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STATISTICS DIVISION

Country Report of

Canada

2014

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I. Introduction

Geography is important to Canada. Canada is the second largest country in the world by area, covering nearly 10 million square kilometres. Canada's land mass is composed of widely different topography and geology. It has the longest coastline of any country in the world, at 234,000 kilometres. More than a third of Canada's territory is under water.

Canada has enormous natural wealth. With huge reserves of energy; massive tracts of forest; lakes, rivers, three oceans; an abundance of minerals and metals and aquatic wealth; natural resources and oceans management are a significant part of the nation's economy. Despite its size, Canada's population of approximately 35.4 million people primarily live within 200km of the border with the United States of America (USA).

Canada is a federal state governed as a parliamentary democracy, with ten provinces and three territories that each has powers similar in scope to that of the Canadian federal government within their respective jurisdictions. Governments at all levels - federal, provincial/territorial and municipal - actively produce, use and distribute geospatial data and information, creating challenges and opportunities to the management of geospatial information in Canada.

At the federal level, the Earth Sciences Sector (ESS), Natural Resources Canada (NRCan) fulfills the role of Canada's national mapping agency. In July 2013, NRCan's Mapping Information Branch and Canada Centre for Remote Sensing were merged into a single branch, the Canada Centre for Mapping and Earth Observation (CCMEO), recognizing the significant and strategic inter-relationships between mapping and remote sensing technologies and service delivery. CCMEO's responsibilities encompass a range of activities along the geospatial value chain, including Earth observation and geomatics research and development, data acquisition and archives; management of geospatial and earth materials collections; provision of services (web, geoanalytics); geomatics and Earth observation strategy and domestic and international partnerships.

Also within ESS, the Surveyor-General Branch (SGB) ensures boundary certainty through: the proper maintenance of the Canada-United States international boundary for law enforcement,

land administration, customs and immigration, and trans boundary resource management; effective boundary surveys of Aboriginal settlement lands to meet Canada's obligations under land claim settlement legislation and treaties; and statutory registration of legal surveys on Canada Lands (the North, Canada's offshore area, Aboriginal Lands and National Parks), essential to the creation of property parcels.

SGB includes the Geodetic Survey Division, which is responsible for maintaining the Canadian Spatial Reference System (CSRS) that provides fundamental reference values for latitude, longitude, height and gravity, including earth's orientation parameters and rotation rate in space, as the foundation for the nation's evolving positioning and navigation activities.

In addition to NRCan, many other federal departments and agencies have responsibilities for the collection/production and/or use of geospatial data and information to support their respective mandates, including the following members of the Federal Committee on Geomatics and Earth Observations (FCGEO – See Section II): Agriculture and Agri-Food Canada; Aboriginal Affairs and Northern Development Canada; Canadian Food Inspection Agency; Canadian Northern Economic Development Agency; Canadian Space Agency; Department of Fisheries and Oceans (Coast Guard, Ecosystems and Oceans Science, Hydrographic Service)[1]; Department of National Defense; Department of Foreign Affairs, Trade and Development; Elections Canada; Environment Canada; Health Canada; Industry Canada; Parks Canada; Public Health Agency of Canada; Public Safety Canada; Royal Canadian Mounted Police; Shared Services Canada; Statistics Canada; Treasury Board Secretariat; and Transport Canada.

For more information:

- Natural Resources Canada, Earth Sciences Sector, Geomatics: http://www.nrcan.gc.ca/earth-sciences/geomatics/10776

[1] Fisheries and Oceans Canada (DFO) has the lead federal role in managing Canada's fisheries and safeguarding its waters**.** Its oceans and fisheries maps and its nautical charts and publications are the 'road maps' that guide mariners safely from port to port, protect property and the marine environment.

II. Institutional Arrangements and Governance

Governance of geospatial information management in Canada is based on a cooperative approach between the federal, provincial and territorial governments, industry, academia and the public. Strong partnerships and collaborative relationships facilitate the management of geospatial information in Canada, where government is decentralized and no legislative framework for spatial data infrastructure and related institutional arrangements exist. Four committees lay the foundation for collaborative governance in geomatics and Earth observations in Canada. A key effort is made to continually seek synergies and linkages across committee mandates, jurisdictions and stakeholder groups, and to link with committees in domains with a strong geospatial component, such as space and public safety, among others.

Federal Committee on Geomatics and Earth Observation (FCGEO)

At the federal level, there has been a recent move to strategically align departments and agencies that are producers and users of geomatics and Earth observation data through the formation of the Federal Committee on Geomatics and Earth Observation (FCGEO). FCGEO represents the renewal of senior level (Assistant Deputy Minister-ADM) engagement in federal geomatics and Earth observations in January 2012, through the consolidation of the Interagency Committee on Geomatics (IACG) and the Canadian Group on Earth Observations (CGEO), which focused respectively on traditional vector mapping and Earth observations. In addition to the ADM committee, the FCGEO governance model includes a Director General Shadow Committee and Director-level working groups.

Established from the ground up through the collaborative effort of federal departments, the FCGEO is providing proactive, whole-of-government leadership in establishing priorities for geomatics and Earth observations and their application to support government priorities, decision-making, and Canada's competitive advantage. In addition, the FCGEO seeks to collectively enhance the responsiveness, efficiency and sustainability of the federal geomatics and Earth observations infrastructure.

