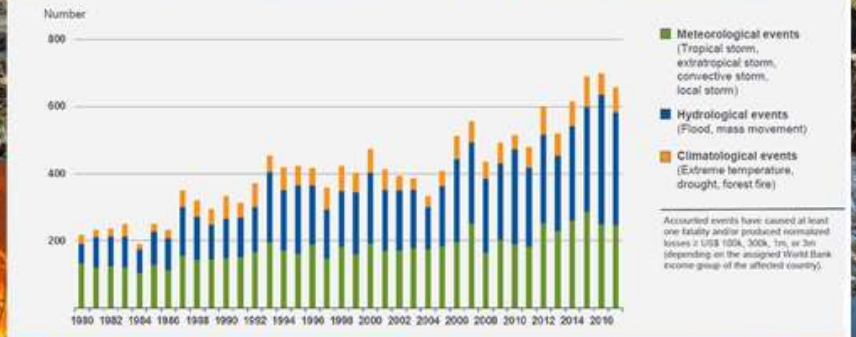
Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests

Endorsed by the Committee on Food Security (CFS) in 2012.

- Guiding principles of responsible tenure.
- Legal recognition and allocation of tenure rights and duties.
- Transfers and other changes to tenure rights and duties (incl. markets and investments).
- Administration of tenure.
- Responses to climate change and emergencies.
- Promotion, implementation, monitoring and evaluation.

RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE

Society: Global Trends – Climate change and natural disasters



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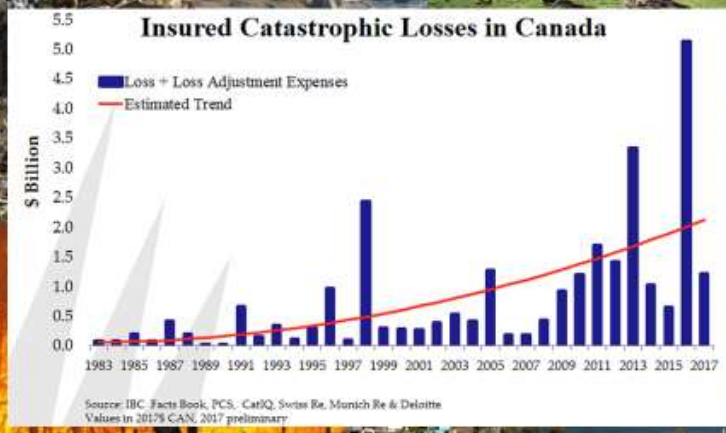
Society: Global Trends – Climate change and natural disasters



RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE

Society: Global Trends – Climate change and natural disasters

Two examples:

- Vietnam CC scenario: To 2100, sea level rise of 1m, 40% the Mekong Delta area and 20% of Ho Chi Minh city submerged: 7 million people to be displaced.
- Maldives: With its highest point at 2,4m above sea level. The government envision to move out the whole population if engineering solutions cannot be found.

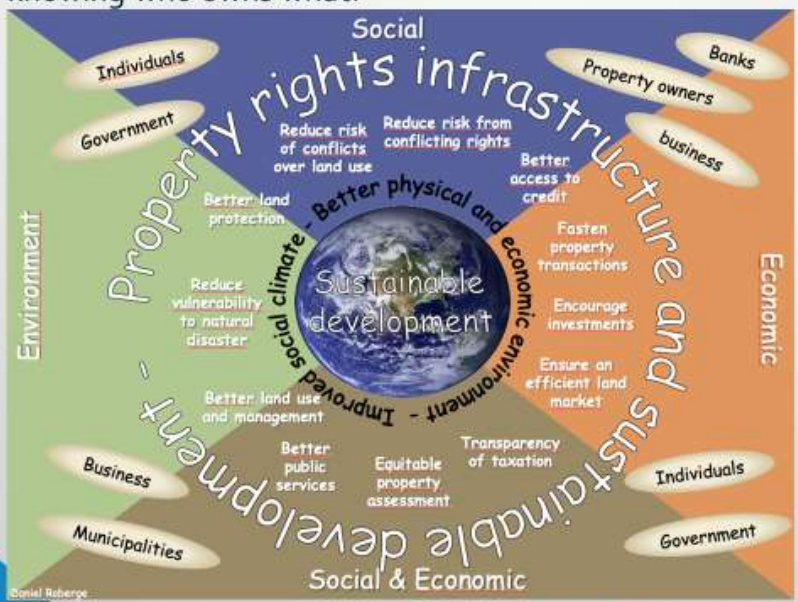
Society: Global Trends – Climate change and natural disasters

Canadian examples

Historical floodings, Spring 2019
Manitoba, Ontario, Québec, New-Brunswick

Wildfires, Summer 2016
Fort McMurray, Alberta

Global Challenges cannot be managed properly without knowing who owns what?




RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Global Challenges cannot be managed properly without knowing who owns what?
Social
Individuals
Banks
Property owners
Government
business
Reduce risk of conflicts over land use
Reduce risk from conflicting rights
Better access to credit
Better land protection
Better physical and
Environment
Economic
In Canada, we have 14 different land rights infrastructures, not interconnected.
Question: Could we think about putting in place a common platform to make this information easily available at one place, without interfering with Federal-Provincial-Territorial jurisdictions?
Business
public services
Equitable property assessment
Individuals
Municipalities
Government
Social & Economic
Daniel Roberge
17
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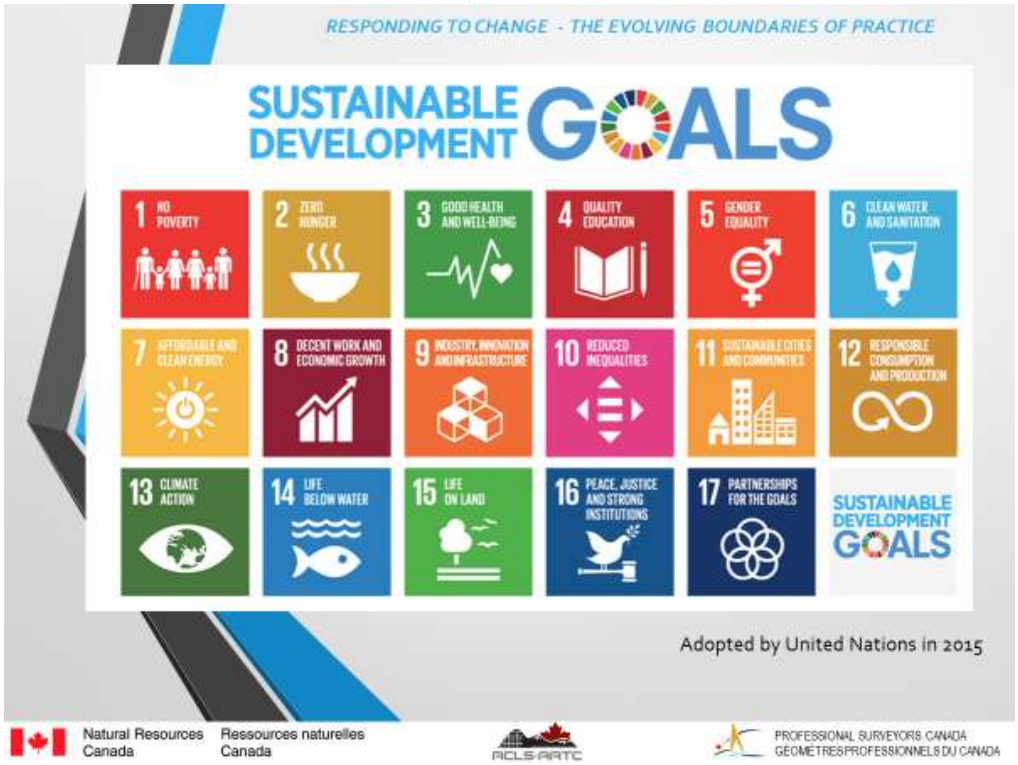
RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS
Adopted by United Nations in 2015
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Sustainable Development Goals

Unlike the Millennium Development Goals which were silent about land tenure security, the SDGs emphasize the importance of land in poverty reduction:

1.4 By 2030, ensure that **all men and women**, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, **ownership and control over land** and other forms of property [...]
Current estimate: 25-30% globally and 1-10% in several African countries

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, **including through secure and equal access to land** [...]

5.a Undertake reforms to give women equal rights to economic resources, as well as **access to ownership and control over land and other forms of property** [...] Current estimate: 2-3% of land rights are held by women.

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STAND FOR HER LAND
ABOUT THE CAMPAIGN
SUPPORTERS
NEWS & EVENTS
RESOURCES
Her rights.
Her land.
A better future for all.
Help make land rights a reality for millions of women around the world.
GLTN
Habitat for Humanity
Landesa
THE WORLD BANK
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Ressources naturelles Canada
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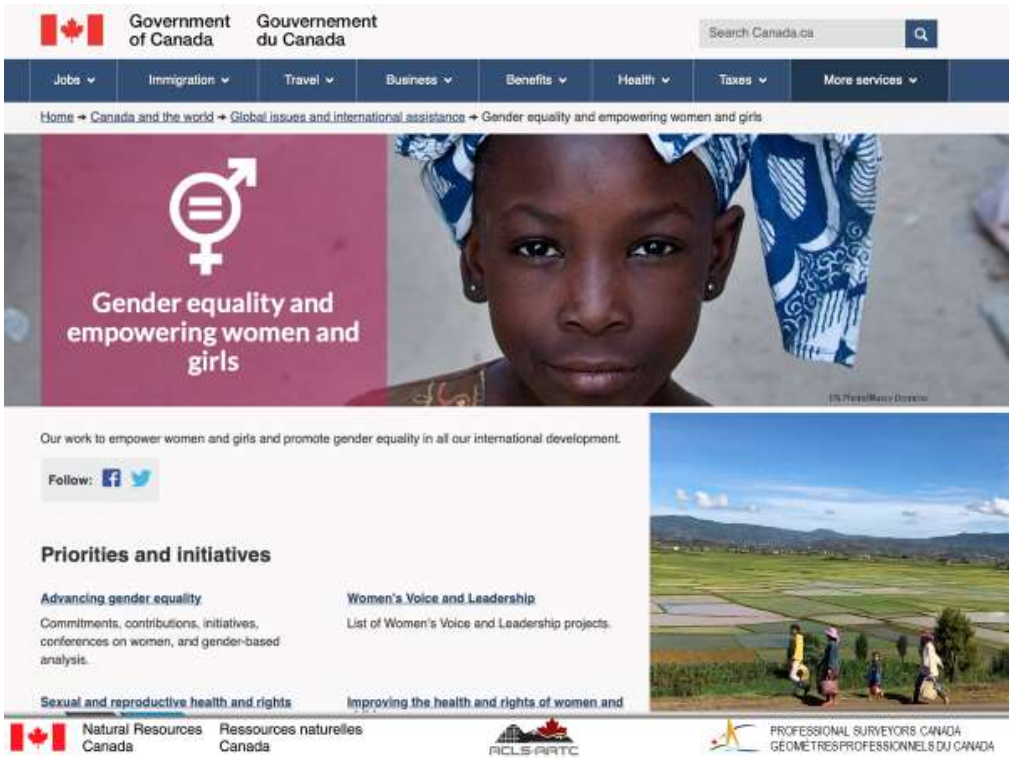
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Gouvernement du Canada
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Jobs
Immigration
Travel
Business
Benefits
Health
Taxes
More services
Home → Canada and the world → Global issues and international assistance → Gender equality and empowering women and girls
Gender equality and empowering women and girls
Our work to empower women and girls and promote gender equality in all our international development.
Follow:
Priorities and initiatives
Advancing gender equality
Commitments, contributions, initiatives, conferences on women, and gender-based analysis.
Women's Voice and Leadership
List of Women's Voice and Leadership projects.
Sexual and reproductive health and rights
Improving the health and rights of women and
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Technology:

- Changes and improves the way we are managing land
- Provides great opportunities to accelerate development and address global, national and local challenges

Aerial and satellite imagery

Indoor positioning

UAVs

Big Data Analysis, Cloud Computing, Machine Learning

3D/4D visualization

Technology: Universal Cloud Based Land Registration System?

- Question: Why international organizations and other stakeholders involved in strengthening land administration would not combine their efforts to develop and make available for developing countries a common platform for property registration?
- This "back office" would facilitate the work of National Land Agencies and speed-up the "Global cadastration"

PKI: Public Key Infrastructure


RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Technology: Blockchain
Blockchain is essentially an online ledger that manages recorded transactions. The ledger is distributed, so anyone connected to the network has a copy of it.
Blockchain technology compiles records of transactions into systems called blocks, which are secured cryptographically and contain a digital fingerprint of past and present records.
"Blockchain could cut the time it takes to buy a house from months to weeks and, if applied globally, could result in an annual saving of about $160 billion."
Instant Property Network
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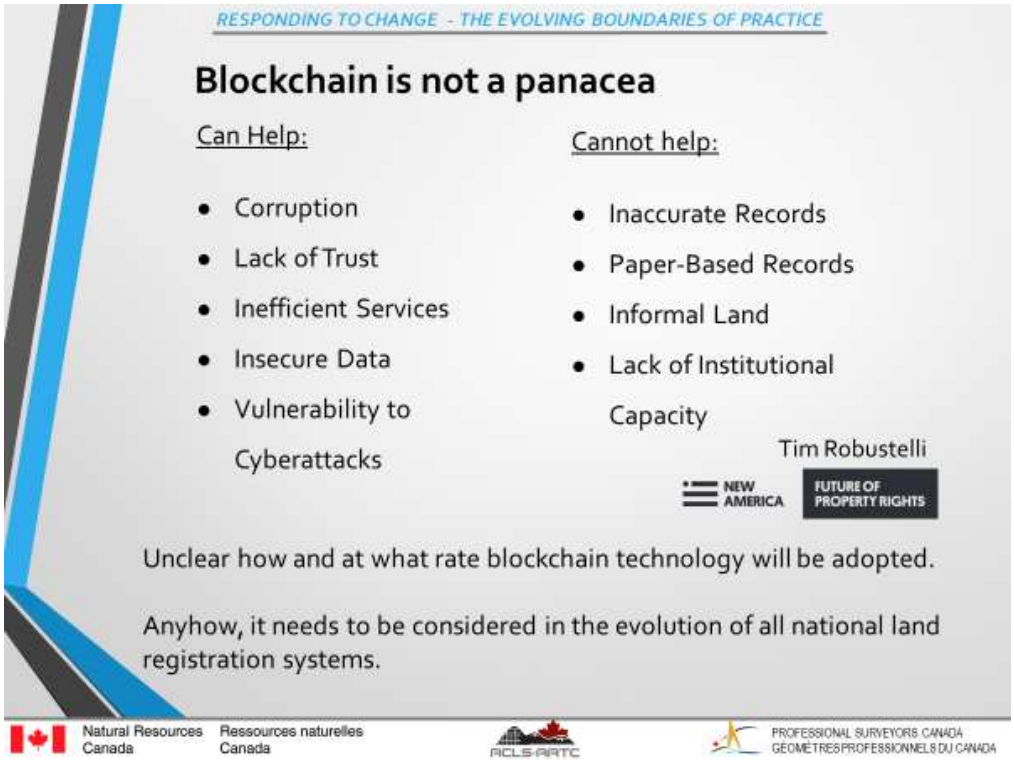
RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Blockchain is not a panacea
Can Help:
Corruption
Lack of Trust
Inefficient Services
Insecure Data
Vulnerability to Cyberattacks
Cannot help:
Inaccurate Records
Paper-Based Records
Informal Land
Lack of Institutional Capacity
Tim Robustelli
NEW AMERICA
FUTURE OF PROPERTY RIGHTS
Unclear how and at what rate blockchain technology will be adopted.
Anyhow, it needs to be considered in the evolution of all national land registration systems.
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Technology: 3D Cadastre

FIG

FIG joint commission 3 and 7 Working Group on 3D Cadastres

Home
Objectives
Topics
Scope
Realization
Timetable
Participants
Organization
Literature

Workshop 2018
Workshop 2016
Workshop 2014
Workshop 2012
Workshop 2011
Workshop 2001

News

FIG Publication Best Practices 3D Cadastres - Extended version, Editor: Peter van Oosterom, International Federation of Surveyors, Copenhagen, Denmark, March 2018 (ISBN 978-87-92853-64-6, ISSN: 2311-8423)

FIG Publication 72 Best Practices 3D Cadastres, Editor: Peter van Oosterom, International Federation of Surveyors, Copenhagen, Denmark, November 2018 (ISBN 978-87-92853-83-7 /ISSN 1018-6530 printed, ISBN 978-87-92853-84-4 / ISSN 2311-8423 pdf)

Introduction

In the past decade various activities have been conducted related to 3D Cadastres. The start of the international awareness of this topic was marked by the first Workshop on 3D Cadastres (sponsored by FIG commissions 3 and 7), organized by Delft University of Technology in November 2001. This was followed by virtually a session at every FIG working week and congress afterwards (stimulated by the 2002-2006 FIG working group on 3D Cadastres). Within cadastral organizations this was paralleled by on-going developments at Cadastral organizations in many countries to provide better 3D-support. The increasing complexity of infrastructures and densely built-up areas requires a proper registration of the legal status (private and public), which only can be provided to a limited extent by the existing 2D cadastral registrations. Despite all research and progress in practise, no country in the world has a true 3D Cadastre, the functionality is always limited in some manner; e.g. only registering of volumetric parcels in the public registers, but not included in a 3D cadastral map, or limited to a specific type of object with ad hoc semi-3D solutions; e.g. for buildings or infrastructure. At the FIG Congress in April 2010 in Sydney it was decided to form

RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE

Governance and Policy: Public Private Partenership

Case study	Driver for PPP	Technology standing
Ontario	Financial limitation to upgrade and operate existing land registry	Paper-based land registration process Partial digital databased of land records
Western Australia	Financial limitation to upgrade existing land registry	Mixed digital/paper-based land registration process Full digital databased of land records
The Philippines	Financial limitation to upgrade and operate existing land registry	Paper-based land registration process No digital databased of land records
India	Financial limitation to upgrade and operate existing land registry	Paper-based land registration process No digital databased of land records
Northern Ireland	Financial limitation to upgrade and operate existing land registry	Paper-based land registration process
NSW, Victoria	Investment in public infrastructure	Digital land registration and digital database of land records
South Australia	Upgrade the current land administration technology and investment in digital start-ups and innovation hub	Digital land registration and digital database of land records

Governance and Policy: Public Private Partenership

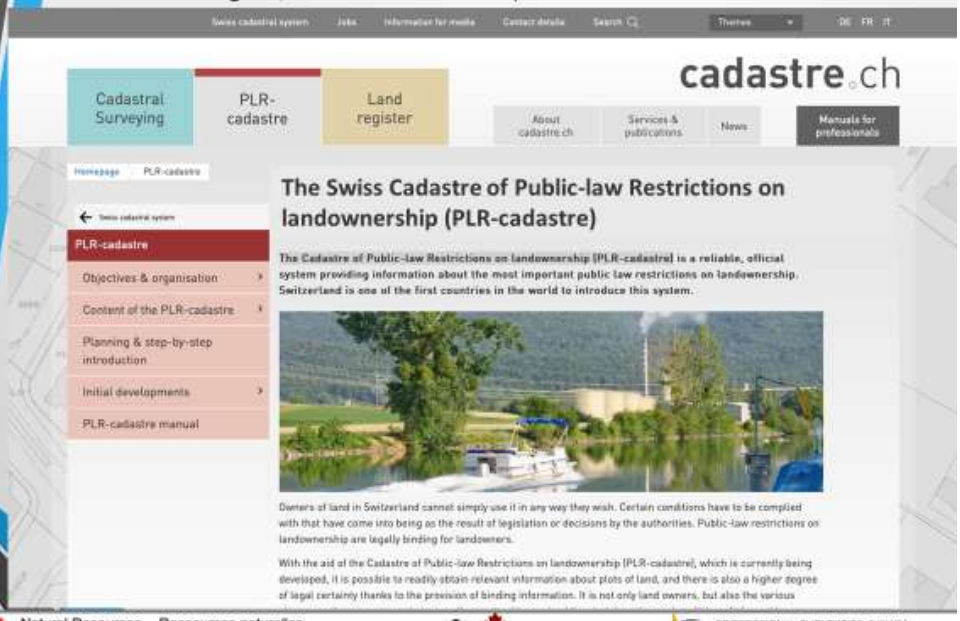
Land property registration is a profitable business as soon as the the first registration is completed in a country and the land market in place.

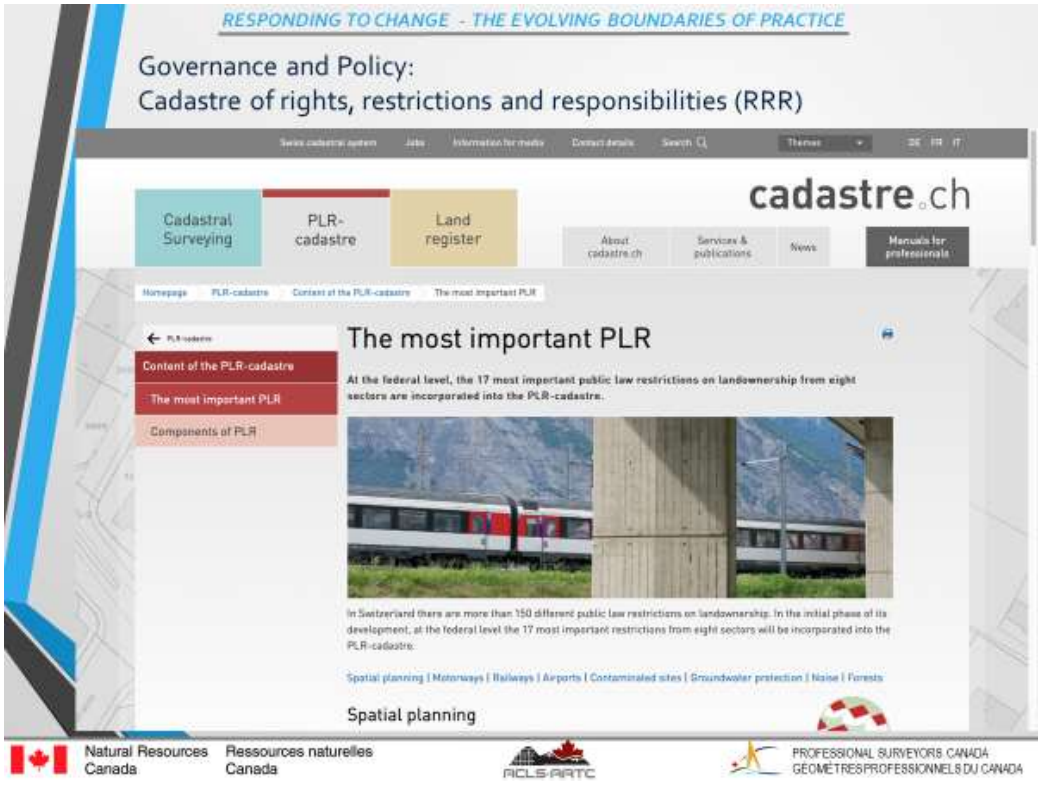
There are many ways for national land agencies to involved the private sector in land administration.

The importance is to keep the control on the ownership of the land register and its evolution.

In Quebec, the surplus generated by the land registration system made possible the realization of the Cadastre Reform Program, in which the private sector has been heavily involved in ICT and cadastral operations.

