What We Heard: Findings from Federal/Provincial/Territorial (FPT) Qualitative Interviews on the Current State of Canada's Spatial Data Infrastructure

Report by Gelder, Gingras & Associates Inc. for Natural Resources Canada

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Executive Summary

This report has been prepared by Gelder, Gingras and Associates Inc., which was contracted by Canada Centre for Mapping and Earth Observation (CCMEO), Natural Resources Canada, to conduct interviews, compile results, summarize and analyze feedback from federal, provincial, and territorial (FPT) government organizations on the state of Canada's Spatial Data Infrastructure (SDI), the "Canadian Geospatial Data Infrastructure" (CGDI). This report is one component of a larger stocktaking exercise led by CCMEO, which also includes government geospatial data producer and user inventories (surveys), a third-party desk study (desktop research) and environmental scan (literature review).

From June 1 to August 31, 2024, respondents from a sample of FPT government organizations (e.g., departments and agencies)[1] were invited to provide input through 1.5-hour interviews and/or by written submission. This report summarizes perspectives, shared by respondents, of Canada's current CGDI against nine key strategic pathways of the United Nations Integrated Geospatial Information Framework (UN-IGIF)[2], providing a point-in-time snapshot of the governance, policy, financial resources, data management, innovation, standards, partnerships, capacity, and communication. Respondents identified both strengths and areas requiring improvement to enhance coordination and collaboration across federal, provincial, and territorial levels. What follows in this executive summary and the full report is a summary of participants' perspectives and shared insights.

Governance and Institutions: Canada's geospatial information management is marked by a complex and decentralized structure, with varied roles and responsibilities across government levels. While federal leadership, especially in capacity-building and standard development, is recognized, coordination challenges persist, hindering effective collaboration and data integration across the country.

Policy and Legal Frameworks: Legal and policy frameworks guiding geospatial data management vary across jurisdictions. While sector-specific frameworks exist, a lack of cohesion creates inefficiencies that hamper data sharing and integration efforts. Stronger coordination and standardization are needed to support consistent geospatial data governance.

Financial Resources: Funding for geospatial data management is unevenly distributed, with some departments maintaining adequate financial support for current operations but lacking sustainable models for long-term growth. Provincial and territorial governments report challenges in accessing and sustaining resources, calling for improved funding mechanisms.

[1] While this report captures the perspective of governments, we acknowledge that the CGDI also includes the contributions of Indigenous communities and organizations, academic, civil society and private sector partners, whose work continues to strengthen Canada's geospatial ecosystem.
[2] https://ggim.un.org/UN-IGIF/

Data Management: Data acquisition efforts are notable, but challenges remain in integrating, sharing, and applying standards, particularly concerning Indigenous data sovereignty. A national data-sharing strategy is necessary to streamline data flows and enhance collaboration.

Innovation: Innovation within the geospatial sector is largely driven by public-private partnerships and academia, but a lack of a national strategy and funding constraints limit broader technological adoption. Continued support for innovation, especially in emerging technologies like AI, is critical for the sector's development.

Standards: Geospatial standards are recognized as essential but are inconsistently applied across regions and departments, leading to interoperability challenges. More concerted efforts to develop and apply standards uniformly across all jurisdictions are necessary.

Partnerships: Strong partnerships exist, particularly in goal-aligned projects. However, these collaborations are often ad hoc, and there is room for improvement in reducing duplication and ensuring broader coordination across sectors and government levels.

Capacity and Education: While specialized sectors have developed educational programs to support geospatial expertise, there is a broader gap in formal training programs, leading to a shortage of skilled professionals in the field. Investment in education and capacity-building remains a priority.

Communication and Engagement: Efforts to communicate the value of geospatial information are fragmented, with inconsistent messaging across regions. A more cohesive and targeted approach is needed to better highlight the societal and economic benefits of geospatial data.

Overall: Interview participants emphasized the need for stronger governance, sustainable funding, clearer communication, and improved coordination to address the gaps in Canada's geospatial infrastructure, and that, by tackling these challenges, Canada can fully leverage its geospatial capabilities to support national priorities, drive innovation, and contribute to economic growth.

CCMEO will use the feedback received during these interviews, together with the findings of other instruments and broader engagement with the private sector, academia, Indigenous organizations, and other partners and stakeholders to generate a more complete picture of the state of the CGDI, and to inform the development of a geospatial strategy.

Acknowledgements

This report would not have been possible without the contributions of key individuals and organizations. We extend our gratitude to the participants from federal, provincial, and territorial governments for their valuable insights into Canada's geospatial infrastructure.

Introduction

Geospatial information management in Canada is pivotal for addressing a wide range of national priorities, from monitoring environmental changes and managing natural resources to supporting infrastructure development and enhancing public safety. The governance of this key domain is marked by a complex and decentralized structure, involving multiple levels of government and various federal departments and agencies. Whereas this distributed approach allows for domain-specific expertise held by different parties, there are also some challenges in coordination, data sharing, and the development of a unified strategy that can effectively leverage geospatial information across the country. Recent strategic reflections by the Canadian Council on Geomatics (CCOG) and the GeoBase Steering Committee have highlighted the importance of addressing areas requiring attention in Canada's Spatial Data Infrastructure (SDI) and aligning efforts with international best practices, such as those outlined by the United Nations Integrated Geospatial Information Framework.

This analysis delves into the current state of Canada's spatial data infrastructure from the perspectives of FPTs familiar with the "Canadian Geospatial Data Infrastructure" (CGDI)[3]. It incorporates their perspectives on the governance, data, financial, innovation, legal and policy, and other considerations that underpin geospatial data management. By identifying strengths, weaknesses, and areas requiring attention within these areas, respondents have provided a foundation for broader, outside-of-government engagement aimed at enhancing coordination and collaboration across partners and stakeholders in Canada's SDI. The ultimate goal is to support a more effective and efficient geospatial information management system that can meet the evolving needs of Canadian governments, society, and the global community.

Methodology

The CCMEO-led stock-take exercise uses the global best practice model of the United Nations' Integrated Geospatial Information Framework (UN-IGIF) as a framework for assessing Canada's SDI - also known as the CGDI – which is the collection of geospatial data, and the standards, policies, applications, and governance that facilitate its access, use, integration, and preservation in Canada. In this report, SDI and CGDI are used interchangeably.

The stock-take includes the following data collection methods: 1) individual/small group interviews with a sample of provincial/territorial and federal government organizations; 2) on-line geospatial data producer and user inventories (surveys) to collect more detailed information from interviewee organizations; 3) a desk study (desktop research) undertaken by a third party; 4) in addition, a third party environmental scan was undertaken (literature review) to provide an overview of trends in geospatial technologies and strategies relevant to the CGDI.

[3] The CGDI is the collection of geospatial data, standards, policies, applications, and governance that facilitate the access, use, and integration of spatial data (CCMEO 2024).