Two foundational priorities for the FCGEO established upon inauguration of the committee, included the collaborative development of a business case for a Federal Geospatial Platform (FGP - See Section VI) and a Strategic Approach and Protocol to better coordinate Canadian participation and positions in international fora and initiatives related to geomatics and Earth observation. Both initiatives were successfully completed in 2014, and have moved to an implementation phase.

Heading into the fall 2014, the FCGEO will be developing a forward policy agenda that will include an increased focus on Earth observation issues, including the use of long term satellite data records (LTSDR – See Section IV) and space utilization to support government priorities. Consideration of the federal role in implementation of the Pan-Canadian Geomatics Strategy (See Section IV), and new opportunities for intergovernmental collaboration under a renewed federal-provincial-territorial (FPT) Geomatics Accord will also be on the forward agenda.

For more information:

- GeoConnections – Geospatial Communities and the Canadian GeoSecretariat: http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/8900

Canadian Council on Geomatics (CCOG)

The Canadian Council on Geomatics (CCOG) is a federal-provincial-territorial government cooperative body that advances geomatics activities of common interest, and facilitates data collection, interoperability and integration between jurisdictions. Since 1972, CCOG has worked to develop and endorse national data and data exchange standards that enable sharing of information and technical expertise between governments, and to advocate for the use of geospatial data and information in enhancing policy and decision making. Initiatives such as Canada's spatial data infrastructure, the Canadian Geospatial Data Infrastructure (CGDI – See Section III) and GeoBase (See Section VI) have been conceived at the CCOG table.

CCOG membership is comprised of 13 representatives from provincial/territorial mapping agencies, and one representative of the federal government (NRCan). Several members of the FCGEO are observers at the CCOG table, including Canadian Space Agency, Department of

Fisheries and Oceans, Department of National Defense, and Statistics Canada. CCOG has three standing sub-committees: the Canadian Geodetic Reference System Committee; the GeoBase Steering Committee (See Section VI) and the Cadastral Sub-Committee. The CCOG also establishes additional working groups as required. 2014 saw the formation of two working groups aimed at solidifying intergovernmental collaboration on Public Safety, and imagery acquisition, storage and access.

For the past decade, the framework for federal-provincial-territorial cooperation via CCOG has been provided by the ministerial level Canadian Geomatics Accord. A third iteration of the Geomatics Accord was ratified by members at the CCOG annual meeting in October 2013, and is expected to be signed by Ministers responsible for geomatics ministries from all jurisdictions by the end of 2014. Annexes to the Accord presently under development, will provide terms and conditions for inter-jurisdictional cooperation in specific areas. The first example of such an annex is a Memorandum of Understanding on data sharing and exchange with the Department of National Defense to support national defense and security, emergency preparedness, and response to man-made or natural disasters.

For more information:

- Canadian Council on Geomatics: http://www.ccog-cocg.ca/
- GeoBase: http://www.geobase.ca/geobase/en/index.html

Geographical Names Board of Canada (GNBC)

The Geographical Names Board of Canada (GNBC) is a national coordinating body that keeps official records and provides expert advice pertaining to decisions, standards, principles, procedures, and changes through time to Canada's place names. Established in 1897, the GNBC is comprised of 32 members, and presently operates under an Order-in-Council; with the Chair appointed by the Minister of Natural Resources Canada. Each of the provinces and territories are represented, as are several federal departments that have a role in official geographical naming. These include Aboriginal Affairs and Northern Development Canada, Canada Post, the Department of National Defense, Elections Canada, Library and Archives Canada, Parks Canada, the Translation Bureau of Public Works and Government Services, Statistics Canada and

Transport Canada. The Board also includes representatives from the user community, and the English and French academic communities. The GNBC maintains the Canadian Geographical Names Data Base (CGNDB), Canada's official place names database built upon standard policies for the treatment of names and terminology shared by federal, provincial and territorial governments.

Under the direction of the Advisory Group on Delineation and Automation, and the Advisory Group on Nomenclature, Policy, and Research, the GNBC has several technical working groups that are tackling common challenges and exploring approaches to feature delineation and identification, cultural generics, Aboriginal toponymy, and marine and undersea features naming.

In 2013-14, the GNBC developed a Strategic Plan to the year 2020, with strategic objectives to: strengthen governance, policy and research; improve functionality of, and expand the national names database; improve Aboriginal naming policy, partnerships and outreach; establish a national process for undersea and surface maritime naming; and, raise awareness of the importance of authoritative geographical names. The GNBC will ratify the Strategic Plan and prioritize actions for the coming year at their annual meeting in September 2014.

For more information:

- Geographical Names Board of Canada: http://www.nrcan.gc.ca/earth-sciences/geography-boundary/geographical-name/search/11084
- Canadian Geographical Names Data Base (CGNDB) search: http://www.nrcan.gc.ca/earth-sciences/geography/place-names/search/9170

CCOG-GNBC Collaboration

In many of Canada's provinces and territories, those responsible for geomatics activities and official naming – members of CCOG and GNBC, respectively - are situated in different ministries within their jurisdictions. Recognizing the many interdependencies and similarities between them, particularly the use of geomatics technologies and methodologies to manage the fundamental geographical names data layer and requirements for consistent application of standards and policies, the CCOG and GNBC have been pursuing opportunities for information sharing and relationship-building.

