



Natural Resources
Canada

Ressources naturelles
Canada



The 2023-26 Integrated Business Plan for the Lands and Minerals Sector



Canada

Library and Archives Canada Cataloguing in Publication

Main entry under title: *The 2023–26 Integrated Business Plan for the Lands and Minerals Sector*

Aussi disponible en français sous le titre : Plan d'activités intégré 2023-2026 du Secteur des terres et des minéraux

© His Majesty the King in Right of Canada, as represented by the Minister of Natural Resources, 2023

Cat. No. M34-45/2023E (Print) ISBN 978-0-660-48817-2

Cat. No. M34-45/2023E-PDF (Online) ISBN 978-0-660-48816-5

Copies of this publication may be obtained by emailing lms_pro-stm_bpr@nrcan-rncan.gc.ca.

Information contained in this publication may be reproduced, in part or in whole, and by any means, for personal or public non-commercial purposes, without charge or further permission, unless otherwise specified.

You are asked to:

- Exercise due diligence in ensuring the accuracy of the materials reproduced.
- Indicate both the complete title of the material reproduced, and the name of the author organization.
- Indicate that the reproduction is the copy of an official work that is published by Natural Resources Canada and the reproduction has not been produced in affiliation with, or with the endorsement of, the Natural Resources Canada.

Commercial reproduction and distribution is prohibited except with written permission from Natural Resources Canada. For more information, contact Natural Resources Canada at: nrcan.copyrightdroitdauteur.nrcan@canada.ca.



Natural Resources
Canada

Ressources naturelles
Canada

The 2023-26 Integrated Business Plan for the Lands and Minerals Sector

Canada 







Table of contents

Executive summary	2
Message from senior management	3
Context: Key external factors	4
LMS vision, mission and values	5
Priorities, risks and key actions	6
Our LMS priorities	7
Sustainable and secure mineral and energy development	7
Improved land management and sovereignty	19
Increased resilience to a changing climate	28
Effective hazards monitoring and explosives safety	31
Our risks	36
Maintaining our diverse and skilled workforce	36
Building modern IT, facilities and equipment	38
Conclusion	41
Appendix 1: Resource snapshot	42
Appendix 2: Branch profiles	45
Appendix 3: Planning and program alignment	53





Executive summary

The Lands and Minerals Sector (LMS) is the largest sector at Natural Resources Canada (NRCan), with more than 1,000 employees across the country.

Hosting the federal government's scientific experts and lead policy advisors on Canada's landmass, our Sector fulfills a variety of mandated responsibilities, such as international boundary maintenance, diamond trade monitoring, geoscience, mining technology and geospatial positioning.

The LMS mission is to support Canada's transition to a low-carbon economy through responsible mineral development and land governance, impactful science and the safety of Canadians in a changing climate.

To accomplish this, the Sector will focus on four priorities for the next three years:

1. Sustainable and secure mineral and energy development
2. Improved land management and sovereignty
3. Increased resilience to a changing climate
4. Effective hazards monitoring and explosives safety

The Sector will also address two risk areas to ensure the accomplishment of its goals:

- Maintaining our diverse and skilled workforce
- Building modern information technology (IT), facilities and equipment

Over the next three years, the LMS will work toward a safe and sustainable future for Canada, with responsible land governance and a secure mineral and energy supply. This plan is a blueprint that will guide the Sector toward that vision.



Message from senior management

We are pleased to release the second integrated business plan for the Lands and Minerals Sector (LMS) of Natural Resources Canada (NRCan). Covering 2023–26, this three-year plan identifies how our Sector will support Canada’s transition to a low-carbon economy through our diverse science, policy and programs.

Since our first integrated business plan in 2020–21, our Sector and the context in which we work have changed. The LMS is navigating both challenging external forces and the adjustment to a new hybrid workplace, which is reflected in our strategic approach for the next three years.

The LMS must balance the need to drive economic growth with environmental and social responsibility to deliver on our commitments. To facilitate this, our integrated business plan will serve as the Sector’s most important strategic document to make progress on our shared goals. The strategic framework outlined in this plan helps support government priorities, by incorporating our core work in responsible mineral development and land governance, delivering impactful science and increasing the safety of Canadians in a changing climate.

Alongside a suite of more detailed supporting plans, the integrated business plan will ensure that the LMS staff have the clarity to sustain their work over the long term. We know that we cannot do it alone. Success will only be possible through collaboration within the Sector, and with our natural resource colleagues and with our Canadian and international partners. Our commitment to innovation will support continued progress in creating a sustainable and secure future for mineral and energy development in Canada.



Jeff Labonté
Assistant Deputy Minister,
Lands and Minerals Sector



Rinaldo Jeanty
Associate Assistant
Deputy Minister,
Science and Operations,
Lands and Minerals Sector



Kimberly Lavoie
Associate Assistant
Deputy Minister,
Critical Minerals and Mining Policy,
Lands and Minerals Sector



Context: Key external factors

The LMS works across the country and around the world. We are influenced by countless external factors, and today, they are impacting our business, our science and how we serve Canadians. There are three key factors that will affect our work over the next three years.

1. Ongoing effects of the COVID-19 pandemic

The world has reopened after the shutdowns of early 2020. However, impacts of the COVID-19 pandemic continue to affect many aspects of our work and international affairs — from the economy to supply chains and shifting international alliances. Our Sector is well positioned to leverage our strengths to support Canada in this new reality. Our team will benefit from a new hybrid workplace in many ways, including through stronger regional representation and new approaches to our sciences and fieldwork.

2. Critical minerals opportunities and industry growth

Critical minerals are the building blocks of a clean energy future and essential to many digital technologies. Global demand for these minerals is projected to increase in the coming years, and there is a need for secure, reliable supplies that meet robust environmental and social standards. This represents an opportunity for Canada, which holds significant amounts of many critical minerals. With the release of the Canadian Critical Minerals Strategy in late 2022, the federal government has made mineral industry development a priority.

3. Climate change commitments and responsibilities

Addressing climate change is a priority for Canada, and the country is acting to mitigate and adapt to a changing climate through measures outlined in the federal budget and the 2030 Emissions Reduction Plan, which commit Canada to reducing its carbon emissions to 40 percent below 2005 levels by 2030. As a science-based sector, the LMS contributes to mitigation and adaptation actions through its research, programming and policy support.



LMS vision, mission and values

About the LMS

The LMS is the leading source of scientific, technological, economic and policy knowledge on Canada's lands and minerals. The Sector has a broad mandate that includes legislative requirements, research, program and policy priorities, and service delivery to clients. Our vision, mission and values are the common pillars that unite the Sector.

Vision

A safe and sustainable future for Canada, with responsible land governance and secure mineral and energy supply

Mission

Support Canada's transition to a low-carbon economy through responsible mineral development and land governance, impactful science and the safety of Canadians in a changing climate.

Values

LMS values build upon the core values of the public service. Our Sector's values are:

- **Innovation:** Leveraging our ingenuity and creativity for impact
- **Expertise:** Instilling confidence through dependable and high-quality science and advice
- **Collaboration:** Exploring new connections and opportunities for joint solutions, and engaging partners early and often
- **Learning:** Seeking continuous improvement, increasing understanding and refining of professional competencies
- **Integrity:** Delivering on commitments and building trusting relationships within and outside the Sector

Over the next three years, the LMS will continue to put these values into practice as we work in support of our mission and toward making our vision a reality.





Priorities, risks and key actions

This integrated business plan is a blueprint that will guide the Sector over the next three years.

The LMS will focus on four priorities:

1. Sustainable and secure mineral and energy development
2. Improved land management and sovereignty
3. Increased resilience to a changing climate
4. Effective hazards monitoring and explosives safety

The Sector will also address two risk areas to ensure its goals are accomplished:

- Maintaining our diverse and skilled workforce
- Building modern information technology (IT), facilities and equipment

In the following sections, we identify the objectives, strategies and key actions, performance measurement, risks and resources for each priority and risk.

Further details about the LMS resources and branches are provided in the appendixes.



Sustainable and secure mineral and energy development



Canada's mineral sector directly and indirectly contributed 665,000 jobs and \$125 billion to the country's economy in 2021, accounting for around five percent of the nominal gross domestic product. Canadian mineral resources are an important economic asset and must be obtained in a sustainable way that minimizes negative environmental and social impact.

LMS work supports every step of the mining process and includes:

- Foundational science on Canadian geology and exploration, with implications for resource exploration, impact assessment, land management, national sovereignty and more
- Research and development on mineral processing techniques and efficiency
- Research on mining waste disposal and on mining minerals from waste deposits
- Economic incentives and policies to support mining
- Regulations related to the mining industry within federal jurisdiction (e.g., *Explosives Act*)
- Technological innovation and commercialization programs
- Research on non-mineral energy sources such as geothermal and hydrogen

What's going on

LMS researchers are working on ways to make the mining industry more efficient and sustainable so Canadians can benefit from our resources with as little impact on the environment as possible.

In the coming years, the Canadian government is focusing on moving the economy away from fossil fuels and relying more on the development, generation and supply of renewable and alternative energy sources (e.g., wind, solar, hydro, geothermal, hydrogen) and technologies (e.g., small modular reactors, electric vehicles [EVs]) for the country's diverse and growing needs. To make this happen, Canada needs a reliable and secure supply of critical minerals to feed the energy transition.

The Canadian Critical Minerals Strategy, released in December 2022, charts the way forward for the critical minerals industry in Canada. The LMS will lead on several key pieces of the strategy such as public geoscience and exploration, research and development, and transportation and energy infrastructure to unlock key regions and deposits. The Sector will also assist industry through the Critical Minerals Centre of Excellence (CMCE) and has already created a new branch, the Minerals Programs Branch (MPB), to help develop and deliver critical minerals-related programs in the coming years.



Why it matters

According to the International Energy Agency (IEA), it takes far more mineral inputs to make an electric car than to make a conventional gas-powered car. Similarly, the IEA notes it takes more mineral resources to build an onshore wind plant than a coal power plant of the same generating capacity.

As countries increase their use of alternative technologies, including Canada, the demand for minerals to build them will grow. The IEA projects that mineral demand for EVs and battery storage could grow between 10 and 30 times by 2040, and demands for minerals to power the energy transition will grow too.

This increased demand represents an opportunity for Canada. Our country is endowed with enormous resource wealth spread across critical minerals-rich regions from coast to coast to coast, including rural, remote and Indigenous communities. For example, Canada is the only Western nation that has an abundance of cobalt, graphite, lithium and nickel, which are all essential when making batteries and EVs. It also has important supplies of niobium, used by the aerospace industry, and indium, a key input in semiconductors.

However, locating new deposits across Canada's vast geography is complicated, as is building up supply and value chains. Related efforts must be consistent with Canadian priorities and objectives, including environmental protection and conservation, safe and responsible labour practices, and respect for the rights of Indigenous Peoples.