Governance and Policy: Cadastre of rights, restrictions and responsibilities (RRR)




RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Governance and Policy:
Cadastre of rights, restrictions and responsibilities (RRR)
cadastre.ch
Cadastral Surveying
PLR-cadastre
Land register
The most important PLR
At the federal level, the 17 most important public law restrictions on landownership from eight sectors are incorporated into the PLR-cadastre.
Content of the PLR-cadastre
The most important PLR
Components of PLR
Spatial planning
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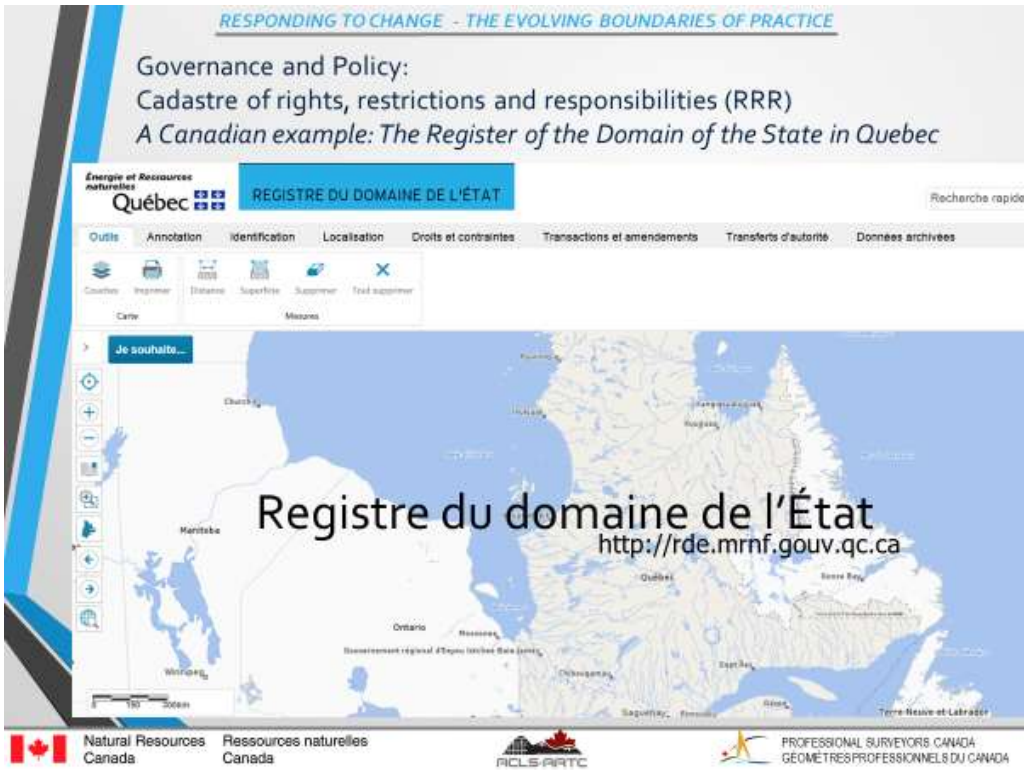
RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Governance and Policy:
Cadastre of rights, restrictions and responsibilities (RRR)
A Canadian example: The Register of the Domain of the State in Quebec
REGISTRE DU DOMAINE DE L'ÉTAT
Registre du domaine de l'État
http://rde.mrnf.gouv.qc.ca
Natural Resources Canada
Ressources naturelles Canada
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Registre du domaine de l'État

More than 230,000 rights, constraints and territories with special legal status

Delegation of the management of lands in the domain of the State
Right-of ways
Leases
Access rights to real property for Hydro-Québec
Regional parks
Easements
Transfers of administration
Aquaculture and fishery licences
Rights of use, usufruct, emphyteusis
Forest management contracts and agreements
Exceptional forest ecosystems
Shrub harvesting licence
Forest stations
Biological refuges
Exclusive hunting, fishing and trapping rights
Wildlife habitats (e.g. bird colonies)
Controlled harvesting zones (ZECs)
Experimental, teaching and research forests
Sugarbush management permit

Seabed exploration licences, seabed mining leases, exploration licences for surface mineral substances and leases to mine surface mineral substances
Mining leases and concessions
Mining exploration licences
Claims (mining sector)
Agricultural zones
Licences to explore for and leases to produce petroleum and natural gas, leases to operate an underground reservoir, authorizations to produce brine
Water power access rights and leases for Hydro-Québec
Historic districts
Recognized and classified cultural property
Historic monument protection areas
Known archeological sites and areas
National historic sites
Plant habitats for threatened or vulnerable species
Saguenay Marine Park
National parks
Aquatic, ecological or biodiversity reserves

Departments and agencies that issue rights and constraints, RDE partners

Regional operations branches of the MERN
Forêt Québec
Hydro development – MERN Energy Sector
Hydrocarbons – MERN Energy Sector
Faune Québec - MERN
Mining Sector – MERNF
Department of Culture, Communications and the Status of Women (MCCCF) – Heritage Directorate
Department of Agriculture, Fisheries and Food (MAPAQ)

Commission de protection du territoire agricole du Québec (CPTAQ)
Centre d'expertise hydrique (MDDELCC)
Ecological Heritage and Parks Directorate (MDDELCC)

http://rde.mrnf.gouv.qc.ca

Governance and Policy:
2019 Doing business report "Registering Property"

Economy	Registering Property Score	Registering Property rank	Procedures (number)	Time (days)
New Zealand	94.89	1	2	1
Rwanda	93.70	2	3	7
Lithuania	92.96	3	3	3.5
Georgia	92.86	4	1	1
Belarus	92.19	5	2	3
Estonia	91.02	6	3	17.5
United Arab Emirates	90.88	7	2	1.5
Kyrgyz Republic	90.27	8	3	3.5
Slovak Republic	90.17	9	3	16.5
Sweden	90.11	10	1	7
Canada (Based on Toronto)	79.31	34	5	4

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Russian Federation Land Registration System
2008: Merger of three Federal agencies: Cadastre, Land Registry, Cartography and Geodesy and creation of the Rosreestr Agency.
Registration time: from 30 days to 8 days (Target: 15)
Registration cost remained very low at 2,000 rubles (US $ 27).
24/7 call centers covering 9 time zones
Interdepartmental electronic interaction system for exchanging information in digital form with 40 federal departments and agencies as well as regional and municipal authorities. (8 million applications in 2015).
Services available in 3516 Rosreestr offices and 2400 multifunctional centers.
Client satisfaction: increased from 60% in 2005 to more than 90% at the end of the project (Target: 78%).
WB Doing Business Registering Property: From 51st position to 8th
35


RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Russian Federation Land Registration System
World Largest
3516
Offices
51,2 millions
documents issued / year
Databases
85 → 1
169 millions
Records (Rights and servitudes)
156 millions
Units (land parcels, buildings et appartments)
+ 30 millions
Records / year
+ 6,1 million
Units created in 2015
30,000
Employees
Adapted slide from Rosreestr
36
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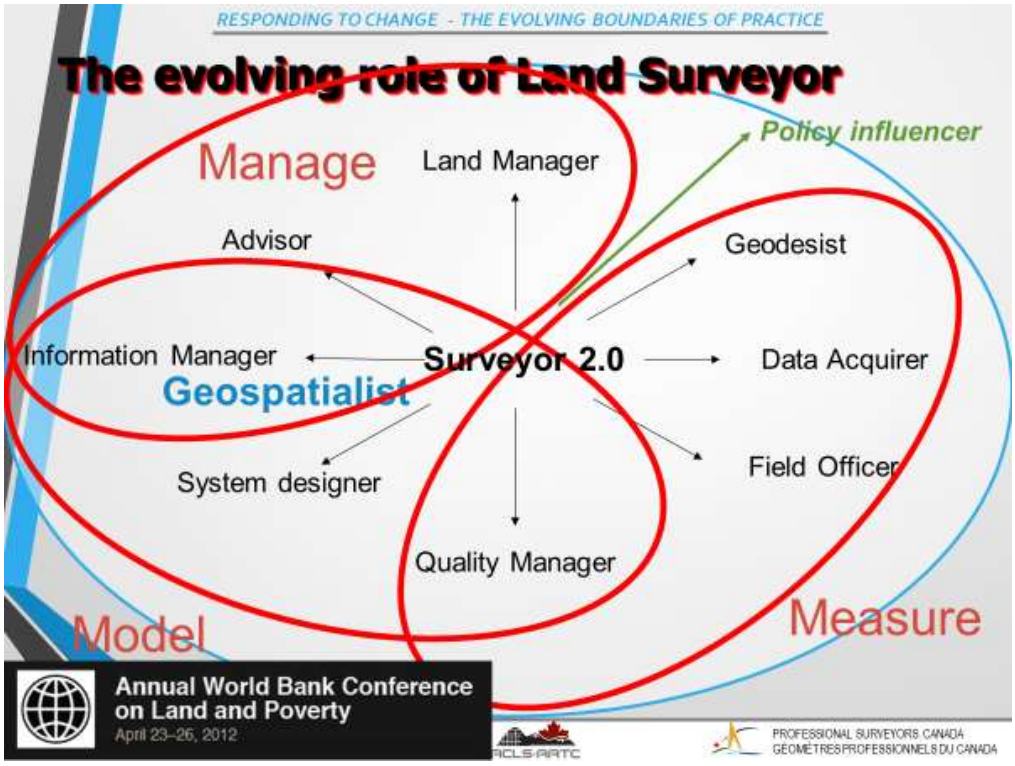
RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
The evolving role of Land Surveyor
Manage
Land Manager
Policy influencer
Advisor
Geodesist
Information Manager
Surveyor 2.0
Data Acquirer
Geospatialist
System designer
Field Officer
Quality Manager
Model
Measure
Annual World Bank Conference on Land and Poverty
April 23–26, 2012
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Thank you for your attention
roberge_d@hotmail.com
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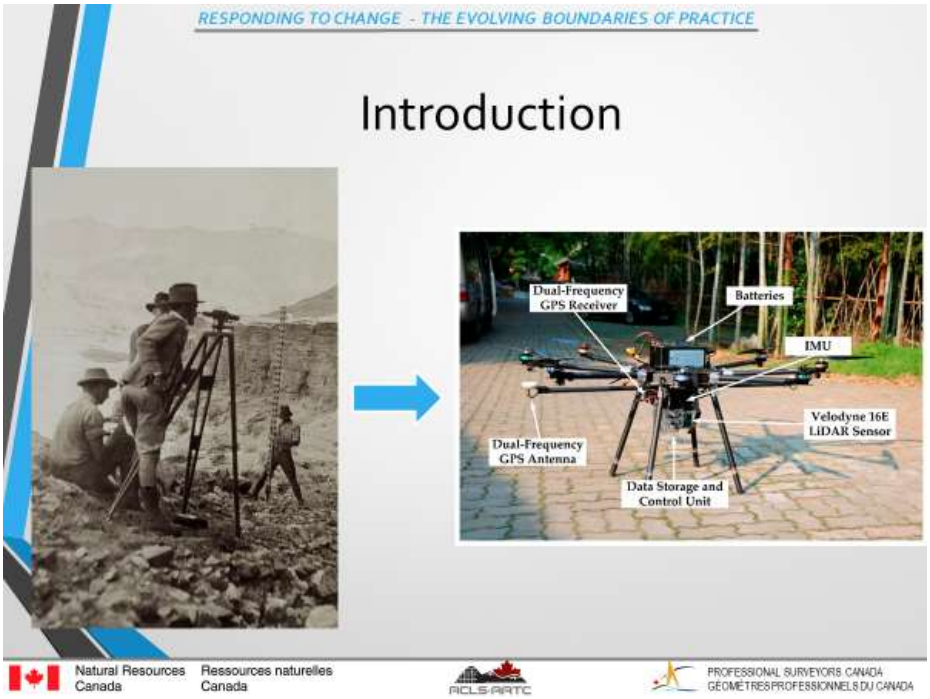
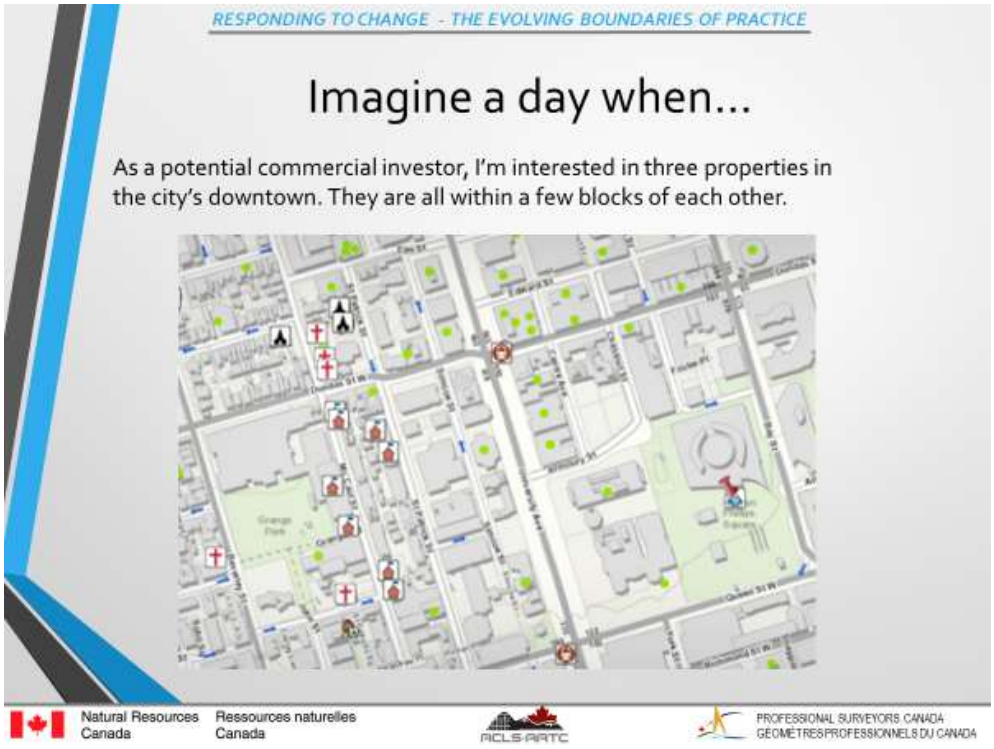
4.0 Technology – Jason Bond, Jordan Litke, Erik Holmlund

As is obvious to all of us, technology is changing. And changing quickly. Not just geospatial technology, but also communication, vehicle, energy, computer processing and other technologies.

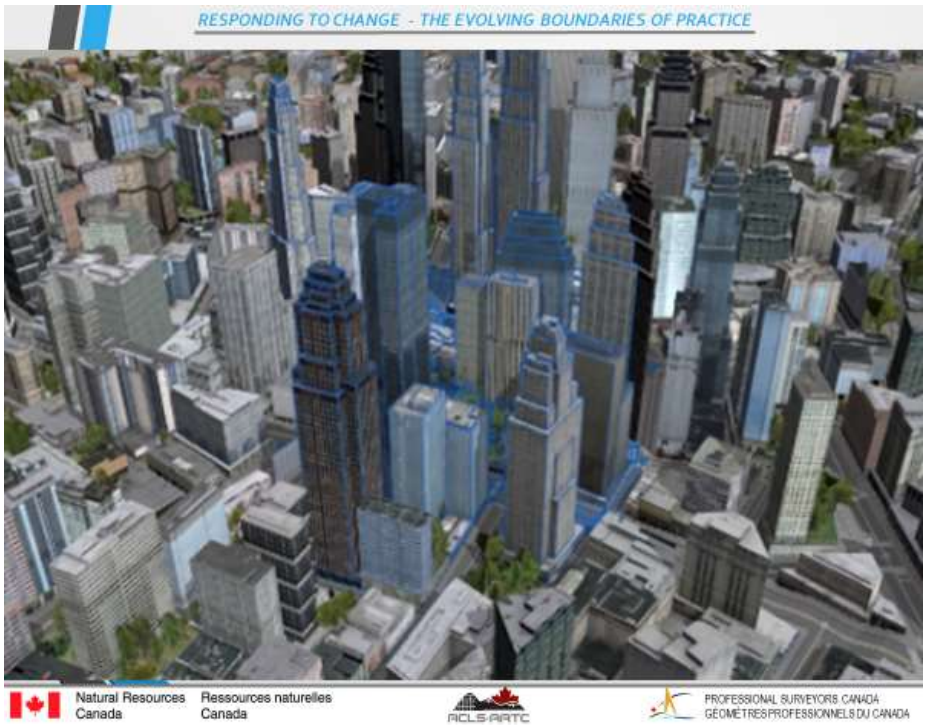
Not only is the pace of change increasing, so is the adoption and integration of technology for practical, everyday use.



With this presentation we'd like to stimulate discussion about what the surveyor's, and land administration community's, role can be in a world where everyone carries a supercomputer in their pocket that has high resolution imagery and increasingly accurate GPS onboard.

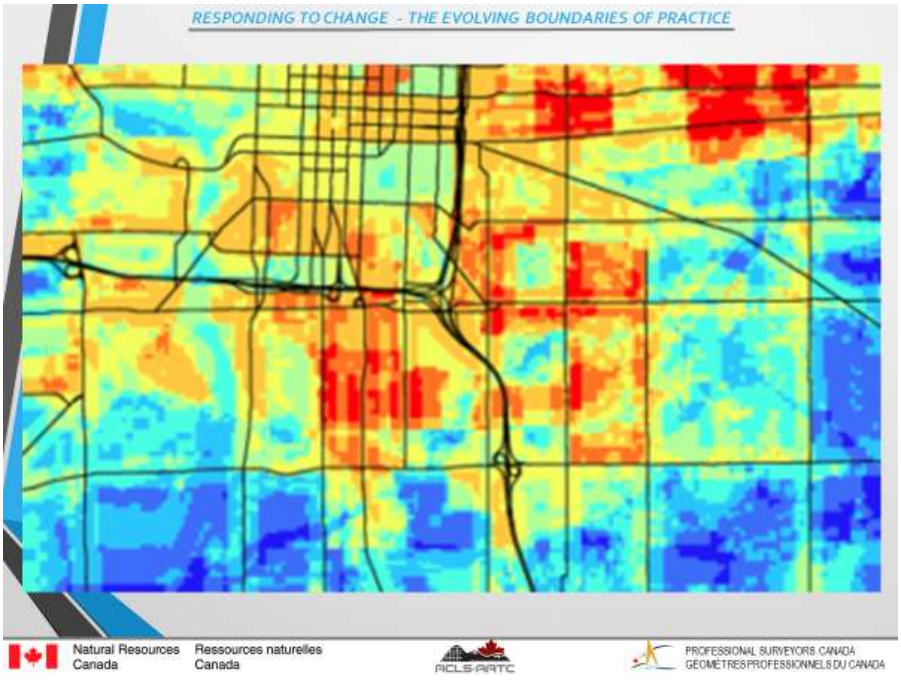


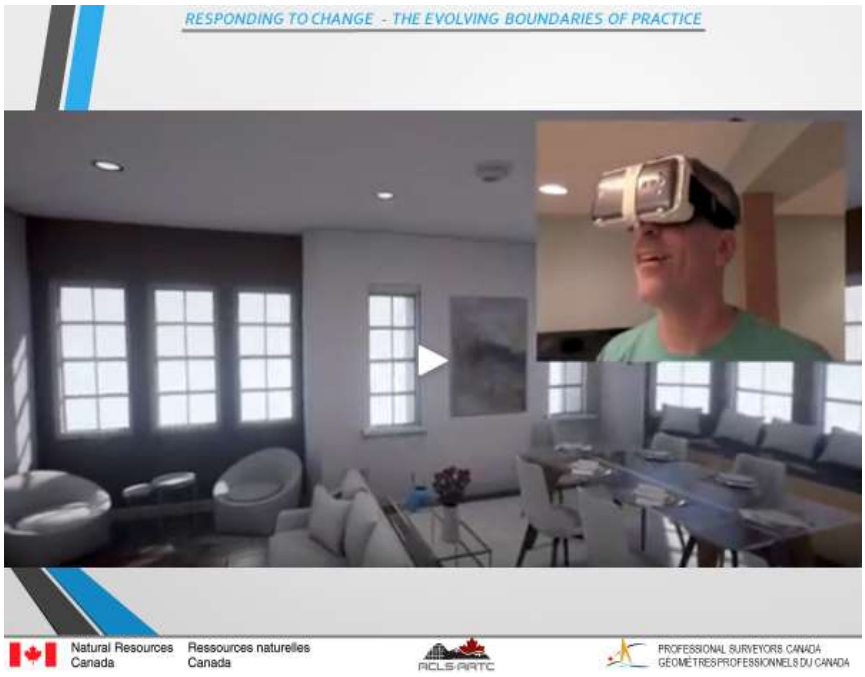
Before I make a decision to make arrangements to view the properties in person, I put on my VR goggles and select a high resolution image that was produced yesterday overlaid with basic mapping (roads, addresses, property boundaries, etc.) to narrow down my view and get an overview of the area.



When I find my area of interest, I can switch to a 3D rendered digital representation view of the city.

I can select various criteria (i.e., zoning, proximity to points of interest, traffic volumes, etc.) to select the property that has the best probability of meeting my business requirements, and narrow it down to one property.



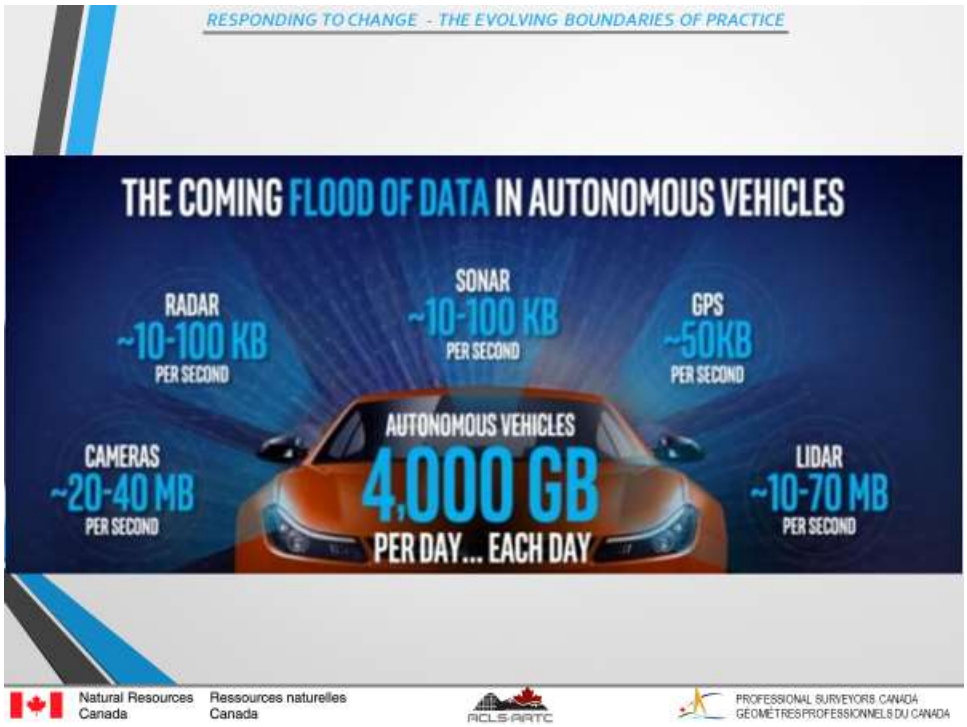


I can then do a virtual tour of the property that is provided by the realtor to determine if the building and property will work for me.