This year the CCOG and GNBC will be holding their annual face-to-face meetings concurrently, from October 1-3, 2014 in Halifax, Nova Scotia. A joint session between the two will provide opportunity to explore synergies and collaboration on feature delineation, where members will discuss the use of feature identifiers (FIDs) as a national standard and development of a federal-provincial-territorial delineation warehouse; and development of a web enabled collaborative tool for standardized entry of geographical naming decisions and information into the Canadian Geographical Names Database.

Canadian Geomatics Community Round Table (CGCRT)

The Canadian Geomatics Community Round Table is a multi-stakeholder forum for open dialogue and collaboration on issues, challenges and opportunities within Canada's geomatics sector. It includes representatives of organizations spanning the geospatial community, including: federal, provincial, territorial governments, industry, academic institutions, non-governmental organizations, professional associations, and users of geospatial information and services. Participation in the Round Table is voluntary, and the committee does not have or seek authority to make binding decisions for those individuals and organizations that participate.

Initially, at an informal gathering of geomatics community leaders at the June 2010 Canadian Geomatics Conference in Calgary, Alberta, Round Table members agreed in 2012 that if real progress was to be made to address the challenges facing the sector, that collaboration would have to be strengthened through a formal governance structure, and that a commonly understood and agreed upon community strategy with accountability for implementation shared across stakeholder groups should be articulated and broadly communicated.

To this end - and since January 2013 - an elected Steering Committee with representation from public, private and non-profits segments of the geomatics community has led the CGCRT in the development of a Pan-Canadian Geomatics Strategy (See Section IV). With community input gathered through 2013 and 2014, this Strategy was finalized at a two-day workshop in June 2014. To complete its term in office – which ends in January 2015 - the Steering Committee is currently exploring models for a new CGCRT governing body whose mandate will focus on implementing, monitoring and reporting on the Strategy.

For more information:

- Geospatial Communities and the Canadian GeoSecretariat: http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/8900
- Canadian Geomatics Community Round Table: http://cgcrt.ca/
- On Twitter: @CGCRT,#CGCRT
- On LinkedIn: Canadian Geomatics Round Table: http://www.linkedin.com/groups?home=&gid=4824554&trk=anet_ug_hm&goback=.anb_4824554_*2_*1_*1_*1_*1_*1

III. Legal and Policy Context

There is no federal legislation mandating spatial data infrastructure (SDI) development in Canada. Canada's commitments under the Open Government Action Plan and collaborative approach to Canada's national spatial data infrastructure, the Canadian Geospatial Data Infrastructure (CGDI) provide the frame for geospatial information management in Canada.

Canadian Geospatial Data Infrastructure (CGDI)

The Government of Canada recognizes the importance of a national spatial data infrastructure (SDI) in spurring innovation, contributing to economic growth and facilitating decision-making by governments, industry and the public. Since 1999, Canada has funded the GeoConnections program, a national initiative led by NRCan, to support the development, integration and use of the Canadian Geospatial Data Infrastructure (CGDI), Canada's spatial data infrastructure.

The CGDI is a convergence of common standards, tools, operational policies and accessible framework data layers that result in the interoperability of federal, provincial, territorial and regional SDI's, creating a navigable online system of information, data, services and applications that improves the sharing, access and use of Canadian geospatial information. With no legislative framework in place in Canada, the development of the CGDI is based upon a cooperative approach between interested organizations and different levels of government. The CGDI governance model reflects Canada's geospatial governance structure, where decision-making and the information needed to support it are distributed across a federated structure.

For more information:

- Canada's Spatial Data Infrastructure: http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/10783

- CGDI Resource Centre: http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/8904

Open Government

Canada's Open Government initiative aims to increase openness and accountability, strengthen democracy, and drive innovation and economic opportunities for Canadians through increased transparency. Canada joined the international Open Government Partnership (OGP) in April, 2012 and shortly thereafter produced Canada's Action Plan on Open Government consisting of 12 commitments in the areas of:

- Open Information: proactive release of information on government activities;
- Open Data (See Section VI): maximization of the release of government data in a useful format to enable citizens, the private sector and non-government organizations to leverage the data in innovative and value-added ways; and
- Open Dialogue: a stronger say for Canadians in policy and priority-setting, and engagement through Web 2.0 technologies.

Canada's Action Plan is underscored by the Directive on Open Government, which provides policy direction for departments and agencies on requirements for maximizing the release of government information to the public. A new version of the draft Government of Canada Directive on Open Government and accompanying Release Criteria Checklist was issued by the Treasury Board Secretariat in July 2014 for consultation within the Government of Canada. Changes from the previous version include stronger definitions and perspectives of the Directive's objectives and expected outcomes.