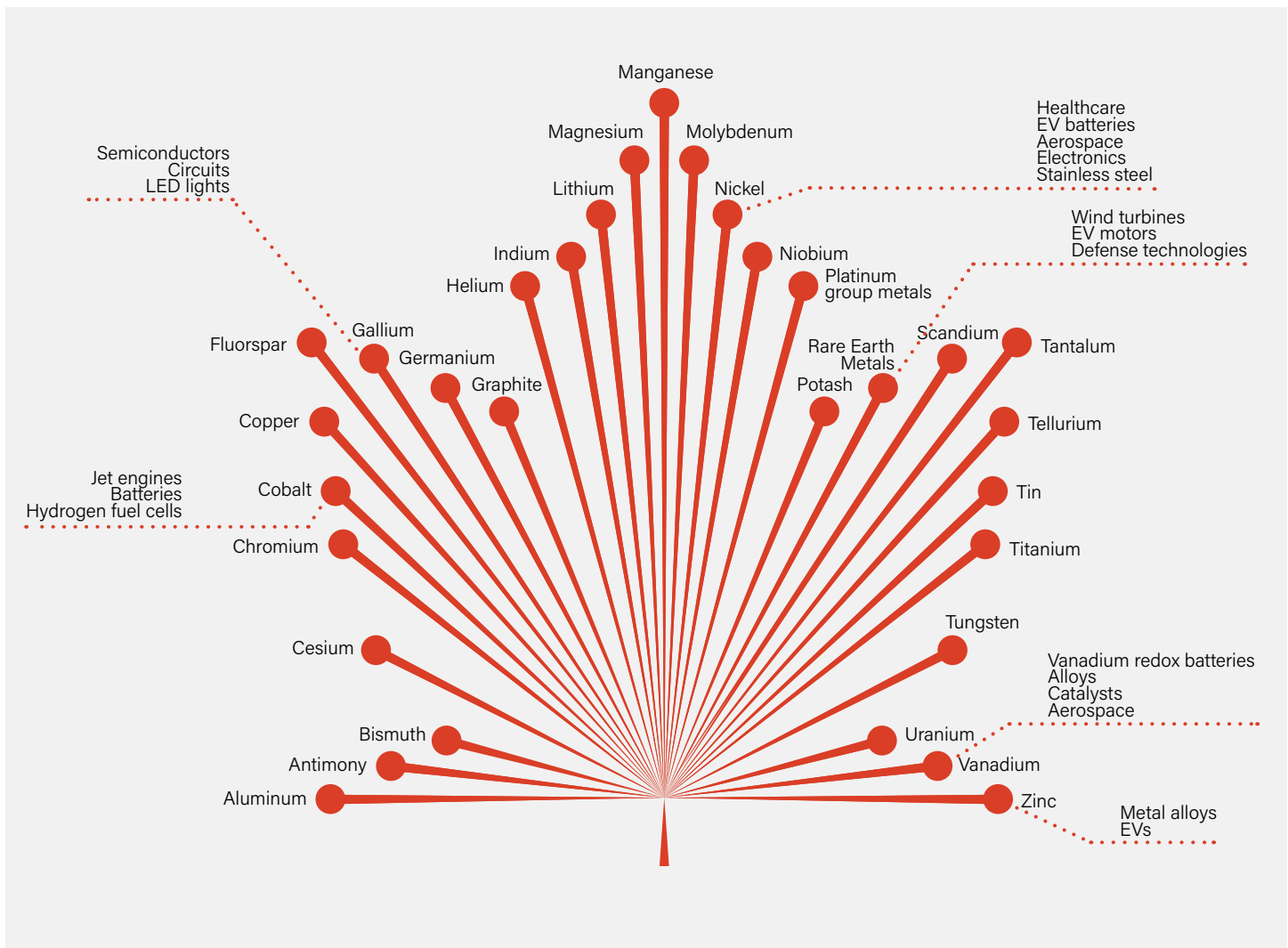


Figure 1: Canada's 31 critical minerals



Big picture

Global supplies of many critical minerals are geographically concentrated, making them vulnerable to economic, geopolitical, environmental and other risks. While Canada has supplies of many critical minerals, most related mining projects are currently at an early stage of development. As a world leader in environmental, social and governance standards with respect to mining, Canada has an opportunity to enhance its competitiveness in both domestic and world critical minerals markets.

At the same time, Canadians and consumers are concerned about the environmental impacts of mining and expect projects to be managed sustainably. Although critical minerals play an integral role in supporting the global green energy transition to reduce greenhouse gas emissions, their benefits cannot be outweighed by negative impacts like damage or loss of biodiversity in sensitive ecosystems.

The meaningful participation and leadership of Indigenous Peoples, including joint decision-making, are integral to ensure that projects advance, Indigenous Peoples share in their benefits, and Indigenous rights and titles are upheld.

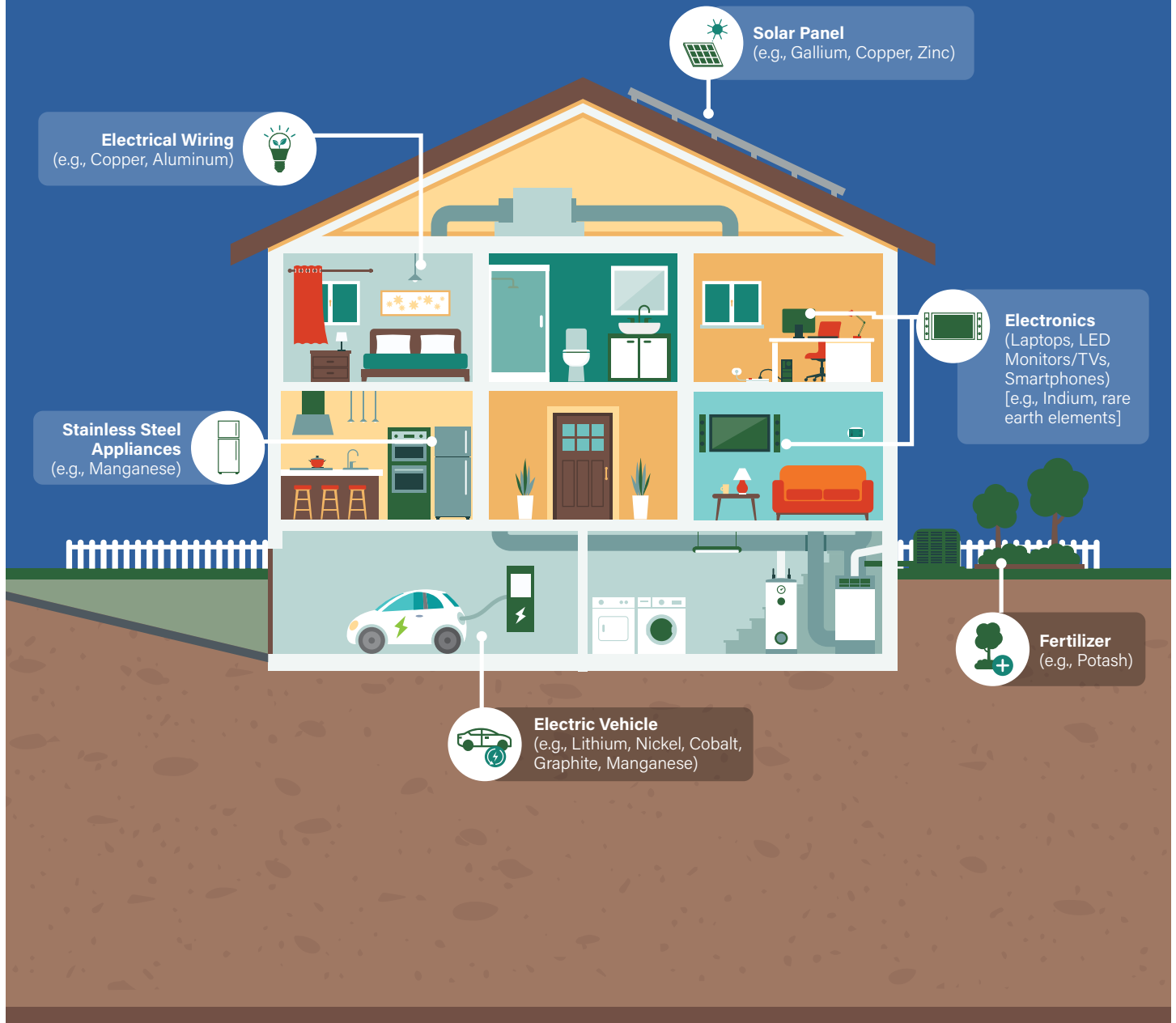
Over the next three years

The LMS will undertake key actions to develop a secure and sustainable supply of critical minerals from exploration to recycling, and advance the science to unlock Canada's mineral resource potential from conventional and unconventional sources in a responsible manner.



Did You Know?

Critical minerals are used in a variety of goods and products, many of which can be found in our homes and daily lives.



Objective 1:

Develop a secure and sustainable supply of critical minerals, from exploration to recycling

By supporting the development of a secure and sustainable supply chain for critical minerals, the LMS will help position Canada for the green energy future. This requires the LMS to support industry, work with international and domestic partners — including Indigenous groups, and encourage investments in all parts of the critical minerals supply chain.

To do this, the LMS is focusing on four areas:

Strategy 1:

Improve the stakeholders' ability to navigate the regulatory regime for critical minerals

To meet Canada's objective of a net-zero economy by 2050, additional mechanisms must be in place to expedite and facilitate strategic critical minerals projects through regulatory approvals pre- and post-assessment. The LMS will act in two areas, both contributing to improving the regulatory process and helping industry actors navigate through it.

Key action

Provide input and advice on efforts to streamline regulatory processes to support clean growth sectors through regulatory reviews

Canada wants projects to move forward in a responsible way, but provinces, territories and industry have noted issues with the current impact assessment process. For example, they report it often takes longer than expected or guidelines are not suitably tailored to specific projects. At the same time, other countries are reforming their own regulatory systems to get projects approved faster.

Now, the federal government is reviewing the implementation of Canada's regulatory framework to improve the predictability and efficiency of regulatory processes. This will, in part, accelerate critical minerals project development while safeguarding the interests of Canadians, protecting the environment and respecting the rights of Indigenous Peoples. The LMS has a key role to play in this process.

Lead: Policy and Economics Branch (PEB)

Performance measurement:

- **Target outcome:** Improved predictability and effectiveness in the federal regulatory process for project reviews
- **Target outputs:** Producing a regulatory roadmap and related materials to identify areas for process improvement

Resources:

- Internal budget and staff time and collaboration with Nòkwewashk, at NRCan, the Impact Assessment Agency of Canada (IAA) and the Treasury Board Secretariat (TBS)

Risk:

- **Main risk:** Lack of expertise within the PEB on mining industry and processes for regulatory roadmaps (e.g., policy implications of different geologies and processes for rare earth elements extraction and processing)
- **Mitigation:** Consult extensively with CanmetMINING and other branch experts, Nòkwewashk and regulatory departments

Assist industry proponents to navigate the critical minerals regulatory process

Canada's current regulatory and permitting processes for critical minerals projects, such as mining or exploration projects, are complex, and the proponents of these projects can benefit from help to navigate processes. The CMCE will directly assist proponents of critical minerals projects to accomplish this. This will facilitate a more efficient and timely review, better project planning and improved investor confidence to accelerate critical minerals project development.

Lead: PEB

Performance measurement:

- **Target outcome:** Accessible point of entry for critical minerals project proponents seeking information and guidance on overall federal regulatory and permitting processes
- **Target outputs:**
 - » Holding meetings and sharing information with proponents and/or federal regulatory leads on specific projects and permits
 - » Acting as a facilitator between proponents and regulators should issues arise, such as lack of progress updates on permits (on a case-by-case basis)

Resources:

- Internal budget and staff time and collaboration with Nòkwewashk, the IAA and the TBS

Risks:

- **Main risks:**
 - » Many regulatory processes are outside NRCan's jurisdiction
 - » Industry may seek advice and expect support or guarantees on expediting projects that NRCan is unable to provide
- **Mitigation:**
 - » Ensure the CMCE focuses on connecting industry with the correct contacts, providing general guidance and facilitating discussions on pressure areas
 - » Make the CMCE's role clear in communications materials



Strategy 2:

Support enabling infrastructure for critical minerals development

Getting new critical minerals mines operational takes more than just digging the mines: these projects require clean energy and transportation infrastructure to get them running and deliver their products to the market.

Key action

Develop and deliver the proposed Critical Minerals Infrastructure Fund

To help develop infrastructure to support Canada's ambitions for critical minerals across the supply chain, the LMS is launching the Critical Minerals Infrastructure Fund (CMIF).

Lead: MPB

Performance measurement:

- **Target outcome:** 20 to 30 new infrastructure projects (e.g., roads, upgraded power lines) across Canada to increase production of Canada's supply of critical minerals in new and existing mining operations
- **Target outputs:**
 - » Launching the CMIF
 - » Establishing contribution agreements with provinces, territories, industry, regional partners and Indigenous communities for infrastructure projects over the seven-year CMIF delivery period

Resources:

- Funding and staff through the MPB and the CMIF

Risk:

- **Main risk:** Need to build CMIF delivery capacity
- **Mitigation:** Support program implementation through the new LMS branch, the MPB



Strategy 3:
De-risk mining investment

There is a gap in available financing for upstream critical minerals mining projects (e.g., exploration, extraction, early-stage) due to their financial risks. A coordinated federal approach to financial incentives is required to ensure departments and agencies cover financing gaps, especially given competitive U.S. incentives for critical minerals industrial development.