This report presents findings from the first line of evidence - individual/small group interviews with federal, provincial, and territorial government officials, from a variety of roles, familiar with the CGDI. Respondents were identified through their participation with the Canadian Council on Geomatics – Canada's national geospatial collaborative body – as well as through identification by senior managers within Natural Resources Canada. To achieve the qualitative data collection for this line of evidence, we conducted 20 virtual interviews and received an additional 3 written responses (provided as written answers to some or all the questions in the interview guide, depending on the respondent), from a total of 28 respondents. Interviews took approximately 1-1.5 hours and were conducted in July and August 2024. Interviews were conducted with 7 participants from 6 provinces/territories, representing the North, West, Central, and Eastern regions (Alberta, British Columbia, Ontario, Manitoba, New Brunswick, Northwest Territories), as well as with 24 federal participants representing 10 departments and agencies. This included Agriculture and Agri-food Canada, Elections Canada, Fisheries and Oceans Canada, Housing, Infrastructure and Communities Canada, Indigenous Services Canada, Department of National Defense, Public Safety Canada, the Canadian Space Agency, Statistics Canada, and Natural Resources Canada.

The interview guide was attached and sent to respondents in advance for their preparation (please refer to Appendix A). The interview facilitator and an additional scribe took detailed notes during the interviews, and respondents were assured that findings would be aggregated into this What We Heard report, and individual attributions would not be made. Interview participants were informed of the next steps from this exercise and that their responses would be used to support the development of a potential national geospatial strategy and other products, including a country report to the United Nations.

Once the interview process was completed, notes were collated and analyzed thematically. This report thus presents the summary of findings, including strengths, weaknesses and gaps identified by respondents, per Strategic Pathway identified in the UN-IGIF, followed by a section presenting the findings from the additional forward looking/visioning questions that were asked of all respondents. Where relevant, unattributed quotes from the interviews have been included in each Strategic Pathway to provide context. It should be noted that quotes are included for illustrative purposes only; they do not represent the position of all respondents or of any participating organization. Findings have also been grouped by federal and provincial and territorial categories to highlight additional insights.

It is important to note that one limitation of this process and report is that the perspectives of Indigenous organizations, as well as those of other key partners/stakeholders (e.g. private sector, academic, not for profit organizations) – which will be sought as a next step in the data collection process to support strategy development – have not yet been collected, and thus are not represented in these findings. This next stage will directly solicit Indigenous perspectives on the proposed strategy through targeted roundtables, which will include former Indigenous Geospatial Advisory Committee members, as well as those with ties to the Geographical Names Board of

Canada (GNBC). As well, the broader stock-take exercise is informed by the results of a gender-based analysis, which includes an Indigenous engagement component.

This report and its findings may be shared as a stand-alone piece of evidence; however, they are intended to be used alongside evidence from the other lines of inquiry to provide a more comprehensive picture of the status of Canada's SDI.

Findings

The findings presented in this report, including descriptions of the CGDI and the perspectives / views shared on the nine strategic pathways of the UN-IGIF,, reflect those provided by respondents in the interviews and are not the perspective of the consultant or based on any additional research.

Strategic Pathway 1: Governance and Institutions

The governance of geospatial information management in Canada is characterized by a complex and decentralized structure, with varying roles and responsibilities across different levels of government, as well as among federal departments and agencies. Most of the federal respondents tend to focus on the challenges of decentralization and the need for clearer coordination at the national level, highlighting capacity, data sharing and standards development as key areas where federal leadership is necessary. In contrast, several provincial and territorial respondents emphasize their autonomy and the practical challenges of coordinating with a distributed federal system. They express frustration over the lack of open and transparent communication and cooperation, which they feel hinders effective collaboration and integration of geospatial data across Canada.

This analysis highlights the governance structure, including its strengths, weaknesses, and areas requiring attention, while also comparing the perspectives of federal and provincial/territorial government respondents.

> *"The issue of coordination remains a significant barrier to effective geospatial management, with inconsistent communication between federal and provincial entities leading to fragmented efforts across jurisdictions."*

Federal Perspective

The federal government's approach to geospatial information management is decentralized, with different sectors managing their infrastructure independently. While this allows specific domains like agriculture or transportation to develop tailored capabilities, it has led to a perceived weakening of centralized leadership.

Governance is often described by participants as 'federated' or ‘distributed’ where different jurisdictions, federal departments/agencies, and even municipalities work somewhat independently, leading to challenges in integrating and coordinating efforts across the country. While some federal departments/agencies like Natural Resources Canada (NRCan) and Statistics Canada have notable capacity and play leading roles, this is not consistent across all jurisdictions – and from some perspectives, there are conflicting or diverging approaches to geospatial data infrastructure and management. For example, the federal government has no jurisdiction over adoption of spatial referencing standards, leaving provincial and municipal agencies to adopt modern standards as their capacity allows; this limits interoperability and accuracy of geospatial data.

According to several participants, federal departments like NRCan are recognized for their clear capacity, particularly in areas like standards development. However, there is an ongoing struggle to coordinate and integrate geospatial information across different jurisdictions and levels of government.

Provincial/Territorial Perspective

Several provincial and territorial respondents emphasize their self-sufficiency. Many of the respondents from these regions note having developed clear internal geospatial management capabilities, often with minimal reliance on federal coordination. However, this self-sufficiency can lead to limited collaboration across provinces and with the federal government, resulting in disparities in geospatial data management and integration.

Provincial and territorial governments report areas requiring attention in coordination and communication with federal entities. There is a perceived lack of a cohesive national strategy, leading to a disjointed approach where some provinces may be or are perceived to be farther ahead in their geospatial capabilities compared to others. This disparity is exacerbated by the absence of a clear, centralized governance structure at the national level.

Strengths, Weaknesses, and Gaps

As identified by respondents:

Strengths

For the most part, both federal and provincial/territorial respondents acknowledge the expertise and capacity within Canada’s geospatial community. This is particularly evident in regions and departments/agencies with well-established geospatial infrastructure. The collaborative efforts, such as those seen in disaster management and environmental monitoring, are also recognized as strengths.

Weaknesses

Despite the strengths, there are some weaknesses in the governance of geospatial information management in Canada. A great number of participants noted that the decentralized nature of governance leads to issues, duplication of efforts, and areas requiring attention in data coverage. The lack of a unified national strategy or governance body further exacerbates these issues, leading to a distributed geospatial landscape where different regions and sectors operate in silos.

Gaps

Key areas requiring attention identified include the lack of centralized leadership or a coordinating body that can bridge the federal and provincial/territorial divide. The absence of standardized practices and data-sharing agreements across jurisdictions also contributes to the challenges in creating a cohesive geospatial infrastructure. Additionally, several noted that funding disparities between provinces and the uneven distribution of resources further widen the gap in geospatial capabilities across the country.

Strategic Pathway 2: Policy and Legal

Most participants indicated that the legal and policy framework governing geospatial data management in Canada is marked by decentralization and fragmentation across various levels of government and federal departments/agencies. As described by participants through specific examples, there are some standards and guidelines in place, the application and effectiveness of these frameworks are inconsistent, leading to a mixed landscape where geospatial data requirements are not uniformly met.

Federal respondents tend to focus on the challenges of decentralization and the need for clearer coordination, with an emphasis on the development of standards and guidelines. In contrast, provincial and territorial respondents highlight their autonomy and the practical difficulties in coordinating with a distributed federal system. The disparity in legal frameworks and the lack of a centralized governance structure are seen as important obstacles to effective geospatial data management across Canada.