Since 2000, Canada has pioneered Open Geospatial Data following a policy decision to make geospatial data and maps available at no cost and with an unrestricted use licence. As such, approximately 261,000 of the 272,000 open datasets available on Canada's Open Data portal are geospatial data (as of June 24, 2014), and several are key and high value datasets that Canada has committed to making available under the G8 Open Data Charter. These include but are not

limited to National mapping data, Canada Land Inventory, CanVec National topographic data, fuel consumption data, and forestry data.

The Federal Geospatial Platform (See Section VI) will enable the Government of Canada (GC) to meet its objectives under the Canada's Action Plan on Open Government, ensuring that the wealth of the federal government's geospatial data and information are available through an organized and accessible web presence, while providing value-added visualization capabilities.

For more information:

- G8 Open Data Charter: http://www.international.gc.ca/g8/open_data-donnees_ouvertes.aspx?lang=eng
- G8 Open Data Charter: Canada's Action Plan: http://data.gc.ca/eng/g8-open-data-charter-canadas-action-plan
- Canada's Action Plan on Open Government 2.0 Consultation: http://data.gc.ca/eng/consultations/open-government-action-plan-20-consultation
- Canada's Open Data Portal: http://data.gc.ca/data/en/dataset
- Open Data Institute: http://actionplan.gc.ca/en/initiative/open-data-institute

Government of Canada Open Government License and Treasury Board Standard on Geospatial Data

Canada's commitment to Open Data enables citizens, the private sector, and non-government organizations to leverage and build upon government data in innovative and value-added ways. Based on the United Kingdom's Open Government Licence for Public Sector Information, the Open Government Licence (OGL) v. 2.0 released in May 2014, removes restrictions on the reuse of all types of published Government of Canada information (data - including geospatial data - information, websites, and publications) and aligns with international best practices to promote the re-use of federal information as widely as possible.

The Treasury Board Standard on Geospatial Data supports stewardship and interoperability of information by ensuring that departments manage, access, use and share geospatial data efficiently and effectively to support program and service delivery through the use of common, interoperable standards for data discovery and data visualization. Under the standard, Canadian federal departments must comply with the North American Profile for ISO 19115 – Metadata,

and must use ISO 19128 for online data visualizations using the Web Map Service (WMS) specification, when making geospatial data available online.

This standard represents a first step in normalizing the access, use and dissemination of federal geospatial data in Canada. Expansion of the Standard to include other common geospatial standards that promote interoperability in a distributed online environment are anticipated, and will ensure that Canada's most relevant information is managed in an open, interoperable, and standardized fashion. This will allow for easy integration, analysis, and mapping of information to enhance decision-making and policy development in support of government priorities.

For more information:

- Open Government License: http://data.gc.ca/eng/open-government-licence-canada
- Treasury Board Standard on Geospatial Data: http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=16553&section=text
- Canada's Open Data Portal: http://data.gc.ca/data/en/dataset

IV. Strategic Plan

Two complementary initiatives – the Pan-Canadian Geomatics Strategy and the Geomatics Environmental Scan and Economic Value Study – are establishing future directions and laying the groundwork for action plans that will see Canada's geospatial sector through to 2020. The Strategy establishes a shared future vision, goals and objectives for the geomatics sector in Canada to 2020, while the Study – once completed - will provide a snapshot of the current context, sector status, and value of Canada's geospatial sector as a baseline from which Canada can measure progress in strategy implementation.

Pan-Canadian Geomatics Strategy

The Pan-Canadian Geomatics Strategy is a collaborative, open effort by the Canadian Geomatics Community Round Table (CGCRT - See Section II) to take a collective and inclusive approach to identifying a desired future for Canada's geospatial sector. Initiated in 2012, the process to develop the Strategy involved engagement of an ever-widening range of stakeholders in Canada, including industry, academia, governments, non-governmental organizations, geospatial data and

service companies, professional associations, individual Canadian citizens, as well as new and emerging players in the geomatics and Earth observations sector. The Strategy and an accompanying draft Implementation and Action Plan were completed in June 2014 at a workshop in Ottawa, Ontario, at which over 100 participants, representing the broad spectrum of Canada's geospatial community, attended.

The Strategy includes a vision, mission, and guiding principles for the geomatics sector in Canada, and outlines seven (7) strategic dimensions with associated goals and objectives to which members of the geospatial community are called to respond, namely: geomatics sector identity; governance and leadership; data sources; business model; markets; human resource capacity; and legal and policy framework. The need to address and to act on each of these areas is recognized by the Round Table as key to ensure that Canada has a healthy geomatics sector that is productive, competitive and sustainable well into the future.

As a community strategy, achievement of the vision can only be accomplished through shared ownership and accountability for implementation by all Canadian geospatial community stakeholders. Participation is voluntary and non-binding, and contributors are being asked to undertake actions within their respective mandates and spheres of influence in alignment with the Strategy's overarching goals and objectives. Upon completion of the Strategy at the June 2014 workshop, the CGCRT established seven (7) working groups – one for each Strategy dimension - to foster uptake and delivery on the Action and Implementation Plan.

