

Natural Resources Canada

2018–19

Departmental Results Report

Originally signed by

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Minister of Natural Resources

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Minister's message

Since becoming Minister of Natural Resources, I've been impressed by the number of ways the department is helping to address some of Canada's most pressing issues.

From climate change and clean jobs to trade and investment, from Indigenous reconciliation and environmental stewardship to social licence, NRCan is playing a central role.

As this report makes clear, NRCan continues to deliver for Canadians by:



- accelerating innovation in clean technology through programs such as Green Mining Innovation, Clean Technology Challenge and the Clean Growth Program;
- improving access to new markets through the Expanding Market Opportunities Program;
- enhancing competitiveness through the Forestry Industry Transformation Program and the Canadian Minerals and Metals Plan;
- strengthening resilience to hazards such as pests and wildfire, including through the Canadian Wildland Fire Strategy; and,
- increasing access to scientific data through initiatives such as the Open Science and Data Platform and the RADARSAT Constellation Mission, which will provide critical data for monitoring ecosystems, managing disasters and observing maritime events.

NRCan has played an essential role in major projects such as LNG Canada and the Trans Mountain Expansion (TMX), as well as contributing to the negotiation of the Canada–United States–Mexico Agreement.

In the case of the TMX, NRCan led the way in advancing reconciliation with Indigenous peoples through meaningful engagement. The department was also responsible for preparing the Crown Consultation and Accommodations Report.

Canada’s resource industries are at a pivotal moment in this century of clean growth. Amid global forces and emerging trends, these traditional sectors are transforming themselves — innovating to make Canada a global leader in the transition to a cleaner, more inclusive and digital economy.

NRCan has been at the forefront of those efforts, with significant investments in infrastructure, such as charging stations for electric vehicles, as well as smart grid technologies and renewable energy. Last year also saw important new initiatives around energy efficiency — reducing costs, cutting emissions and improving operating performance.

I look forward to building on this momentum with provincial and territorial colleagues, Indigenous partners, industry stakeholders and innovators as we create the low-carbon economy, together.

The Honourable Seamus O’Regan

Minister of Natural Resources

Results at a glance

Canada’s natural resources provide tremendous benefits to Canadians and are a cornerstone of our economy, accounting for approximately 17% of Gross Domestic Product (GDP), more than 1.7 million jobs, and almost half of all merchandise exports (\$264 billion in 2018).ⁱ

In 2018-19, Natural Resources Canada (NRCan) delivered results to Canadians across its three Core Responsibilities:

- Natural Resource Science and Risk Mitigation;
- Innovative and Sustainable Natural Resources Development; and,
- Globally Competitive Natural Resource Sectors.

As highlighted below, the Department advanced five priorities through evidence-informed policies and innovative programs, working collaboratively with domestic and international partners, and Indigenous Peoples.

PRIORITY

Accelerating the development of clean technology and the transition to a low-carbon economy

Moving toward a low-carbon economy and meeting climate change targets requires clean growth policies supported by science, research and regulations, as well as significant investment in clean technology. In 2018-19, NRCan:

- **Advanced Canada’s Transition to a Low-Carbon Economy** – Through the **Clean Growth Program**,ⁱⁱ we worked with the provinces and territories, and other partners to select 50 research, development and demonstration (RD&D) projects in the energy, mining and forest sectors. These projects are addressing environmental challenges and economic opportunities facing Canada’s natural resource operations. We collaborated with other federal departments to provide advice to over 900 clean technology stakeholders through the **Clean Growth Hub**.ⁱⁱⁱ This included supporting their research development, technology demonstration, business growth and exports. We also encouraged the **adoption of low-emission vehicles**^{iv} through Canada-wide demonstration and deployment projects that resulted in the addition of 134 electric vehicle (EV) fast-chargers and four natural gas refuelling stations for public use, as well as 10 real-world demonstration projects of innovative EV infrastructure in urban environments. We promoted electricity grid modernization through the **Smart Grid Program**,^v supported 24 projects across Canada, and funded the demonstration and deployment of a variety of smart grid technologies; from a battery



Area reserved for vehicles using electric power supply

and solar powered smart grid project in Edmonton to using artificial intelligence in the City of Saint John to help optimize the efficiency and cost effectiveness of the city’s existing system. As part of our commitment to a competitive, innovative and cleaner natural resources sector, we also supported the development of **Resources of the Future**^{vi} and the **Clean Technology Economic Strategy Tables**,^{vii} which produced visions, targets, and sector-specific recommendations to make Canada a globally competitive force in natural resources and to provide a clear path to economic, environmental and social leadership.