Now it's time to visit the property. I grab my 5G enabled tablet and instruct my car where I want to go.

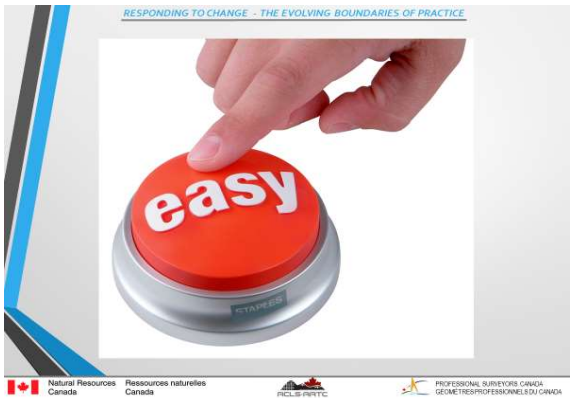
On the way, I am able to search on any zoning restrictions, review the title for the property, as well as any of the documents associated with the title.

While I drive to the property, the LIDAR, IoT data, and imagery my car is collecting is being wirelessly streamed to the city and other data hubs.

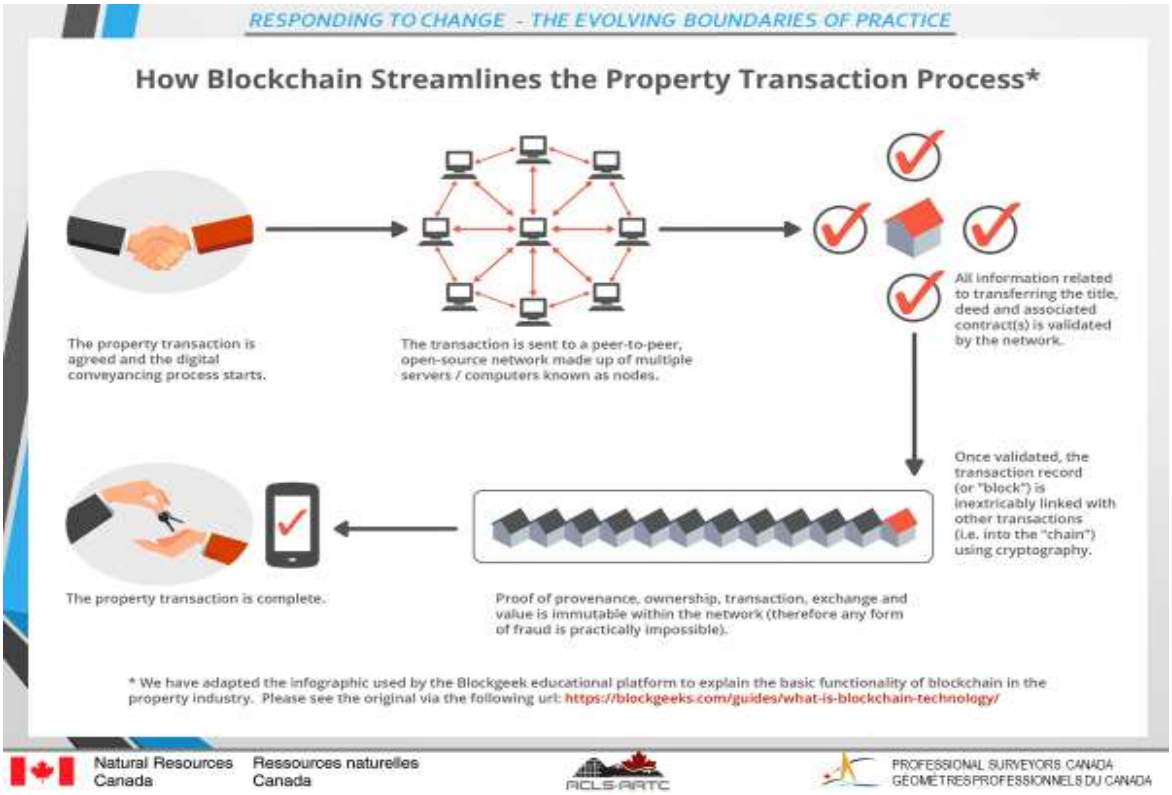


The data is used for asset management, daily map updates, etc.

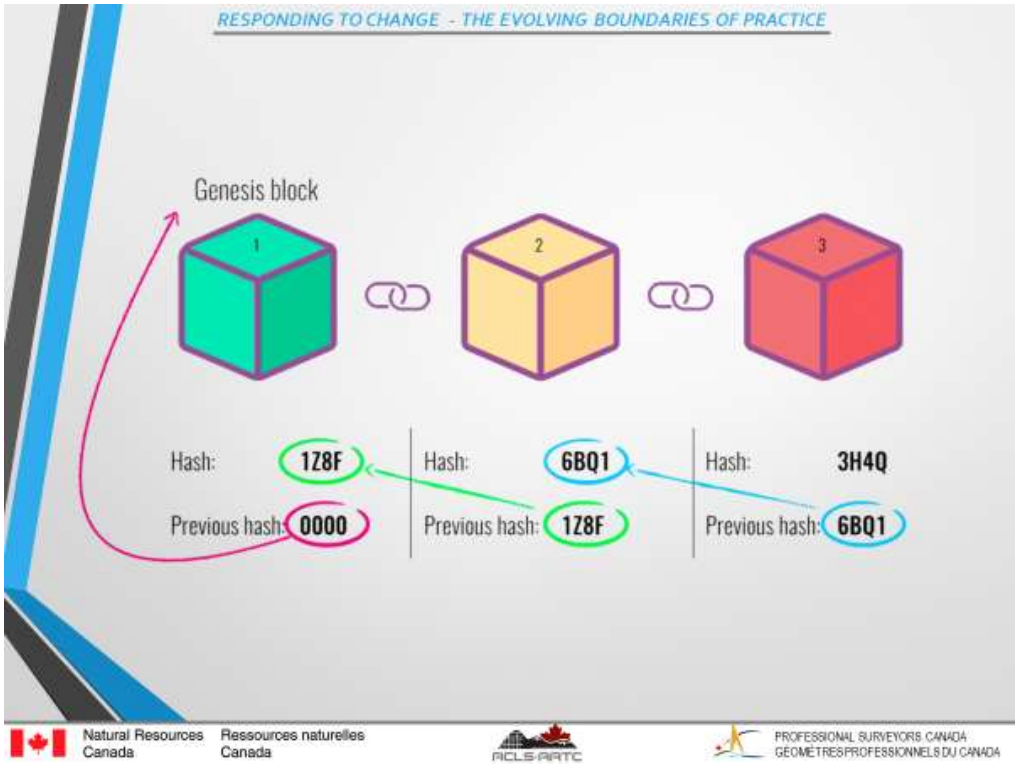
I pull out the tablet, select an augmented reality app and point it at the property. The app shows me 3D scan data, the property lines, zoning, real estate information (pricing, square footage, etc.) draped over the property in real time.



I'm happy with what I've seen and contact the seller to complete the sale.



The purchase of the property is done without escrow using blockchain technology. After purchase, the transfer of title is registered using blockchain technology. The entire transaction is completely transparent to anyone on the blockchain (if it's public) but personal information and other details can be hidden as required. And the transaction uses fewer intermediaries.

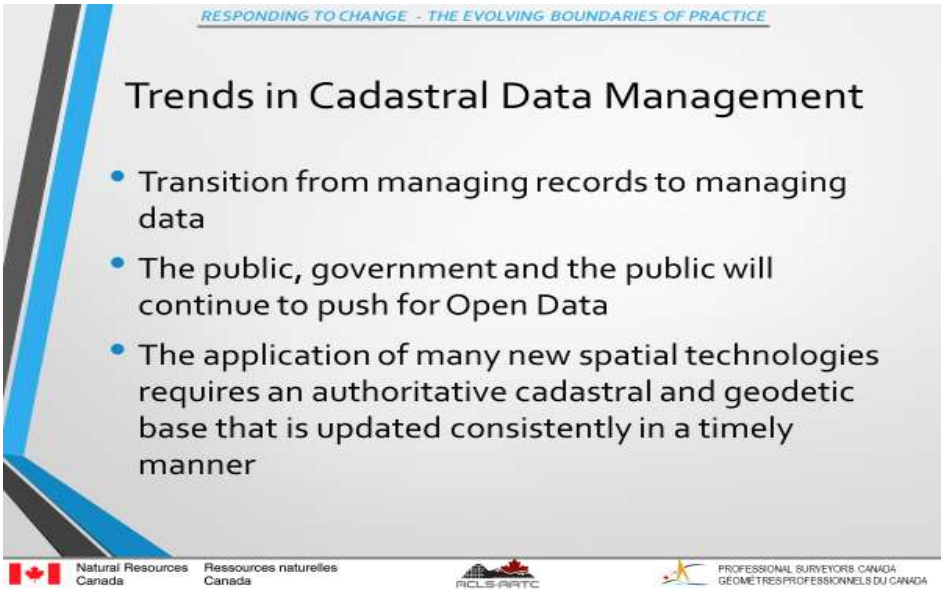


This process uses a number of technologies. We'll briefly touch on two: blockchain and smart contracts. First Blockchain. Blockchain is not BitCoin or other cryptocurrency.
Blockchain is not a programming language. Blockchain is not machine learning or AI.
There is not only one blockchain. A blockchain is a decentralized and distributed ledger that is used to record transactions across many computers so that any record can't be altered retroactively.

The other technology that will change property transactions is smart contracts. Smart contracts are translations of an agreement into a computer program that can use transactions or other external factors to automatically trigger the execution of a contract. The biggest change from a conventional contract is that there is little, or no, need for traditional intermediaries.

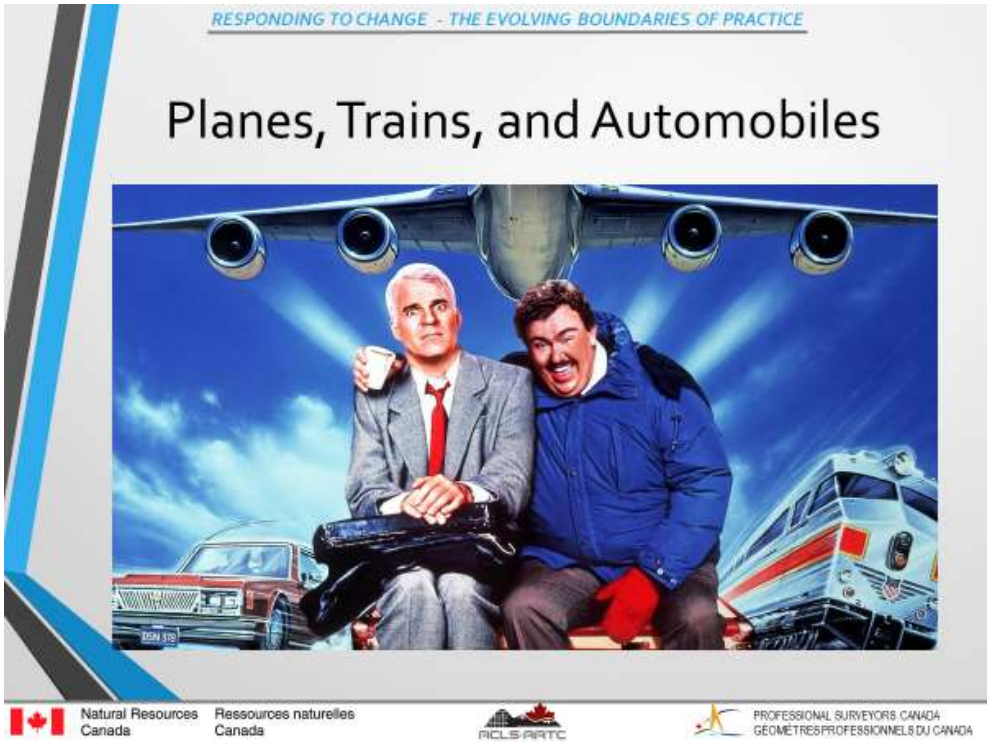
As an example, Sweden has seen a significant reduction in the number of steps and the time required to register a property, as well as a reduction in risk of potential fraud.

Today, land administrative systems are built to handle records – titles, deeds, dispositions – whether paper or electronic. For reasons of cost, security, privacy and risk, there will be a movement towards managing the data, both attribute and geometry, rather than the record.



Open Data allows for any lawful use of the data at no-cost to the user. There is a spectrum from *Closed* to *Open* data that needs to be examined for different data sets depending on a number of factors including privacy, cost, defined end use, etc.

This is the key opportunity for the land surveying community – to provide and/or influence the authoritative base.



I'm going to pick up and elaborate on a few things Erik mentioned in his hypothetical real-estate purchase. Let's begin with vehicles. Back in the 80's, when our friends Neal Page and Del Griffith made their infamous trip across the American heartland, transportation and the associated technology was a lot simpler.

In today's world, we have found ways to mount all kinds of sensors on a wide variety of vehicles. This data may be collected intentionally, or as a byproduct of another purpose.

As Erik mentioned, the latest autonomous vehicles have a wide array of sensors collecting vast quantities of data. Each vehicle will come equipped with LIDAR, RADAR, GNSS, and Cameras, all continuously collecting data in order to position the vehicle.

While this data is used in real time to keep your Tesla from rear ending a tractor trailer, it is also collecting spatial data for all the features along the route.

This technology has spread to construction sites as well, with autonomous equipment just entering the market. Again, a byproduct of this technology is the continual mapping of a site, providing real time as-built data, in addition to actually completing the task at hand.

Mobile data collection isn't just the by-product of navigation and autonomous vehicles. There are also a multitude of sensor platforms built for mass data acquisition.

These 'mobile mapping solutions' are capable of collecting up to 1 million points per second, at highway speeds, along with high-resolution imagery. With these platforms, cities and transportation corridors can be mapped at survey level accuracy in very short time frames.

Through mobile mapping, photogrammetry and LiDAR, large datasets become easier and cheaper to acquire. With mass data collection becoming more accessible, the way we interact with data is also changing. Increasingly, entire cities are being mapped with full 3D models generated. Helsinki, Istanbul, and Singapore are good examples where an entire city has been mapped, modelled and provided for third-party use.

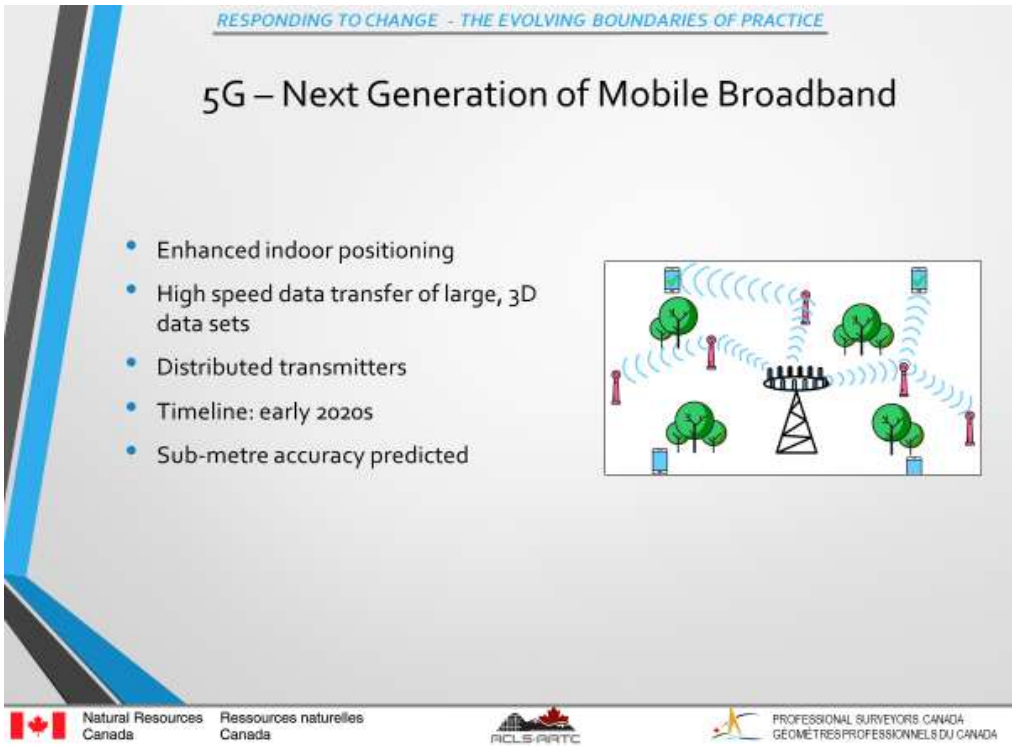
At a somewhat smaller level, new buildings are increasingly being designed in 3D. With Building Information Modelling becoming more commonplace, buildings are being designed with a full 3D model from inception. This modelling approach facilitates virtual reality, enabling a developer to spend hours inspecting and checking the building design, or potential purchaser being given the ability to 'walk though' a unit, prior to making a pre-sale offer.

These detailed models provide an immersive experience, allowing the user to dive in to the virtual world in order to understand constraints, evaluate options and make decisions, all from the comfort of a home or office.

Virtual reality may be a useful tool, but sometimes you just need to be at a site to see what is going on. Augmented reality is quickly gaining ground as a means of visualizing hidden spatial data and has been described as a future delivery system for geospatial data. Unlike virtual reality, augmented reality takes place on the ground and is a means of projecting GIS data in full 3D to the real-world environment. This could be viewing infrastructure within a building…

…or visualizing utilities and property lines at a construction site. An Augmented Reality product like this would likely be cloud based, incorporating data on the fly from Google Maps, OpenStreetMap, client databases, municipal or provincial cadastral mapping, and other sources. Augmented Reality is possible with a smart phone, tablet, or purpose-built device, such as the Microsoft Hololens. For AR to be meaningful, these devices need to have an accurate position in the field.

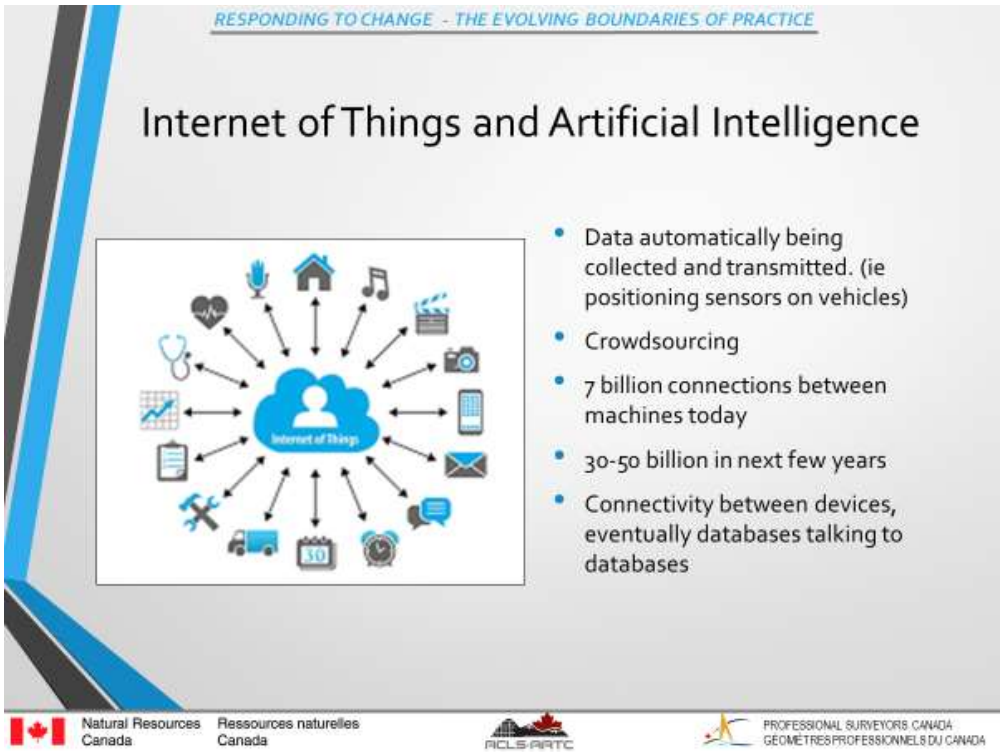
They may use a combination of GNSS, ortho imagery and object recognition software as part of a positioning solution. However, the position of the device is only half of the equation. An unspoken yet fundamental component of Augmented Reality is the quality of the data. If decisions are made based on Augmented Reality, or Virtual Reality, the dataset needs to be complete, it needs to be current, and it needs to be spatially correct.



One of the largest challenges with implementing some of these technologies will be accessing and transferring data. This is where 5G comes in. 5G, being the 5th generation of cellular wireless, will be implemented in the coming years. It will be faster than 4G, with data rates up to 20 gigabits per second, but likely the more impactful improvements are increased connectivity and latency.

These gains will result in instant and fast access to data sources such as ortho imagery and digital terrain models, as well as enabling the uploading of large datasets as they are collected. Simultaneous connections to many data sources and devices will further enhance smart cities, machine learning, autonomous vehicles, augmented reality and so on.

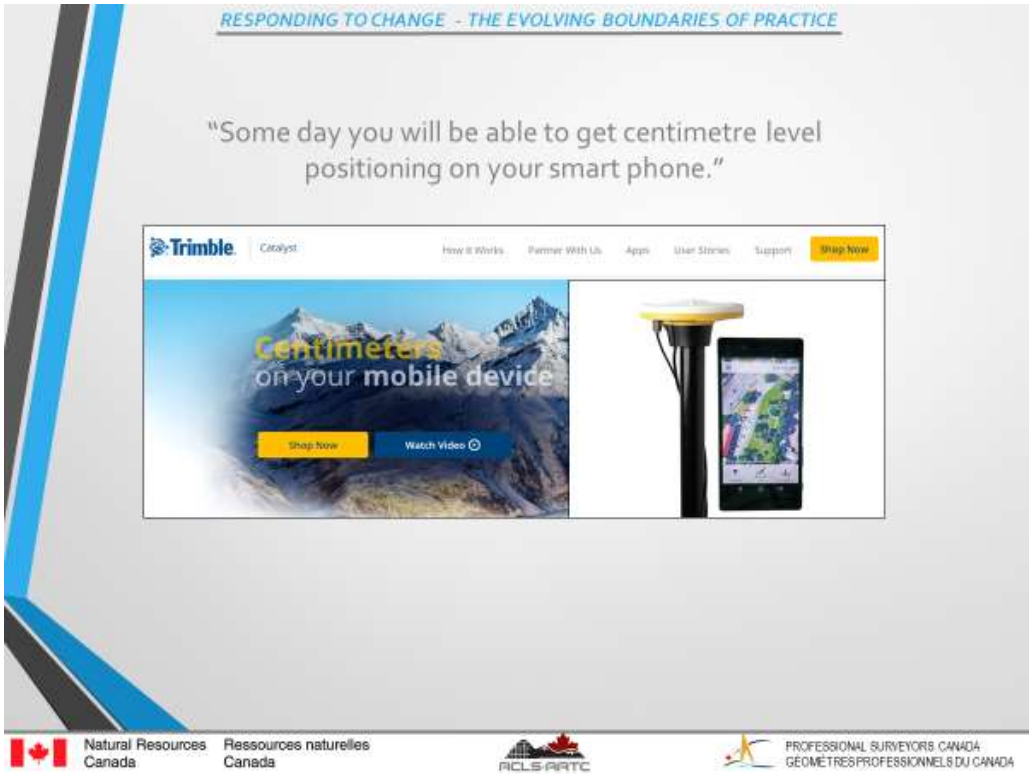
With respect to 5G, recently a telecom representative stated that “organizations which make intensive use of location-based data will be able to do their work much more cheaply, quickly and easily – whether that involves monitoring infrastructure, surveying and mapping, public safety, virtual-reality or location-based services.” An example would be the use of UAVs. Currently, their use is restricted in that a UAV pilot typically cannot fly beyond visual line of sight. 5G may be part of the solution to this constraint as it enables transmission of a UAV’s position with millisecond latency, providing regulators with confidence in a UAV’s location with respect to other airborne vehicles, restricted areas and physical obstructions.