Key action

Contribute to increasing the availability of financial incentives that help de-risk investments for upstream critical minerals development

The LMS will contribute to a better coordination of federal financial incentives to help de-risk critical minerals mining projects and stimulate private capital investments.

Lead: PEB, in partnership with other federal departments and agencies

Performance measurement:

- **Target outcome:** Enhanced critical minerals value chain development in Canada
- **Target outputs:** Increasing the number of upstream critical minerals projects receiving federal financial incentives, which are currently not available to them, by two or more per year from 2022–23 onward

Resources:

- Internal budget and staff time

Risk:

- **Main risk:** Lack of coordination between federal departments and agencies
- **Mitigation:** Hold regular engagements with relevant contacts and share information early in the project development cycle

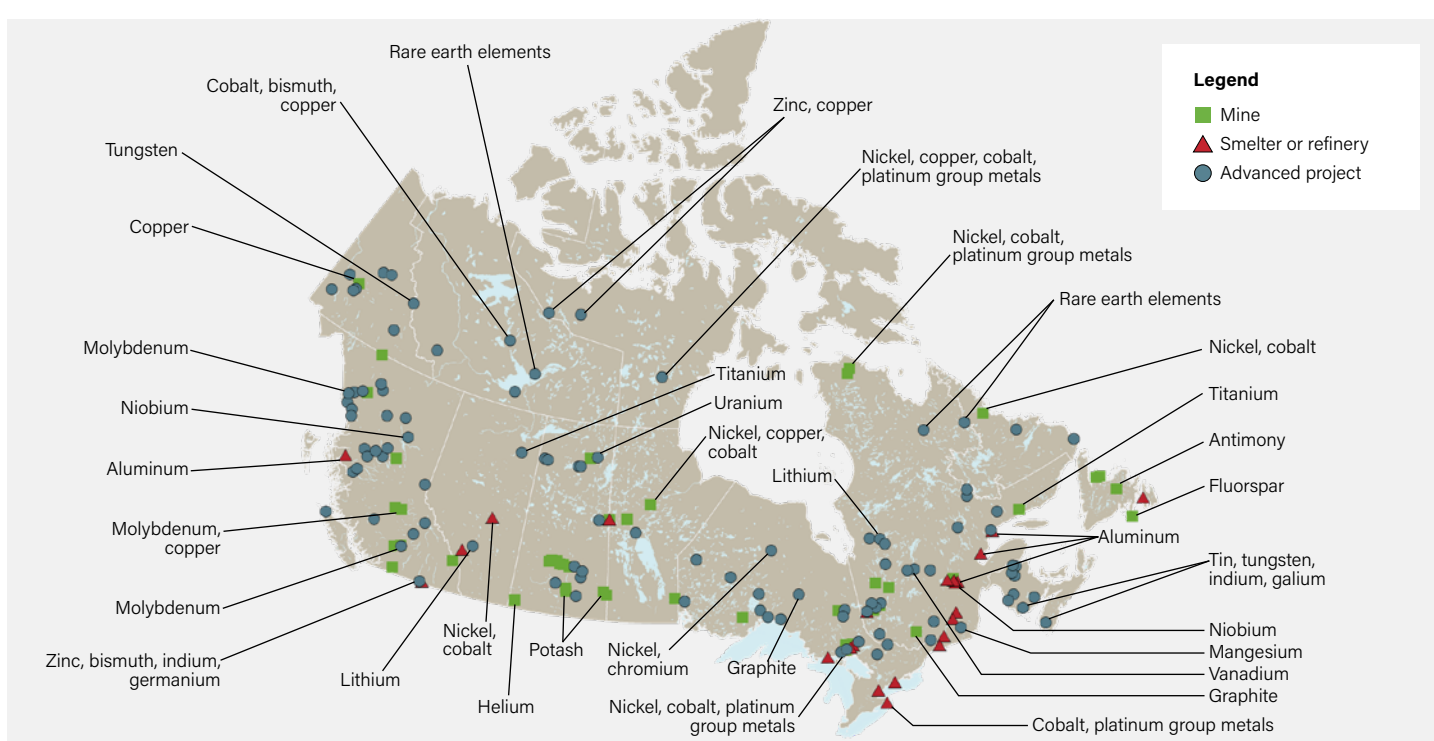


Figure 2: Potential opportunities for critical minerals development nation-wide

Strategy 4:

Strengthen Canada's leadership in critical minerals, national security and partnerships with allies

Canada's allies show growing interest to pursue collective action to secure critical minerals value chains across the globe. To ensure enhanced sustainability practices, Canada will leverage its international partnerships to improve responsible business conduct, environmental, social and governance standards, traceability, and best practices in critical minerals-related activities — including human rights and Indigenous reconciliation considerations.

Key action

Maintain or increase the number of international activities and active partnership agreements related to the critical minerals and metals sector

Canada has already signed several international partnership agreements, but having more will help solidify our leadership role in this area.

Lead: Multi-team effort within the LMS, involving PEB, MPB, the Explosives, Regulatory and Business Services Branch (ERBSB), CanmetMINING, and the Geological Survey of Canada (GSC)

Performance measurement:

- **Target outcome:** Increased Canadian influence and leadership in critical minerals with international like-minded partners through bilateral and multilateral engagements to enhance global critical minerals supply chain resiliency and environmental, social and governance standards
- **Target outputs:**
 - » Increasing international activities and active partnership agreements that enhance the resiliency of critical minerals supply chains
 - » Establishing more research and development as well as grants and contributions agreements with international partners
 - » Producing technical publications and intellectual property products as well as holding research and development workshops

Resources:

- Funding and staff through the Global Partnerships Initiative of the Canadian Critical Minerals Strategy and the development of IT infrastructure and secure cloud space

Risks:

- **Main risks:**
 - » Lack of available staff given project timelines
 - » Unexpected delays in departmental processes (e.g., IT, procurement, contracting, recruitment, funding)
- **Mitigation:**
 - » Recruit and staff proactively
 - » Reallocate funds to later years if departmental processes are delayed

Objective 2:

Advance the science to unlock Canada's resource potential

Good geoscience and technology can help better position the industry to explore and develop mineral projects by reducing the risks involved.

The LMS is working to provide the public with good geological information so the industry is more aware of the mineral potential of different sites and with good technology to develop them. Making this information and technology publicly available also helps communities and governments zone land appropriately and make decisions about whether and where to allow exploration and development.

Strategy 1:

Undertake research, development and innovation to increase knowledge of Canada's resources

Key action

Contribute to advancing research and development leading to pilot and demonstration projects of new mining technologies and approaches

Industry has an appetite for new mining technologies and LMS programs can help to move these technologies to the demonstration stage through our own research and collaboration with external partners.

Lead: CanmetMINING

Performance measurement:

- **Target outcome:** Increased technological readiness for Canadian mining to contribute to Canada's net-zero goals
- **Target outputs:**
 - » Advancing three zero-emission vehicle-related chemical technologies to demonstration or pilot project stage
 - » Stimulating new investments in critical minerals production in Canada
 - » Ensuring more than 25 percent of critical minerals-related mining technologies are developed by NRCan and ensuring federal labs are ready for commercial use
 - » Advancing knowledge through the Program of Energy Research and Development, carbon capture, utilization and storage, and hydrogen research projects

Resources:

- Funding and staff through the Critical Minerals Research Development and Demonstration Program

Risk:

- **Main risk:** Risk of difficulty hiring qualified personnel (particularly for research and development positions)
- **Mitigation:**
 - » Begin staffing processes as early as possible
 - » Establish and use professional networks to advertise opportunities
 - » Use staffing mechanisms like remote work, student bridging and casual contracts to fill staffing gaps

Increase knowledge of mineral potential through assessment of conventional and unconventional sources of minerals

Minerals are found in ore deposits, but some can also be extracted from other sources, like waste products from mining. LMS researchers are improving our knowledge of both.

Leads: CanmetMINING and GSC

Performance measurement:

- **Target outcome:** Improved information to guide resource development decision-making
- **Target outputs:**
 - » Producing hundreds of geoscience publications, 200 conference presentations and 20 data products accessible to the public
 - » Recording more than 20,000 downloads of geoscientific and technical materials (tracked via the GEOSCAN database)
 - » Producing modern inventories and maps of conventional and unconventional mineral sites in Canada, focusing on critical minerals potential
 - » Advancing development and testing of mineral processing flowsheets (documents describing the processing methodology along with inputs, equipment and other information) applicable to the recovery of critical minerals from secondary sources and battery recycling
 - » Developing a Canadian mine tailings inventory database, based on provincial and territorial publicly accessible data, providing a critical minerals inventory and a comprehensive catalogue on mine tailings sites in Canada
 - » Developing a tailings sampling program to find a means of obtaining representative samples of tailings material (i.e., mining by-products). With this information, stakeholders could estimate the quantity of a given metal in tailings.

Resources:

- Funding and staff through the Mining Value from Waste Program, the Targeted Geoscience Initiative, the Critical Minerals Geoscience and Data Initiative, and GEM-GeoNorth

Risk:

- **Main risk:**
 - » Achievement of expected results slower than anticipated due to delays in procurement and staffing processes
 - » Difficulty obtaining additional mine waste information from provincial and territorial sources
- **Mitigation:**
 - » Recruit and staff proactively
 - » Submit procurement requests well in advance of needs
 - » Renew efforts to communicate needs to provincial and territorial partners

Develop integrated geological and landscape modelling approaches for responsible resource development

Models that incorporate geoscience with economic and socioeconomic considerations help provide a more complete picture of mineral potential and could encourage exploration activities. This integrated approach also ensures that environmental, social, hazard risk assessment and infrastructure factors are considered when examining potential mining activities.

Lead: GSC

Performance measurement:

- **Target outcome:** Confirmation that mineral development is sustainable and aligned with domestic priorities and mandates earlier in the mineral resource cycle
- **Target outputs:** Producing and disseminating integrated geological and landscape modelling tools, and more than 20 maps and bulletins on critical minerals potential inclusive of environmental, social and governance as well as economic and infrastructure considerations

Resources:

- Funding and staff through GEM-GeoNorth, the Targeted Geoscience Initiative and the Critical Minerals Geoscience and Data Initiative

Risk:

- **Main risk:**
 - » Lack of internal capacity given project timelines
 - » Unexpected delays in departmental processes (e.g., IT, procurement, contracting, recruitment)
 - » Difficulty in accessing large volumes of high-quality data needed for modelling
- **Mitigation:**
 - » Recruit and staff proactively
 - » Develop collaborations with stakeholders (e.g., provinces, territories, industry) to facilitate data access





Improved land management and sovereignty



LMS work sets standards and systems for effective land management and supports Canadian sovereignty. It does this by providing science to inform land-use decisions, supplying information to support submissions filed with international bodies and maintaining a clearly defined boundary between Canada and the United States. The LMS also supports Indigenous land governance by working with Indigenous Peoples and territorial governments.

Specific LMS activities in this area include:

- Managing the Canada Lands Survey System, including survey standards
- Conducting seafloor mapping and geoscientific research to support Canada's extended continental shelf submissions entitlement filed under the United Nations Convention on the Law of the Sea (UNCLOS)
- Maintaining the clearly demarcated Canada-U.S. boundary, in accordance with treaty obligations
- Conducting research on more accurate geospatial positioning
- Supporting Nunavut devolution
- Managing Canada's land survey programs and capacity building to support devolution of land management through modern treaties with Indigenous Peoples
- Providing scientific expertise to support the impact assessment and regulatory processes

What's going on

A robust and accessible land management system allows individuals, communities and governments to make and implement informed decisions about how to develop lands. Having robust science and precise geographical positioning infrastructure for those lands also helps inform decision-making.