For more information:

- Pan-Canadian Geomatics Strategy (about): http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/geospatial-communities/pan-canadian
- Pan-Canadian Geomatics Strategy (Draft June 2014): http://cgcrt.ca/draft-strategy-3/

Canadian Geomatics Environmental Scan and Economic Value Study

The use of information and data for product and process innovation across all sectors, including the public sector, has emerged as the primary engine of productivity and growth for the national economies, rendering information and data - 80% of which has a spatial component - the new

global currency. Canada uses geospatial data for a wide range of issues of importance to Canadians including national security, environmental protection, and public health management with significant economic, environmental and social benefits accruing to the Canadian public. The impacts of geospatial information are increasingly well documented as countries undertake studies to quantify tangible and intangible benefits to the economy and society.

To substantiate and quantify these impacts within the Canadian context, and to better understand the Canadian sector at this point in time as a baseline for future growth, NRCan launched the Canadian Geomatics Environmental Sector Scan and Economic Study, in Spring 2013 with two components:

- The Environmental Scan will provide a snapshot of the current geospatial information market in Canada and profile the Canadian geomatics sector; examining current participation in international markets and evaluating the importance of the sector to Canada's domestic market. The scan will also identify technological, economic, social and demographic trends; examine the contributions and roles of government, industry and academia and the challenges and opportunities for each within the geospatial sector; and provide an analysis of the current labour market, education and training.

- The Economic Study will: quantify the economic value (impact) of open geospatial information within the Canadian economy and its contribution to competitiveness and innovation in Canada; evaluate geospatial information as a 'public good' in the Canadian context; and make recommendations on the future strategic direction for geospatial information in Canada with an emphasis on the roles that can be played by the government, industry and academia.

Results of the combined Study are anticipated for Winter 2014/2015.

For more information:

- Canadian Geomatics Environmental Scan and Economic Value Study: http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/cgdi-initiatives/canadian-geomatics

V. Data Collection, Generation and Production

Canada continues to make investments in critical infrastructure and system improvements that support data collection, generation and production activities.

Revitalizing Canada's Satellite Station Facilities

Canada uses leading-edge satellite ground systems technology to provide real-time scientific information on its landmass to address a wide array of topics that are important to Canadians, such as environmental monitoring, stewardship, resource exploration and development, emergency response, navigation, sovereignty and security. The Government of Canada is revitalizing NRCan's satellite station facilities with the installation of four antennas: two in Prince Albert, Saskatchewan (June 2014 and fall 2014), one in Gatineau, Québec (June 2014) and one in Inuvik, Northwest Territories (August 2014). These three satellite station facilities are strategically located across Canada to provide full coverage of Canada's landmass. The revitalization also includes a data management system to house and safeguard satellite information and to ensure the data received by these facilities are accessible to the users. The data management system will be completed by the end of 2014.

For more information:

- Satellite Facilities: http://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/satellite-facilities/10816

Height Reference System Modernization

A consistent reference system for height determination at the national scale is an essential component of the basic infrastructure that enables good governance of our natural resources. Accessed by stakeholders in the field of surveying, engineering, mapping and earth sciences, the height reference system maintains compatibility among all types of geo-referenced information so that it can be interrelated and exploited reliably. While the height reference system supports numerous applications, from highway engineering to monitoring water resources, it is also referred to in many legal documents related to land and water management and safety such as easement, flood control and boundary demarcation.

Height Reference System Modernization (Height Modernization) is a project at NRCan for the development, implementation and promotion of a gravity-based height reference system for Canada. In other words, it is the realization of a new vertical datum for Canada by geoid modelling, rather than by geodetic levelling. It will enable measurements of elevations with respect to a consistent vertical datum everywhere across the country using the Global Positioning System (GPS) and emerging Global Navigation satellite System (GNSS) technologies. This new approach will allow reduction dependency on monumented networks for height determination. It will reduce the physical maintenance from some 80,000 federal benchmarks to some 250 stations making the Canadian Active Control System (CACS) and Canadian Base Network (CBN). These networks will be augmented by the provincial High Precision Networks (HPN).

The Canadian Geodetic Vertical Datum of 2013 (CGVD2013) was released in November 2013, and is now the new standard for heights across Canada. This new height reference system is replacing the Canadian Geodetic Vertical Datum of 1928 (CGVD28), which was adopted formally by an Order in Council in 1935.

For more information:

- Height Reference System Modernization: http://www.nrcan.gc.ca/earth-sciences/geomatics/geodetic-reference-systems/9054

Renewed System for National Digital Elevation in Canada

Digital Elevation Models (DEM) represent convenient ways of storing elevation information, and of making this information available to applications for a wide range of disciplines including cartography, geomorphology, security and defense, geology and energy exploration, civil engineering, geographic information systems, satellite image processing and analysis, among others.

In response to user needs and the increasing availability of new data sources, NRCan undertook a project to define and implement an altimetry strategy that would enable the provision of up-to-date relevant elevation data for Canada, available on the Internet. The result is a new system of interaction and access for National Elevation in Canada, which was made public in April 2013.

Two data sources are now available for the creation of elevation products: the Canadian Digital Elevation Model (CDEM) and the Canadian Digital Surface Model (CDSM).

Besides digital elevation models, other derived products such as slope maps, shaded relief maps, color relief maps, color shaded relief maps, aspect maps, and elevation points can be extracted. Parameters allow users to personalize their products. The web interface offers a dynamic map for pre-visualizing the information and to locate the area of interest.