Continuing with the conversation around connectivity, 5G further enables the Internet of Things and Artificial Intelligence. The Internet of Things is a phrase that was coined 20 years ago and refers to the world of physical objects being connected through the internet.

It is estimated that 6 billion connections between machines exist today and this number will increase to 30 billion in the next 5 – 10 years (estimated higher in other sources). Data is being collected on a multitude of systems, such as phones, vehicles, and buildings and these systems are communicating with each other automatically and instantaneously.

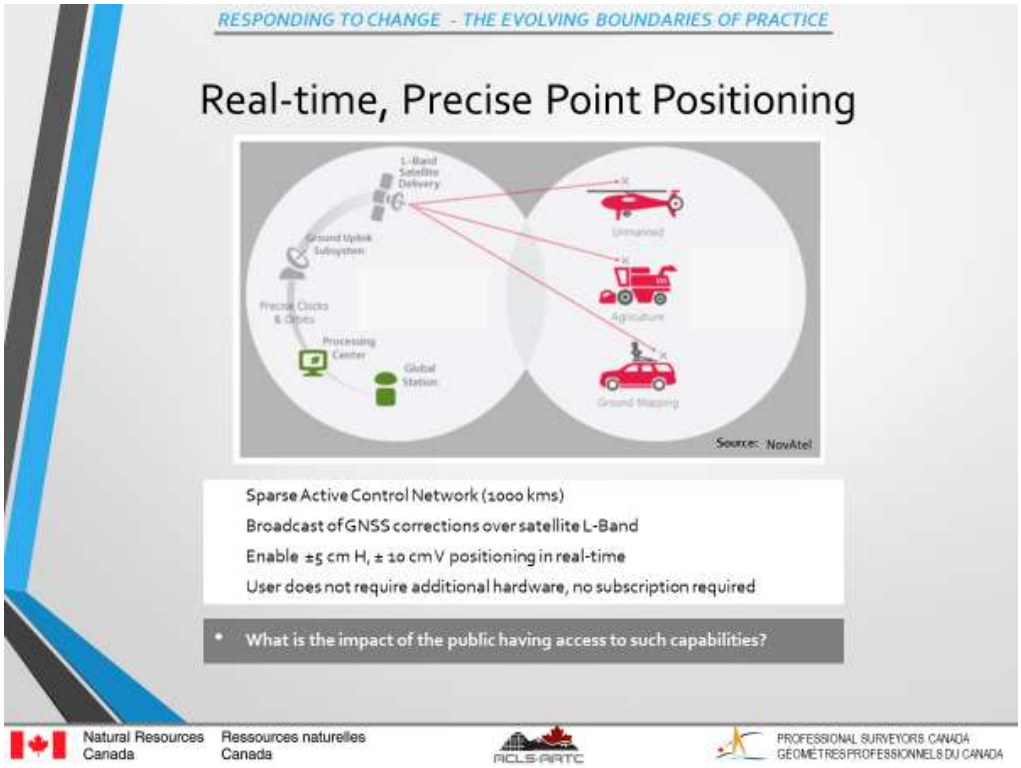
Right now, we're talking about connectivity between devices, but this will grow to become databases talking to databases, where computers or AI can sense things for themselves.



When envisioning the future of positioning, it is common for people to turn to their smart phone and imagine a day when it has the ability to offer centimetre level positioning. That vision has already been realized by at least one company.

Although the list of compatible phones is limited to certain models having the ability to track dual frequency, carrier phase measurements, the capability exists. For the highest accuracy positioning that is needed for applications like surveying, a high-quality antenna is required. A small, geodetic antenna is provided that plugs into the USB port on the phone. An antenna pole is also provided, to which your phone can be mounted.

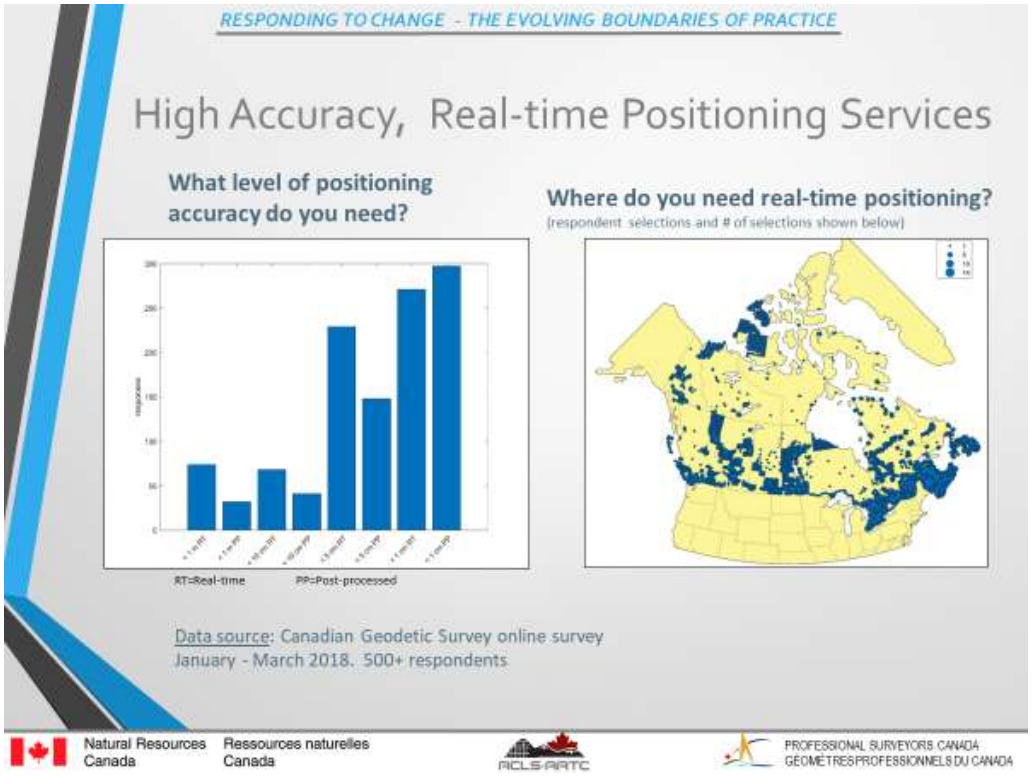
The phone acts as a high quality, geodetic receiver at a fraction of the cost. This is really no surprise given the computing power of present-day phones. The phone receives RTK corrections over the air to obtain cm level positioning.



One of the more exciting developments with respect to GNSS positioning services has been the provision of widespread access to high accuracy, real-time, positioning services, as is being pursued by Australia.

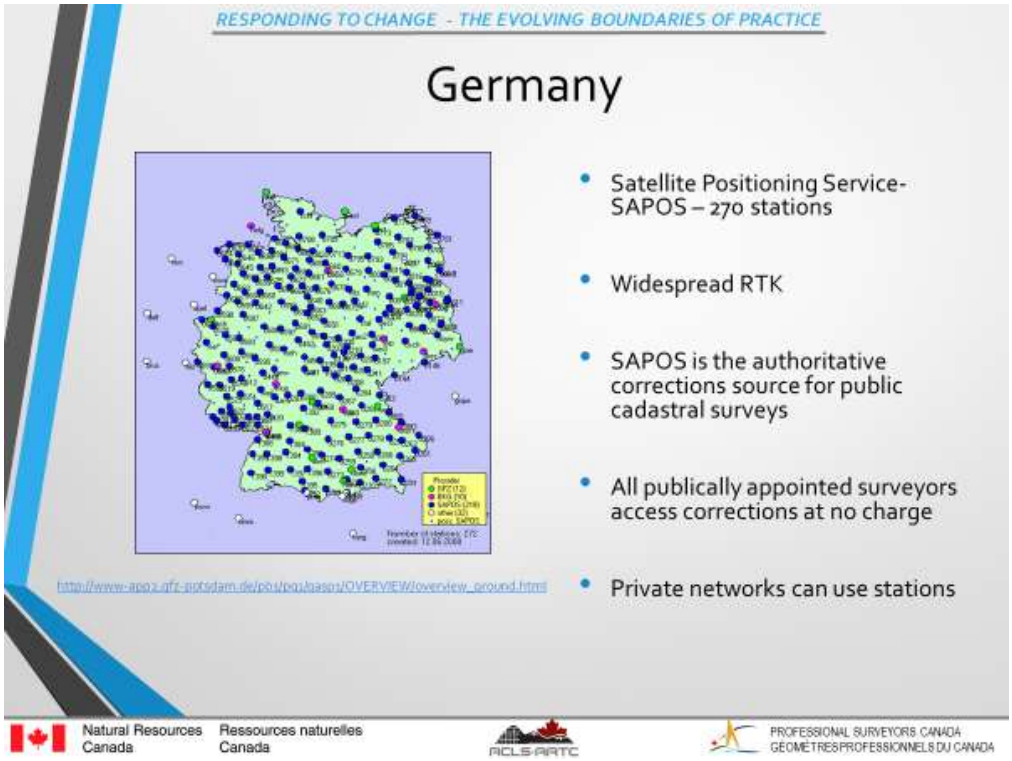
Such a service could be provided in Canada without any additional ground stations in Canada and offer 5 cm horizontal, 10 cm vertical positioning accuracy. Such corrections could be broadcast over the L band so that they could be leveraged directly by your GNSS receiver without additional hardware or subscriptions.

The technology is illustrated in the graphic where a network of global ground stations are used to estimate precise clocks & satellite orbits. This information is then uploaded to a communications satellite for delivery over the L-band. The corrections signals can be used for unmanned vehicles, autonomous tractors, mapping and other applications. The corrections provide positioning intelligence as an enabler for other technologies and innovation.



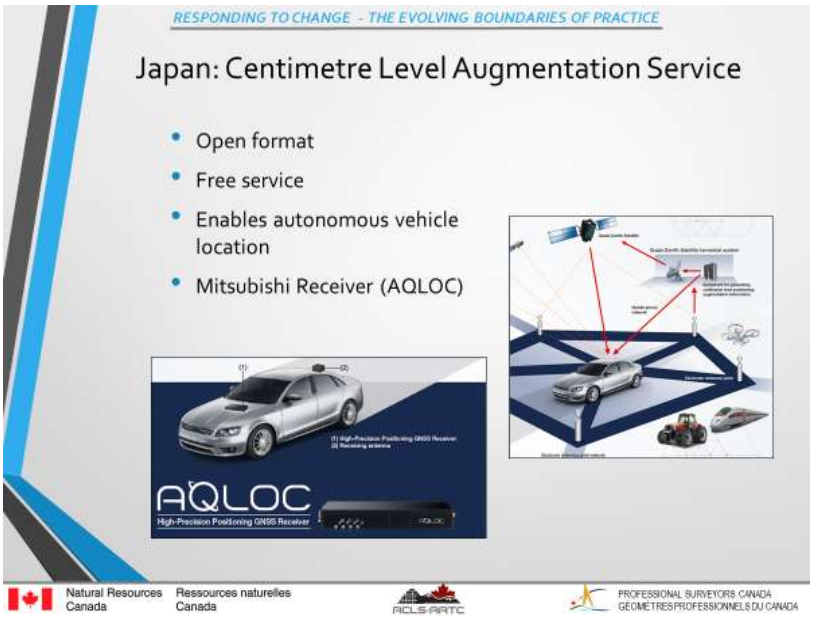
Between January and March of last year, Natural Resources Canada conducted an online survey to gain more insight into user needs for positioning services in Canada. The bar graph on the left indicates that the majority of respondents require a positioning accuracy of better than 5 cm, many of which desire real-time capabilities.

When looking at the interactive map selections on the right, we see areas in blue where users have indicated the need for real-time positioning. Although most selections overlap with populated areas, there are a significant number of selections in remote areas that may coincide with exploration work, engineering work or scientific applications. It is clear, however, that well over 50% of the Canadian landmass was not selected.



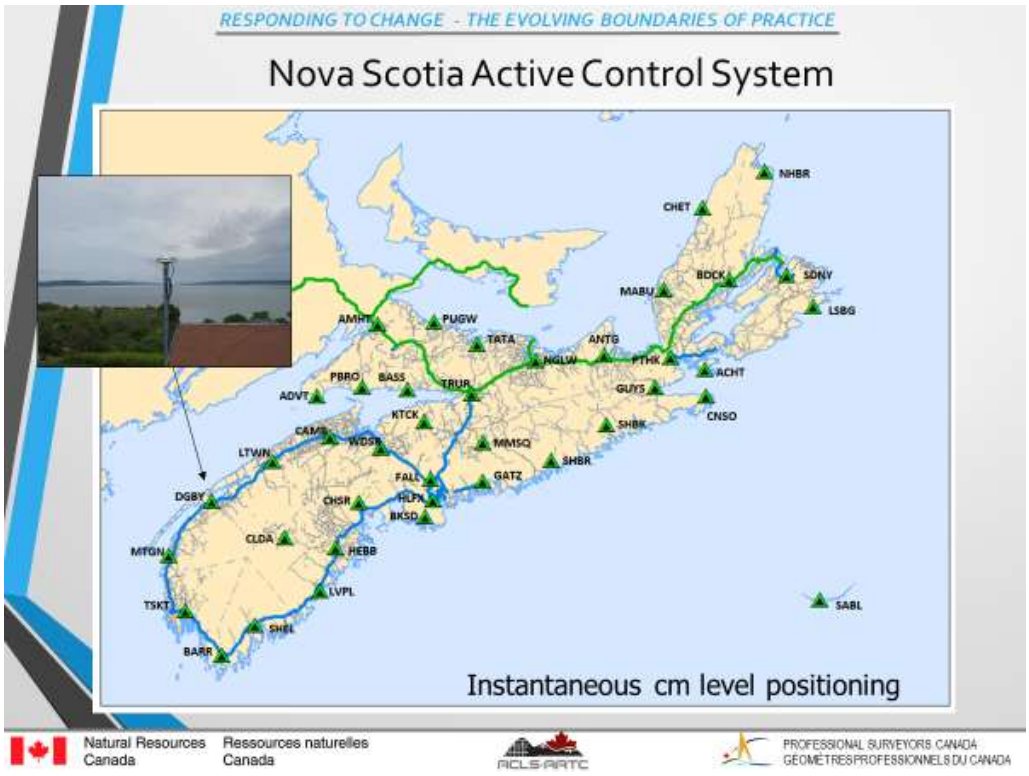
Germany has also taken efforts to make cm level positioning available across the country. Its ground infrastructure network is called the Satellite Positioning Service (or SAPOS) and consists of 270 active control stations.

For public cadastral surveys, SAPOS is the authoritative corrections source that must be used for RTK surveys. As a result, all publicly appointed surveyors can access SAPOS corrections at no charge. Data from the ground stations can also be accessed by private networks to augment their services.



Japan has recently developed its Centimetre Level Augmentation Service (or CLAS) to provide all of Japan with access to survey grade accuracy at no charge. The GNSS corrections are broadcast in an open format on the L6 frequency. Receivers must be able to track and decode the corrections in order to benefit from the service. Currently, Mitsubishi produces a receiver that can leverage the corrections. It is envisioned that the corrections will provide a fundamental data stream to enable autonomous technologies.

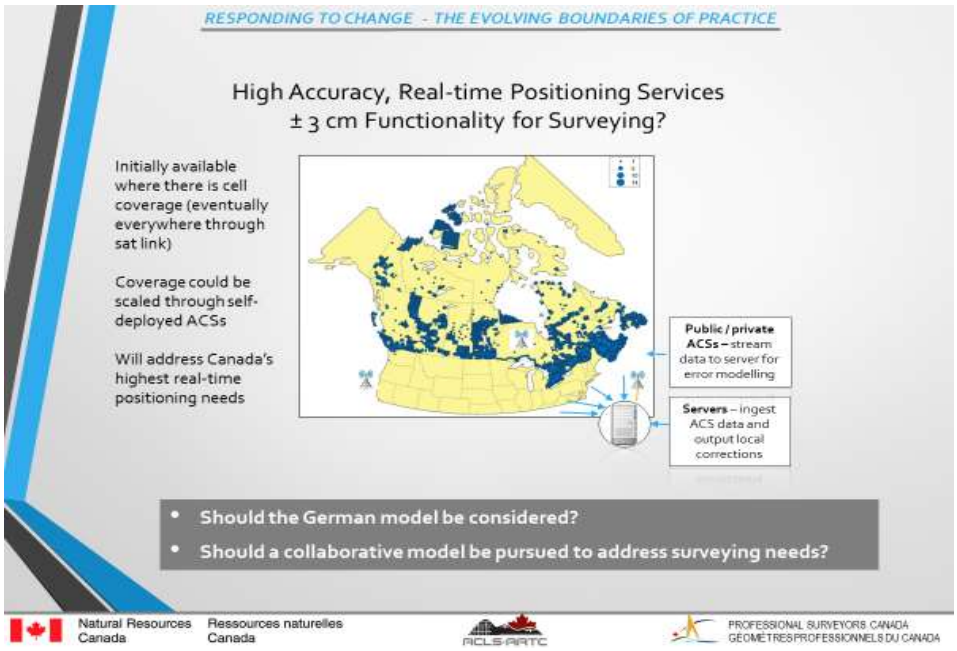
Early last summer the Australian government announced that it would be investing $225 million into Australia's spatial referencing program. It is envisioned that all of Australia will have access to positioning data enabling 10 cm level accuracy. Additionally, areas with mobile coverage will have access to positioning data accurate to 3 cm.



The Nova Scotia Active Control System consists of 40 active control stations, spaced at approximately 50 km to enable centimetre level positioning across the province in real-time. Areas without cell coverage can be served by accessing the archived data free of charge through CGS's website. Data from all of the stations is licensed to service providers so that they can offer high accuracy positioning services.

The Province does not compete in the industry. The NSACS has allowed the passive, Nova Scotia High Precision Network to be expanded from approximately 100 control points to over 1000 through efficient observation methods.

The NSHPN allows for ground truthing of NSACS performance at centimetre level. This is important for verifying system performance during the course of a surveying and ensuring that biases (e.g., incorrect antenna height or antenna model at the base or rover) are not impacting survey results. There are various aspects to this model that may be considered for a national service.



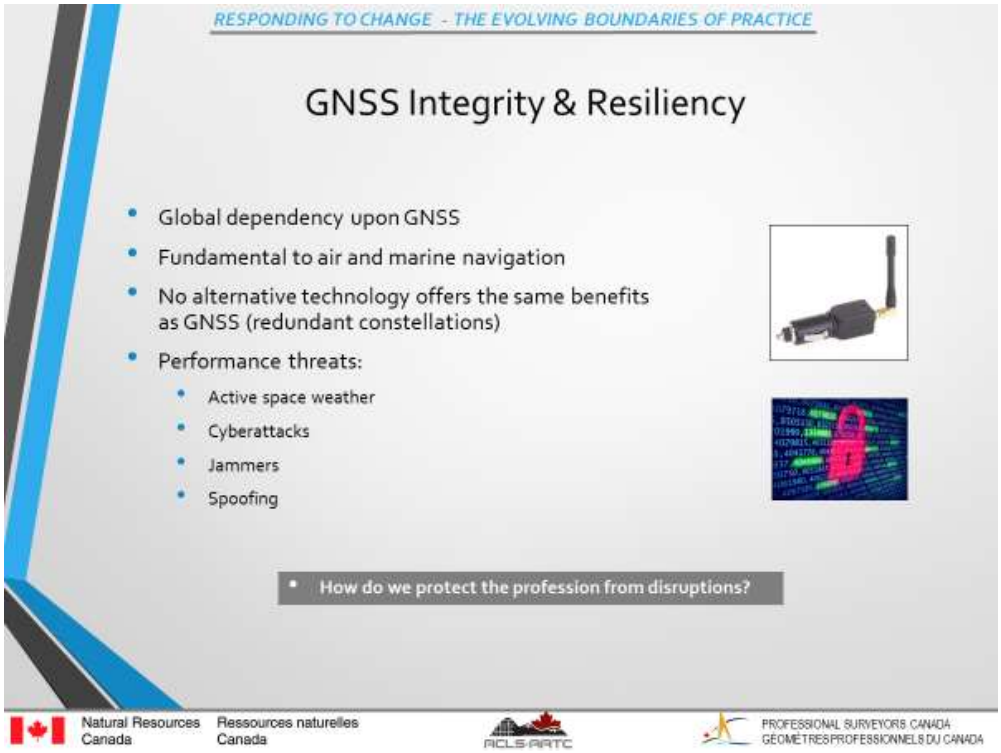
In order for real-time PPP services to approach RTK level accuracies, local atmospheric error estimates are required. Local atmospheric error estimates require dense ACS infrastructure. To alleviate investment costs in trying to produce ± 3 cm level accuracy across Canada, one possibility is to use a coordinated approach for densifying infrastructure that would contribute to a nationwide service. Such an approach could have the following characteristics:

A central server could be used to ingest real-time data streams from ACSs across the country, and that data could be used to estimate and broadcast high accuracy corrections.

Users could control the accuracy of the corrections by densifying infrastructure wherever desired, making the solution highly scalable.

Because of the need to communicate user position to determine the required local correction, internet connectivity is required. This is probably sounding very familiar and you are right, these concepts are used with RTK networks. There are some distinctions. The idea here is that a collaborative infrastructure model could be used with one central source for high accuracy corrections, run by an organization. Also, instead of being based upon RTK, the service could be based upon PPP. The base level of positioning would be ± 5 cm horizontal and ± 10 cm vertical broadcast over L-band, and this could be augmented by local infrastructure to achieve survey grade accuracy where infrastructure is in place. ACSs could be put in place on a permanent or temporary basis. These are purely ideas to consider at this point in trying to address the accuracy and coverage needs of the surveying profession in real-time.