Demands for land management systems and information are shifting in a few areas, notably Indigenous lands and Canada's offshore. The LMS is working with Indigenous Peoples to build their land management survey capacity and develop governance regimes aligned with their inherent right to self-determination.

Canada's offshore has historically played an important role in our country's economic development. Canada is looking at sustainably using ocean resources and adopting practices that support healthy ocean ecosystems, and to do this, it needs scientific information and governance systems.

Why it matters

Lands and natural resources, which are scarce, account for much of the Canadian national wealth. They also provide the complex environmental ecosystem that supports life on Earth. Making good land-use decisions to support our environmental and economic future requires science and tools that provide integrated knowledge about the landmass.

Big picture

Accurate, reliable survey information and science and legal frameworks are a necessary underpinning for economic growth, environmental protection, national security, and for self-determination of Indigenous Peoples.

Over the next three years

The LMS will continue to contribute science and surveying expertise that support land governance, including Indigenous land governance, land-use decision-making and Canada's sovereignty.

Objective 1:

Contribute science expertise and support for land management

To make good decisions about how to use their lands, Canadians need information on the land itself, as well as rules and systems to support their choices. These actions contribute to both.

Strategy 1:

Strengthen responsible land management and sovereignty through science

The LMS will contribute research to further understanding of the land, particularly in Canada's vast offshore and the North. The LMS work will also contribute scientific expertise to the impact assessment process for proposed major infrastructure projects and to the fulfilment of Canada's obligations to international agreements.

Key action

Provide scientific expertise to support land-use decisions, including under the impact assessment process

The GSC convenes on-demand geoscientific expertise for impact assessments through the Environmental Impact Assessment Service. Starting in 2023, the GSC is also participating in an interdepartmental initiative to support current federal land management priorities more comprehensively. This builds on significant environmental geoscience work previously done by the GSC.

Lead: GSC

Performance measurement:

- **Target outcome:** Canada has the geoscience required to inform responsible resource development and environmental stewardship in both terrestrial and marine environments
- **Target outputs:**
 - » Providing scientific expertise and advice to support the IAA's multi-phase impact assessment activities
 - » Helping to deliver regional terrestrial assessments, including information on cumulative effects, for areas that have been prioritized for potential development
 - » Filling knowledge gaps related to Canadian water resources, thus supporting sustainable water management and decision-making aligned with environmental, social and governance principles
 - » Developing new marine geoscience knowledge products to inform onshore and offshore planning in prioritized areas

Resources:

- Funding and staff through environmental and marine geoscience programs

Risk:

- **Main risk:** Sharp increase in the number of assessment requests due to the growing interest in land use and development
- **Mitigation:** Maintain ability to reassign or engage additional expertise as needed

Map the extended continental shelf to support Canada's Arctic Ocean submission presented to the United Nations

The UNCLOS program is the sole means by which the Government of Canada seeks to secure international recognition of the full extent of Canada's continental shelf in the Arctic Ocean. Over seven years, the program will map the full lengths of the Lomonosov and Alpha-Mendeleev ridges complex in the Arctic Ocean. This will establish our nation's last maritime boundary and confer sovereign rights to the living and non-living resources on and under the seafloor.

Lead: GSC

Performance measurement:

- **Target outcome:** International recognition of the outer limits of Canada's extended continental shelf as our last maritime boundary and sovereign rights to the natural resources on and under the seafloor
- **Target outputs:**
 - » Carrying out mapping and geoscientific research to validate Canada's outer limits beyond 200 nautical miles in the Arctic Ocean and support its continental shelf submission
 - » Collaborating with national and international geoscientific organizations
 - » Presenting a revised Arctic Ocean submission to the UN Commission on the Limits of the Continental Shelf before the end of 2030

Resources:

- Proposed funding to support surveys in the Arctic Ocean and the addition of new scientific personnel to maintain capacity and geoscience expertise in the Extended Continental Shelf program, which is responsible for the UNCLOS Program (subject to Treasury Board's approval)

Risk:

- **Main risk:** Complex Arctic operational logistics to support surveys and research and procurement of professional services for the program
- **Mitigation:** Proactive program planning, international collaboration, financial monitoring and risk management plan



Support the advancement of scientific knowledge about Canada's Northern lands

The GSC provides geoscience focused on mineral potential and sustainable development in Canada's North in the context of a changing climate. This work informs decisions related to mineral development, climate-resilient infrastructure and land use. While all science themes studied by the GSC include a Northern component, this particular Northern-specific research is necessary due to the unique scientific knowledge gaps and infrastructure challenges in the region.

Lead: GSC

Performance measurement:

- **Target outcome:** New geoscience to increase the attractiveness of Canada's North for mineral development in the context of Northerners' priorities and a changing climate
- **Target outputs:**
 - » Providing new public geoscientific data, knowledge and maps of Northern Canada, focusing on areas with high potential for critical minerals and other commodities, and where economic and/or infrastructure development is likely to benefit Northern communities
 - » Holding collaborative dialogues with territories/provinces, Indigenous governments and organizations, and other Northerners, to maintain alignment of research with Northern priorities
 - » Providing accessible plain-language geological information to inform Indigenous land-use decision-making

Resources:

- Funding and staff from the GEM-GeoNorth Initiative

Risk:

- **Main risks:** Delays in engagement with Indigenous Peoples due to competing priorities in Indigenous communities and in fieldwork due to weather or provincial/territorial processes for obtaining permits
- **Mitigation:** Align program priorities with Indigenous government and community priorities, hold regular meetings with provinces/territories, and continue proactive work by the GEM-GeoNorth Coordination Office to advance planning, permit issuance and logistics



Enhance relationships with Indigenous Peoples for research collaboration and knowledge sharing

Indigenous Peoples have important relationships with the lands and waters in Canada, and thus are in a strong position to both contribute to and benefit from geoscience. Through the GSC's Indigenous Relations Network, the LMS seeks to enhance its relationships with Indigenous Peoples to integrate Indigenous perspectives into geoscience.

Lead: GSC

Performance measurement:

- **Target outcome:** Enhanced relationships and collaboration with Indigenous Peoples to support the co-development of research priorities and partnerships across GSC science programming
- **Target outputs:**
 - » Offering ongoing training to GSC staff, including new courses developed in collaboration with Nòkwewashk and the Circle of Nations, with a target of 200 learners attending classes
 - » Providing tools and training to support a consistent engagement approach within the GSC that respects the rights of Indigenous Peoples, including two English and two French toolbox workshops, and continued development and compilation of tools and resources to aid in Indigenous engagement and relationship-building
 - » Holding at least one meeting with each provincial/territorial authority on Indigenous engagement, and meeting with Indigenous representative organizations
 - » Increasing the number of priority-setting projects or other mechanisms to incorporate Indigenous priorities

Resources:

- Internal budget and staff time

Risk:

- **Main risk:** The LMS reputation with Indigenous partners could be negatively affected without sufficient support
- **Mitigation:** Provide training to support LMS staff in future engagement activities with Indigenous stakeholders



Strategy 2:

Improve regulatory systems for land governance

Having clear systems and boundaries is essential for effectively governing lands. Through two key actions, the LMS will contribute to better governance offshore — an area of growing economic interest — and improve Canada's geographical positioning infrastructure — the national standard to accurately locate any point on the land.

Key action

Advance policy frameworks for seabed governance

Canada currently does not have a national policy or regulatory framework on seabed mining. The International Seabed Authority (ISA) is currently in the process of developing exploitation regulations that would govern commercial seabed mining of critical minerals in areas beyond national jurisdiction.

Seabed mining is increasingly attracting media and public attention as interested parties, such as environmental groups, raise concerns on the environmental harm from seabed mining and call for Canada to support domestic and international moratoria on seabed mining.

The LMS will support the development of seabed mineral governance in Canada over the next few years, as well as Canada's delegation head at the ISA on seabed mining regulations negotiations.

Lead: PEB

Performance measurement:

- **Target outcome:** Policy recommendations on seabed mineral governance for Canada
- **Target outputs:**
 - » Participating in meetings with other government departments (OGDs) to provide advice and input related to domestic seabed mineral governance
 - » Participating in ISA council meetings (March, July and November 2023) and intersessional workshops, in support of Canada's delegation led by Global Affairs Canada

Resources:

- Funding and staff through the Blue Economy Strategy and/or the Departmental Reserve, working with experts across NRCan (e.g., GSC) and the federal government (e.g., Department of Fisheries and Oceans)

Risk:

- **Main risk:** Lack of alignment with other federal departments on seabed mineral governance and relevant ocean-based programs and policies, which is necessary to advance this horizontal policy initiative
- **Mitigation:** Early and frequent engagement with OGDs with regular meetings

Modernize Canada's geographical positioning infrastructure

The LMS intends to improve coverage of the Global Navigation Satellite System (GNSS) ground network by installing additional stations. This GNSS network provides positioning, navigation and timing information to support a variety of essential services, as well as geoscience applications.

These improvements will support services to Canadians such as survey efficiency in the North, meteorological and climate modelling (in partnership with Environment and Climate Change Canada) and advanced vehicle positioning for the future (in partnership with Transport Canada).

Lead: Surveyor General Branch (SGB)

Performance measurement:

- **Target outcome:** Increased resilience of GNSS network with fewer coverage gaps
- **Target outputs:**
 - » Installing approximately 22 new GNSS stations by 2026
 - » Achieving successful operation of expanded GNSS network

Resources:

- Funding and staff through GNSS ground-based infrastructure initiative (part of larger Government of Canada Space-Based Earth Observation funding); GNSS receivers, construction equipment and additional materials to support the installation and function of each new GNSS receiver

Risk:

- **Main risks:**
 - » Difficulty acquiring lease agreements for GNSS receiver sites
 - » Procurement costs and delays
- **Mitigation:**
 - » Work with other federal departments and the NRCan Real Property and Workplace Services Branch to draft appropriate lease agreements
 - » Begin procurement process immediately and, only when goods and services are confirmed as procured, commence work activities



Objective 2:

Support Indigenous land governance

LMS programs strive to support Indigenous land governance by improving relations with Indigenous Peoples and engaging Indigenous communities about research and work on the land. The LMS also supports First Nations land governance through land registries, survey work and capacity building.

Strategy 1:

Contribute land surveys, geoscience and capacity building to empower Indigenous land governance

Key action

Provide boundary certainty and build the land-management capacity of First Nations to support self-governance

The Framework Agreement on First Nations Land Management empowers First Nations to replace the 44 sections of the *Indian Act* that pertain to land management with a community-approved land code developed as the legal framework. The LMS supports this by bringing knowledge about boundaries, so that informed decisions can be made from a land-governance perspective.

The LMS is delivering on the government obligation to give the Gwich'in First Nation boundary certainty to fulfill the governance of their lands, as per a separate agreement between Canada, the territories and the Gwich'in Tribal Council.

For Gwich'in and other First Nations, the LMS is also contributing to building skills like understanding land surveys and land survey-related products.

Lead: The SGB, with federal partners, Indigenous Services Canada (ISC) and Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)

Performance measurement:

- **Target outcome:** Enhanced land-management capacity of participating First Nations through skill-sharing and delivery of survey-related products
- **Target outputs:**
 - » Providing legal description reports and identifying any issues on boundaries to support First Nations land management
 - » Participating in discussions to bring a member of the Gwich'in community to assist in the issuing of contracts, developing their understanding of the planning and process and providing them with surveying knowledge to bring this information into the community

Resources:

- Funding and staff through Gwich'in and First Nations land-management programs; surveying expertise, procurement of field vehicles and survey equipment, and travel to communities for in-person capacity development through the SGB

Risk:

- **Main risk:** Contracting surveyors and other experts in a competitive environment
- **Mitigation:** Pay careful attention to the contracting process to minimize delays and costs when possible

Support a First Nations-led national land registry

The First Nations Lands Advisory Board is proposing a new First Nations-led national land registry. This will provide greater authority for First Nations over management of their lands consistent with the Framework Agreement, land code and First Nations governing authority.