Current efforts are underway to add capability to the system for the acquisition, quality control, storage, management and distribution of derived elevation models.

For more information:

- Web tool for dynamic creation of elevation products and the extraction of vector data using National Elevation data: http://geogratis.gc.ca/extraction/
- Elevation API: http://data.gc.ca/data/en/dataset/a2501903-129f-4a72-a16b-758eb56c902d

Canadian Geographical Names Database of Canada (CGNDB) Re-engineering

An initiative to reengineer, modernize and streamline procedures related to the processing, validation and integration of provincial/territorial naming decisions in the Canadian Geographical Names Database is underway. This reengineering work will result in standardized and automated decision entry and validation processes wherever possible, for improved efficiencies and accuracy with respect to this fundamental data layer.

For more information:

- The Canadian Geographical Names Data Base (CGNDB): http://www.nrcan.gc.ca/earth-sciences/geography/place-names/about-geographical-names-board-canada/9182

VI. Data Publishing and Sharing

Geospatial standards and operational policies facilitate the development, sharing and use of geospatial data by eliminating barriers and enabling users to exchange geospatial information effectively and efficiently. New standards, access mechanisms and services are making it easier for Canadians to find, mine and use authoritative and accurate Government of Canada data.

For more information:

- Geospatial Standards and Operational Policies: http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/8902

Evolution of GeoBase (GeoBase 2.0)

GeoBase is a federal, provincial and territorial government initiative to ensure the provision of, and access to, common, up-to-date and maintained base, or framework geospatial data for all of Canada. Overseen by the Canadian Council on Geomatics (CCOG – See Section II), the initiative provides access through the GeoBase portal to quality geospatial information without cost or restriction under the Government of Canada Open Data License. More than a decade has passed since the GeoBase portal was launched and great success has been achieved in the provision of many quality, framework geospatial data sets for all of Canada.

Significant changes have taken place in the Canadian geomatics landscape over the recent years and some of the major challenges that GeoBase originally faced (licensing, open data and access, etc.) have, in most part, been overcome. Challenges remain for governments to collectively define and provide the core Authoritative, Accurate, and Accessible geospatial framework data that meets user expectations for currency and interoperability in a world increasingly defined by integrated data and information services. Existing opportunities such as the Federal Geospatial Platform (establishment of a common single geospatial environment for all federal departments – See Section VI), the Geofoundation exchange (ESRI), and crowdsourcing/Volunteered Geographic Information (VGI), could greatly benefit the GeoBase initiative.

Over the next several years, it is expected that there will be changes to GeoBase data and information offerings as core framework data sets for Canada are definitively decided upon, as current data offerings are enriched, and as methods for GeoBase data and information management and access evolve.

With both challenges and opportunities in mind, the CCOG will be examining GeoBase operating principles and evaluating the potential to leverage opportunities to maximize collective

resources for the continued maintenance of this key core data component of the Canadian Geospatial Data Infrastructure. This will include a revitalization of the membership and mandate of the GeoBase Steering Committee. The results of this modernization exercise are expected by March 2015.

For more information:

- GeoBase: http://www.geobase.ca/
- GeoBase in Action: http://www.geobase.ca/geobase/en/action/index.html

GeoGratis Website

GeoGratis is a web portal that provides access to a wide collection of ESS geospatial data, maps, remote sensing imagery, and publications in several different popular formats, at no cost and without restrictions under the Government of Canada Open Data License. In 2013, NRCan renewed the GeoGratis website with a re-designed search capability, and provided access to several location-based web services. In 2014, new web services were added such as a series of Canada base maps focusing on transportation, elevation, and hydrology, and a new data extraction tool for vector and elevation data.

The new GeoGratis service is compatible with Open Geospatial Consortium (OGC) standards, and provides a better one-stop site for people to obtain Canadian geospatial data, maps, images and publications. These services incorporate the latest trends and technologies that specifically target mobile and modern web-application developers. The GeoGratis web application-programming interface (API) is a state-of-the-art standards-based platform that allows internal and external clients to tap into ESS data and information products, and the primary mechanism by which data.gc.ca and search engines access ESS data and information products.

For more information:

- Geogratis: http://www.geogratis.gc.ca/

Federal Geospatial Platform

Geospatial data are widely used across the federal government to support broad national objectives such as economic growth, citizen well-being, environmental management and

regulatory review. Many challenges still exist in realizing the potential of some of Canada's most valuable data assets, including the need for a single source to search, view and analyze the complete catalogue of federal geospatial data. Sharing and integration of "trusted" data across the federal family and with Canadians is now relatively limited due to technology, standards, and licensing barriers, and needs to be expanded. Acquisition and use of geospatial information, services, technology, and expertise by departments and agencies must be optimized in a fair, transparent and fiscally responsible manner. And, to meet the rapidly evolving demands of Canadians and industry, within a tight fiscal context, aging infrastructure and public service demographic – innovation and efficiency are required.