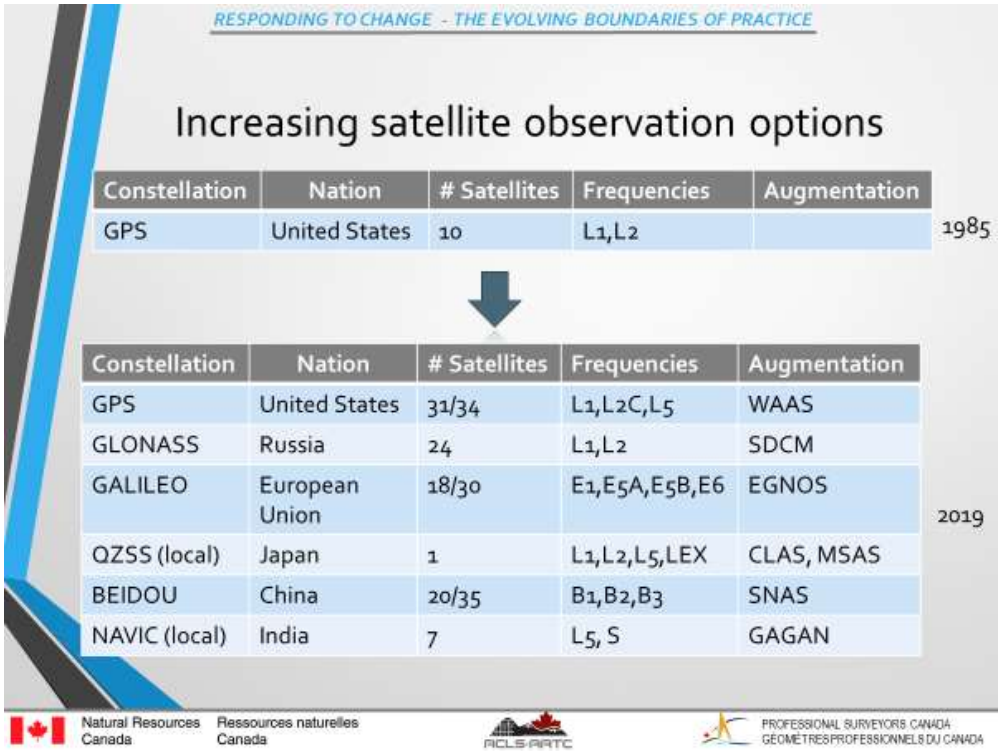
Questions to consider include***, "Should the German model be considered where the surveying profession is given special status for accessing high accuracy GNSS corrections?" and "Should a collaborative model be pursued to address surveying needs?"***



Another consideration for the profession is the importance of GNSS integrity and resiliency. There is a global dependency upon GNSS. Most of our critical infrastructure relies upon it. If GNSS is disrupted, there is no, one, alternative technology that offers the same benefits of GNSS in terms of accuracy, widespread coverage and a comprehensive solution to PNT needs.

There are a number of performance threats, however, that can compromise GNSS operations. Active space weather can compromise the accuracy of GNSS positioning. Many GNSS receivers are accessible online and are therefore susceptible to cyberattacks. Similarly, servers for broadcasting GNSS corrections or for storing GNSS data are susceptible to cyberattacks. GNSS jammers like the one shown here can be readily purchased on eBay for $50 or less. They plug into the DC 12 volt and saturate the L band so that GNSS satellites cannot be tracked. The intent in using these devices is often not to prevent others from using GNSS but rather to prevent the GNSS system in their vehicle from working so that they cannot be tracked. In fact, these are sometimes referred to as “Personal Privacy Devices”. There is a well-known example of a New Jersey truck driver whose use of a GPS jammer caused harmful interference to the ground based GNSS augmentation system at the Newark International Airport. The US Federal Communications Commission proposed a fine of over $30,000. The driver also lost his job.

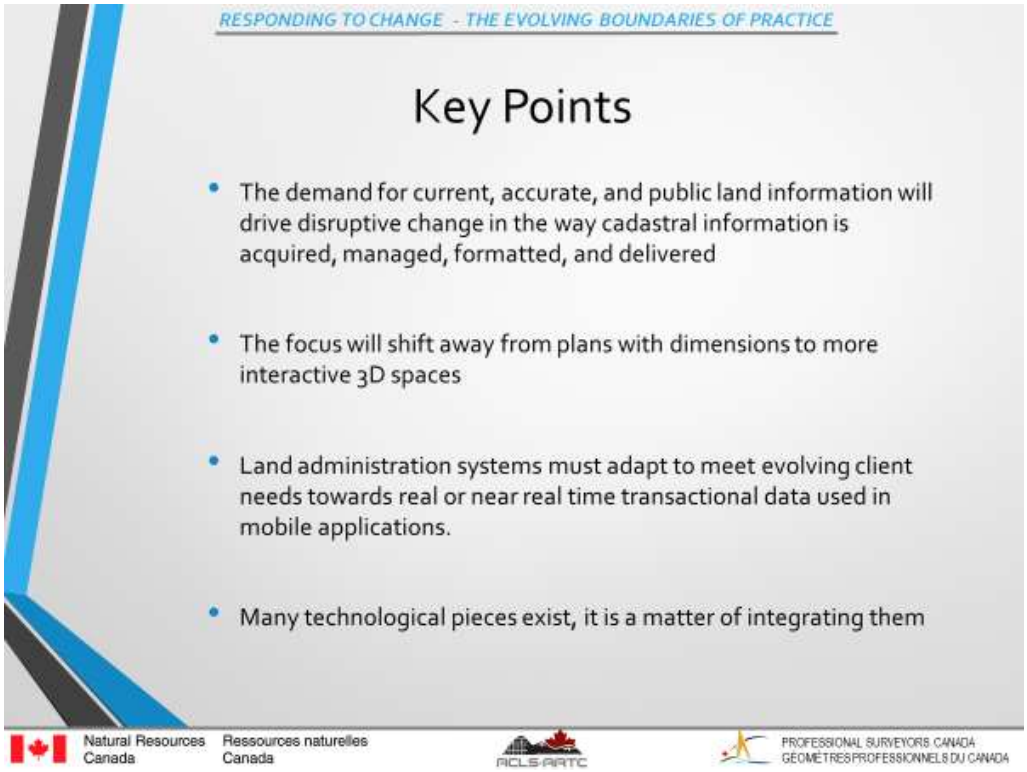
The use of such devices is also illegal in Canada. The question that is raised here is ***“How do we protect the profession from disruptions?”***

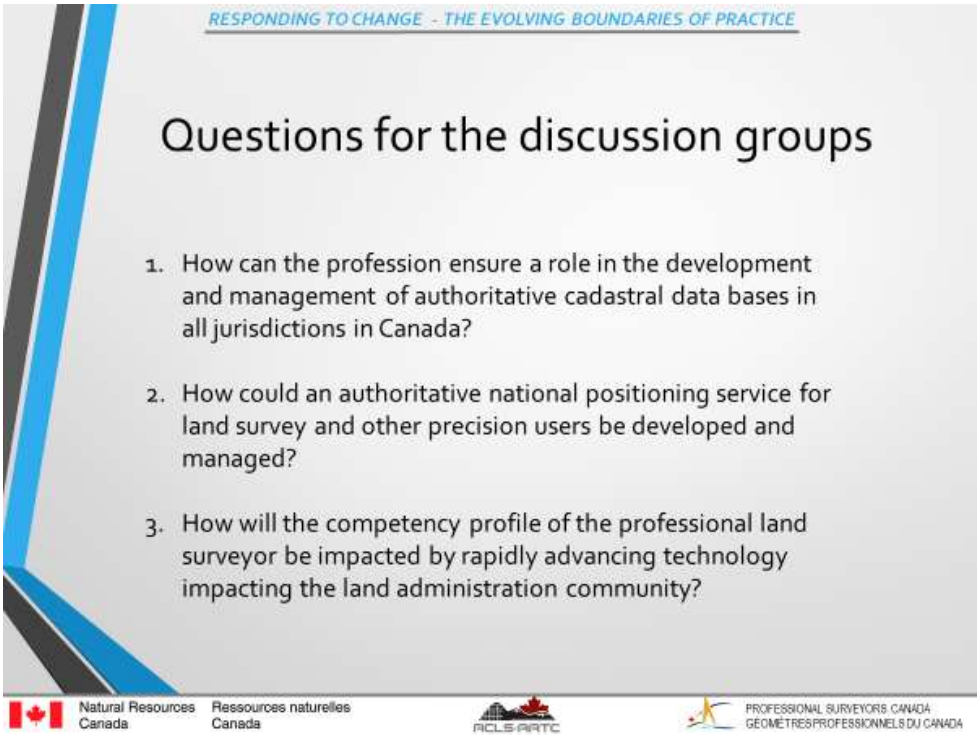


Another key advance in the world of GNSS is the number of satellite constellations. Currently the American, Russian, Chinese, European, Indian and Japanese governments have all made investments in GNSS constellations.

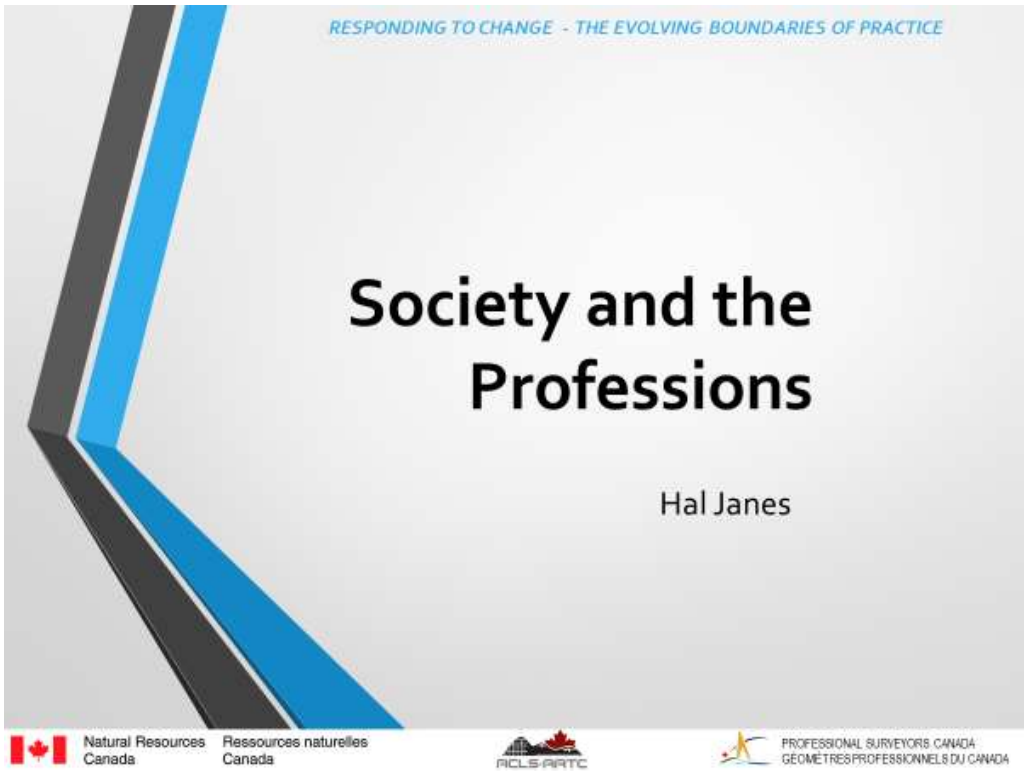
When we look at where we were back in the mid 1980s, it is clear that there has been a dramatic increase in satellite observation options. In 1985, there were only 10 GPS satellites available, broadcasting two frequencies. Mission planning was a critical part of conducting a GPS survey. Without it, PDOP spikes or insufficient satellite visibility could come back to bite you.

Presently, it is common in an area with good satellite visibility to be tracking more than 20 satellites at a time. Satellite signals can be tracked on up to three frequencies from 6 different constellations. This increase in satellite observation options has helped improve consistency in solutions, solution availability and accuracy.


RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Key Points
The demand for current, accurate, and public land information will drive disruptive change in the way cadastral information is acquired, managed, formatted, and delivered
The focus will shift away from plans with dimensions to more interactive 3D spaces
Land administration systems must adapt to meet evolving client needs towards real or near real time transactional data used in mobile applications.
Many technological pieces exist, it is a matter of integrating them
Natural Resources Canada
Ressources naturelles Canada
PROFESSIONAL SURVEYORS CANADA
GÉOMÈTRES PROFESSIONNELS DU CANADA


RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Questions for the discussion groups
1. How can the profession ensure a role in the development and management of authoritative cadastral data bases in all jurisdictions in Canada?
2. How could an authoritative national positioning service for land survey and other precision users be developed and managed?
3. How will the competency profile of the professional land surveyor be impacted by rapidly advancing technology impacting the land administration community?
Natural Resources Canada
Ressources naturelles Canada
PROFESSIONAL SURVEYORS CANADA
GÉOMÈTRES PROFESSIONNELS DU CANADA

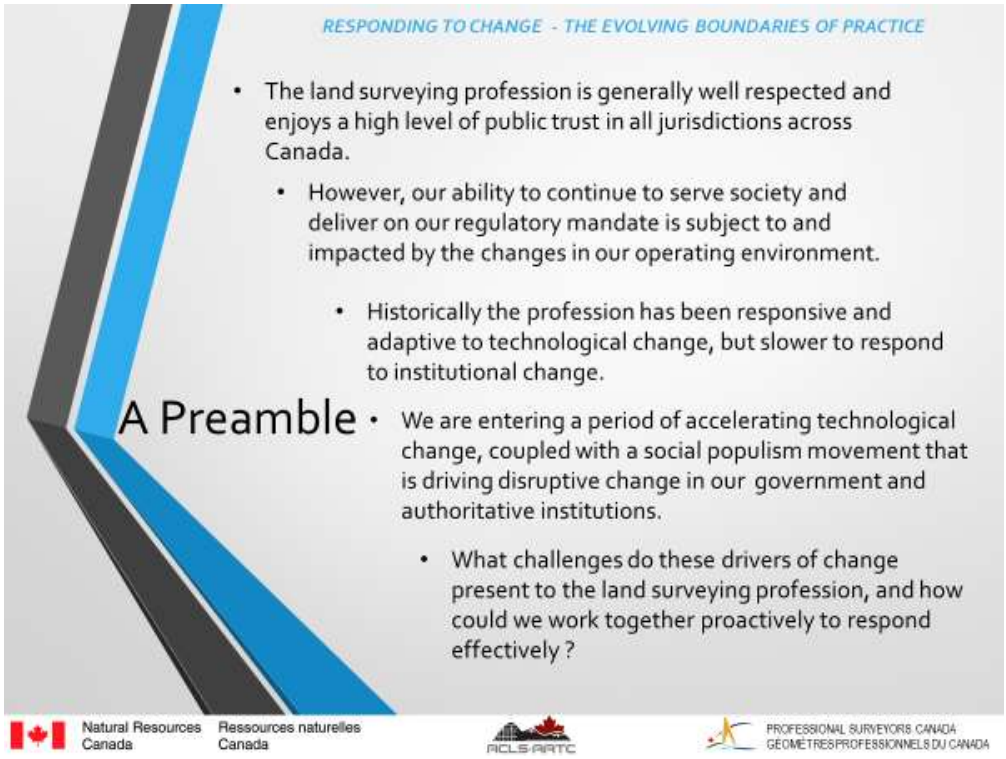
5.0 Society and the Professions – Hal Janes



In this segment of our presentation this morning I am hoping to explore aspects of our relationship as a self-regulating profession with society.

We are one party to a social contract, in which we have been granted the privilege (not the right) of an exclusive scope of practice that gives us control over a fundamental and foundational piece of social infrastructure, the cadastral systems of the country, which underpin and are the tangible realization of our property rights and land tenure systems, which together with our democratic rights and human rights are the triad of rights our country is founded on.

In return, our obligation under this social contract is to ensure we manage our cadastral systems to the very best of our ability, and in keeping with the highest standards of competence and ethics, placing our own self-interest secondary to the public interest, and with fairness, transparency and full accountability,



It is a sobering responsibility. And it is a responsibility we have met, I would say, with distinction over the entire span of history of our Country. As Peter Sullivan alluded to this morning this profession has played a key role in the quiet, efficient, peaceful settlement and growth of this country that far outweighs the relatively small size of our numbers. And we have executed that role often so quietly that society and government have had little cause to bear us much in mind. As some have put it – we are an invisible profession managing an invisible infrastructure.

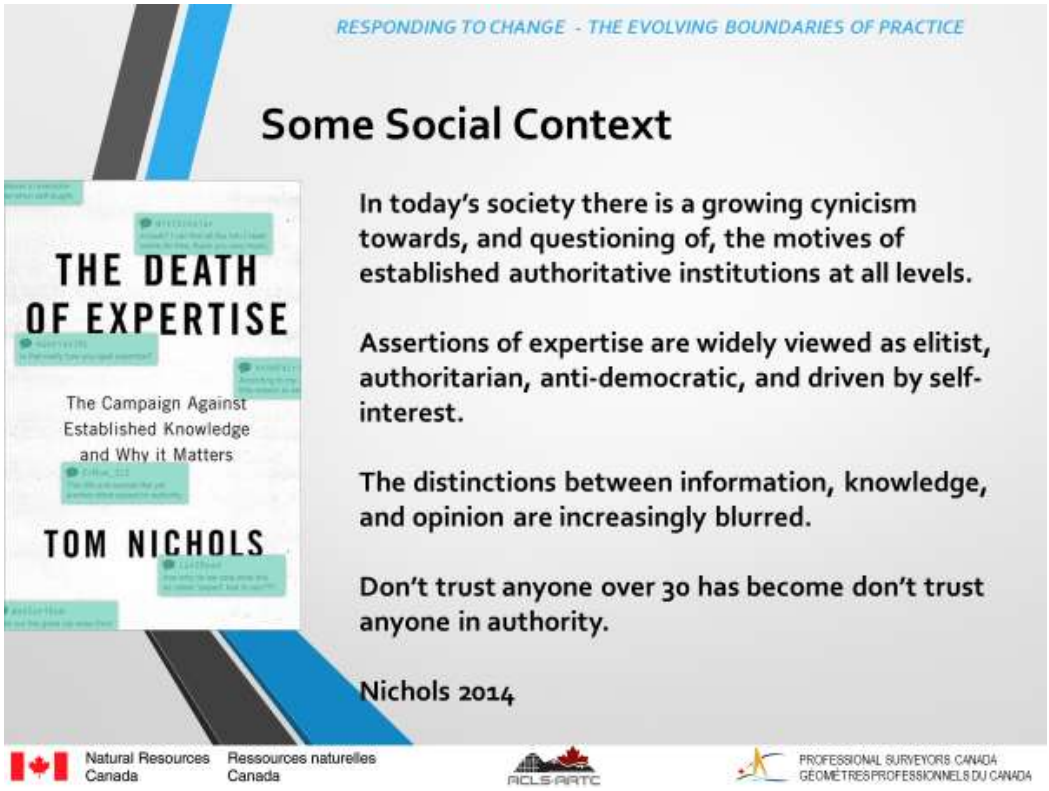
So, we can be proud of that accomplishment, and our history. But we can't dote on it, we can't be complacent, because meeting the challenges that will face us in this century in delivering on our part of our social contract is just as important and fundamental to social peace and prosperity as was for our predecessors in the last.

Are we still relevant? Absolutely. But we also need to be effective, and I would even say, assertive, in meeting our obligation to the public going forward.

So, these are the three key challenges facing our profession. You could rightly say, facing all the professions. You could also rightly say we have always faced, and met, these same three challenges.

But by all accounts, we are entering a century that will be characterized in its first half by disruptive environmental, social, and technological change. The fourth industrial revolution, the digital economy, globalization, and the mass migration and urbanization of peoples will challenge all traditional social constructs and contracts, including ours. And I would expect that professions like ours will be needed more than ever to manage that change effectively in the best interests of society.

Let's start with trust.



In his recent book The Death of Expertise, Tom Nichols captures the full extent of a growing social cynicism toward all authoritative institutions, and the impact of the internet and social media platforms on the blurring of the distinction between knowledge, and information and opinion.

Whether you are talking about the rise of homeopathy and the anti-vax movement, political populism, or the flat earth society, people are questioning traditional knowledge memes and authoritative institutions in all spheres of science, politics, journalism, and academia like never before.

Knowledge, fact, if not truth are buried in the over-whelming storm of information, dis-information, speculation and opinion available at your fingertips on the internet. Conspiracy theories and celebrity causes are the order of the day. In the face of it all people simply don't know what or who to believe.

Most damaging of all, Nichols asserts, the growing partisanship and self interest evident in our politics and journalism, the dis-crediting of science for political gain on issues like climate change, the self-interest evident in our financial institutions and leading businesses as publicized in recent expose' of corruption, incompetence, and executive excess, all contribute to an undermining of trust in all our authoritative institutions.

And it does filter down to us as a profession.

James Casey of Field law, in a recent presentation before a BC law conference noted these key trends in Canadian law governing the regulation of the professions.

Casey's key messages are diligence in meeting our regulatory obligations, communication of our purpose and public protection role, and clear focus on accountability.

There are many examples of recent government legislation which impact the self regulation of the professions:

Provincial Agreement on Internal Trade
Labour Mobility Act
Rulings of the Competition Bureau
Alberta Bill 41 Engineering & Geosciences Professions Act
Ontario 2006 – Fair Access to Regulated Professions Act
Nova Scotia – Access to Regulated Professions Act
Manitoba 2007 - Fair Registration Practices in Regulated Professions Act
British Columbia 2019 – Professional Governance Act

Increased government oversight is apparent in every Canadian jurisdiction to ensure fair registration and open professions, reduce barriers to mobility and competition, and increase transparency and accountability in regulatory functions.

A secondary feature is a trend toward increasing industry participation in the delivery of cadastral information through the formation of crown corporations such as Saskatchewan's Information Services Corporation, or public-private partnerships such as Alberta's Alberta Data Partnership, or full transfer to private entities such as Terranet in Ontario and Manitoba. The intent is to make public data more accessible and open, and to implement some level of cost recovery.

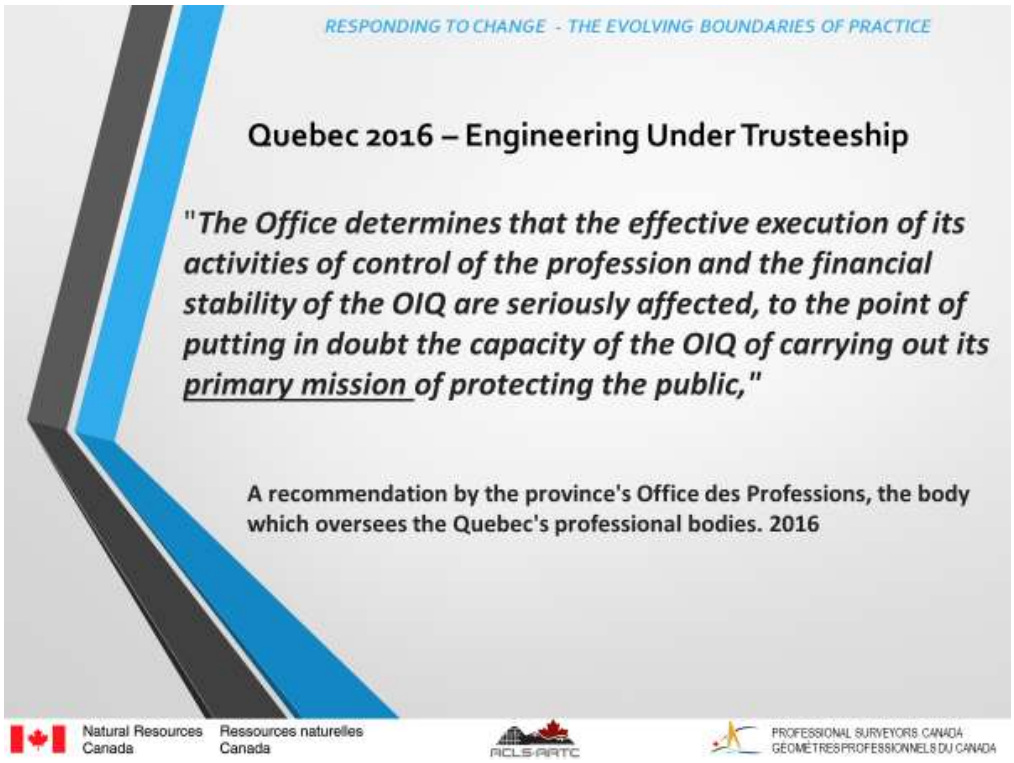
Two of the most sweeping changes to professional legislation have occurred in recent years in British Columbia and Quebec.