It will also provide for the ownership, control and use of the registry system and data by First Nations. The LMS supports reconciliation through this First Nations-led initiative.

Lead: The SGB will provide support to CIRNAC and ISC.

Performance measurement:

- **Target outcome:** Contribution to the development and operations of an independent First Nations land registry
- **Target outputs:**
 - » Providing the legal survey system under the *Canada Lands Surveys Act* to support the operations of the new registry
 - » Supporting an expanded mandate of the new registry, by providing surveying and technical services to map unsurveyed parcels that are recorded in the registry

Resources:

- Funding and staff through First Nations land-management programs; procurement and installation of IT resources to support registry activities

Risk:

- **Main risk:** Contracting surveyors and IT experts in a competitive environment
- **Mitigation:** Pay careful attention to the contracting process to minimize delays and costs when possible





Increased resilience to a changing climate

LMS research examines climate change risks, including activities on coastal erosion and permafrost, and communicates information to stakeholders, including communities, industry and OGDs.

Our work in this area includes:

- Geological research on coastal erosion, the effects of climate change on permafrost and the natural sources of methane and carbon from permafrost
- Research on the impacts of climate change on natural hazards (e.g., landslides, sea-level rise, glacier mass balance and coastal flooding)
- Logistics for research programs in Northern Canada
- Research and development related to climate change mitigation strategies for mines
- National knowledge assessment of climate change impacts and adaptation
- Creating and maintaining adaptation resources for communities, and building adaptation skills and competencies
- Collaboration with OGDs on adaptation strategy development

What's going on

Canada is exposed to a range of natural hazards such as earthquakes, floodings, landslides, coastal erosion and wildfires, and to diverse environmental changes like permafrost thaw, glacier melt and sea-level changes. Many of these phenomena are exacerbated by climate change, and we must adapt to this new reality.

Why it matters

Communities, governments and industry can prepare for climate change and reduce the severity of the impacts. With better information on what to expect and the skills to act on it, decision makers can make choices on land-use planning; nature-based adaptation actions (e.g., preventing erosion by planting trees); as well as on application of codes, standards and technologies.

Big picture

While we work to reduce emissions, we also need to adapt to a future with a different climate. Good preparation can help save lives and prevent severe damage to infrastructure, homes and businesses.



Over the next three years

The LMS will support the assessment and development of solutions to climate change risks.

Objective 1:

Support the assessment and development of solutions to climate change risks

Strategy 1:

Develop and share information on climate change impacts and adaptation for infrastructure, businesses and communities

The LMS can help Canadians adapt to the future climate by researching the impacts of climate change on natural hazards (e.g., landslides), studying areas where experience greater impacts from climate change will be felt and improving the stakeholders' understanding of climate change risks and opportunities.

Key action

Support the development of guidelines, tools and standards to help adapt to climate change impacts

LMS research and climate programs will improve the resilience of critical economic sectors and the communities that depend on them. It will also ensure that Canada has the trained, professional workforce it needs to design and implement adaptation actions.

Leads: Hazards, Adaptation and Operations Branch (HAOB) and GSC

Performance measurement:

- **Target outcome:** Increased resilience to climate change in natural resource sectors and communities
- **Target outputs:**
 - » Developing monitoring methods, maps and predictive models on changes in permafrost, glaciers, coastal erosion and sea level to support climate adaptation decisions and a systems-based approach to climate change
 - » Providing targeted communities and natural resource businesses with increased access to the information and tools needed to develop adaptation solutions, improving their skills to put this information and these tools into action and having more of them identify climate change adaptation measures by 2027
 - » Seeing more than half of targeted professionals, like engineers and planners, participate in professional development activities for climate change adaptation by 2027
 - » Providing open and easily accessible data on the potential impacts of natural hazards in Canada

Resources:

- Funding and staff through the Climate Change Adaptation Program, internal GSC resources and possible future Treasury Board-funded initiatives

Risk:

- **Main risk:** Capacity of partners to engage on adaptation when both adaptation and mitigation programs launch simultaneously
- **Mitigation:** Build on established program relationships, particularly in regions where adaptation is an urgent issue

Contribute to mining infrastructure resilience to climate change impacts

Climate change-induced hazards and events could directly affect mining operations (e.g., through an extreme rainfall event washing out a road), and mine operators need to be prepared. The LMS work helps to define these risks and potential ways to address them.

Leads: CanmetMINING and GSC

Performance measurement:

- **Target outcome:** Improved ability of the Canadian mining industry to deal with specific climate change threats
- **Target outputs:**
 - » Ensuring more robust environmental performance of organic covers (e.g., topsoil or mulch) for reclaiming or restoring former mine sites
 - » Putting in place better predictive tools and databases to assist with environmental assessments for new mine projects in a changing climate
 - » Developing better dust monitoring methods for mine dust management

Resources:

- Funding and staff through CanmetMINING climate resilient mining priority

Risk:

- **Main risk:** Insufficient engagement with industry stakeholders
- **Mitigation:** Organize regular meetings with industry groups to ensure the advancement of LMS programs





Effective hazards monitoring and explosives safety



The LMS is the unique provider of many services that keep Canadians safe. The Sector tests, inspects and regulates explosives in Canada. The LMS also monitors and researches a variety of natural disasters and events.

Our work in this area includes:

- Monitoring, alerting and assessing risks of earthquakes
- Providing space weather information to protect critical services in Canada
- Estimating risks from volcanoes
- Researching landslides and tsunamis in Canada
- Evaluating and approving explosives for handling in Canada
- Licencing explosives and ensuring compliance through inspection
- Detecting nuclear and radiological events

Why it matters

Ensuring the safety of Canadians is a fundamental government responsibility, and updating LMS technical and regulatory capabilities in hazards monitoring and explosives regulation will help to achieve that objective.

Periodically revisiting the explosives regulations and evaluating our hazards monitoring capabilities are important to make sure that the LMS keeps pace with the latest developments in fields like earthquake early warning systems and new research on explosives.

Big picture

The LMS has specific legislated responsibilities related to public safety that it must fulfill while also striving to improve its systems to better deliver its programs and better protect Canadians.



Over the next three years

The LMS will undertake key actions to sustain and enhance systems to support legislated safety, security and emergency management responsibilities in two areas: explosives safety and natural hazards monitoring.

Objective 1:

Sustain and enhance systems to support legislated safety, security and emergency management responsibilities

Strategy 1:

Operate and modernize our explosive regulatory regime

Under the *Explosives Act*, NRCan is responsible for regulating the safe and secure handling of explosives and helps in ensuring that their production, storage and transportation are done in a way that keeps Canadians safe — including from the misuse of explosives for criminal and terrorist activities.

Due to the nature of this mandate, it is imperative that NRCan keeps pace with change. To address this, the LMS is focusing on two actions.

Key action

Improve usability of licencing system for explosives

Upgrading the current partially paper-based system to an efficient, user-friendly digital interface will provide licence holders and NRCan with real-time information and assessment tools, as well as create a more robust data foundation to support the Explosives Program in its oversight planning.

Lead: ERBSB

Performance measurement:

- **Target outcome:** Modernized electronic licence management system and proper infrastructure in place to support its functionalities and stakeholder requirements
- **Target outputs:**
 - » Conducting research and defining business and technical requirements for a new system
 - » Defining a business solution that can be maintained internally, fits within the NRCan IT infrastructure and is scalable to link to other internal systems
 - » Developing a new application or modernizing the current system for an improved capacity to monitor and analyze information related to explosives licencing and inspection

Resources:

- Funding and support staff through the initiative for reinforcing the Explosives Program and existing reference levels

Risk:

- **Main risk:** Lack of internal capacity (financial and personnel) and IT infrastructure to support the application
- **Mitigation:** Seek support from external stakeholders, as necessary

Complete the explosives regulatory review

The *Explosives Act* and the associated *Explosives Regulations, 2013* need to be updated for better oversight of the safe and secure handling of explosives.

Lead: ERBSB

Performance measurement:

- **Target outcome:** Improved enforcement powers under the *Explosives Act* and a more efficient, modern regulatory regime
- **Target outputs:**
 - » Performing a comprehensive review of the *Explosives Regulations, 2013*
 - » Consulting and engaging with internal and industry stakeholders, and setting final objectives
 - » Developing amendments to update the *Explosives Act* to provide strengthened authorities to support inspection and enforcement
 - » Updating and developing operational policies and guidance to mitigate safety and security risks as well as to support a modernized regime

Resources:

- Funding and staff through the initiative for reinforcing the Explosives Program and existing reference levels

Risk:

- **Main risk:** Dependency on OGDs and industry stakeholders could create unexpected delays
- **Mitigation:** Ensure proactive engagement earlier and throughout the process



Strategy 2:

Advance science and operate systems for natural hazards to reduce disaster risks

The LMS is responsible for monitoring natural hazards like earthquakes, tsunamis and space weather. Having a robust monitoring system and risk assessment capability helps to ensure public safety, and improving this capacity will strengthen safety even more.

To advance risk monitoring and assessment, the LMS will focus on two actions.

Key action

Develop a new earthquake early warning system

Being warned of an earthquake a few seconds before shaking occurs can give people the ability to drop, cover and hold on, and allows critical infrastructure operators to shut down systems for protection. The earthquake early warning system will add a new capability to Canada's earthquake mitigation system in higher-risk areas.

Lead: HAOB

Performance measurement:

- **Target outcome:** Improved public safety through providing warnings of strong shaking from major earthquakes
- **Target outputs:**
 - » Installing over 300 earthquake early warning sensors in high-risk regions
 - » Creating early warning software and establishing data centres
 - » Preparing to issue warnings to critical infrastructure operators and to the public using the National Public Alerting System
 - » Collaborating with the United States to ensure warning for cross-border earthquakes
 - » Extending the earthquake early warning sensor network and conducting research through targeted contributions (about 10 projects)
 - » Working with OGDs, provinces, territories and First Nations to raise public awareness and prepare them to respond to alerts

Resources:

- Funding and staff through an emergency management strategy for ensuring better disaster management in Canada (Budget 2019); procurement and installation of core stations, extended network stations, data centres and software through LMS

Risk:

- **Main risk:** Possibility that the system is not operational by the end of March 2024
- **Mitigation:** Prioritize key steps such as ensuring that sufficient sensors are installed and data centres are completed



Key action

Transform space weather forecasting to meet the needs of government and critical industries users

Space weather produces atmospheric disturbances that disrupt radio communication and navigation services, space environment effects that damage satellites and geomagnetic disturbances that impact power networks and other systems on the ground.

Canada does not have a dedicated or centralized space weather monitoring program and instead relies on a combination of outputs from various existing projects.

Given the increasing need for robust and reliable forecasts for use by critical infrastructure operators and government departments, Canada needs an operational space weather system. This new system will require technical staff to support 24/7 operations, freeing up research staff to focus on improvements and addressing gaps. The LMS will also work with U.S. and other international partners, where appropriate, to provide forecasts and alerts for integrated infrastructure systems, such as power grids, and to seek common approaches to protect critical systems.

Lead: HAOB

Performance measurement:

- **Target outcome:** Reliable operation of critical services during major space weather disturbances and reduced impact from space weather events
- **Target outputs:**
 - » Providing robust, essential information to protect critical services in Canada, such as energy supply, maritime and aviation communication and navigation, and public safety and security operations
 - » Offering space weather services targeted at the specific needs of Canadian users

Resources:

- Funding and staff provided by HAOB and Shared Services Canada

Risk:

- **Main risk:** Inability to secure the necessary funding
- **Mitigation:** Continue to explore other avenues for funding





Maintaining our diverse and skilled workforce



The LMS has a workforce of nearly 1,000 employees in almost every region across Canada. We support science and other critical services for Canadians from coast to coast to coast. Our staff is highly skilled and specialized: 68 percent of staff work directly in science- or technology-related fields.