> *"There's not a lot of legal framework around geospatial data, especially at the national level, which results in gaps in standardization and communication between provinces and the federal government."*

Federal Perspective

The responses from most of the federal departments/agencies interviewed highlight the absence of a cohesive legal framework specifically for geospatial data. There are various acts and

guidelines in evidence, but they often do not directly address geospatial information, resulting in inconsistent application across departments/agencies. In cases where geospatial standards and guidelines do exist, participants noted they are not uniformly applied across the federal government, leading to frustration and an uneven playing field.

As described by a few participants, the Federal Geospatial Platform (FGP)[4], which once provided a cohesive framework, had its merits, but overall coordination at the federal level remains decentralized. Gaps, such as data sharing, are exacerbated by a lack of a central governing body for geospatial data, which in turn inhibits the development of a unified approach to geospatial data management.

As explained by several, while there are efforts to develop standards, such as those supported by the Treasury Board of Canada Secretariat and NRCan, these are often seen as time-consuming and not necessarily beneficial in practice. The disproportionate focus on standards development over practical application reflects a broader issue within the federal approach to geospatial data management.

The presence of silos within federal departments/agencies further complicates data sharing and interoperability. Some participants highlighted how risk aversion and departmental silos create barriers to effective data sharing, despite existing policies that encourage openness.

Provincial/Territorial Perspective

Provincial and territorial respondents generally perceive the legal and policy framework as inadequate. Respondents underscore the lack of a centralized legal framework, and the challenges posed by varying provincial legislation and regulations. The absence of a unified national policy leads to discrepancies in data management practices across provinces and territories.

Similar to the federal perspective, many provincial and territorial respondents emphasize the autonomy of individual jurisdictions, which often leads to disparities in geospatial data management. The responses reveal frustration over the lack of coordination with federal entities, with disparities between jurisdictions being noted (e.g. some jurisdictions stand out for their clear legal framework, while others have ad hoc components or no framework).

Privacy concerns and inconsistent regulations are cited as barriers to data sharing. For example, one participant points out that federal regulations on data housing and privacy can be restrictive, though not necessarily impediments to geospatial data sharing. The need for better policies to facilitate data sharing, particularly with Indigenous communities, is also highlighted.

[4] The Federal Geospatial Platform (FGP) was an initiative by the Government of Canada to provide a collaborative, online environment for accessing, managing, and sharing authoritative geospatial data and services. While still operational, the platform is no longer the primary tool for many federal departments. The FGP's catalogue and data continue to be leveraged by multiple platforms such as Canada.ca, the Open Science and Data Platform, GEO.ca, and The Atlas of Canada.

Strengths, Weaknesses, and Gaps

As identified by respondents:

Strengths

The existence of some standards and guidelines, as well as the collaborative efforts seen in initiatives like the Federal Geospatial Platform, are recognized as strengths by many. There is also acknowledgment of the expertise and capacity within specific federal departments/agencies and provinces/territories.

Weaknesses

The primary weaknesses identified include the decentralized and distributed nature of the legal and policy framework, leading to inconsistent application and challenges in data sharing. The lack of a centralized coordinating body exacerbates these issues, resulting in issues and duplication of efforts.

Gaps

Areas requiring attention include the absence of a national policy or legal framework that applies uniformly across all jurisdictions. The lack of coordination and communication between federal and provincial/territorial governments is a recurring theme, as is the need for standardized practices and data-sharing agreements.

Strategic Pathway 3: Financial

Public financial resources related to geospatial information and their management in government are characterized by varying levels of adequacy, utilization, and sustainability across different departments/agencies and jurisdictions.

Federal respondents often focus on the challenges of maintaining and growing geospatial capacity within the constraints of existing budgets, while provincial and territorial respondents emphasize the challenges of accessing and sustaining funding for geospatial initiatives. Both perspectives highlight the need for better coordination and the development of sustainable funding models to support the long-term viability of geospatial data management across Canada.

While some departments/agencies report adequate resources for maintaining current operations, the overall picture reveals a lack of sustainability and challenges in realizing the full

> *"When funding is available, particularly through programs like the National Disaster Mitigation Program (NDMP), it's well-utilized and yields a good return on investment, particularly in supporting disaster management and environmental monitoring."*

potential of geospatial investments, particularly when it comes to moving beyond the data acquisition stage (e.g. archiving, storing, maintaining data).

Federal Perspective

It was noted by almost all that current funding is adequate to maintain the status quo but insufficient for future growth or realizing the potential of geospatial data, especially with rising costs for data management and archiving. The decentralization of funding and lack of overarching coordination were highlighted as challenges.

While budget cuts and changes are frequent occurrences, geospatial data acquired and the services provided are often noted to offer good return on investment, particularly in areas like emergency management, urban planning and public benefit. However, looking at the broader picture of budgets, there remain issues in how funds are allocated, with a lack of emphasis on data management and archiving, leading to potential data loss and issues.

Variation exists across departments/agencies. One set of participants noted that their department's financial resources are adequate and well utilized, with a focus on policy decision-making. However, they acknowledged that this is not the case nationally, where historical challenges in obtaining centralized funding persist. Another set of participants highlighted the disparity in geospatial capacity across departments/agencies, with some struggling to secure adequate funding and resources. Yet another highlighted the rising costs and challenges associated with maintaining and updating geospatial data infrastructure. There is an opportunity for growth, but this requires investment and better coordination to avoid duplication and maximize the value of geospatial data.

Provincial/Territorial Perspective

Most provincial and territorial respondents expressed concerns about the adequacy and sustainability of funding. For example, one set of participants reported that funding is often based on population size, which disadvantages smaller or more remote jurisdictions. They also noted that the lack of continuous funding results in distributed data collection efforts.

When funds are available, they appear to be well-utilized, leading to a good ROI, particularly in programs like the National Disaster Mitigation Program (NDMP) and the Flood Hazard Identification and Mapping Program (FHIMP). However, there are challenges in accessing funding, particularly for provinces with less developed geospatial infrastructure.

Some provincial respondents highlighted the effectiveness of collaboration with federal ministries on joint projects. However, they also pointed out the lack of a framework for broader coordination, which could help avoid duplication and facilitate better access to funding opportunities.

The responses from both provincial and territorial governments underscore the challenges of sustaining geospatial data initiatives without consistent and equitable funding. Opportunities for improvement include better information sharing about funding opportunities and the establishment of centralized repositories for data to improve access and utilization.

Strengths, Weaknesses, and Gaps

As identified by respondents:

Strengths

The existence of specific programs like NDMP and FHIMP, as well as collaborative efforts between federal and provincial governments, are recognized by many as strengths. These initiatives have provided valuable data and improved geospatial capabilities in some regions.

Weaknesses

The primary weaknesses include the distributed and inconsistent funding landscape, which leads to disparities in geospatial capacity across jurisdictions. The lack of a centralized governance structure and the issues in data management and archiving further exacerbate these issues.

Gaps

Areas requiring attention identified include the lack of sustainable funding models and the challenges in accessing and utilizing public financial resources equitably across different jurisdictions. There is also a need for better coordination and communication to optimize the use of available resources.