As a result of a public inquiry into the causes of the Mount Polley Tailings Pond spill in 2014, The B.C. government has enacted legislation aimed at making sure decisions affecting the province's natural resources are science-based, transparent and protect B.C.'s unique environment for future generations. The Professional Governance Act will, if passed, modernize and strengthen the roles and expectations of qualified professionals in the province, in turn providing greater, science-based public oversight of how B.C.'s natural resources are managed. It will also establish an office of the superintendent of professional governance to ensure consistency and best practices are applied in the work of qualified professionals moving forward.

The newly enacted professional governance legislation dominated discussion amongst the ABCLS membership. While this legislation caught many out when it passed with surprising speed last fall, the genesis actually goes back years before to the previous Liberal government regulation reforms aimed at ensuring that all legislation and regulation meets the current needs of the public. The 2014 Mt. Polley tailings pond breach in the BC Cariboo region and investigations into the root causes put a number of BC professions under scrutiny.

In November 2018, the BC Government passed the *Professional Governance Act*, which consolidated government oversight of the five professional regulators for engineering and geoscience, forestry, agrology, applied biology, and applied science technology under a new Office of the Superintendent of Professional Governance. This legislation will set consistent governance standards across the professions it governs, and will come into force over the next few years as regulations are developed to support its implementation. Once it is fully in place, the new act will replace the *Engineers and Geoscientists Act*, the current legislation governing the practice of engineering and geoscience in BC.

As concerned observers only at this time, ABCLS is carefully monitoring development of regulations which will change the makeup of elected Councils and Boards of Management, including a greater number of appointed public members and "merit based" nominations for elected office. The ALSA and other professional regulatory associations across Canada are watching these developments.



In 2016 the Ordre des ingénieurs du Québec – OIQ (Quebec Order of Engineers) lost its right to be self-governing when the Quebec Offices des Professions (Office of Professions), which oversees professional bodies in Quebec announced that it was placing the OIQ under the trusteeship of the province. My understanding is that this trusteeship continues and despite ongoing discussions between the OIQ and the province there is no indication how long this trusteeship will be continued.

The Office of Professions found shortcomings in governance and internal management at OIQ to the point where it believed the OIQ could not effectively exercise controls over the engineering profession, and to a point where its financial stability was threatened. The situation meant that the OIQ might not be able to protect the public, which is its primary purpose.

Therefore, the Office decided to appoint three directors to oversee the OIQ board's decisions. Interestingly, among the problems the office identified was a strong internal resistance to efforts to raise licensing fees to sufficient levels to enable effective regulatory oversight of the profession.

Meeting our regulatory obligations as a profession has an element of duality that requires a careful balancing of the need for regulation to ensure competence and adherence to standards of practice, against the need to ensure that the professions are accessible to all, that they provide value and protection to the public, and that any restrictions to mobility and competition are reasonable, fair and in the publics best interest.

Our exclusive scope of practice, our entrance standards, and our standards of practice all must be defensible on that basis, and must be adaptable and responsive to the changing needs of the public, and to changes in technology.

Fair registration legislation, labour mobility legislation, competition bureau rulings, foreign trained professional registration – all impact on these areas of self-regulation.

Another key focus of self-regulation relates to the effectiveness of our programs that act to ensure the competence of our membership through continuing professional development, that ensure compliance to standards of best practice through practice review, and that respond to perceived cases of unskilled practice or unprofessional conduct within our membership.

Here, transparency, objectivity, and true adherence to accountability are necessary, and this is the area where we are potentially most vulnerable to criticism if not fully funded and effective. The bottom line in these areas of regulation is - do we really hold our members accountable, and are there real and meaningful consequences for non-compliance.

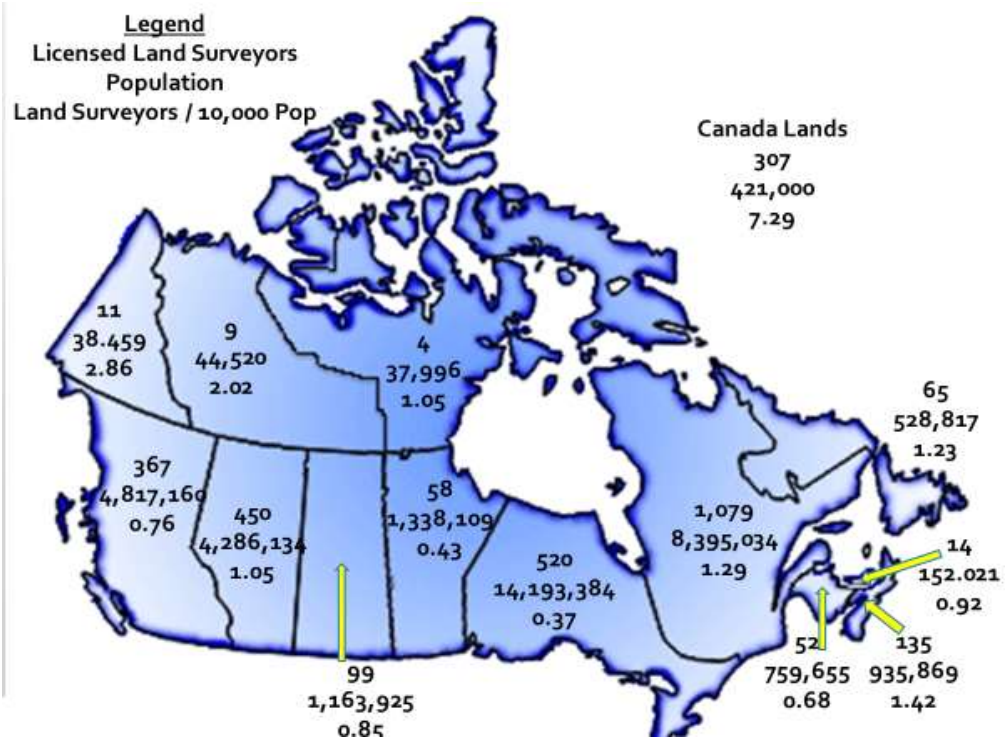
In particular, Complaints & discipline is where the public has direct involvement and insight into the objectivity and effectiveness of self-regulation. Two common concerns are:

- Perceptions of bias in favour of the surveyor (lack of arms length adjudication)
- No redress to the complainant even when breach of practice or ethics is proven (lack of satisfaction & justice denied).

Some associations noted an apparent trend in recent years toward an increase in complaints, and perhaps more concerning, a tendency to appeal the decisions by discipline bodies to higher authority. If those trends are generally true, they may well reflect the generally held view that we are moving in the direction of a more sceptical, questioning and litigious society. Certainly, the discipline process is one of our more taxing and costly regulatory functions. It is also the function most likely to garner adverse public attention, and the direct intervention of the courts, if not effective.

Is professional misconduct or unskilled practice an offence by a practitioner, or a systemic failure?

So here we come to a practical question.



This map represents my informal assessment of our national membership, taken from the lists of practicing or licensed members on each association's web page. The top number represents the number of licensed surveyors in each area. The second the population of the area. The third, the number of land surveyors per 10,000 population in each area.

The 1:10,000 metric is a very blunt tool for "right-sizing" the profession, but it does provide an interesting first cut at comparing the relative situation in each jurisdiction. Other metrics such as economic activity and geographic area are probably more meaningful.

There are a total of around 3200 licenses across Canada. But about 15% of provincial surveyors hold multiple provincial licenses, and around 80% of Canada Land Surveyors also hold a provincial license.

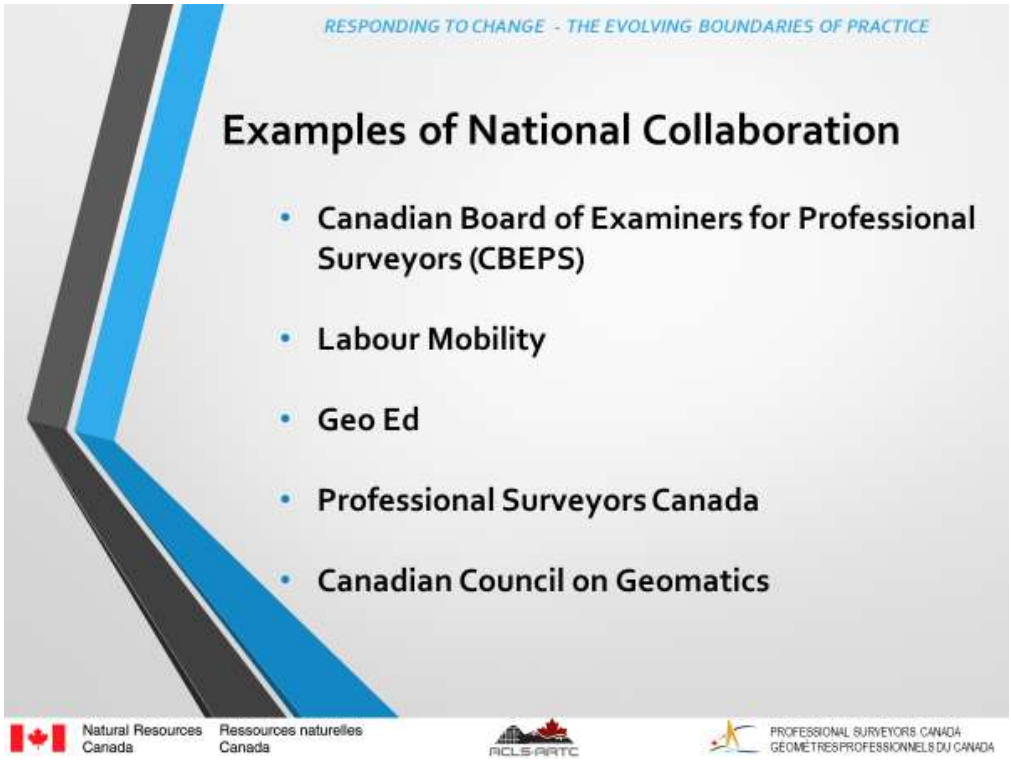
Taking multiple commissions into account my estimate is that we have approximately 2800 actual breathing land surveyors in Canada. Of this total nearly 1100 are in Quebec, leaving somewhere around 1700 for the rest of Canada.

We are 11 associations operating in 13 jurisdictions. Of the 10 provincial associations 5 associations have fewer than 100 members. Many associations have aging membership concerns.

Our small size and fragmented structure presents a critical challenge to meeting public expectations and the recent trends in government legislation directed at ensuring that professions can effectively maintain their regulatory compliance, and are financially sustainable.

A recent article in the Alberta Association News pegged the cost of a typical discipline hearing at $20,000.00 per day. An extended discipline case represents a significant cost burden even for our larger Associations. Some, but not all associations have set aside assurance funds to cover the risk. Some associations have foregone practice review, and others a very informal CPD program, largely because of the cost involved.

So, given our small numbers, and our fragmented structure, do we need to consider a regional or national collaboration to improve our ability to provide effective programs for CPD and practice review, and ensure to we can meet the challenge of providing an arms length complaints and discipline process.



There are other critical areas of governance where our associations and membership have adopted a national collaborative approach to meet common goals.

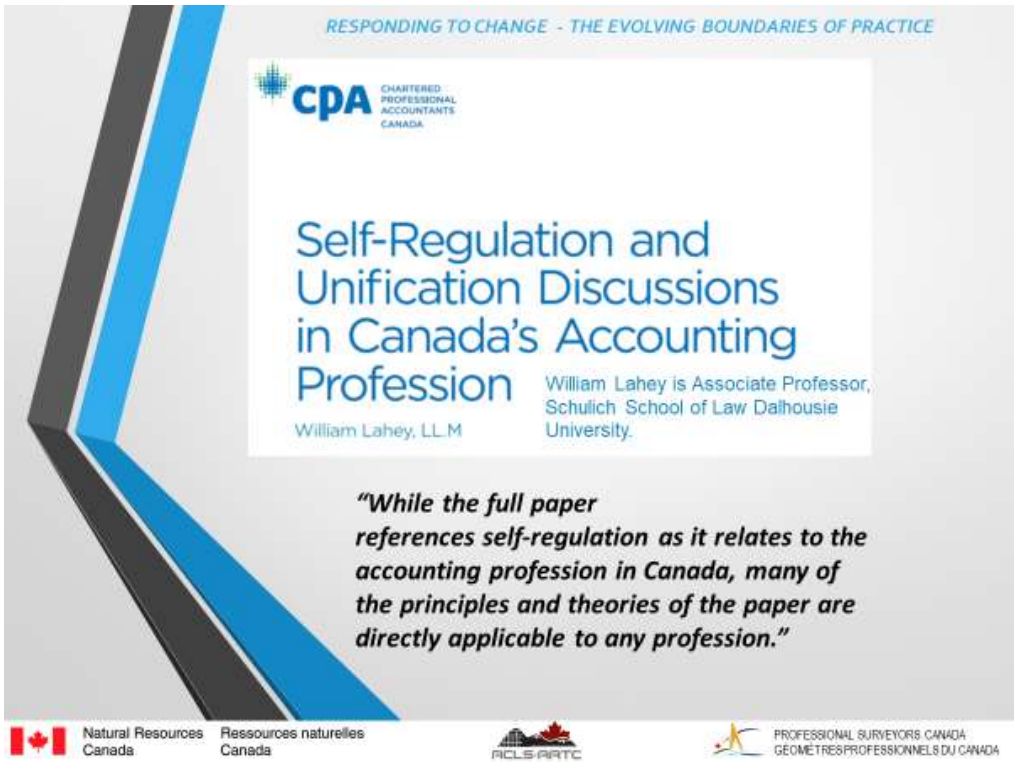
- CBEPS
- Establishing, assessing and certifying the national academic standards for entrance to the profession;
- Developing and implementing the Pathways to Foreign Credential Recognition in partnership with all Canadian land surveying associations;
- Leading the Future of Education Task Force.
- GeoEd.

“A cooperative of Canada's Provincial and Federal Professional Land Surveying Associations and public and private education providers for the purpose of advancing Continuing Professional Development of Canada's professional Land Surveyors.”

Professional Surveyors Canada

Communicating the value of the land survey profession to the public, and advocating in the public interest to government on legislation and public policy affecting property rights and our cadastral infrastructure.

Canadian Council on Geomatics – Cadastral Working Group
A committee of the directors of surveys and surveyors general from across the country.



Other associations have adopted a more collaborative approach. For example, the accounting profession which in 2015 gathered together 40 associations with over 200,000 members under one unifying banner.

CPA Reasons for professional unification:

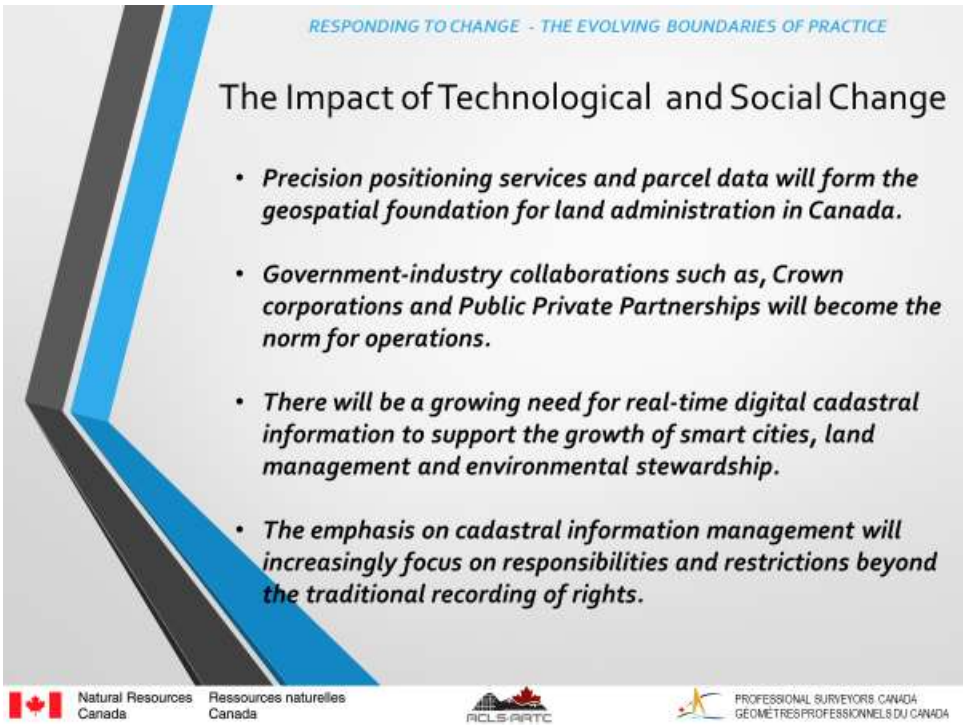
1. Protection of the public (more effective regulatory control).
2. National Branding. Elimination of marketplace confusion.
3. Creation of a single certification for entry to the profession
4. Strengthened national influence and reputation
5. Support of interprovincial mobility
6. Simplified operations and governance (remove redundancy)
7. Enhanced member support and services

Our regulatory processes, standards of practice, and competence profile must also be responsive to technology, and aligned with societies needs.

In particular, as the presentations by Jason Bond, Jordan Litke, and Erik Holmlund made clear this morning the digital economy will require a re-thinking of our traditional approaches, away from plan and title registries, and toward a more integrated authoritative parcel-based cadastral information base that fully represents all the rights, responsibilities, and restrictions associated with a parcel and which supports timely and effective land management.

This next generation cadastral structures and systems must also be aligned to support and enable Canada's social well being priorities.

For example, less than half of Canadians lived in urban centres in 1911. Today over 81% of Canadians live in urban centres. Almost all future population growth will come from immigration, and will be increasingly concentrated in major urban centres.



So what does all this mean?

Increasingly our role as the authoritative source for cadastral information will be linked and inter-twined with a broader land information management community. We need to actively start to make those connections now.

Mission:

The Canadian Registry Leaders Council (CRLC) is an association of leaders in land registry operations from across the country, including regulators who are also responsible for land registry operations. The focus of the Council is to serve as a neutral environment in which public and private sector operators from across Canada can share information and work together to promote Canada as a world leader in land registry operations.


RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Questions for the discussion groups
1. How can the land surveying profession continue to meet its regulatory obligations and maintain trust in society given its demographic profile and jurisdictional structure? For example, how could the profession move towards a national collaborative approach to the administration of practice review, complaints and discipline, continuing professional development?
Natural Resources Canada
Ressources naturelles Canada
PROFESSIONAL SURVEYORS CANADA
GÉOMÈTRES PROFESSIONNELS DU CANADA


RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Questions for the discussion groups
2. How can the profession better understand and proactively respond to technological change and society's evolving needs? For example, how could the profession play an expanded and effective role in the delivery of precision location-based services and cadastral data management?
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RESPONDING TO CHANGE - THE EVOLVING BOUNDARIES OF PRACTICE
Questions for the discussion groups
3. Given the evolving needs of society, how could the future competency profile for the land surveyor evolve to a role recognized by society as a multi-disciplined land administration professional? How could the profession collaborate with academia and government to transition towards this new profile?
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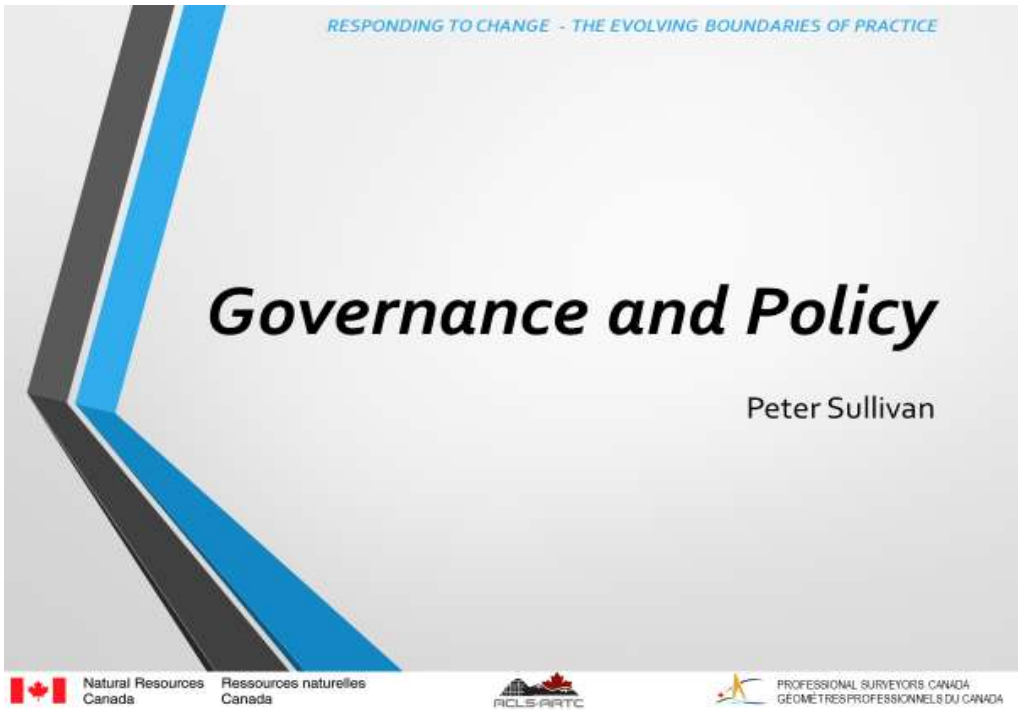
GÉOMÈTRES PROFESSIONNELS DU CANADA

6.0 Governance and Policy – Peter Sullivan



Each of the Evolving Boundaries of Practice workshop presentations have provided a foundation to help the profession understand its current context and build strategies for the future role of the professional land surveyor in Canada.

We can certainly celebrate our many contributions to the development of Canada however it seems that it is time to work collaboratively towards how we would like to frame our future role in Canadian society.

This presentation will summarize some key trends, particularly from a government context and provide some ideas as to how we can move forward.

We have a reasonable idea as to what the profession has to do, however the challenge will be developing how we go forward.