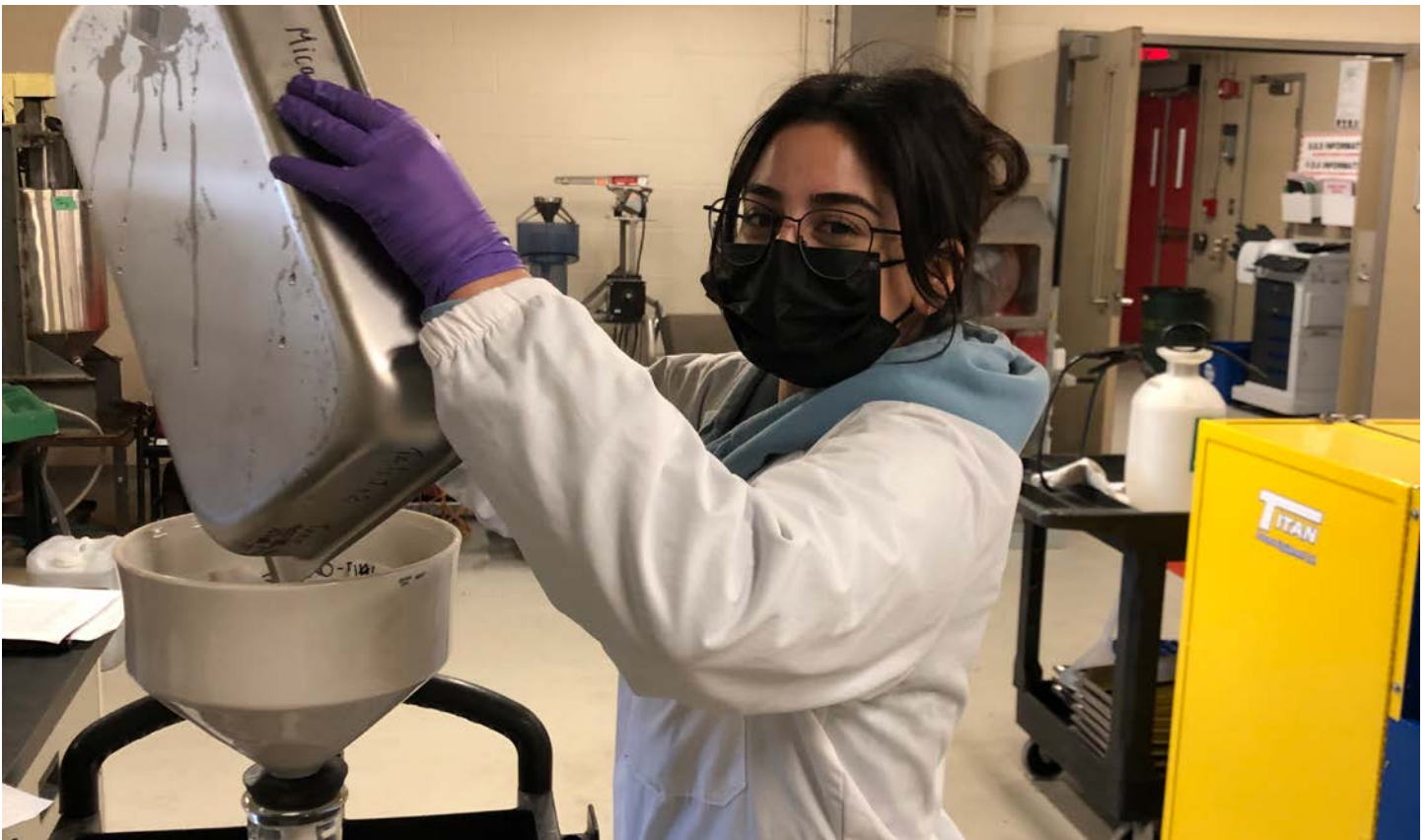
Maintaining our highly skilled workforce into the future will require action. Like many parts of the federal government, our Sector faces workforce-related challenges. Over 20 percent of our employees were eligible for retirement as of March 31, 2023. Given the specialized knowledge that many of these employees have, ensuring a seamless transition and continuity represents a challenge.

LMS managers also note challenges related to hiring, such as slow processes and difficulty finding people with the right skills. Some of these challenges are out of our hands, but the Sector could take some actions to help mitigate these issues and ensure that the LMS is able to hire the right people at the right time.

Finally, the LMS wants to make sure that our workforce is representative of Canada's society in being diverse and inclusive — with women, people with disabilities, visible minorities, Indigenous Peoples and other equity-seeking groups. While the Sector has made significant strides in some areas, such as improving its representation of women in the Sector, the LMS still has some way to go to meet the departmental targets for several of these groups — particularly visible minorities and people with disabilities.

Why It matters

The LMS requires a diverse and skilled workforce to meet its current goals and overcome the challenges of the future.



An employee performing laboratory work
Photo credit: Samir Samhat, 2022

Over the next three years

The LMS will strengthen its ability to build the right teams, focusing on targeted human resources plans that incorporate inclusion, diversity, equity and accessibility (IDEA) objectives.

Objective 1:

Develop and support our human resources capacity

Strategy 1:

Establish human resources plans that incorporate IDEA objectives

Key action

Implement succession planning efforts with a focus on diversity

As of March 2022, 195 LMS employees, representing around one fifth of our workforce, were eligible to retire. This trend is particularly pronounced among research scientists (occupational group of SE-RES): nearly one third of LMS employees in positions of this group were eligible to retire as of March 2022. About 20 percent of the employees in the occupational groups of EN (engineering and scientific support) and PC (physical sciences) were also eligible to retire as of that date, compared to just eight percent of employees in the occupational group of EC (economics and social sciences).

Given how much LMS work relies upon the scientific expertise of its employees, the Sector needs to make sure succession plans are in place. Pending retirements represent an opportunity to increase the diversity of the LMS workforce to better position the Sector to reach IDEA targets.

Leads: Each LMS branch should ensure they have a succession planning approach for critical roles.

Performance measurement:

- **Target outcome:** Succession management plans in place for every branch
- **Target outputs:**
 - » Identifying critical positions at risk of vacancy over the next five years
 - » Establishing succession management plans for critical roles

Resources:

- Internal budget and staff time



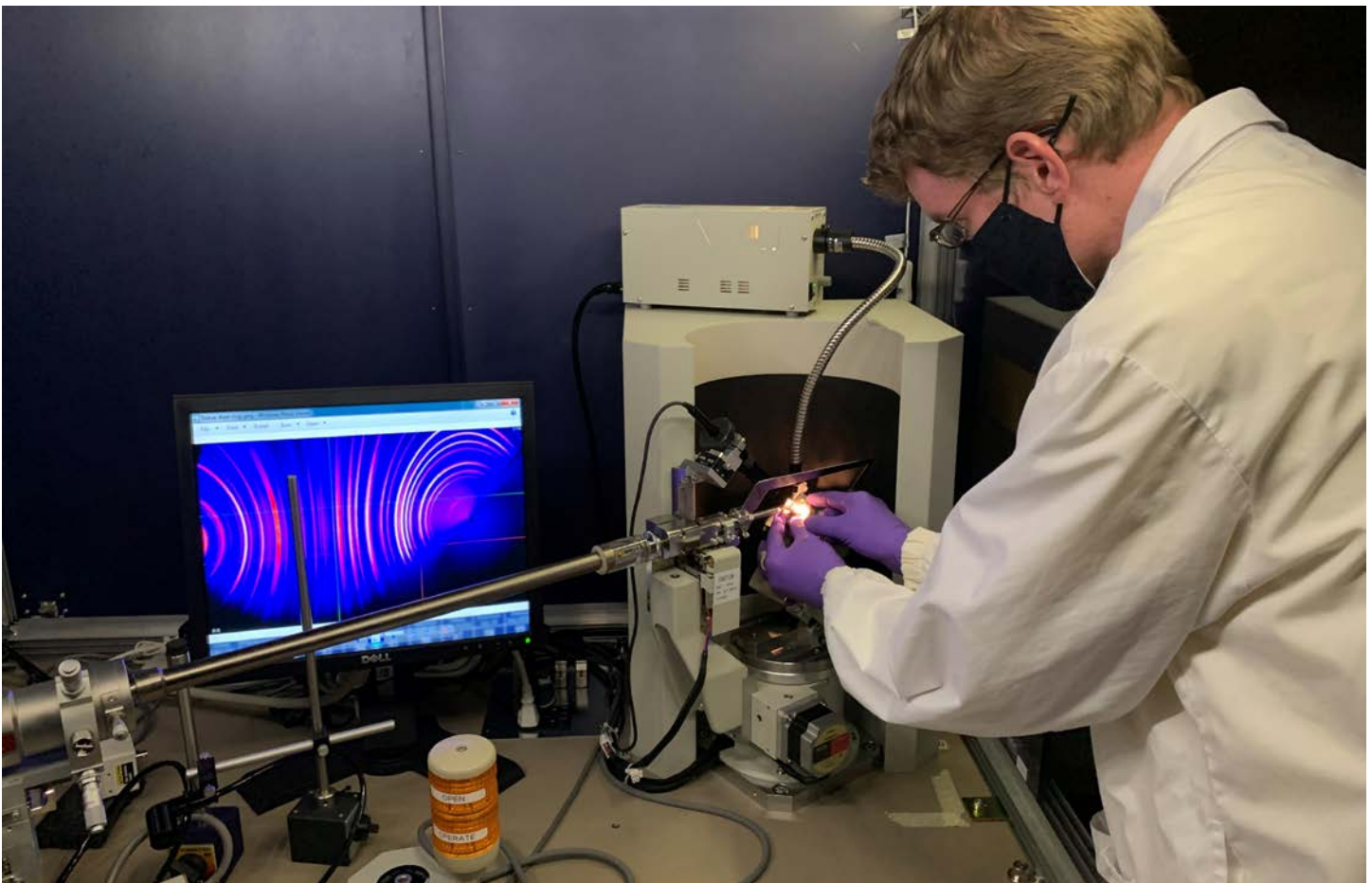
The LMS strives to position itself as a valued and trusted authority in our many areas of expertise and scientific capacity. To maintain this, the LMS requires modern infrastructure, including facilities, equipment and IT.

Why It matters

LMS equipment, facilities and computer systems need to support the Sector's goals of attracting and retaining global talent while delivering on LMS science priorities and programs for Canadians. Currently, the Sector does not have a comprehensive inventory of its assets and equipment or a clear line of sight on upcoming investment requirements. A clear roadmap on how to support the Sector's emerging and future digital and scientific equipment needs is crucial to ensure the LMS thrives in a quickly changing operating environment.

Over the next three years

The LMS should consider approaches to identify digital and equipment requirements to provide reliable, accessible services and meet research goals. It should also establish a roadmap to ensure up-to-date data on equipment and the integrated planning and management of these assets.



An employee manipulating laboratory equipment
Photo credit: Yves Thibault

Objective 1:

Provide employees with facilities, equipment and digital capabilities to ensure the long-term viability of our science

Strategy 1:

Have an adequate understanding of the current status of the Sector's IT, equipment and real property assets in order to plan and prioritize future needs

Key action

Develop an IT strategy to enhance the sector's technological capacity and improve its planning and investment decision-making

The LMS is a long-standing federal government leader in science computing and has expertise in managing complex IT applications. However, the Sector could improve coordination and clarify governance in this space.

The LMS IT strategy should focus on three areas: strengthen stakeholder relationships with the Chief Information Officer and Security Branch, improve portfolio management and ensure technical alignment with business priorities.

This strategy should clarify IT governance.

Lead: ERBSB with collaborators from all LMS branches

Performance measurement:

- **Target outcome:** Improved IT outcomes for branches, resulting in better IT support to staff and, in turn, better service to Canadians
- **Target outputs:** Approved LMS IT strategy

Resources:

- Funding and staff through existing sources, on an as-required basis

Risk:

- **Main risk:** Lack of clarity on branch investment requirements and responsibilities
- **Mitigation:** Finalize the LMS IT strategy as a roadmap to modernize the Sector's systems and better support its future business requirements

Develop an asset management strategy for the Sector to enhance scientific and program activities

The LMS needs modern facilities and equipment to continue to produce important research and deliver on its science priorities.