Strategic Pathway 4: Data

Geospatial data within the Canadian government flows through a complex and often distributed process, from its origin or collection to the end user, including stakeholders and partners outside of government.

Federal respondents often focus on the technical aspects of data flow and the challenges of integrating and disseminating data across different departments/agencies and platforms. In contrast, provincial and territorial respondents emphasize the practical challenges of data collection and sharing, particularly the lack of resources and coordination. Both perspectives highlight the need for improved metadata standards, better integration of Indigenous data, and more effective communication and collaboration to address the areas requiring attention in geospatial data management.

This analysis explores the strengths and areas requiring attention in this process, with particular attention to the handling of Indigenous data.

> *"Canada has made great strides in data management, with platforms like GeoBase offering centralized access to core datasets, and efforts to integrate Indigenous data sovereignty principles continue to evolve."*

Federal Perspective

This strategic pathway yielded somewhat mixed results. One set of respondents have described a sector-specific approach to data generation and utilization, with most data remaining close to its source and shared through interoperable systems. Another described a classical data flow with strict quality control and assurance processes, with acknowledgement of areas requiring attention in data sharing and integration, particularly for new entrants to geospatial domains. However, with respect to a multi-departmental approach, the flow of data through the FGP was noted to be limited.

It was also noted by several that a lack of clear policies and the generational gap in open data practices result in inconsistent data sharing. Several challenges were identified, such as communication issues, a lack of awareness of existing geospatial platforms, the ad hoc nature of data sharing with no systematic approach for a national repository, and an insufficient user needs analysis in federal data production, leading to products that may not meet user requirements.

Several federal departments/agencies highlight the importance of respecting ownership, control, access and possession (OCAP®) principles and Indigenous data sovereignty. However, challenges remain in terms of developing legal frameworks and practical implementation of data sharing agreements that are culturally sensitive and legally sound, as well as difficulty in effectively integrating Indigenous data into broader government data systems.

Provincial/Territorial Perspective

Provincial and territorial governments report varied approaches to data collection and sharing. For instance, one set of respondents highlighted issues with the discoverability and usability of data through platforms like GEO.ca, while another discussed the siloed nature of data sharing within its jurisdiction, leading to duplication and inefficiency. Although there is evidence of efforts to improve data sharing through central databases and cloud platforms, challenges remain in maintaining data standards across different datasets.

A common theme across provinces is the lack of a coordinated approach to data sharing, with areas requiring attention in metadata standards, data integration, and discoverability. For example, respondents noted the lack of a territorial SDI to support data harvesting, as well as challenges in creating and maintaining foundational data layers. These areas requiring attention

are compounded by inconsistent relationships with federal entities and limited resources for maintaining up-to-date and comprehensive datasets.

Provincial governments acknowledge the importance of Indigenous data sovereignty but report varying levels of engagement. Similar to the federal respondents, efforts to apply OCAP® principles are at varying stages of maturity, and there is an acknowledged need for better relationships with Indigenous communities.

Strengths, Weaknesses, and Gaps

As identified by respondents:

Strengths

The existence of platforms like the FGP and provincial/territorial geospatial centers are recognized strengths by many, providing a foundation for data sharing and management. Additionally, some federal departments/agencies report successful implementation of Open Data policies and the use of international standards, which contribute to the accessibility and usability of geospatial data.

Weaknesses

Key weaknesses include the distributed nature of data sharing processes, the lack of coordination across jurisdictions, and the inconsistent application of data standards. These issues lead to issues, duplication of efforts, and challenges in accessing and utilizing geospatial data effectively. The ad hoc nature of data sharing and the lack of a centralized repository exacerbate these weaknesses.

Gaps

Areas requiring attention identified include the need for better metadata standards, improved data integration processes, and more effective communication and collaboration between federal and provincial/territorial governments. The challenges in applying Indigenous data sovereignty principles and the limited engagement with Indigenous communities in data collection and sharing are also key areas requiring attention that need to be addressed. As well, gaps exist in legal frameworks and practical implementation of data sharing agreements that are culturally sensitive and legally sound, and there is limited integration of Indigenous data into broader government data systems.

Strategic Pathway 5: Innovation

Per the insights of the participants, the innovation ecosystem for geospatial data in Canada is complex, with both strengths and areas for improvement. Federal respondents often focus on the availability of tools and programs to support innovation, while provincial and territorial respondents emphasize the challenges of implementing innovative solutions within the

constraints of government operations. Both perspectives highlight the importance of collaboration and the need for more open data to drive innovation. However, there is a clear divide between the resources and support available at the federal level compared to the provincial and territorial levels, where innovation efforts are often limited by funding and capacity.

This analysis explores the tools, partners, and challenges related to innovation in the geospatial sector, and provides insights into where the ecosystem can be further developed.

> *"Canada's innovation in geospatial data is hindered by reliance on proprietary systems, limiting the adoption of open-source technologies that could spur broader technological advancements."*

Federal Perspective

Respondents had different perspectives on innovation, depending on their personal and professional experience with innovation and entrepreneurship across the different sectors in Canada and their level of familiarity with current grants, programs, opportunities, and areas of focus. Innovation within the geospatial ecosystem in Canada involves distinct efforts across multiple sectors. There are groups focused on both the creation of geospatial tools and the maintenance of geospatial infrastructure. Innovation is being driven by ongoing collaboration in standards and data sharing, supported by both public and private sectors. Additionally, universities play a key role as significant partners in fostering innovation within the geospatial field. This collaborative environment highlights the importance of cross-sector partnerships in advancing geospatial technology and its applications.

The innovation ecosystem is supported by a variety of tools, including proprietary software from companies such as ESRI and open-source alternatives like the Quantum Geographic Information System (QGIS). Some sector-specific programs such as smartEarth and Research Opportunities in Space Science under the Canadian Space Agency were noted as key drivers of innovation, providing opportunities for collaboration between industry, academia, and government.

Improvements are needed in fostering a clearer community within the federal government and enhancing collaboration across sectors. There is also a need for better funding and human resources to support innovation, while improving national governance structure for key areas such as geodesy. For example, there is a need to develop tools and resources (human, financial, technical) to transform 'data' into 'information' that is more easily usable by decision-makers.

Provincial/Territorial Perspective

Provincial and territorial governments experience innovation in different ways. The private sector is recognized as a key driver of innovation by most participants, while government efforts face

limitations due to operational demands. Positive examples of innovation include the use of AI and machine learning in the creation, management, and analysis of spatial data, highlighting the growing role of advanced technologies in improving geospatial processes. This suggests a dynamic but varied innovation landscape across different regions.

Jurisdictional governments rely on tools like ESRI and QGIS, but there is a recognition that innovation often comes from small businesses and private sector partners. In consequence, participants noted a broader challenge in balancing proprietary software with open-source options within the geospatial ecosystem.

The need for better data sharing and more open data policies is a common theme across provinces and territories. Participants noted the importance of opening up more data to foster innovation, as well as the need for better integration between geospatial science and data science to truly drive innovation.