Recently approved as a three-year, $40 million dollar project by Canada's Treasury Board, the Federal Geospatial Platform (FGP), an initiative of the Federal Committee on Geomatics and Earth Observations (FCGEO – See Section II), will provide a comprehensive solution to these challenges by providing the means for Canadian federal departments and agencies to manage geospatial information assets in a more efficient and coordinated way, using a common "platform" of technical infrastructure, policies, standards and governance, and providing "AAA" (Accurate, Authoritative, Accessible) geospatial data to support decision-making by government and citizens, and stimulate downstream applications development.

The FGP brings together geospatial data from the 21 departments and agencies of FCGEO (Listed in Section I) within a platform that will enable the rapid search of all federal geospatial data assets. Results will be discovered, viewed, accessed and analyzed through a single window on Canada's Open Data portal (data.gc.ca – See Section III). The portal offers data from 25 federal departments and agencies in machine readable formats, available for download and re-use under the open terms and conditions of the Open Government Licence.

The FGP will be freely accessible online for use by Canadians, governments and industry, thus feeding the growing appetite for open data and the creation of location-enabled services and applications. Key components of the platform will include:

- Shared infrastructure, managed by Shared Services Canada.
- Data repository of quality-assured, interoperable "AAA" data.

- Standards-based, searchable metadata catalogue.
- Web service and application development environment.
- Value-added visualization and analytical capabilities on data.gc.ca.

Creation of the FGP based on the policies and standards of Canada's spatial data infrastructure, the CGDI, is in strong alignment with Open Data Initiative's intent to develop common standards and provide a common platform for the access and use of open data. A suite of operational policies and standards will underpin the shared infrastructure, quality data, services and applications that comprise the FGP, and a baseline of policies and standards that support the FGP will be codified as part of an update to Canada's Standard on Geospatial Data.

For more information:

- Federal Geospatial Platform: http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/geospatial-communities/federal

National Earth Observation Data Framework (NEODF)

Canada's National Earth Observation Data Framework (NEODF) is the data management, discovery and delivery system providing on-line access to nationally-significant remote sensing data holdings. The NEODF provides federal users and participants in federal RADARSAT programs access to processed data from Canada's RADARSAT; commercial satellite imagery purchased via the government's National Master Standing Offers (NMSOs)[2]; and a range of national-scale value-added remote sensing products. Raw data from RADARSAT missions is also searchable from the NEODF.

NEODF presently provides public users access to the National Air Photo Library. Additional NEODF products, including national satellite-derived 10-day composites spanning up to 30 years, and a variety of land-cover products, will be made available to the public in 2014. NEODF functionality will be incorporated into the satellite data management system, which is

[2] The National Master Standing Offer (NMSO) is a procurement mechanism that permits federal departments to purchase commercial imagery with an efficient procurement vehicle, at a competitive price, and "buy it once, use it many times".

being developed under Satellite Station Facilities revitalization project (See Section V), and will be completed by the end of 2014.

For more information:

- National Earth Observation Data Framework and Catalogue: http://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/satellite-imagery-products/neodf/11003

VII. Use of Geospatial Data, Information and Applications

The Government of Canada's key priorities in 2014 include responsible resource development, national security, jobs, economic growth and competitiveness, public safety and development of the North. Geomatics, Earth observation, surveying and geodesy play a critical role in the fulfillment of these Government of Canada priorities. Following are a just a few examples of how geospatial information is being used to deliver on these priorities:

Emergency Geomatics Services (EGS)

NRCan's Emergency Geomatics Service (EGS) provides geomatics support through the provision of subject matter expertise and satellite-derived products and services for emergency situations requiring federal-level coordination and response under the Federal Emergency Response Plan.

The focus of EGS is primarily on response to flood events; providing near-real time, open water flood extent polygons derived from RADARSAT-2. However, over the next three years, the role of EGS will be expanded to provide a seamless process from mitigation, to preparedness, to response and recovery; enabling near-real time response to flooding, ice jams, and damage assessment based on multi-sensors technologies. To achieve this, EGS will be integrated with the Public Safety and Security business line of the of the Federal Geospatial Platform (FGP – See Section VI), and research and development activities will be directed to development or improvement of algorithms to better exploit Earth observation information in support of a broader range of emergencies, across all phases.

For more information:

- Natural Hazards – Emergency Geomatics Services: https://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/applications-development/natural-hazards/10981

Geo-mapping for Energy and Minerals (GEM)

Geo-mapping for Energy and Minerals (GEM) provides industry with modern geological information, facilitating industry's ability to identify areas with potential sources of energy and mineral resources. The activities are focused on updating the geological framework, which identifies the potential areas where certain mineral and energy types could be located, and disseminating this knowledge to all involved stakeholders. This fills the critical information gap in the knowledge base needed to increase exploration investment and facilitate land-use decisions in the territories.

For more information:

- Geo-mapping for Energy and Minerals: http://www.nrcan.gc.ca/earth-sciences/about/current-program/geomapping/7131

Long Term Satellite Data Records (LTSDRs)

Canada produces a range of satellite-derived national-scale information products, often spanning long periods of time. CCMEO's internationally-recognized data correction methods yield high-radiometric and geometric quality, cloud-free composites. These multi-use products are derived from a variety of satellite sensors including AVHRR, Terra/MODIS, and Landsat. The longest record includes 10-day composites spanning a 30 year period. These data products, and the indicators (e.g. vegetation indices, albedo, evapotranspiration, snow and land cover) derived from them, are collectively known as the LTSDRs. These assets respond to the needs of many downstream users from multiple levels of governments, industry, academia and more widely.