The LMS should ensure branches develop an asset management strategy that considers infrastructure and equipment priorities related to the LMS business lines and lifecycle management for scientific equipment that includes renewal, upgrade and replacement needs.

Leads: Each branch responsible for the sound management of its critical assets.

Performance measurement:

- **Target outcome:** Lifecycle approach for critical asset management across all branches
- **Target outputs:**
 - » Updating infrastructure and equipment inventories listing and tracking assets that are required to support the evolving mandate and business of the LMS
 - » No reporting of failures or downtime of critical assets at the end of their useful life
 - » Developing an asset management strategy to target modernization investments and prevent infrastructure failures, which could disrupt laboratory work and compromise program delivery

Resources:

- Funding and staff through existing sources, on an as-required basis

Risk:

- **Main risk:** Aging infrastructure requires a heavy financial and human resource investment to meet business needs and new technical standards
- **Mitigation:** Increase planning efforts around asset management





Conclusion

As the federal government's scientific expert on Canada's lands and minerals, the LMS is uniquely suited to make significant contributions to many government priorities over the next three years.

The *2023–26 Integrated Business Plan* outlines the Sector's upcoming work on climate change, mineral resource development, land management and sovereignty, hazards monitoring and explosives safety, as well as the impact this work will have on Canada's future.

Internally, the LMS will continue to engage with staff on the significance of our integrated business plan, how it relates to our everyday work and how we can follow up to monitor progress toward our shared goals.

Together, we will work toward ensuring the responsible stewardship of Canada's lands and mineral resources for the benefit of all Canadians.



An aerial photograph of a rugged mountain range. The foreground shows a valley with a winding river and green, grassy slopes. The middle ground features steep, rocky slopes with patches of snow and scree. The background consists of jagged, dark mountain peaks under a cloudy sky.

Appendix 1: Resource snapshot

Our budget

The LMS had a budget of approximately \$213.0M for 2022–23.¹ The 2023–24 planned spending is estimated at \$192.5M.² Here are the details by branch:

Branch	Approximate 2023–24 planned spending (\$ millions)	Approximate FTEs
CanmetMINING	22.8	135
Explosives, Regulatory and Business Services Branch	12.6	120
Geological Survey of Canada	75.5	430
Hazards, Adaptation and Operations Branch	45.4	120
Minerals Programs Branch³	27.0	25
Policy and Economics Branch	11.0	80
Surveyor General Branch	21.0	130

Canada's Critical Minerals Strategy

In addition to the funding listed in the table above, the LMS will receive funds specifically for the Critical Minerals Strategy. Funded initiatives include the Global Partnerships Program, the Critical Minerals Centre of Excellence, the Critical Minerals Geoscience and Data Initiative and the Critical Minerals Technology and Innovation Program.

At the time of writing, this funding had been received through the 2023–24 Supplementary Estimates (A). However, allocation by branch has not been fully confirmed, so these numbers are preliminary.

Branch	Funding (\$ millions)			
	2023–24	2024–25	2025–26	TOTAL for 2023–26
CanmetMINING	2.3	5.3	6.3	13.8
Explosives, Regulatory and Business Services Branch	2.5	2.5	2.5	7.5
Geological Survey of Canada	15.3	15.1	15.2	45.6
Hazards, Adaptation and Operations Branch	0.7	1.1	0.7	2.5
Policy and Economics Branch	8.2	27.5	37.0	72.6
ADM Reserve funds	0.8	0.8	0.8	2.4
TOTAL	29.7	52.3	62.5	144.5

³Some of this funding is to be directed to the Minerals Programs Branch (amount to be determined).

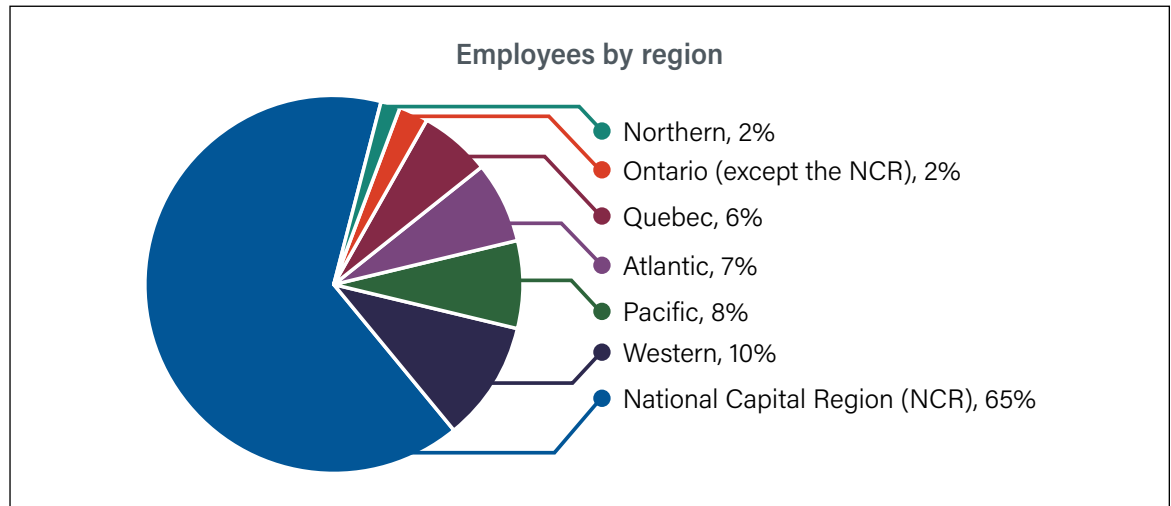
1 The current total budget includes any funding received via the 2022–23 Supplementary Estimates and transfers between sectors.

2 The budget figures represent the Sector's financial picture as of early 2023.

3 The budget and FTE figures for the new Minerals Programs Branch are preliminary.

Our people

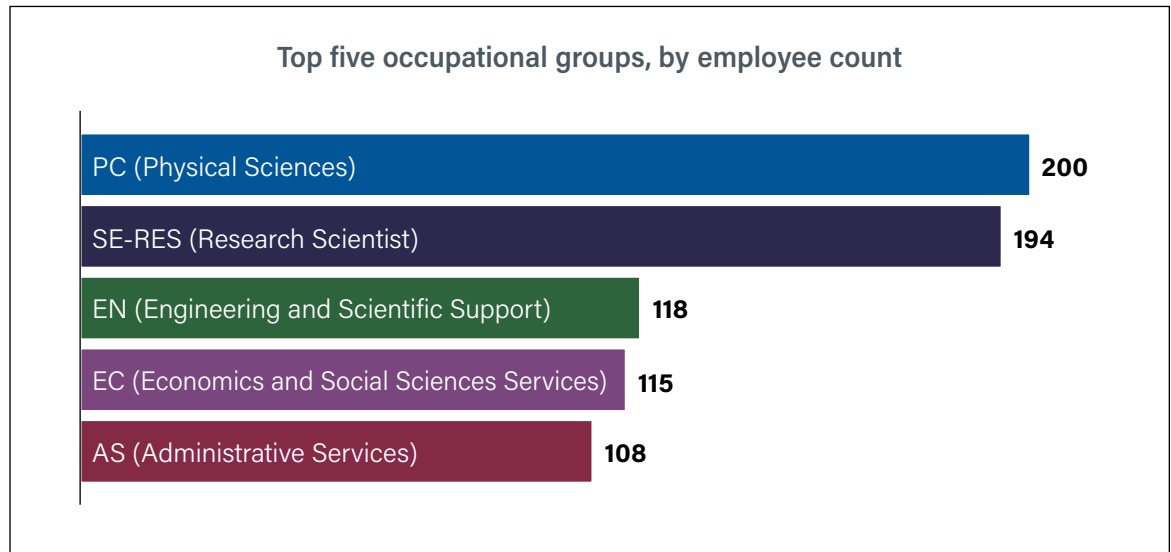
The LMS is NRCan's largest sector with close to 1,000 employees. Working in almost 40 offices and research facilities across the country, our employees are skilled, knowledgeable and passionate about their work.



Source: HR analytics dashboard (data as at September 30, 2022)

Leaders in science

Almost 70 percent of LMS employees work in science and technology areas. The remainder provide a broad range of expertise in areas such as policy and program development, data and statistics, economic and industry analysis, planning and operations, and regulations.



Source: HR analytics dashboard (data as at September 30, 2022)

Diversified, skilled workforce

The LMS is committed to building a diverse and representative bilingual workforce, allowing fresh ideas and perspectives to inform policy, programs, science and services that will underpin Canada's future in mining and land governance. The diversity of our workforce is growing, with planned recruitment and self-identification initiatives underway to address employment equity representation gaps. As of September 2022, the LMS is surpassing targets for two employment equity groups — women and Indigenous Peoples, but has gaps for the other two groups — people with disabilities and visible minorities.

An aerial photograph of a wetland landscape. A winding waterway flows through the scene, filled with numerous lily pads. The waterway is bordered by dense, tall grasses in shades of green and brown. In the background, there is a larger pond or lake, also containing lily pads, surrounded by a mix of evergreen and deciduous trees with autumn foliage. The overall scene is a rich, natural environment.

Appendix 2: Branch profiles



Our work

CanmetMINING develops the science, technologies and tools to support the sustainable development of Canada’s mineral resources. Our research also informs regulation and policy decision-making, with the goal of positioning Canada as the greenest, safest and most innovative mining jurisdiction in the world. Our mission is to drive green mining innovation and the application of digital technologies to generate social, economic and environmental benefits for Canada and all stakeholders in the minerals and metals sector.

Key operational priorities

- Foster a modern work environment with work-life balance and access to world-class laboratories, technology and facilities
- Align our workforce with the future of research through recruiting, hiring and developing talent
- Align research initiatives with available financial resources



Our people
Approximately 135 FTEs

Located in Ottawa, Sudbury, Val-d’Or and Smithers

Our budget

Total for 2023–24
~\$22.8M

- Permanent funding (A-Base) = ~\$11.2M
- Temporary funding (C-Base) = ~\$11.6M
 - » Critical minerals (Budget 2021) = \$11.1M
 - » Impact assessment = \$0.5M



A cool project: unlocking lithium

CanmetMINING’s Critical Mineral R&D team is researching how to significantly reduce the energy consumption involved in the mineral processing stages of lithium production. Lithium is a key component of EV batteries, and thus critical to the shift to a low-carbon transportation sector. This novel method developed at CanmetMINING has the potential to supply battery manufacturers with a sustainable, lower-carbon, Canada-based supply of lithium.



Key strategic priorities

- Build battery and critical minerals value chains in Canada from Canadian sources of critical minerals
- Contribute to a globally more competitive and environmentally responsible Canadian mining industry
- Contribute to a Canadian mining industry that is resilient to climate change and carbon neutral
- Recover critical minerals from the recycling of wastes



Our work

The ERBSB provides regulated safety and security measures and initiatives related to explosives, as well as promotes ethical and transparent mining practices through regulatory compliance. We deliver strategic corporate functions to support the Sector and offer a wide range of integrated, client-focused business services and strategies — all to keep the LMS running smoothly. As such, the ERBSB is an important ally and partner to all branches in keeping our Sector aligned with corporate and regulatory departmental priorities.

Key operational priorities

- Support branch priorities through budgeting, aligning workforce with key objectives and managing risks
- Recruit, hire, develop and retain specialized technical expertise
- Integrate AI and automation transformations for smart offices and laboratories
- Ensure that IM/IT infrastructure can support branch core mandates and protect our intellectual property



Our people

Approximately 120 FTEs

Located across the country, including in Ottawa, Toronto, Winnipeg, Calgary and Vancouver



Our primary legal framework

- *Explosives Act and Explosives Regulations, 2013*
- *Export and Import of Rough Diamonds Act*
- *Extractive Sector Transparency Measures Act*

Our budget

Total for 2023–24
~\$12.6M

- Permanent funding (A-Base) = ~\$12.6M
 - » Regular A-Base = ~\$8.0M
 - » Public safety and anti-terrorism = ~\$2.0M
 - » Explosives = ~\$2.0M



A cool project: testing explosives

Alongside international partners, scientists of the Canadian Explosives Research Laboratory (CanmetCERL) recently tested precursor chemicals — products that can be used to make homemade explosives. This testing characterized the physical properties and potential hazards of these chemicals, which will provide scientific data in support of Canadian policies and regulations.