Cadastral systems (land survey, legal frameworks, land-use planning and land registration) in Canada have advanced remarkably in the last twenty years. All of this progress has contributed to each of these trends

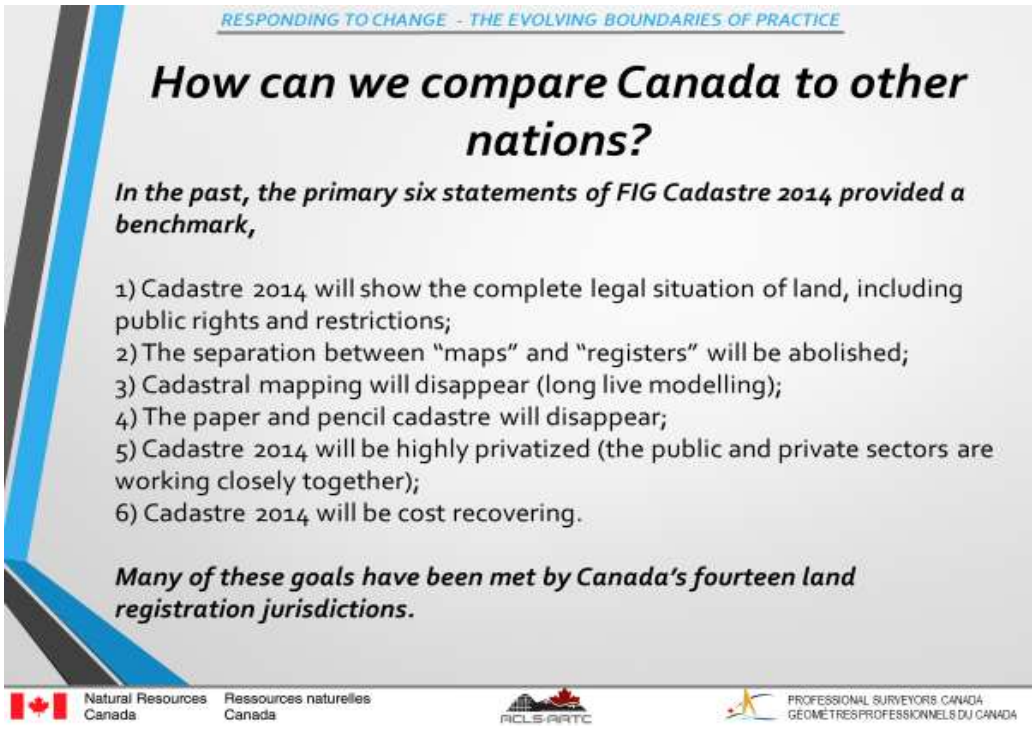
The land surveying profession has been involved and experienced the impacts of this change at various levels in multiple unique jurisdictions. Each initiative has required a response that has influenced the role of the land surveying professional in Canada.

Internationally governments are seeking innovative solutions to societal problems and government policy priorities such as:

- "Poverty reduction
- Urbanization
- Population growth
- Rising Demand for Land
- Climate Change" (Roberge)

In Canada, we have numerous challenges that include finding ways to provide quality government services as efficiently as possible, modernizing regulatory regimes, promoting innovation and economic development and reconciling with Canada's Indigenous Peoples.

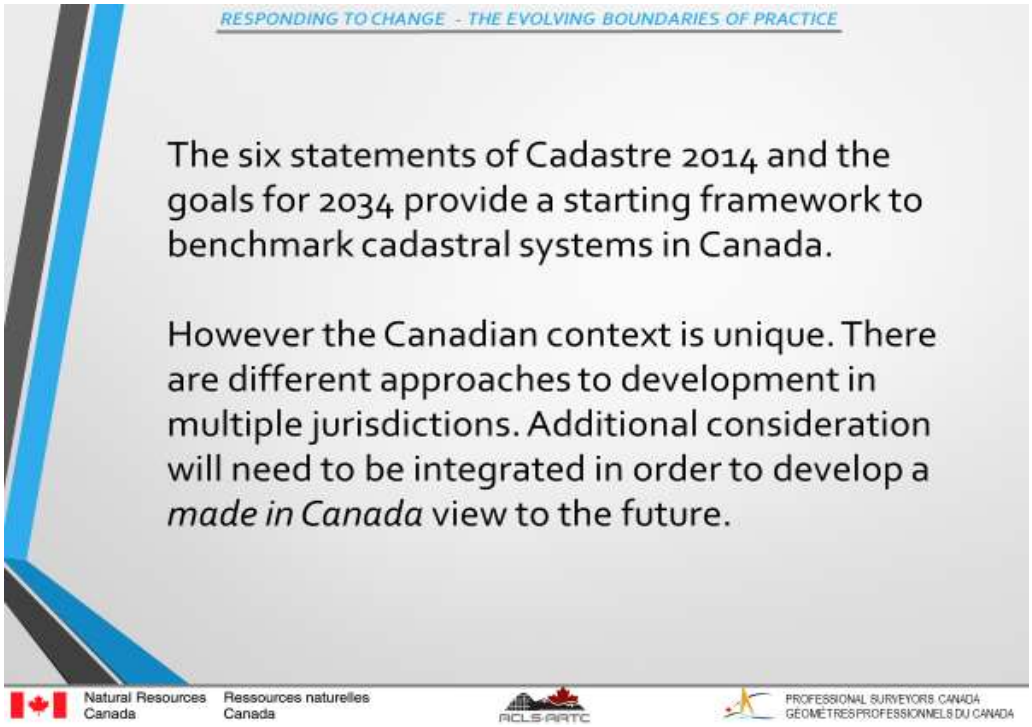
We can learn from international trends towards more holistic approaches to cadastral management, considering the full bundle of rights, responsibilities and restrictions associated with land. In the Canadian context this could include indigenous rights (for example, sacred lands such as gravesites), environmental reserves, historical locations and other rights that would impact the use and development of land.



Remember Cadastre 2014? This model, developed by the International Federation of Surveyors (FIG) was developed in the 1990s and provided a method to benchmark cadastral systems. In fact, the Surveyor General Branch used this model to provide strategic direction for modernization of the Canada Lands Surveys System.

Clearly, many of the objectives of Cadastre 2014 have been met and some may not be all that relevant in today's context.

A group of FIG participant nations have provided an update with a view to 2034. Australia and New Zealand have both published their visions for cadastral systems in 2034. What would a "made in Canada" version look like?



Would it be possible to migrate towards a national model that also reflects the diversity and needs of each jurisdiction? Certainly, any Canadian model would need to emphasize and integrate Indigenous perspectives on land management. There is the obvious link between environmental management, climate change and who owns the rights, restrictions and responsibilities in land.

Then of course we have the vast Canadian Arctic and offshore regions.

Given the concentration of the population in urban centres, recognition of the emerging role of cities and their potential to lead in innovation must be considered.

How would all of this be brought together to build our "made in Canada" version of Cadastre 2034? This may seem like an enormous undertaking, however perhaps it would be feasible when addressed in smaller pieces with a focus on the cadastral and geodetic survey components.

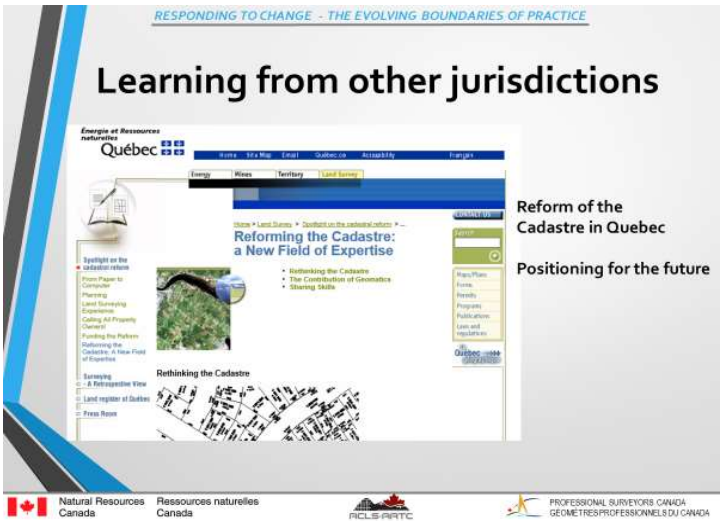
It is clear that the Canadian Land Survey Profession is innovative, modern and capable of providing many essential services to society going forward. But do we have a good sense of where we want to go from a national perspective? Do we fully understand the economic and societal space that is emerging and who will be our colleagues and competitors in this space? What are the unique capabilities of the land surveying profession that will differentiate the profession and lead to a sustainable and successful role in tomorrow's society?

The profession has the unique responsibility to maintain the cadastral fabric that underpins land governance activity in Canada. As we move forward, the cadastre supported by a solid geodetic foundation will be essential to enable applications that are visualized in smart cities as well as the numerous technical solutions being implemented for modern land administration.

Land surveyors provide the connection from the virtual to the ground where human activity and interaction takes place. Understanding a jurisdiction's history, jurisprudence, statutory and administrative frameworks provides essential local knowledge for land development projects. Further, as recognized experts in geospatial data management combined with practical and common-sense approaches to delivery, society has traditionally had trust in the land surveyor's ability to deliver technical excellence and legal boundary certainty.

Practitioners in government and the private sector lever their deep understanding of land administration regimes to effectively navigate clients through complex systems and processes. These fundamental roles and responsibilities provide the core foundation for the profession that could underpin a national strategy going forward.

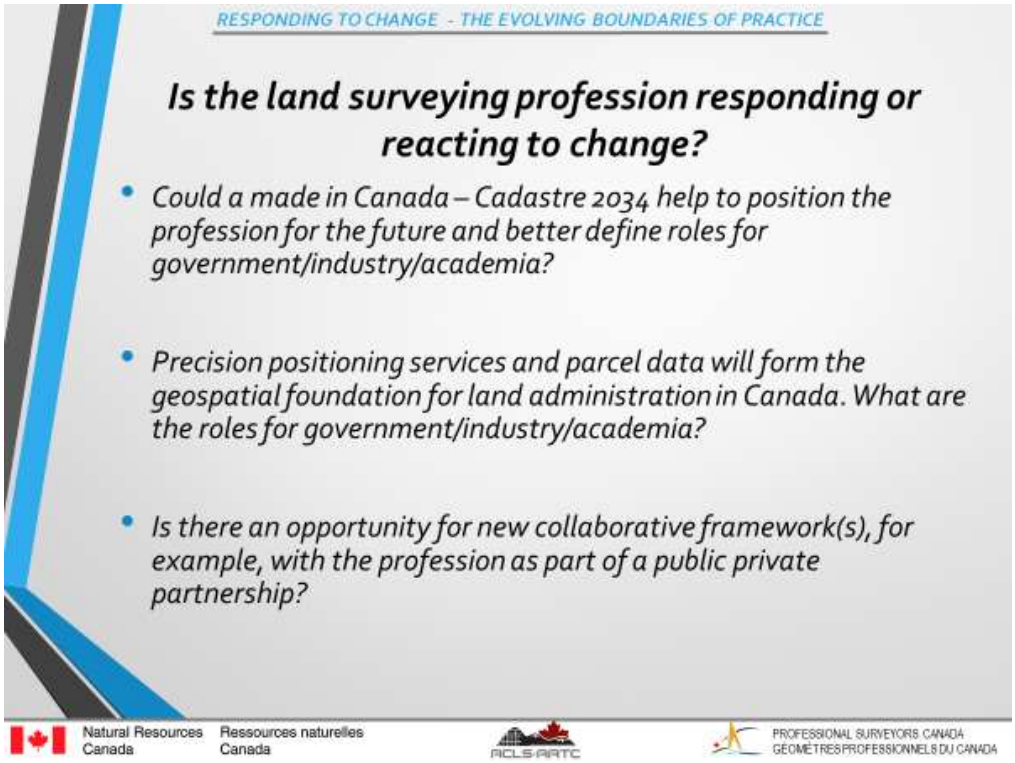
Many new and innovative delivery models have been developed and implemented in Canadian jurisdictions to help improve the delivery of cadastral services. Could the profession be more engaged in the delivery of this change? How could a national strategy help to provide a gateway to increased participation and help position the profession for the future?



We can learn a great deal from other jurisdictions. As we learned earlier, in Quebec the surplus generated by the land registration system made possible the realization of the Cadastre Reform Program. This innovative program has transformed and positioned the provincial cadastral system as well as the land surveying profession in Quebec for success in the digital economy.

The Alberta Data Partnerships (ADP) model highlights a successful public private partnership that was conceptualized and built by the key user communities of cadastral data.

This is an example of an innovative business model built specifically to meet the needs of a group of key users. ADP has levered their position to deliver many other important services to the Government of Alberta. Can the land surveying profession enlist the support of key users of data and services towards the development of a new community or framework for the delivery of cadastral and/or geodetic data and services in Canada?



Perhaps an overarching national vision or a Canada Cadastre 2034 would provide a high-level model and direction for the profession to move forward. Canada would also need to benchmark the current status of each jurisdiction such that gaps can be identified and addressed.

Cadastre 2034 would be underpinned by precise, real-time positioning service(s) and authoritative parcel data. An effective framework for each participant in government/industry/academia will need to be developed such that each contributes and interacts in the most effective way possible.

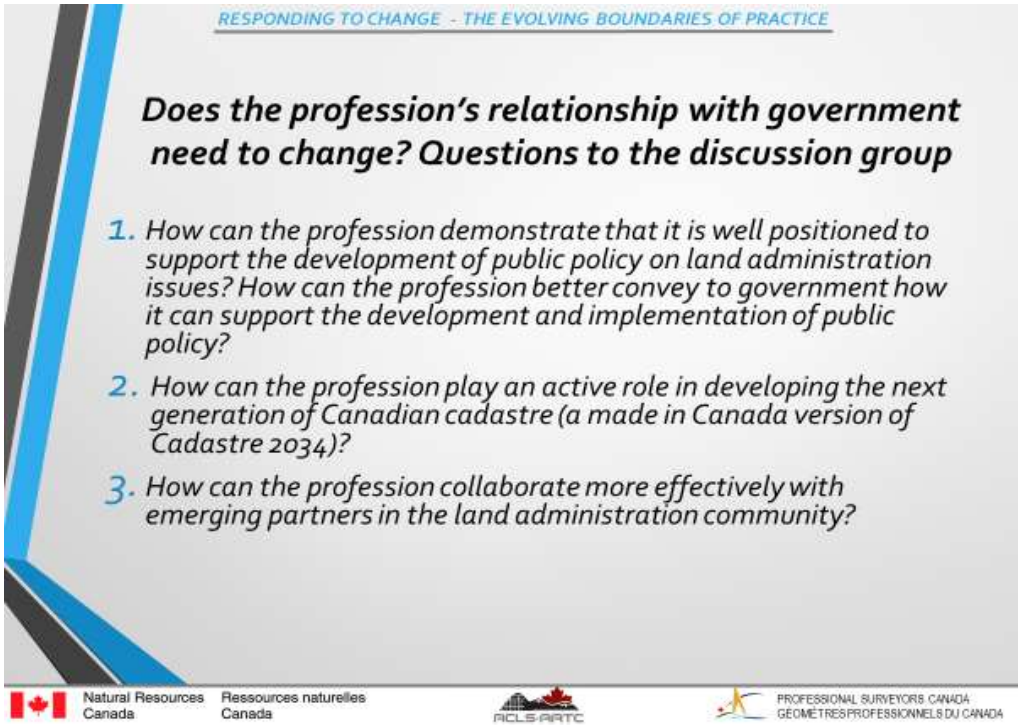
Innovative operating models such as Public, Private Partnerships will be required to deliver in the most cost-effective and efficient means possible.

This vison must be communicated and endorsed by all participants and those overseeing the profession.

Communicating key messages at the right level to those in influential or decision-making roles will be a critical component of a national strategy. There is a clear need for the land surveying profession to engage at a senior level in all levels of government to demonstrate how the profession can help facilitate change management and address contemporary land administration and property rights issues for Canadians.

There is a requirement for the profession to align messaging with the needs of society and influence policy development. For example, how does the work of the land surveying professional help to address climate change, coastal erosion, reconciliation with Canada's Indigenous Peoples and sustainable economic development. Land surveying practitioners, in government, academia and the private sector play a role towards developing solutions to these and many other issues facing Canadian society.

As the Right Honourable Joe Clark so clearly articulated, there needs to be engagement. Implementing and asserting a future role for the profession will be a challenge considering the relatively small numbers in our profession. This is why it is absolutely essential that we come together at the national level and collaborate to lever the most impact from limited resources.



These are the three challenge questions for the discussion groups. As recommendations are developed, the inter-relationships between the technology, society and governance working groups will need to be considered and synthesized into a concise and doable list of strategic next steps for the profession going forward.

7.0 Summary of Morning Presentations - Izaak de Rijcke[1]

Good afternoon everyone. Welcome to the afternoon sessions and workshops. I thank ACLS and Professional Surveyors Canada for a great conference and the privilege of participating at this event. Thank you also, Peter for the kind words and introduction.

When first approached by Peter and Hal to become involved in this year's National Surveyors Conference, I thought, “Great! - this will be an opportunity to learn and gain insights". But then some realities began to sink in. As part of the Society group, I was keenly aware of how all professions are changing:

First, change is happening internally in regards to how professional organizations function: discipline, ensuring competence, CPD are all constantly evolving and all with a view to protecting the public. However, more importantly,

Second, more importantly is the context in place of professions in general within society.

The *contract* is changing: society expects more and wants to see that more is being done.

In this context, society is becoming intolerant of professions suspected (or seen) as protecting their own… or advancing the financial interests of their own members ahead of acting in the best interests of the public.

Why do I begin with a recap of this morning's sessions with the third driver: 3 – *society and the professions*? Why not just give a summary of the three drivers of change? Yes, this would have been possible, but I want all of us to consider also the spaces in between the drivers themselves. Each driver is not a silo. We must therefore also consider the following important questions:

1. How does technology interact with society and the professions and *vice versa*?
2. How does technology interact with governance and policy? and,

[1] Introduced as a presenter with bio: ““Already well-established in a long career as a lawyer in boundary law, Izaak teaches survey law subjects for willing universities and colleges across Canada through Four Point Learning. After serving as editor for 5 years of *Geomatica*, Izaak published *Principles of Boundary Law in Canada*. Also a practicing cadastral surveyor, he is a frequent speaker at CPD events and looks forward to learning at NSC2019.”

3. How does governance and policy respond to society and what the professions have to offer?

The overwhelming message from this morning can be summed up in one word: CHANGE!

We are on the cusp of change for not only each one of the three stated drivers but also in how we manage change itself. Let's consider each one of the three drivers in turn:

I. ***Technology***: considerations for the land surveying profession:

Issues arising from changes in technology were well described by Jason, Jordan, and Erik. From mobile supercomputers and high-resolution imagery to the ever-increasing accuracy for GPS, we were shown a future in which a search for a particular property is defined by user needs criteria. The search narrows down based on how the parameters define potential utilization of property: zoning, size of floor space available, cost, proximity to points of interest, traffic volume, and all of this compounded with the availability of a virtual tour that can be offered through a realtor.

For the sake of not running afoul of distracted driving law, I might not recommend checking the title on my device on the way to the property but, what emerges as a clear message is the ever-increasing quality of data and the ability to merge multiple data sets using that technology. It all enables an enriched experience that drives the consumer's decision-making process in a seamless manner: both data and tools converge in order to make the decision-making process informed. This is a process for millennials to welcome but, land, property, accommodation and business space is now increasingly turned into a commodity that is ever easier to transact in legally, and financially, as a parcel that is defined, secure and stable in order to allow all of this to occur.

Through block chain and smart contract technology we reduce the potential for fraud and we may even lessen the need for third-party intermediaries, such as lawyers. We also heard about opportunities for the survey community in being able to influence the “authoritative base” because technology is a disruptor or will become an ever-greater disruptor to the cadastral surveying profession. These were excellent questions posed at the end of the presentation:

1. Is there a role for the profession in cadastral database sets in Canadian jurisdictions? The answer is not to say that we remain the only ones who have a right to manage this data. No; the answer lies in “what can

we do to earn the public trust as guardians of data that is free, ubiquitous, but may conflict with legal parcel fabrics?"

2. How can authoritative positioning databases be managed for the land survey and land manager professions in Canada? Again, the answer is not to leave it as a free-for-all. This in fact is an opportunity to use our geomatics education and skills to be proactive and demonstrate the profession as the trusted guardian.

3. Competency profiles will change as a result of technology but the question is how? This challenge is answered by not only focusing on competency in the sciences. With respect, our competency profile will increasingly include history, sociology, law and people skills.

This segues into our next driver of change…

II. Society and the professions

Thank you, Hal, for a very intriguing and thought-provoking presentation. For this driver, we heard about the same qualities that were noted at the end of the second presentation being technology. Key elements included the following:

1. Trust, through self-governance mandates to protect the public
2. Keeping competency profiles relevant and updated, and
3. Respond to societal needs on the basis of what technology enables.

Let's delve somewhat deeper into each of these:

a.) Self-government and professional misconduct:

It was suggested that when a discipline proceeding or misconduct charges take place it may reflect a failure of the profession. I disagree. It is not a failure of the profession; it is a failing of an individual member who has been charged and brought into the discipline machinery of a professional regulator. I can tell you from personal experience in having prosecuted numerous practitioners that this is one of the most difficult and painful things

that a member can experience. Members are charged and the process is not unlike a criminal proceeding. Members feel deep shame. For the regulator this is excruciatingly expensive while also highly complex and loaded with many risks.

Yet, these are so essential to maintaining public trust that we always will get onto thin ice if we do not pursue prosecutions vigorously or if we do not publish the results on a regulator's website. The public has every right to ask, “what are you hiding?" and, “what are you protecting?" if this does not occur. Increasingly, discipline penalties involve some monetary compensation to the complainant.

b.) Maintaining competency levels and topical areas that are public needs:

This was highlighted by Hal at the other end of the spectrum. The numbers spoke loudly. The paradox of course is that if we raise competency levels, university programs get longer and tougher. Barriers to entry go up. Likewise, if we make CPD post commission more onerous, we risk turning potential members away. Yes, we do have a crisis in numbers. But how do we reconcile a need for more members with a duty to maintain high competency levels? In this afternoon's workshops we will no doubt have many ideas for responding to all of the drivers of change that we heard described this morning. But here is one to get started:

What if gaining competency (including training and CPD) became the shared responsibility of members and their employers? Some firms already do this but, would not on the job CPD and training make for a better qualified profession? Would it not enable a profession that is also relevant to industry and society?

The scenario described by Hal at the end of the society and professions drivers of change contemplated the cadastral surveyor of the future as encompassing all aspects of the property and land use regulatory framework in Canadian jurisdictions.

This complements the profile and attributes of the future surveyor as one who is far more than one simply surveying legal boundaries on the ground. It contemplates a future surveyor who can think like a planner, can talk the vocabulary of lawyers and can visualize problem-solving like an engineer. The implications for universities, colleges and CBEPs are profound – and so too for employers as we implement programs that enable these competencies.

III. Governance and policy

Thank you, Peter, for this presentation at the outset of this morning. It was most insightful. The Canada of 2019 and in years to come has become hardly recognizable. Let me share with you some comments that I received to a feedback questionnaire at the end of teaching Survey Law 2 in early April this year. The question was, “what is the least useful part of this course?" I was stunned when I read one response, “the subject of reconciliation because that is maybe useful if I want to become a CLS but I only need a provincial commission.”

Reconciliation with indigenous peoples in Canada is not just an afterthought: it has become a core component of understanding property rights in Canada so that the future cadastral surveyor’s profile, as a land manager, must include knowledge of history, culture, property law and indigenous title – irrespective of whether a licensed member is commissioned provincially or as a CLS. This is part of what Peter described as a “made in Canada" view of how we move from present day cadastral systems to *Cadastre 2034*. Canadian land surveyors are challenged to develop a national strategy and communicate what we can do in order to have a role – to even have a seat at the table.

You may well ask, “what table?"

It is the forum; it is every forum in which a voice is needed to explain the legal link between human activity on the ground and mathematical and virtual reality of that human activity on the ground. Peter described public private partnerships as one example of governance models and corporate opportunity to deliver cadastral products and integrate these with other products and services. It was described with examples taken from Québec and Alberta as highlighting the lead-in to other partnerships between the profession of the future and the agencies that offer real-time precise positioning services and parcel data.