Collectively, the LTSDRs provide organizations with the capacity to establish baselines, and monitor changes and trends to the Canadian landmass. They feed weather, climate and hydrology models, support forest inventories, contribute to groundwater recharge mapping, support ecosystem and wildlife studies, enhance fire and carbon reporting, among others. Of key

relevance, LTSDRs support responsible resource development by assisting with an understanding of the potential and actual impacts of development, and monitoring of remediation efforts.

These data assets are massive. Historically, their size was a significant hurdle to their efficient release, and thus their widespread use. As of 2014, LTSDRs are available to federal users via the National Earth Observation Data Framework (NEODF) (See Section VI). Public release will follow shortly this year.

For more information:

- Long Term Satellite Data Records - http://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/long-term-satellite-data-records/10935

VIII. Capacity Development and International Engagement

Ensuring the usability of Canada's geospatial information to better support decision-making as well as access to timely and accurate mission critical data and information requires inter-jurisdictional collaboration, co-operation and innovation. Participation in international fora and initiatives provides the opportunity for Canada not only to share expertise and experience to facilitate capacity development in other countries, but likewise, provides the opportunity for Canada to harness international expertise, standards, and science and technology.

To this end, Canada participates in and contributes to a number of geospatial information management and related organizations. Following is a partial list of key engagements:

- Arctic Spatial Data Infrastructure (ASDI) – Member and Chair (NRCan)
- Centre for Spatial Policy and Law – Member (NRCan)
- Global Spatial Data Infrastructure Association (GSDI) – President (University of New Brunswick); Member (NRCan)
- Group on Earth Observations (GEO) – Member of the Executive Committee (Environment Canada)
- Intergovernmental Oceanographic Commission – Member (DFO)
- International Hydrographic Organization - Member and Chair of Committees/Sub-Committees, including the Marine Spatial Data Infrastructure, the Transfer Standard

Maintenance and Applications Development, and the Standing Committee on Undersea Feature Names (DFO)

- International Organization for Standardization (ISO) – Member and Chair, ISO/TC211 Canada (NRCan), Member (DFO)
- International Maritime Organization – Member (DFO)
- Open Geospatial Consortium (OGC) – Member (NRCan)
- United Nations Committee of Experts on Global Geospatial Information Management (UNCE-GGIM) – Member (NRCan)
- United Nations Committee on Global Geospatial Information Management: Americas (UN-GGIM: Americas) – Executive Board Member, North American Vocal (NRCan)
- United Nations Committee on the Peaceful Uses of Outer Space (UN-COPUOUS) – Member (CSA)
- United Nations Group of Experts on Geographical Names (UNGEGN) – Member; past-Chair (2011-12) (NRCan)
- World Meteorological Organization (WMO) – President (Environment Canada)

Canada also works closely with the United States Federal Geographic Data Committee (FGDC), and the Infrastructure for Spatial Information in the European Community (INSPIRE).

Arctic Spatial Data Infrastructure (Arctic SDI)

The Arctic Spatial Data Infrastructure (Arctic SDI) consists of the Canadian and International regionalized components of the CGDI and Global Spatial Data Infrastructure, respectively. Canada's domestic Arctic SDI is contributing to development in the North by providing a geographic reference foundation to help inform sound decision making and policy development related to responsible resource development, emergency management, and environmental issues.

The development of an international Arctic Spatial Data Infrastructure is supported by the national mapping agencies of Canada, Denmark, the Faroe Islands, Greenland, Finland, Iceland, Norway, the Russian Federation, Sweden and the United States; and backed by a Memorandum of Understanding signed by all member countries.

The Arctic Council – the intergovernmental forum for Arctic governments and peoples, presently chaired by Canada (2013-15) – is prototyping Arctic SDI via its Conservation of Arctic Flora and Fauna (CAFF) working group as a possible common information management methodology for the Council. Arctic SDI is currently in the process of publishing each member nation's topographic and CAFF data; and defining operational policies in support of a circumpolar initiative.

In the fall 2014, there will be further strategic discussions to explore an expanded scope of Arctic SDI that improves sharing, access and use of other location based information spanning the Arctic. The operational phase is scheduled for the last quarter of 2014.

For more information:

- Arctic Spatial Data Infrastructure (International): http://arctic-sdi.org/
- Arctic Council: http://www.arctic-council.org/index.php/en/

IX. Conclusion

In moving forward, the use of geospatial information needs to be maximized for better decision-making, and to meet broad national and international objectives such as economic growth, emergency preparedness and response, social cohesion and well-being, and responsible resource management. To this end, Canada will continue to evolve the CGDI based on the convergence of geospatial policies, standards, legal and administrative issues, and continue to respond to change brought on by evolving technologies. Canada will continue to support Canadian geomatics and Earth observation initiatives and international collaborations to ensure effective management of Canadian geospatial information in an interoperable environment that is well aligned with international standards and policies.