Strengths, Weaknesses, and Gaps

As identified by respondents:

Strengths

The innovation ecosystem benefits from a clear private sector and the availability of a wide range of tools and technologies. Programs such as NRCan's GeoConnections and sector specific initiatives provide valuable support for innovation. There is also innovation happening at the municipal level, where needs-driven solutions are being developed and implemented.

Weaknesses

Key weaknesses include the over-reliance on proprietary software, which limits flexibility and innovation. The lack of a coordinated national strategy for geospatial innovation, particularly in areas like geodesy, is also a challenge. The rigid nature of government processes and the slow pace of adoption of new technologies further inhibit innovation.

Gaps

Areas requiring attention exist, for example, with regards to the availability of open data and the integration of geospatial science with other disciplines, such as data science. There is also a need for better support for small businesses and academic institutions that are driving much of the innovation. The lack of a national governance structure for geospatial data is a key gap that needs to be addressed.

Strategic Pathway 6: Standards

The responses to the question of how clear and widely accepted the case for geospatial data and technology standards is among partners and stakeholders reveal a complex landscape. While most participants indicate that there is clear support and recognition of the importance of standards across different levels of government, the reported degree of acceptance and

implementation varies notably, with some sectors and regions showing more maturity than others.

Federal respondents emphasize the importance of standardization and the role of federal departments/agencies in driving geospatial standards. However, they acknowledge challenges with decentralized governance and a lack of urgency, which can hinder consistent application. Provincial and territorial respondents highlight variability in standard adoption, with some regions closely adhering to standards applicable to federal departments, while others adapt or reject them based on local needs. This leads to inconsistent geospatial data interoperability, especially in cross-border collaborations. Both perspectives call for better coordination and communication between federal and provincial/territorial governments to support more uniform geospatial standards across Canada.

> *"Standards exist, but their adoption is inconsistent across different sectors and regions, leading to interoperability issues and inefficiencies in data sharing."*

Federal Perspective

According to most participants, the federal approach to geospatial data management reflects a mature industry that values standards and interoperability, but the application and understanding of these standards vary across departments/agencies.

The overall findings indicate that the federal approach to geospatial standards is pragmatic, prioritizing flexibility in implementation to meet specific needs. While some departments/agencies focus on what works best for their sectors, such as using diverse protocols in agriculture and ensuring strict adherence in specialized areas like hydrography and emergency management, there are challenges in achieving broader consistency. The need for improved coordination and urgency in standardization efforts is highlighted, with some reliance on proprietary datasets posing additional challenges to the uniform application of geospatial standards across departments/agencies.

Overall, while there is a clear foundation of standards and a clear recognition of their value, the application across federal departments/agencies varies. Some sectors excel in their use, while others face challenges in consistent implementation. The need for a more coordinated governance structure and a greater emphasis on education and urgency within working groups are seen as steps to enhance the effectiveness of geospatial data management across the federal government.

Provincial/Territorial Perspective

The provincial and territorial perspective reflects a recognition of the importance of standards, but there are challenges in their practical application and consistency across jurisdictions.

Some regions accept the clear case for geospatial standards but note that they are not widely accepted or consistently applied for varying reasons. There is an emphasis on the need for more focused efforts in standard development and communication, especially in key areas like emergency management and building footprints. While there is an understanding of the importance of standards, the practical application in these regions remains inconsistent.

While geospatial standards are generally adhered to across regions, there are challenges in achieving uniformity and consistency. Reliance on industry standards, which are often not tailored to Canada's needs, highlights the opportunity for developing more Canada-specific standards to improve alignment across jurisdictions. Concerns about the practical application of standards, especially with multiple versions and optional frameworks, further complicate consistency. Additionally, issues with data scale, currency, and integration across regions underscore the need for improved collaboration and standardization to enhance geospatial data management across the country.

Overall, while there is a recognition of the importance of geospatial standards across provincial and territorial governments, the practical challenges of applying these standards consistently across different jurisdictions remain a hurdle. Addressing these challenges through better communication, development of Canada-specific standards, and more coordinated efforts across regions is seen as essential for improving geospatial data management nationwide.

Strengths, Weaknesses, and Gaps

As identified by respondents:

Strengths

The analysis reveals a theoretical foundation for geospatial standards across various levels of government. There is broad recognition of the importance of standards, especially in specialized sectors like hydrography and emergency management. Federal departments/agencies are generally leading in the development and promotion of these standards, ensuring that interoperability is achieved across various domains.

Weaknesses

Despite the recognized strengths, there are notable weaknesses in the implementation and consistency of geospatial standards. The lack of urgency in some federal working groups, reliance on proprietary datasets, and reluctance to fully embrace standards across all levels of government are challenges. These issues are exacerbated by the decentralized nature of Canada's governance structure, leading to distributed and inconsistent applications of standards.

Gaps

There are areas requiring attention in the coordination and communication of geospatial standards across jurisdictions. The absence of a unified national strategy or governance body to bridge the federal and provincial/territorial divide is a gap. Additionally, the inconsistency in standard adoption across different provinces and sectors highlights the need for a more cohesive approach to geospatial data management.

Strategic Pathway 7: Partnerships

The responses to the question of how well the public sector is working together and with partners, including efforts to reduce duplication of work and implement complex programs, reveal a mixed landscape. While there are pockets of clear collaboration (e.g.,the long-standing federal-provincial partnership facilitating maintenance of the Canadian Spatial Reference System (CSRS)), challenges remain, particularly in terms of coordination, communication, and resource allocation. The involvement of civil society in creating and using geospatial information is also noted, with varying degrees of success and integration.

Federal respondents generally emphasize the challenges of working within a large, decentralized system, with issues such as duplication of efforts and inadequate coordination hindering progress. They highlight the need for clearer partnerships and better engagement strategies to overcome these obstacles. Provincial and territorial respondents, on the other hand, often describe their efforts as reactive and needs-driven, with collaboration occurring on a project-by-project basis. While there is a willingness to collaborate, constraints related to time, resources, and leadership often limit the effectiveness of these partnerships. Both perspectives underscore the need for a more coordinated and proactive approach to geospatial data management, with an emphasis on reducing duplication and enhancing collaboration across all levels of government.

> *"Strong partnerships, especially in goal-aligned projects like flood mapping, show that collaboration can be highly effective when there is a clear focus and shared objectives."*

Federal Perspective

The federal perspective on partnerships highlights challenges in coordination and collaboration across departments/agencies, with a consensus that current efforts are not as effective as they could be. There is widespread acknowledgment among participants that improving partnerships and reducing duplication of efforts are key for more efficient and impactful geospatial data management.

The overall findings reveal a common concern across departments/agencies about the lack of coordination in fulfilling mandates, with calls for clearer communication, better engagement, and improved collaboration. There is a need to reassess the current approach, with suggestions for creating more defined communities, enhancing business development efforts, and increasing understanding of geospatial partnerships. Reducing duplication, especially vis-à-vis academia and industry, is seen as a priority, and stronger partnerships with civil society are recognized as valuable, particularly in open-source initiatives and community-based efforts. Better representation on key committees and the establishment of more targeted federal subcommittees are also proposed to enhance coordination in geospatial data management.

Overall, there is consensus that while there are ongoing efforts to collaborate and reduce duplication, much more needs to be done to strengthen partnerships, improve coordination, and fully leverage the contributions of civil society in geospatial data management across the federal landscape.