NRCan increased energy efficiency and addressed climate change by improving how buildings are designed, renovated, constructed and managed. This included releasing **2018-19 Action Plans under Canada’s Buildings Strategy**^{viii} and a market transformation roadmap for energy-using equipment, as well as launching an online platform for home energy labelling and disclosure for provinces, territories, municipalities and other partners to share home energy use ratings. We also developed three amendments to Canada’s **Energy Efficiency Regulations**^{ix} covering 38 product categories which will provide benefits to Canadians through energy cost savings and improved environmental outcomes.

- **Accelerated Clean Technology Innovation** – Canada continues to accelerate the transition to a low-carbon future by delivering on its **Mission Innovation**^x commitment to double federal investment in clean energy research development and deployment over five years, from \$387 million to \$775 million by 2019-20. Through the **Green Mining Innovation Program**,^{xi} we fostered solutions to waste management, helping to maximize economic potential and reduce environmental impacts. We launched the **Green Construction through Wood (GC Wood) Program**^{xii} to accelerate the use of wood for low-carbon construction projects and we encouraged the development of innovative clean technologies to further help reduce greenhouse gases (GHG) through the **Energy Innovation Program**.^{xiii} Under the **Impact Canada Initiative**^{xiv} we launched five **Clean Technology Challenges**^{xv} intended to help unlock breakthrough solutions to complex and persistent problems: increasing representation of women in the clean technology sector, sustainable aviation fuel, reducing energy use in mining, modernizing power grids and reducing reliance on diesel generated electricity in Indigenous communities.

PRIORITY

Strengthening Canada’s resilience to key natural and human-induced hazards including climate change

Helping to better manage risks related to natural and human-induced hazards will benefit Canadians, as well as enhance the security of Canada’s natural resource infrastructure and the overall economy. In 2018-19, NRCan:

- **Improved Capacity to Address Natural Hazards** – We worked with provinces and territories to continue implementing the **Canadian Wildland Fire Strategy**^{xvi} recommendations, which

were endorsed by the **Federal, Provincial and Territorial (FPT) Canadian Council of Forest Ministers** (June 2016). This resulted in a national consensus of research priorities and for increased investment in innovation in wildfire management announced in Budget in 2019. We also supported efforts to reduce forest pests by funding science to reduce the effects of **spruce budworm^{xvii}** in Atlantic Canada, and, together with the provinces, territories and academia, delivered a national risk assessment of the **mountain pine beetle^{xviii}** to guide actions and research priorities. To improve the detection of earthquakes, we installed 116 monitoring stations and 26 **Global Navigation Satellite System** stations. In response to floods in British Columbia and New Brunswick, we provided local emergency responders and municipalities with **satellite-based flood extent products^{xix}** in real time. NRCan also enhanced the cyber-physical security and resiliency of our critical energy infrastructure by working with industry, international partners, and other federal departments through a number of key initiatives. This included commissioning state-of-the-art research and innovation for critical energy infrastructure that serves as a platform for digital security simulation exercises.

- **Strengthened Regulations and Security Around Explosives** – With the publication of proposed amendments to the **Explosives Regulations^{xx}** (May 2019), we are now moving towards a strengthened security regime for managing and storing explosives. The proposed amendments will expand the coverage of the **Restricted Components Program^{xxi}** (which regulates substances commonly used to make homemade explosives). NRCan adopted a Risk-Based Inspection Plan which is targeting higher-risk sites for inspections, while improving operations and planning. In collaboration with Transport Canada, we also introduced new regulations for the safe handling of explosives at Canadian ports and wharfs to address public safety and commercial issues.