This led to a challenge for involvement at perhaps higher levels of government than what has been traditionally experienced. I am a firm believer that a made in Canada version of at *Cadastre 2034* is not only needed, it can and must be developed. It will however, require a land surveyor in 2034 (remember, that is only 15 years from now!) to look back at events like today and see that we were on to something: something that is much more than just talk and ideas. No, we are not victims of disruption but we do become and can enable the drivers of change that allow for these outcomes to be attained.

These are daunting challenges, but society will only take us seriously if we are prepared to take ourselves seriously. Unlike the “Easy” button on the slide in Erik's presentation this morning, there is in fact no “Easy” right now. Erik told us so as well. To get there, we have some hard work to do - from bottom up thinking of how we get there. I am looking forward to our afternoon workshops. Thank you again.

8.0 Discussion Group Summaries

Discussion Group 1 – Part 1 Technology – Bruce Clark

Flip Charts

1. **How can the profession ensure a role in the development and management of authoritative cadastral data bases in all jurisdictions in Canada?**

- There is a need to define what is meant by Authoritative in the cadastral data context.
- Are there regional differences and needs that need to be considered?
- There is a need to communicate to "them" that we are the experts – Who is them?
- Is there a need to create a business case?
- There is a need to convey consistency in expertise – for example through education, etc.

2. **How could an authoritative national positioning service for land survey and other precision users be developed and managed?**

- There is a need for national standards with regional differences.
- Who is this to be communicated to?
- Who owns this problem?
- Public Private Partnerships
  - Maintained?
  - Regulated by Government
  - Public Utility!

3. **How will the competency profile of the professional land surveyor be impacted by rapidly advancing technology impacting the land administration community?**

- Greatly – we have continuously maintained competence historically.

Key messages heard:

1) There is a need to clearly define what is meant by authoritative cadastral data bases as a means to promote and differentiate the value that the land surveyor brings to this data set. This would require developing a business case explaining the need for and increased utility of authoritative data that the land surveyor would provide.
   The business case would identify the key users who would recognize the value in this approach. A communication plan would convey the importance of a consistent national approach with consideration to regional differences.

2) As with cadastral data, there is a need for national positioning standards, again with consideration to regional differences. A business case would identify who would own this problem, a proposed financial model for development and ongoing operations such as in a public private partnership. Standards would be regulated by government as a public utility.

3) The competency profile would be impacted dramatically. Note: That work on future competency profiles is underway through the Canadian Board of Examiners for Professional Land Surveyors (CBEPS) as well as work related to certifying foreign trained professionals.

Discussion Group 1 – Part 2 Society

1. **How can the land surveying profession continue to meet its regulatory obligations and maintain trust in society given its demographic profile and jurisdictional structure? For example, how could the profession move towards a national collaborative approach to the administration of practice review, complaints and discipline, continuing professional development?**

    - Consistency across Canada
    - National – CPD Standards
      Standards
      Discipline
      Entrance Requirements
    - A common "Body"/ Committee
    - Regionalism?
    - ACLS Home?

2. **How can the profession better understand and proactively respond to technological change and society's evolving needs? For example, how could the profession play an expanded and effective role in the delivery of precision location-based services and cadastral data management?**

    - Big Table
    - SWOT Analysis
    - Business Case
    - Continue to explain our role as Land Management Experts
    - Anticipate needs
    - Let's not be the smartest guys in the room!
    - Get others' views
    - Social scan.

3. **Given the evolving needs of society, how could the future competency profile for the land surveyor evolve to a role recognized by society as a multi-disciplined land administration professional? How could the profession collaborate with academia and government to transition towards this new profile?**

    - Recognize that we need to be at the table
    - Push to be part of the discussion with industry and government – federal, municipal, provincial, local.
    - Policy development.
    - History + Tradition vs Future
    - Messaging to attract entrants
    - Expanded profession
    - CPD emphasis

Key messages heard:

1) It is important that the profession maintain consistency in regulatory functions across Canada. This could be done through national CPD standards, a national approach to discipline and entrance requirements to the profession. Regional differences would need to be considered and integrated. Perhaps the ACLS could provide a home for national operations.

2) The profession needs to expand its community of practice and be part of a bigger table. A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis could underpin the development of a strategy and business case for precision location-based services and cadastral data management. There is a need to continue to explain and communicate the profession's role as land management experts. There is a need to reach out, listen, anticipate needs and ensure other's views are considered through an in-depth social scan.

3) The profession needs to have a voice at decision making tables to be part of the conversation with industry and all levels of government. Land surveying expertise should be integrated into policy development. There is value in understanding our history, in terms of the profession's contribution to the development of the country, however there is also a need to look forward to determine a future role. New messaging will be required to attract entrants as well as an expanded approach to the profession. Continuing professional development will need to be emphasized.

Discussion Group 2 – Part 1 Technology – Sue MacGregor

Flip Charts

1. **How can the profession ensure a role in the development and management of authoritative cadastral data bases in all jurisdictions in Canada?**

- Research international existing cadastres
    - Understand their sustainability
    - How they came about?
    - costs?
    - What standards and legislative processes were involved?
- What tables do we need to attend/influence?
    - Municipal
    - Industry
- Client needs study/Impacts

2. **How could an authoritative national positioning service for land survey and other precision users be developed and managed?**

- Combination federal government and Public Private Partnership (PPP), depending on sustainable cost model and industry needs.
- The survey community would set standards.
- Collaborate with all precision users.
- Examine cost recovery / cost-benefit analysis.
- Political engagement
- National regulation to fix property corners.

3. **How will the competency profile of the professional land surveyor be impacted by rapidly advancing technology impacting the land administration community?**

- Move from data acquisition to data management and influencers of the authoritative use of data
- Common standards across Canada
- Influencing a much broader community and collaborators with tangible outcomes.

Key messages heard:

1) There is a need to better understand cadastral system development around the globe in terms of, what drove their development, their sustainability and associated costs. This review would also include an understanding of the standards and legislative processes involved.

A better understanding is needed of the key tables where the profession could influence. This would include municipal and industry tables. This could be obtained through a client needs/impact study.

2) An operating model needs to be developed that could include the federal government as part of a Public Private Partnership (PPP). A business case would be required to review cost recovery options and cost-benefit analysis. The model would define roles for participants, for example the survey community could set standards. Collaboration would be required among the key user community and this would support messaging for required political engagement. The model would contain a framework to allow the recording of data to fix property corners.

3) The emphasis on competency development would move towards management of data and providing information regarding the use of authoritative data. There needs to be a consistent approach to competency development across the country. This approach would include a larger group of collaborators in the land administration/location-based services community.

Discussion Group 2 – Part 2 Society

1. **How can the land surveying profession continue to meet its regulatory obligations and maintain trust in society given its demographic profile and jurisdictional structure? For example, how could the profession move towards a national collaborative approach to the administration of practice review, complaints and discipline, continuing professional development?**

- One model for discipline, complaints and CPD. Change legislation ind/fed overarching
- National best practices statement (collate the best with the best)
- Public representations on Council
- Status of membership open to the public
- Better tools for regulation eg. Fines go to complainant
    - Remedies to client?
    - Funds to remedy public?

2. **How can the profession better understand and proactively respond to technological change and society's evolving needs? For example, how could the profession play an expanded and effective role in the delivery of precision location-based services and cadastral data management?**

- Public believe the boundary is absolute – can we provide that?
- Build a collective team of land professionals.

- Framework to allow for authoritative data insertion with attribute data (eliminate/reduce data loss)
- Communicate links of services to societal issues (climate change)

3. Given the evolving needs of society, how could the future competency profile for the land surveyor evolve to a role recognized by society as a multi-disciplined land administration professional? How could the profession collaborate with academia and government to transition towards this new profile?

- Expand CPD to cover skill requirements for the future.
- Collaborate with other Eng/Planners/Environmental professionals to develop content.
- Keep working with universities and colleges for on-line content and coop programs.

Key messages heard:

1) There is a need for a national approach to regulation of the profession, supported by a consensus statement on best practices. The public must be represented on council and in transparent processes and membership status should be open and available to the public. Better tools for the protection of the public are required to ensure there are effective remedies available to correct problems.

2) There is a need to deliver authoritative parcel data that the public can rely on, however with attributes that describe the quality of the data. The profession needs to develop a framework to allow the collection of coordinate data on property corners to build reliability and curb the huge loss of information that occurs in current practice. A team or community of land professionals working collaboratively would provide a better framework to communicate roles and responsibilities in the land administration process and help to better provide the links to societal issues such as climate change.

3) The profession needs to expand CPD programs to align with the future competency profile for the land surveyor. The future profile should be developed with other land administration practitioners such as engineers, planners and environmental professionals. Work needs to continue with the academic community to develop on-line content as well as coop programs.

Discussion Group 3 – Part 1 Technology – Martin Gingras

Flip Charts

1. **How can the profession ensure a role in the development and management of authoritative cadastral data bases in all jurisdictions in Canada?**

- Cadastral authoritative
    - Users might be tempted to accept what they see on the screen and position with precise data.
    - What is an authoritative data base?
- All associations to work together to define this strategy (business case) and influence legislators.
- Who to own this database nationally?
- National advocacy for maintaining consistent standards for cadastral databases.
- Biggest fight is with people out of this room.

2. **How could an authoritative national positioning service for land survey and other precision users be developed and managed?**

- What we do next
    - Finding the right strategic partners.
    - Develop an MOU
    - Form regional groups – get buy in

3. **How will the competency profile of the professional land surveyor be impacted by rapidly advancing technology impacting the land administration community?**

- Empower a national group to develop a study on mandatory? CPD, Practice Review.
- Connect with regional groups
- Find and agree on commonality
- Develop national standards for practice review and discipline
- Communication to the public to explain our role
- Attract people to the profession

Key messages heard:

1) There is a need to define what is meant by an authoritative data base and communicate this to ensure appropriate use by the public. The associations need to work collaboratively to build a consensus, strategy and business case as well as a communication plan to legislators and the user

community. The business case will define participants' roles including ownership of related data bases and the strategy and communication plan will advocate for consistent standards.

2) There is a need to identify and connect with strategic partners and formalize a way forward with an agreement such as a memorandum of understanding. Given the size and nature of the country, regional groups will be required to support the process.

3) A national group should be empowered to find commonality of the competency profile for the future surveyor, connect with regional groups, communicate a future vision to the land administration community and use this as a base to attract people to the profession.

Discussion Group 3 – Part 2 Society

1. **How can the land surveying profession continue to meet its regulatory obligations and maintain trust in society given its demographic profile and jurisdictional structure? For example, how could the profession move towards a national collaborative approach to the administration of practice review, complaints and discipline, continuing professional development?**

- Trust in society – what does it mean?
- Role for PSC
- CPD for the public
- Protecting the public or surveyor
- Accountability

2. **How can the profession better understand and proactively respond to technological change and society's evolving needs? For example, how could the profession play an expanded and effective role in the delivery of precision location-based services and cadastral data management?**

- Identify the fundamental role of surveyor, independent from technology
- Expanding our profession in different types of work – data management
- Society needs it quick and cheap – what is the plus value of the surveyor?

3. **Given the evolving needs of society, how could the future competency profile for the land surveyor evolve to a role recognized by society as a multi-disciplined land administration professional? How could the profession collaborate with academia and government to transition towards this new profile?**

- Benefits to society – multi-faceted

- Surveyor – migrates – digital society
    - Involved more in land management aspect
        - Land administration
        - Planning
        - Underground
        - 3D
        - Virtual augmentation
- New focus on CPD towards these subjects
- Manage information – survey
    - Land registry
    - Value added information
- Society needs Information and data
- Surveyors add value, precision, information and quality
- How we transfer this information to society – does not equal a survey plan – something else - as an expert in the field.

Key messages heard:

1) There is a need to better define what is meant by "trust in society" and how the profession can improve public perception. Roles also need to be better defined such as the role for PSC, versus CPD. The profession needs to be viewed as protecting the public as opposed to a practitioner with clear and transparent accountability.

2) First, the profession needs to define its fundamental role in society independent of technology. Next, identify different types of work that would support this role such as data management. In a society that demands quick and cheap solutions the surveyor needs to find where they can add value.

3) The potential benefits to society are multi-faceted as the surveyor migrates to a digital environment. It is clear that more involvement will be required in land management/administration as well as evolving needs such as 3 or 4 dimensional cadastres and spatially locating underground facilities. Society is demanding virtual information and data and surveyors must migrate from providing their information on conventional plans towards authoritative data sets. This needs to be built into our culture and be imbedded in future CPD programs.

Discussion Group 4 – Part 1 Technology – Robert Pinkerton

Flip Charts

1. **How can the profession ensure a role in the development and management of authoritative cadastral data bases in all jurisdictions in Canada?**

- Common platform
    - Common metadata
    - Accuracies
- Task Force (TF) where are we now
- Trust in the data
- Costs $

2. **How could an authoritative national positioning service for land survey and other precision users be developed and managed?**

- Existing providers?
- Augmentation?
- 5G How does it fit in?
- Security/protection of public
- Push from end users

3. **How will the competency profile of the professional land surveyor be impacted by rapidly advancing technology impacting the land administration community?**

- Investigate each association's minimum standards
- Practice review focus on education
- Metrics for assessing competency via crowdsourcing
- Expanded full scope practice review
- Reciprocity between provinces
- Contracting PR Services between jurisdictions
- Pool all our resources
- Explore how everyone else does it

Key messages heard:

1) Canada should explore the possibility of developing a common authoritative platform to allow national access to cadastral data with well documented meta data including accuracies. A national task force could be established to determine the current status of systems and data across the country. Note the SGB National Parcel Data study (2006) could be used as a starting

point for research. This work could lead to a business case with proposed models and associated costs.

2) A proposal for a national positioning service would need to include current service providers, the need for augmentation and consideration on emerging 5G technology. The business case for such a service would best be developed using a push from key end users. Security/protection from the public could be a primary argument for the system, including others that align well will emerging needs such as smart cities.

3) Resources need to be pooled to have the most impact, and there is a need to learn from other professions. There needs to be consistency and reciprocity between jurisdictions and practice review should focus on education. Innovative methods such as using crowdsourcing should be considered for assessing and developing competency needs.

Discussion Group 4 – Part 2 Society

1. **How can the land surveying profession continue to meet its regulatory obligations and maintain trust in society given its demographic profile and jurisdictional structure? For example, how could the profession move towards a national collaborative approach to the administration of practice review, complaints and discipline, continuing professional development?**

- Speak with one grassroots voice.
- Advocacy vs Regulation
- PSC

2. **How can the profession better understand and proactively respond to technological change and society's evolving needs? For example, how could the profession play an expanded and effective role in the delivery of precision location-based services and cadastral data management?**

- Effective property rights systems are economic drivers
- Survey plan 2.0 towards data manager

3. **Given the evolving needs of society, how could the future competency profile for the land surveyor evolve to a role recognized by society as a multi-disciplined land administration professional? How could the profession collaborate with academia and government to transition towards this new profile?**

- Develop a model for the expanded profession
- We want, but does society need?

- No easy answer
- Does the expanded profession want to work with us
- We already do this, but don't advertise this
- PSC

Key messages heard:

1) There is a need for the profession to communicate with one grassroots voice on regulation of the profession. Roles need to be clearly defined particularly regarding advocacy and regulation.

2) Effective property rights regimes need to be better communicated as economic drivers. The key communication product that the surveyor produces, the plan of survey, needs to migrate to survey plan 2.0 or data with information and knowledge transfer.

3) There needs to be a review of the profile for the future role of the land survey professional with a view to expanded skills. Society's needs going forward need to be determined and competency gaps for the future addressed and communicated.

9.0 Next Steps and Recommendations – Hal Janes

1. **That a national task force be struck to develop a strategic roadmap for the realization of the next generation of integrated digital land survey and registry systems infrastructure that will be required to underpin and enable effective and responsive land information management in support of Canada's evolving social, environmental and economic priorities and the needs of society in the emerging digital world.**

   Context - Building a land administration community for the digital society. The ultimate goal of this recommendation is to initiate a collaboration across the broader land administration community in Canada, leading to the articulation of a cohesive vision for the next generation of integrated digital land information management systems and infrastructure. This recommendation envisions a national dialogue sponsored by Natural Resources Canada and bringing together the survey, registry, planning and geo-spatial information communities to develop a high-level conceptual design and implementation roadmap for a national land information management infrastructure that can effectively leverage the digital revolution to support Canada's priorities and social needs. This framework should be developed such that an overview of the Canadian model can be presented at the National Surveyors Conference / International land Administration Conference in Mont Tremblant in 2020.

2. **That Professional Surveyors Canada on behalf of the land surveying community request the federal Positioning, Navigation and Timing Board to create a working group to develop a Canadian model for a national civilian service to deliver authoritative real-time, high precision, Position, Navigation and Timing (PNT).**

   Context – Developing consensus on a real-time PNT service for Canada. Real-time precise positioning at the one to three-centimetre level, is required by Canadian users to support land development, engineering and scientific applications, as well as stimulate location-based innovation. Precise timing is required for numerous applications including managing banking transactions and the nation's energy grids. This service is essential in large municipalities to support smart cities development, in agricultural and natural resource development regions to support effective land management, for major infrastructure development projects such as highways and railroads, and to support civilian emergency response. While Professional Surveyors Canada would initiate the request, the proposed working group is to be representative of key users of the proposed civilian service and will bring together government regulators with industry service providers and technical end-users from the survey, geomatics, engineering and scientific/academic communities. A principal goal is to develop a sustainable delivery model for a real-time, high precision enhanced GNSS civilian positioning service across Canada.

3. **That Canadian land surveying regulatory professional associations assemble a professional self-regulation task force with representatives from each jurisdiction to review the status of**

land surveying professional regulation across the country with a view to improve sustainability, effectiveness and efficiency.

Context – Ensuring the most effective and efficient self-regulating structure for the land surveying profession in Canada. A key goal of this recommendation is to enhance existing collaborative initiatives among the land surveying associations within the mandate of self regulation encompassing such activities as professional registration, continuing professional development, practice review, and complaints and discipline. As a first step, the proposed task force will review the possibilities of levering the existing national initiatives that are in place as well as opportunities for regional collaboration. All with a view to sustainably provide and communicate transparent, fair and optimized approaches to regulating the profession with the ultimate goals of delivering land tenure security and protection for the Canadian public.

4. **That Professional Surveyors Canada lead the development of a comprehensive communications and advocacy plan, to communicate the importance of maintaining and evolving our national land survey infrastructure as a foundation for effective land information management supporting the social, environmental, and economic priorities of Canadians at all levels of government, and to communicate the legislated role of the land surveying profession in managing that infrastructure and in providing authoritative survey and land information administration services to the public.**

   Context – Communicating the role of the land surveying profession in Canadian society: Canada's survey infrastructure and boundary fabric are foundational to our system of property rights and land tenure, and fundamental to our ability to manage restrictions and responsibilities relating to land use and stewardship. Canada's land survey professions have been assigned key responsibilities under legislation for the management of our survey systems and for the delivery of effective and reliable survey related services, on behalf of, and for the benefit of, the public.

   Currently, the land survey profession may be the only major profession that has not created an arms length body to advocate to government on matters of policy within their professional scope and legislated responsibility to the public.

   Advocacy by the land surveying profession is intended to do two things:

   (i) To promote the effective and sustainable management of our national survey and registry systems in the best interest of the public, and

   (ii) To communicate to all levels of government the role and responsibility that the land survey profession has under legislation to maintain an effective and publicly accessible survey infrastructure, and to deliver authoritative survey products and information to the public.

   Our responsibility to advocate is essential to enabling effective decision making at all levels of government, by providing a clear view of the land surveyor's role and how the profession supports the objectives of Canadian society. Examples range from the profession's contribution

to reconciliation with Canada's Indigenous peoples, to the sustainable development of land and natural resources, to including sub-surface utility information in the public survey record, to supporting natural hazard mitigation and emergency response, and to how these activities link to addressing climate change, public safety and economic development and many other challenges facing Canadian society.

As most professions have noted, advocacy communications are best conducted at arms length from our legislated professional bodies, whose principal role is to regulate the profession and practice of land surveying. In this respect, Professional Surveyors Canada has no formal connection to any of the legislated professional regulatory bodies in Canada and is well suited to this role. Rather, PSC is a not-for-profit association representing individual land surveyors across Canada and was created to raise awareness across government and the public, of the fundamental importance of Canada's survey systems and land survey profession to protecting property rights and ensuring effective land administration.

5. **This recommendation has the following two components, flowing from the working group research and the discussion groups at the National Surveyor's Conference:**

   i) That the Canadian Board of Examiners for Professional Surveyors (CBEPS) lead the development of a competency profile for the future professional land surveyor in Canada, based on the evolving needs of society and the profession's key role in facilitating land administration and geospatial knowledge management; and

   ii) That based on this future profile that the syllabus for candidates be reviewed and re-designed to ensure that land surveying professionals have the ability to effectively meet the needs of society going forward. The re-design is not to add more material or create barriers to enter the profession, but is to re-balance the content and academic requirements based on the domestic and global, technical and societal, context of the profession.

   Ideally, CBEPS would Investigate the appropriate balance of conventional and on-line course delivery combining the best available content from academic institutions across Canada.

   Context - Ensuring that the competency profile of the land surveying professional in Canada continues to meet the evolving needs of society.

   Maintaining competency is a fundamental component of change management for all professions. All must adapt to maintain relevance in an environment where rapid and disruptive change is the norm.

   Land surveying professionals are well positioned to provide the connection from the virtual to the ground where human activity and interaction takes place. Understanding a jurisdiction's history, jurisprudence, statutory and administrative frameworks provides essential local knowledge for land development projects. Further, as recognized experts in geospatial data management combined with practical and common-sense approaches to delivery, society has

traditionally had trust in the land surveyor's ability to deliver technical excellence and legal boundary certainty.

It is expected that the traditional perception of the land surveyor as a measurement and boundary definition expert will continue to expand to encompass land administration and spatial data and knowledge management. Society will continue to recognize the land surveyor as a land administration professional that will guide clients through all facets of the land and resource development process, while protecting the public rights in land (ownership, use as well as environmental, cultural and indigenous considerations).

Success as a profession will depend on our response to society's demands for authoritative information and advice on how land can be used, developed and protected. In other words, how the rights, responsibilities and restrictions on land are managed. The land surveyor's quasi-legal role as a boundary and survey law expert will expand to encompass all aspects of the property and land use regulatory framework in Canadian jurisdictions.

As summarized by Izaak de Rijcke after the morning sessions:

"1) Competency profiles will change as a result of technology but the question is how? This challenge is answered by not only focusing on competency in the sciences. With respect our profile will increasingly include history, sociology, law and people skills.

2) Maintaining competency levels and topical areas that are public needs."

Further, from the discussion groups: "A national group should be empowered to find commonality of the competency profile for the future surveyor, connect with regional groups, communicate a future vision to the land administration community and use this as a base to attract people to the profession.

Resources need to be pooled to have the most impact, and there is a need to learn from other professions. There needs to be consistency and reciprocity between jurisdictions and practice review should focus on education. Innovative methods such as using crowdsourcing should be considered for assessing and developing competency needs."

There is therefore a need to develop the future competency profile of the land surveying professional as a means to continue to effectively serve society, to attract new members to the profession and ensure that continuing professional development efforts are well-aligned and effectively support change management and continuing relevance for the profession.

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