Provincial/Territorial Perspective

The provincial and territorial perspective on partnerships emphasizes the need for improved coordination and proactive collaboration between federal and regional levels, as well as the importance of involving civil society in these efforts. While some regions report effective partnerships, there is a consensus that more can be done to enhance information sharing, address operational needs, and foster broader collaboration.

The overall findings indicate concerns about the disconnect between high-level federal decision-making and the operational realities on the ground, with a need for better coordination at the working level to inform higher-level decisions more effectively. While some jurisdictions report positive collaboration on project-based initiatives, there is room for improvement in information sharing and broader partnerships. The involvement of civil society is seen as valuable, particularly through contributions from environmental and recreational groups. However, collaboration is often reactive rather than proactive, and there is a call for stronger leadership and long-term planning to enhance the effectiveness of partnerships. Additionally, there is a need for greater awareness and integration of civil society's use of geospatial information.

Overall, there is a consensus that while some regions experience effective collaboration, particularly in project-based initiatives, there is a broader need for improved coordination, proactive leadership, and enhanced information sharing across federal and regional levels. The notable involvement of civil society further underscores the importance of fostering these partnerships to provide more effective and comprehensive geospatial data management across Canada.

Strengths, Weaknesses, and Gaps

As identified by respondents:

Strengths

There are pockets of clear collaboration within the public sector, particularly in specific programs and projects where coordination is more focused. Civil society involvement in geospatial data creation and use is also a strength, providing valuable contributions to various sectors, including environmental monitoring and community planning.

Weaknesses

However, weaknesses exist, particularly in the duplication of efforts across different levels of government and the lack of effective coordination. Challenges include the absence of high-level strategic leadership, insufficient engagement, and resource limitations that hinder the ability to work together effectively.

Gaps

Key areas requiring attention include the need for better coordination mechanisms, more inclusive engagement of all partners/stakeholders, and improved resource allocation to support collaborative efforts. The lack of a unified approach to geospatial data management across federal and provincial/territorial governments further exacerbates these challenges.

Strategic Pathway 8: Capacity & Education

The responses to the question of how government is supporting and stimulating entrepreneurship to grow the capability of the business sector in geospatial information reveal varying levels of engagement.

Federal respondents generally highlight specific programs that support entrepreneurship, particularly in the Earth Observation (EO) and space technology sectors. There is a focus on initiatives that provide funding and create opportunities for innovation, though there are concerns about the cost-effectiveness of some programs. Provincial and territorial respondents, on the other hand, often note a lack of specific support for geospatial entrepreneurship, with some regions struggling to prioritize or recognize the importance of geospatial information in their economic development strategies. This reflects a broader challenge in ensuring that support for entrepreneurship is both accessible and effectively communicated across all levels of government.

Responses may not speak to all aspects of capacity development, as outlined in the relevant Strategic Pathway of the UN-IGIF; however, respondents did highlight specific topics such as the one quoted below. Many aspects of capacity development and education are distributed across jurisdictions in Canada.

"There is a need for more investment in education and capacity-building to ensure a pipeline of skilled professionals in the geospatial field, which is currently lacking."

Federal Perspective

The federal perspective on capacity and education underscores the importance of collaboration, innovation, and the economic value of geospatial information. There is a broad recognition among participants that closer collaboration, particularly between the spatial and EO communities, is crucial for advancing the sector. The need for more funding for ready-to-use products and services, as well as common messaging to convey the economic and societal benefits of geospatial data were noted. These aspects can help support capacity and education.

Notable examples of government initiatives include the Innovation for Defence Excellence and Security (IDEaS) program, which supports entrepreneurship in cloud-based services, and the Innovative Solutions Canada program, which tests new technologies. While these programs are recognized for stimulating innovation, there are concerns about their cost-effectiveness, indicating a need for more strategic investments in the geospatial sector.

Provincial/Territorial Perspective

The provincial and territorial perspective highlights challenges in scaling initiatives, accessing funding, and effectively communicating the support available for geospatial entrepreneurship. While small initiatives exist, there are gaps in scaling these into larger programs.

On the side of the private sector, startups face difficulties in securing funding (especially in competition with larger, established entities), with calls to adjust procurement rules to better support innovation. Although there is awareness of support for the EO sector and space technology companies, this support may not be effectively communicated across the geospatial community. Additionally, geospatial entrepreneurship is not consistently prioritized, and the perception of GIS as complex may be limiting broader engagement, pointing to a need for more outreach and education to increase participation.

Strengths, Weaknesses, and Gaps

As identified by respondents:

Strengths

The government's support for entrepreneurship in the geospatial sector is evident in several programs, particularly those aimed at enhancing the use of space data and stimulating innovation in related industries. These initiatives help to create opportunities for businesses to develop new products and services underpinned by geospatial information.

Weaknesses

However, weaknesses remain, particularly in the lack of a cohesive national strategy and the challenges startups face in accessing funding and navigating procurement rules. The perception of GIS as complex and intimidating may also limit the broader adoption of geospatial technologies in entrepreneurial ventures.

Gaps

Key areas requiring attention include the need for better pipelines to scale small initiatives into broader programs, more cost-effective approaches to stimulating entrepreneurship, and improved communication about the availability of support for the geospatial sector. Addressing these areas requiring attention could help to unlock the full potential of geospatial information in driving innovation and economic growth.

Strategic Pathway 9: Communication & Engagement

The responses to the question of whether there is common messaging to convey the economic and societal value of investing in the governance, standards, and other requirements to access, share, and use location data reveal a general consensus that such messaging is overall either lacking (i.e. needs to be increased) or ineffective in its purpose for various reasons. While some respondents acknowledge existing efforts, the effectiveness and reach of these messages are often questioned, with many calling for more targeted and impactful communication strategies.

Federal respondents generally acknowledge the existence of some messaging efforts but express concerns about their effectiveness and reach. They emphasize the need for more public engagement and better communication of the value of geospatial data, particularly within the federal government itself. Provincial and territorial respondents, on the other hand, often highlight the lack of political awareness and support for geospatial information, suggesting that better communication at the highest levels of government is needed to improve the overall impact of messaging.

"We need ambassadors to verbalize and synthesize the information to share what geomatics is... Platforms like EODMS, CSA's Earth Observation, and ECCC's weather app have already showcased how geospatial data impacts everyday life, and more public engagement like commercials and educational programs could further raise awareness."

Federal Perspective

The federal perspective on geospatial information emphasizes the need for more effective and unified messaging that conveys the value of geospatial data in addressing broader societal challenges. It was mentioned by many participants that current messaging is often limited and does not resonate with diverse audiences.

Some departments/agencies underscore the importance of 'storytelling' to secure more funding, advocating for a focus on how geospatial technology supports important issues like climate change rather than presenting it merely as a technical tool. Some suggested that messaging should be thematic and outcome-focused, making it more accessible and relevant to various user communities.

Similarly, some are skeptical about current messaging strategies, with one department suggesting that the focus should be on communicating the benefits of standards and centralization within the geospatial community rather than aiming at public outreach. They argue that messaging should reduce perceived burdens and clearly demonstrate the value of standardization.