- **Strengthened Climate Change Adaptation** – To help communities, organizations, small and medium-sized enterprises and practitioners access information and tools to adapt to climate change, we worked with provincial governments and stakeholders to build skills and knowledge through 18 contribution agreements in the **Building Regional Adaptation Capacity and Expertise Program^{xxii}**. Through the **Permafrost Information Network^{xxiii}**, we helped stakeholders improve infrastructure and adaptation planning in Canada's North to better respond to climate warming.

Through Canada's pilot **Climate Change Adaptation Leaders Forum** (January 2019), NRCan brought together senior leaders from the Canadian finance and investment sector to discuss how to align investment decisions with efforts to make Canada more resilient to a changing climate, and to improve the consideration of climate resiliency in capital decisions and business strategies.

PRIORITY**Enhancing our sustainable resource advantage through science**

Creating and leveraging scientific knowledge and expertise is essential to maintaining Canada's competitive advantage, building a more sustainable future, and meeting the highest standards of stewardship. In 2018-19, NRCan:

- **Enabled Access to Government Science and Earth**

Observation – We have been working with other government departments on the **Open Science and Data Platform (OSDP)**^{xxiv} to provide access to science and data on development projects, and their current and planned impact on communities and the environment. OSDP is an online tool that provides open science products and evidence to the public, including shared Indigenous knowledge. We also prepared for the 2019 June launch of the **RADARSAT Constellation Mission (RCM)**,^{xxv} Canada's newest generation of radar Earth Observation satellites. This satellite will contribute to a better understanding of Canada's land and natural resources.



Inside this SpaceX Falcon 9 rocker are the three RADARSAT Constellation Mission satellites.

- **Improved Understanding of Science in Key Areas** – In consultation with the provinces, territories and Indigenous groups, we worked on the preparation of the **Arctic and Northern Policy Framework**^{xxvi} to reorganize and reprioritize federal activities in the Arctic. The Framework will increase partnerships and collaboration between the federal government, Indigenous Peoples and territorial and provincial governments. We also published **Natural Resources Canada's Policy on Scientific Integrity**,^{xxvii} adopted in January 2019, to promote a culture of scientific integrity, excellence in science, and to strengthen Canadians' trust in NRCan's scientific research.

- **Advanced Collaboration on Artificial Intelligence (AI)** – We explored the potential applications of AI through 40 projects across natural resource sectors, engaging with academic and industry collaborators to build AI capacity in areas such as energy efficiency. We also used AI to support augmented reality for a 3D representation of Canada bedrock and mineral potential, as well as the potential for earth sciences and geology.

PRIORITY

Improving market access and competitiveness

As the global landscape continues to evolve, NRCan supports Canada’s competitiveness in the natural resource sectors as a source of jobs and economic growth. In 2018-19, NRCan:

- **Supported Legislative and Policy Changes** – In collaboration with other government departments, we advanced Bill C-69, which received Royal Assent in June 2019. It enshrines better rules for the assessments of major projects to protect communities and the environment, advances reconciliation with Indigenous Peoples, and ensures good projects can go forward in a responsible way, creating good jobs and economic opportunities for Canadians. It also led to the establishment of the *Canada Energy Regulator (CER)*,^{xxviii} a modern energy regulator to help oversee a strong, safe and sustainable Canadian energy sector, as it moves toward a low-carbon economy.
- **Ensured the Responsible Development and Use of Canada’s Natural Resources** – We ensured that projects in our natural resource sector moved forward in the right way, including through project reviews based on science criteria and Indigenous knowledge. We led focused and meaningful Phase III consultations with 129 Indigenous groups (spearheaded by former Supreme Court of Canada Justice Frank Iacobucci) affected by the **Trans Mountain Expansion Project (TMX)**,^{xxix} in response to the Federal Court of Appeal’s decision on marine shipping and adequacy of Indigenous consultations (August 2018). We also coordinated whole of government submissions to the National Energy Board for its reconsideration of the project. The TMX project was approved by the Governor in Council in June 2019. We also demonstrated our commitment to developing key infrastructure to get Canada’s natural resources to markets by supporting **LNG Canada’s**^{xxx} liquefied natural gas export facility, which is the largest private sector investments in Canada, and is expected to create 10,000 jobs at the height of construction. Through the **Expanding Market Opportunities Program**,^{xxxi} we partnered with industry and the provinces to maintain and grow export markets for Canadian forest products, including South Korea, China, Japan and India. We supported industry in commercializing first-in-kind technologies using forest fibre through our **Investments in Forest Industry Transformation Program**.^{xxxii} In addition, we helped the forest sector’s ongoing transformation through science-based solutions via the **Forest Innovation Program**.^{xxxiii} Through the **Canadian Minerals and Metals Plan (CMMP)**,^{xxxiv} we raised the awareness of Canadians to the importance of the minerals sector, responded to ongoing and emerging challenges facing the sector and helped position Canada for opportunities offered by an evolving and greener economy. The Department also led Canada’s presence at global trade and investment events, such as China Mining and the LNG Producers and Consumers Conference.

● **Demonstrated Domestic and International Leadership in Advancing Clean Growth** – At home we supported the **Generation Energy Council** in releasing the **Generation Energy Council Report**^{xxxv} (June 2018). The Council recommended pathways for the Government to accelerate clean growth strategies and enhance the energy sector’s competitiveness. To further the Generation Energy Council’s work, we released Canada’s Energy Future in May 2019. On the international stage we co-launched the **Nuclear Innovation: Clean Energy Future Initiative**^{xxxvi} with the U.S. and Japan to advance work in key areas such as small modular reactors for mining, as well as building on perspectives from women and youth on the role of nuclear energy in clean energy systems of the future. At the first annual **Hydrogen Energy Ministers Meeting**^{xxxvii} in Nagoya, Japan, Canada reinforced its leadership in the development of hydrogen technology. Canada also co-launched **Equal by 30**,^{xxxviii} a gender equity campaign that invites companies and governments to take action in the areas of equal pay, leadership and opportunities for women in the energy sector. The Equal by 30 campaign contributes to the Economic Participation and Prosperity, and the Leadership and Democratic Participation pillars outlined by the **Gender Results Framework (GRF)**.^{xxxix} In June 2018, we co-chaired the **G20 Energy Transitions Ministerial**,^{xl} further demonstrating Canada in the global energy transition, and announced participation with Argentina in the G20’s Inefficient Fossil Fuel Subsidies Peer Review process. NRCan also hosted the **G7 Energy Ministerial**^{xli} in Halifax, September 2018, where discussions centered on working together to build the energy systems of tomorrow. Further, we planned Canada’s hosting of the **10th Clean Energy Ministerial (CEM)**^{xlii} and **4th Mission Innovation Ministerial (MI)**^{xliii} in Vancouver (May 2019), introducing new elements including a focus on a just and inclusive transition, women, youth and Indigenous Peoples. We also joined the **International Renewable Energy Agency (IRENA)**^{xliv} to further the Government of Canada’s energy transition goals in this multilateral forum.

● **Established International Agreements and Partnerships** – We contributed to the negotiation of the **Canada-US-Mexico Agreement (CUSMA)**,^{xlv} and secured the Canada-U.S. Side Letter on Energy, which ensures continued integration of the Canada-U.S. energy markets. We participated in the negotiation of the **Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)**,^{xlvi} and the ongoing negotiations for the Pacific Alliance and MERCOSUR trade agreements to modernize Canada’s trade relationships and improve market access. We executed high-level missions to Japan, China, India, and the United Arab Emirates, to enhance strategic partnerships, and promote Canada as a stable investment destination. With respect to China, we worked closely with industry, through the Track II Energy Dialogue and trade missions, to identify opportunities to boost trade and investment. Further, we signed memoranda of understanding (MOU) on energy efficiency, mining and nuclear cooperation with Argentina, facilitating information sharing, business, research and development opportunities, and the development and refining of resource governance approaches, and supported the uranium industry by advancing negotiations to amend the Protocol to the Canada-China Nuclear Cooperation Agreement.