Key strategic priorities

- Establish a modern regulatory framework for explosives, including updating the *Explosives Regulations, 2013*
- Provide global leadership and expertise on extractive sector transparency, anti-corruption and the good governance of natural resources
- Strengthen the LMS performance related to NRCan's duty to consult with Indigenous Peoples for impact assessment decisions and explosives licenses
- Support branch partners in realizing their objectives through a new suite of strategic business and communications services



Our work

The GSC — Canada's longest-standing scientific organization — provides authoritative and cutting-edge geoscience. We study Canada's vast onshore and offshore lands to develop knowledge and data that help assess risks and protect Canadians from natural hazards, enable our country to adapt to climate change, as well as support Canadian sovereignty and better management of Canada's minerals, energy and groundwater resources.

Key operational priorities

- Connect geoscience to Canadians with different priorities and levels of scientific expertise
- Enhance national and international partnerships to produce the best possible science and outcomes for Canadians
- Manage people, systems and infrastructure to attract and retain talent, and support new research horizons



Our people

Approximately 430 FTEs

Located in Dartmouth, Québec, Ottawa, Calgary, Vancouver, Sidney and Iqaluit



Key strategic priorities

- Attract investments in traditional mining areas and in the North to further grow as a leading supplier of responsibly developed minerals
- Inform responsible resource development and environmental stewardship in both terrestrial and marine environments
- Ensure decision makers and communities have access to the geoscientific information, tools and data they need to make Canada more resilient to natural hazards and climate change



A cool project: underwater earthquakes

GSC researchers are mapping the seafloor and investigating geohazards — underwater earthquakes, landslides and other seismic events. Knowing where these might happen is essential when building underwater pipelines, wind turbines and other infrastructure.



Our budget

Total for 2023–24

~\$75.5M

- Permanent funding (A-Base) = ~\$48.9M
- Temporary funding (C-Base) = ~\$26.5M
 - » GEM-GeoNorth = \$15.5M
 - » Targeted Geoscience Initiative (TGI) = \$4.6M
 - » Impact assessment = \$3.1M
 - » Marine Conservation Targets = \$1.6M
 - » Emergency Management Strategy for Canada = \$1.1M
 - » UNCLOS = \$0.5M (not including renewal announced in Budget 2023–24 of ~\$108.0M in program costs, from 2023–24 to 2029–30)



Hazards, Adaptation and Operations Branch (HAOB)

Keeping alert for climate change, hazards, Arctic research and data



Our work

The HAOB conducts monitoring operations and research to better protect Canadians from hazards, responds to nuclear emergencies, and meets Canada's obligation under the Comprehensive Nuclear-Test-Ban Treaty. We provide research support and logistics in collaboration with other departments and agencies, universities and research institutions, primarily in the Canadian Arctic. We help Canadians become more resilient to climate change, lead the national knowledge assessment of climate change impacts and adaptation, and play a lead role on adaptation governance across the federal government. We also provide access to authoritative data on various natural resource sectors for economic and policy decision-making. Through our programs, policies and procurement opportunities, we aim to advance Indigenous reconciliation.

Key operational priorities

- Secure funding for the Polar Continental Shelf Program (PCSP)
- Strengthen partnerships with key departments and agencies to meet increasing demand for services
- Staff vacant positions
- Conduct activities focused on reconciliation and relationship building with Indigenous Peoples
- Modernize IT infrastructure



Our people

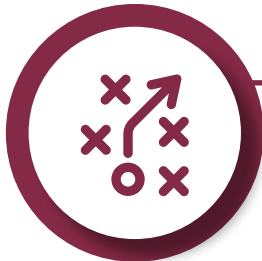
Approximately 130 FTEs

Located in Dartmouth, Ottawa, Sidney, Yellowknife and Resolute



Our primary legal framework

- *Resources and Technical Surveys Act*



Key strategic priorities

- Through programming and policy activities, improve the resilience of Canada's economy, including natural resource sectors and communities that depend on them, which contributes to the goals of the National Adaptation Strategy
- Provide authoritative information on earthquakes, space weather, foreign nuclear explosions and nuclear incidents, and conduct research to support service improvements
- Enable Arctic science through the provision of field equipment and aircraft logistics services in support of research in the North, in particular through the PCSP
- Collect and manage authoritative data on mining, forestry and energy



Our budget

Total for 2023–24

~\$45.5M

- Permanent funding (A-Base) = ~\$17.9M
- Temporary funding (C-Base) = ~\$27.6M
 - » Climate change (Budget 2022) = \$7.4M
 - » Emergency Management Strategy = \$8.6M
 - » PCSP = \$11.6M



A cool project: Earthquake Early Warning System

With the new Earthquake Early Warning System, Canadians in high-risk earthquake areas will be alerted sooner — giving them time to take action to protect themselves. Expected to be operational in 2024, this new system is currently being deployed in various parts of Canada.

Minerals Programs Branch (MPB)

Unlocking critical minerals for a sustainable and secure future



Our work

The MPB delivers programming to support the advancement of the Critical Minerals Strategy through project agreements and monitoring, performance management and reporting, as well as regional strategies and infrastructure — all to unlock mineral-rich regions and accelerate the mining of critical minerals. The MPB also fosters relationships with Government of Canada colleagues, Indigenous partners, industry, and provinces and territories. Our oversight and leadership focus on how to deliver NRCan's critical minerals programs and their results. The MPB's programming ranges from geoscience and innovation to infrastructure and global partnerships.

Key operational priorities

- Set up the newly created MPB through classification and staffing actions
- Clarify governance for the delivery of new critical minerals infrastructure programming with OGDs
- Design new programs and set up the architecture to deliver programming and monitor performance



Our budget

Preliminary total for 2023–24
~\$27.0M

Our people

Approximately 25 FTEs

Located in Ottawa



Key strategic priorities

- Deliver \$1.5B of programming for infrastructure projects in close collaboration with the Energy Systems Sector, at NRCan, and Transport Canada
- Coordinate whole-of-government efforts to unlock critical minerals infrastructure projects in regions of strategic interest
- Launch and deliver next wave of critical minerals innovation programming with CanmetMINING
- Deliver programming for geoscience in close collaboration with the GSC and provinces and territories
- Deliver programming under the Global Partnership Program

A cool project: Critical Minerals Infrastructure Fund

The Critical Minerals Infrastructure Fund will support clean energy and transportation infrastructure projects that are necessary to accelerate critical minerals production in Canada. Led by NRCan, it will complement other federal clean energy and transportation infrastructure programs.





Our work

The PEB strengthens Canada's position as a leading mining nation and supports its minerals and metals industry to be innovative, sustainable and globally competitive. It also plays a policy coordination function for the LMS — supporting the ADM. Through strategic and economic policy advice, the PEB enables the federal government to make informed, evidence-based decisions in consultation and collaboration with provincial, territorial and international governments, industry, communities, Indigenous Peoples, non-governmental organizations and academia.

Key operational priorities

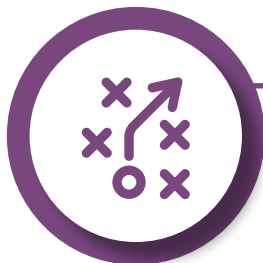
- Provide policy support for LMS branches to deliver on the vision of Canada as a leading mining nation
- Foster meaningful partnerships with domestic and international stakeholders to advance policy objectives and ensure their relevance and impactful reach



Our people

Approximately 80 FTEs

Located in Ottawa



Key strategic priorities

- Lead the development and implementation of the Canadian Critical Minerals Strategy
- Position the mining sector to contribute to economic growth, including through building supply chains in Canada
- Support industry in navigating regulatory processes to help bring projects online quickly
- Promote sustainable mining practices and environmentally conscious economic development, in line with Canada's climate and environmental, social and governance commitments
- Further Canada's position as a leading mining nation by advancing strategic directions under the Canadian Minerals and Metals Plan



Our budget

Total for 2023–24

~\$11.0M

- Permanent funding (A-Base) = ~\$7.5M
- Temporary funding (C-Base) = ~\$3.6M
 - » Critical minerals (Budget 2021) = \$2.6M
 - » Marine protected areas = \$0.5M
 - » Impact assessment = \$0.4M



A cool project: Canadian Critical Minerals Strategy

Backed by nearly \$4.0B in funding, the Canadian Critical Minerals Strategy sets out a course for Canada to become a global supplier of choice for critical minerals and for clean digital technologies they enable. It sets the stage for job creation and economic growth across the country, the advancement of reconciliation with Indigenous Peoples and close collaboration with Canada's allies — all in line with Canadian and international objectives for climate adaptation and environmental protection.

Surveyor General Branch (SGB)

Giving survey precision for territory lines and global positioning



Our work

The SGB ensures Canadians have access to a secure and reliable land survey system on Canada Lands, clearly defined boundaries and accurate positioning information to meet Canada's economic, social and environmental needs. To this end, we are responsible for three major programs: the Canada Lands Survey System, the International Boundary Commission (IBC) and the Canadian Geodetic Survey.

Key operational priorities

- Align our workforce with land survey, geodesy and international boundary initiatives, and Indigenous reconciliation efforts
- Modernize applications and databases to ensure precise survey information and positioning tools are available through flexible access



Our people

Approximately 130 FTEs

Located in Ottawa, Halifax, Amherst, Québec, Toronto, Winnipeg, Regina, Edmonton, Vancouver, Sidney, Whitehorse, Yellowknife and Iqaluit, for important fieldwork and key collaboration with clients

Key strategic priorities

- Provide boundary certainty to support Indigenous Peoples' control of their lands and northern property rights
- Spatially enable Canada to ensure the future well-being of our economy
- Provide the cadastral and geodetic systems to support spatial management of Canada's oceans and critical minerals



Our primary legal framework

- *Canada Lands Surveys Act* (used in the implementation of several federal, territorial and Indigenous legislation, and land claim agreements)
- *Canada Lands Surveyors Act* and several treaties (defining the international boundary)
- *Resources and Technical Surveys Act*



A cool project: Nunavut devolution

The SGB is contributing to Nunavut's devolution with respect to control over its lands and resources. Through the surveying of federal government properties, SGB helps other departments define which lands will be turned over to Nunavut.

Our budget

Total for 2023-24




























~\$21.0M

- Permanent funding (A-Base) = ~\$16.6M
- Permanent funding (Special Purpose Allotment – IBC) = ~\$2.0M
- Temporary funding (C-Base) = ~\$2.4M
 - » Implementation of the Gwich'in Comprehension Land = ~\$1.2M
 - » Space Based Earth Operations = ~\$1.1M





Appendix 3: Planning and program alignment

NRCan strategic priorities*	LMS priorities	LMS objectives	LMS contributing branches
Accelerate development and adoption of clean technology to build a more resilient economy and transition to net-zero by 2050	 Sustainable and secure mineral and energy development	Develop a secure and sustainable supply of critical minerals, from exploration to recycling	    
		Advance the science to unlock Canada's mineral resource potential	 
Protect Canadians from the impacts of natural and human-induced hazards while supporting and advancing climate change adaptation	 Effective hazards monitoring and explosives safety	Sustain and enhance systems to support legislated safety, security and emergency management responsibilities	 
	 Increased resilience to a changing climate	Support the assessment and development of solutions to climate change risks	  
Create and maintain market access while improving competitiveness for Canada's resource sectors	 Improved land management and sovereignty	Contribute science expertise and support for land management	  
	 Sustainable and secure mineral and energy development	Develop a secure supply of critical minerals, from exploration to recycling	    
Advance reconciliation, strengthen relationships, increase engagement and share economic benefits with Indigenous Peoples	 Improved land management and sovereignty	Support Indigenous land governance	

*NRCan Strategic Priorities outlined in the [2022-23 Departmental Plan](#)