Others suggested approaches include greater public engagement through initiatives like commercials and educational programs to raise awareness about the importance of geomatics.

Overall, while there are varying views on the effectiveness of current strategies, there is a shared recognition of the need for more cohesive, outcome-driven messaging that effectively communicates the importance and value of geospatial information.

Provincial/Territorial Perspective

The provincial and territorial perspective on geospatial information messaging underscores the challenges and variability in effectively conveying the value of geospatial data to different audiences.

While there is recognition of the importance of common messaging among most participants, its reach and impact are inconsistent. Tailored messaging has been successful in some regions in

conveying the economic and societal benefits of geospatial data but communicating its value to diverse audiences remains a challenge. Platforms like CCOG help share knowledge and advocate for funding, but gaps in communication, particularly at the political level, persist. There is a need for more targeted, high-level communication to ensure that the importance of geospatial data is better understood and appreciated across different sectors and government levels.

Strengths, Weaknesses, and Gaps

As identified by respondents:

Strengths

Some respondents note the existence of successful messaging examples, particularly those that are outcome-focused and tailored to specific audiences. Platforms like CCOG are recognized as effective in coordinating messaging across different jurisdictions.

Weaknesses

However, weaknesses exist in the overall communication strategy for geospatial information. There is a perceived lack of impactful and widespread messaging, with many respondents calling for better storytelling and more targeted communication efforts.

Gaps

Key areas requiring attention include the need for improved messaging that resonates with both public and political audiences. There is also a call for more effective use of ambassadors and public engagement strategies to raise awareness of the value of geospatial information.

Emerging Issues and Trends

The emerging issues and trends in Canada's geospatial infrastructure highlight the challenges of decentralization, technological advancements, and security concerns. Both federal and provincial/territorial perspectives emphasize the need for improved coordination and the integration of geospatial data to address critical societal and technological developments

Federal Perspective

Decentralization and Coordination Issues

Per most participants, the federal governance of geospatial information is decentralized, with different departments/agencies managing their infrastructure independently. This leads to a lack of centralized leadership, particularly in storytelling and integrating geospatial data across disciplines like agriculture, infrastructure, and public safety. Most respondents emphasize the need for better coordination and more effective storytelling to reflect the achievements in geospatial data usage.

Challenges in Keeping Pace with Technological Advancements

Respondents expressed concerns about the challenges of adopting new technologies, such as AI and cloud computing. These challenges are exacerbated by slow governmental processes and security concerns, which prevent efficient adoption of innovations that are already prevalent in the private sector and academia.

Security and Strategic Concerns

Respondents highlighted the importance of including key infrastructure data in governance plans to protect lives during disasters. The need for secure, reliable, and up-to-date geospatial data is related to growing demands for data accuracy and reliability in fields such as precision farming and autonomous navigation.

Provincial/Territorial Perspective

Self-Sufficiency and Coordination Gaps

Provincial and territorial respondents emphasize their self-sufficiency in managing geospatial data but also recognize the areas requiring attention in coordination with federal counterparts. There is a growing interest in digital twinning and the integration of geospatial data with social elements to address issues like housing crises and disaster management.

Technological Advancements and Social Issues

The increasing availability of EO data and the potential for new technologies like AI and machine learning are highlighted as trends. However, there is also a need to address social issues, such as the housing crisis, through better integration of geospatial data.

5-10 Year Vision for Geospatial Infrastructure in Canada

The future of the geospatial ecosystem in Canada, as envisioned by federal and provincial/territorial government respondents, requires advancements in governance, data accessibility, and technology integration. The key areas identified for improvement include clarifying roles and responsibilities, enhancing collaboration across jurisdictions, and ensuring the sustainability of funding and resources.

Federal Perspective

Clarifying Roles and Responsibilities

There is a need for a review and adjustment of roles within Canada's geospatial ecosystem to support future value creation. Many respondents emphasize the confusion caused by the presence of multiple platforms and the lack of clear organization in federal geospatial information, identifying this as a priority for improvement. Additionally, there were multiple

mentions of support for establishing CCMEO as the national mapping agency and enhancing cooperation with provinces/territories to streamline efforts and improve the overall coordination of geospatial data management.

Open Data and Governance

Multiple respondents noted the importance of making as much data open and available as possible, supporting transparency and decision-making. This vision requires a culture change and possibly clearer legislation to prioritize data sharing. Similar thoughts were shared on the democratization of data, envisioning a future where users can access and utilize geospatial data more easily through integrated systems.

Long-Term Funding and Sustainability

Many respondents highlighted the need for a consistent source of funding for the creation and maintenance of geospatial data. This would provide sustained support for geospatial initiatives across the country.

Technological Integration and Standards

Several respondents noted the need for better resourcing of geodesy and the geodetic supply chain, which would improve efficiencies across commercial sectors. Additionally, there is a call for the development of interoperable web mapping services and the consolidation and simplification of data storage systems to reduce redundancy and improve accessibility.

Accessibility and Resource Sharing

Some respondents identified the need for better curation of thematic metadata, moving towards a system where data can be discovered and utilized based on thematic queries rather than simple keywords. This approach would enhance the accessibility and usability of geospatial data across various sectors.

Provincial/Territorial Perspective

Collaboration and Data Integration

Provincial and territorial respondents express a desire for greater collaboration in data acquisition, particularly for expensive resources like EO data and LiDAR. They also emphasize the need for federal leadership in driving geospatial governance and standards, which would facilitate easier data sharing and integration across jurisdictions.

Data Precision and Comparability

Several respondents emphasized the importance of achieving consistent levels of data precision and accuracy across jurisdictions. This would enable better comparability of geospatial data nationwide, facilitating more effective collaboration and decision-making.

Need for a National Collaborative Location Data Strategy

The development of a national collaborative location data strategy in Canada is widely supported across federal and provincial/territorial governments. The responses highlight the potential benefits, key success factors, and risks associated with such a strategy. The involvement of various stakeholders, from federal agencies to private industry and Indigenous communities, is deemed essential for its success.

Federal Perspective

Support for a Collaborative Strategy

Respondents underscore the importance of coupling a national geospatial strategy with a clear implementation plan, including a diagnostic phase to identify potential challenges. Many recognize the need for a unified vision, especially in establishing standards and ensuring interoperability to support decision-making across multiple sectors. Additionally, having a central hub of expertise is seen as beneficial for reducing duplication and ensuring broad departmental involvement, which would improve coordination and the effectiveness of geospatial data management across Canada.

Risks and Challenges

Several respondents expressed concerns about the risks of centralization, such as creating a single point of failure and the potential for security breaches. There is also concern about the lack of buy-in from various departments/agencies, inadequate funding, and the challenge of implementing the strategy across Canada's federated system. Furthermore, some highlighted the difficulty of rolling out a strategy across different jurisdictions without a clear authority to enforce it, noting the risk of stakeholders subverting the system if they are not fully committed.

Success Factors

Critical success factors identified by respondents include having a clear governance structure, involving all relevant departments/agencies (especially those not traditionally seen as geospatial), and ensuring the strategy is well-funded and supported by all levels of government. It is also important to include all geospatial pillars, such as positioning and gravity standards, in the strategy, and to include stakeholder/partner consultation and involvement (i.e. from the private sector, civil society, Indigenous communities, and academia).

Opposing Views

It is important to note that there are opposing views on the necessity of a national strategy. For example, some argue that too many resources have already been spent on similar initiatives, which have not been conducive to promoting geospatial information effectively. This highlights the potential for differing perspectives within federal departments/agencies, which could impact the strategy's success.

Provincial/Territorial Perspective

Benefits of a Collaborative Strategy

Provincial and territorial respondents agree that a national collaborative strategy would be beneficial, particularly in terms of standardizing data formats and improving data sharing across jurisdictions. Some stress the importance of shared resources and reducing the burden on individual provinces to manage large volumes of data.

Concerns and Risks

Respondents express concerns about the potential for a national strategy to impose too much on provinces that may not have the capacity to meet the standards set. They also highlight the need for willing participation from all partners and the risks of creating an overarching framework that lacks flexibility. Without a strategy that alleviates the workload, it may not be beneficial for all provinces and territories.

Success Factors

Success factors for a collaborative strategy include clear leadership, adequate resources, and the ability to blend national and location-specific data seamlessly. Some emphasize the importance of a relevant and specific strategy that can guide provinces and territories in combining and aggregating data effectively.

Stakeholder/Partner Involvement

Inclusion of Various Sectors

Respondents across the board agree that a wide range of stakeholders/partners should be involved in the development of a national location data strategy. This includes federal, provincial, and territorial governments, municipalities, the private sector, civil society, academia, Indigenous communities, and chief data officers across government. Willing participants must be aware of and interested in the strategy's goals.

Collaboration and Leadership

The need for a collaborative process led by a central body, such as NRCan or a similar federal department/agency, is emphasized by multiple federal and jurisdictional respondents. The involvement of a broad set of departments/agencies, including those not traditionally involved in geospatial data, is seen as crucial for the strategy's success. Additionally, respondents suggest looking at models like the UK’s Geospatial Commission for guidance.

Risks of Bureaucratization

There is also concern about the potential for heavy bureaucratization if the strategy tries to centralize all work. Some warn against centralization, which could lead to issues and a lack of responsiveness to local needs. Instead, a balanced approach that allows for regional autonomy while providing national guidance is suggested.

Conclusion

This report endeavoured to capture a snapshot of Canada's geospatial infrastructure from the perspectives of FPT governments according to the nine Strategic Pathways of the UN-IGIF, offering insights into governance, policy, financial resources, data management, innovation, standards, partnerships, capacity, and communication. Through the perspectives of CGDI producers and users within government that were interviewed for this study, both the strengths and areas for improvement were highlighted. This report encapsulated their insights and recommendations.

In sum, participants shared that the current state of geospatial information management in Canada reveals the need to address the challenges posed by its decentralized governance structure. The lack of centralized leadership and coordination has led to issues, areas requiring attention in data sharing, and limited collaboration across jurisdictions. Enhancing centralized governance, developing a cohesive National Spatial Data Infrastructure (NSDI), and establishing a national strategy are crucial steps toward more efficient and effective geospatial data management – however, this work must be done in acknowledgement of, and while leveraging, regional and sectorial pockets of expertise and autonomy.

Improving the legal and policy frameworks governing geospatial data is also essential to facilitate consistent application of standards and facilitate better data sharing across all levels of government. Additionally, integrating Indigenous data sovereignty principles into these frameworks is key to ensuring that data management practices respect the rights and cultural sensitivities of Indigenous communities. Coordinating financial resources more effectively, with a focus on establishing sustainable funding models, and fostering innovation through a national strategy will be key to advancing the geospatial sector and ensuring that Canada remains competitive in the global digital economy.

By addressing these challenges and closing the identified areas requiring attention, participants perceive that Canada can notably improve its geospatial information management capabilities. This will enable more effective public service delivery, support informed decision-making across various sectors, and contribute to the country's overall economic and social development. The path forward requires a commitment to reform, collaboration, and innovation, ensuring that Canada's geospatial infrastructure is well-equipped to meet the demands of the future, while also respecting Indigenous data sovereignty and fostering sustainable, long-term growth.

Finally, a note that this report and its findings may be shared as a stand-alone piece of evidence; however, it is intended to be viewed alongside evidence from the other lines of inquiry envisioned for this stocktaking to provide a more comprehensive picture of the status of Canada's SDI.

Appendix A: Interview Guide

Thank you for taking part in this exercise to take stock of Canada's geospatial, or 'location', data ecosystem – the collection of geospatial data, and the standards, policies, applications, and governance that facilitate its access, use, integration, and preservation in Canada.

The interview is expected to take from 60-90 minutes and will proceed in the language of your choice.

If you wish, feel free to provide written responses to the questions below to supplement and/or to provide precision to your answers.

A written inventory will follow the interview to collect more detailed, complementary, and quantitative information.

Interview Questions

1. From your perspective, describe the governance of geospatial information management in Canada, including roles and responsibilities. Please describe any strengths, weaknesses, or areas requiring attention.

2. Describe the legal and policy framework applicable to geospatial data management in Canada. Does it adequately meet the geospatial data requirements? Are there certain components that either enable or restrict geospatial data sharing?

3. Are public financial resources related to geospatial information and its management in government adequate, well utilized, and sustainable? Do they lead to good return on investment/value for money? Why or why not?

4. Describe how geospatial data flows from origin/collection to end user within government, and with stakeholders and partners outside of government. What are the key areas requiring attention and strengths related to data production and sharing? Are special considerations given to the use and sharing of Indigenous data?

5. How would you describe the innovation ecosystem for geospatial data in Canada? What tools and partners support this? Where could there be improvements? Which geospatial technologies and methods are available to deliver new services and insights beyond specialized users?

6. How clear and widely accepted is the case for geospatial data and technology standards across/among partners and stakeholders? Where are the strengths and weaknesses with respect to standards?

7. How well is the public sector working together and with partners, including to reduce duplication of work and/or to implement complex programs where multiple areas of expertise are required? Can partnerships be strengthened, and how? Are you aware of any civil society (individuals/community groups) either creating (i.e. through crowdsourcing) or using geospatial information for their own purposes?

8. Are you aware of instances where government is supporting and stimulating entrepreneurship to grow the capability of the business sector to develop products and services underpinned by geospatial information? If so, how would you describe these efforts?

9. Is there common messaging to convey the economic and societal value of investing in the governance, standards, etc. required to access, share, and use location data? If so, how effective is the messaging? If not, what should be considered in future communication and engagement efforts?

10. What issues or information needs could location data benefit or supplement in the future that it isn't presently? What trends will affect your organization's ability to create, manage, use geospatial data, or information?

11. In 5 years, 10 years, where would you like to see the geospatial ecosystem in Canada? What one urgent change or low-hanging fruit would get us closer?

12. Would your organization benefit from a national collaborative location data strategy? Why/why not? What key success factors should be considered for approaching a collaborative location data strategy? What are the biggest risks to its success?

13. Who else needs to be involved in the development of a location data strategy?

14. What else would you like us to know?

Thank you for your valuable insights!