PRIORITY**Advancing reconciliation with Indigenous Peoples**

Reconciliation with Indigenous Peoples based on the recognition of rights, respect, co-operation and partnership are essential to a renewed nation-to-nation relationship. In 2018-19, NRCan:

- Promoted Opportunities and Economic Development** – To support Indigenous-led economic development in Canada’s natural resource sectors, an additional investment of \$10 million over three years was made in the **Indigenous Forestry Initiative (IFI)**^{xlvii} with 42 projects announced this year. We also collaborated with Indigenous Clean Energy Social Enterprises (ICE SE), the Pembina Institute, and engaged with communities to co-develop Impact Canada’s **Generating New Ideas: Indigenous Off-diesel Initiative**,^{xlviii} which featured an all-Indigenous panel of jurors. For Phase 1 of the initiative, the panel selected 15 Energy Champions to receive specialized clean energy training on engaging their communities in the development of clean energy plans. To make it easier for First Nations and Metis communities to access existing federal economic programs and services, we piloted the **Economic Pathways Partnership**, which provided tailored supports to assist Indigenous communities that may be impacted by the TMX and Line 3 projects. We also brought together Indigenous and government representatives at the **Indigenous Advisory and Monitoring Committees (IAMCs)**^{xlix} for the TMX and Line 3 pipeline projects to create new opportunities for Indigenous partners to work with government and federal agencies to review and monitor project activities. To help build Indigenous capacity in the mining sector and assist industry and government through information sharing and protocols for Indigenous engagement, we invested with FedNor to establish a **Centre of Excellence for Indigenous Mineral Development**.¹ Through the **Clean Energy for Rural and Remote Communities Program**, we supported 53 renewable energy and capacity building projects to reduce reliance on diesel in rural and remote communities. Fifty-one of these projects are located in Indigenous communities.

● **Renewing and Strengthening our Relationship** – To advance the Department’s work in reconciliation, NRCan renovated the former Royal Astronomer’s residence to serve as the **Circle of Nations Learning Centre (the Centre)**. This venue will foster engagement and meaningful partnerships with Indigenous communities and groups. The Centre will also provide NRCan employees with the opportunity to learn more about Indigenous cultures and how they connect to NRCan priorities. In addition, we completed Phase One of the “**Antenna as Canvas**” Project,ⁱⁱ which visually celebrates the vibrant cultures in the Northwest Territories with artwork created

by local Indigenous artists for three of the satellite reception antennas at the Inuvik Satellite Station Facility. One of the top priorities of the **Canadian Minerals and Metals Plan (CMMP)**ⁱⁱⁱ is to increase the participation of Indigenous Peoples in the minerals and metals sector, through co-developed specific goals and targets. For example, we implemented a 12-week in-community capacity building program on Land Surveying for First Nations operating under the **First Nations Land Management Act**.ⁱⁱⁱⁱ This will help Indigenous communities build capacity to govern their own lands according to their cultural needs and values. Six First Nations communities received training in 2018-19, which was the second year of this five year program. Currently, the mineral sector employs 16,500 Indigenous Peoples.



Inuvialuit Artist, Sheree McLeod, in front of NRCan's ICAN-1 antenna



Gwich'in Artist, Ronnie Simon, in front of the DLR (German Aerospace Centre) antenna

by local Indigenous artists for three of the satellite reception antennas at the Inuvik Satellite Station Facility. One of the top priorities of the **Canadian Minerals and Metals Plan (CMMP)**ⁱⁱⁱ is to increase the participation of Indigenous Peoples in the minerals and metals sector, through co-developed specific goals and targets. For example, we implemented a 12-week in-community capacity building program on Land Surveying for First Nations operating under the **First Nations Land Management Act**.ⁱⁱⁱⁱ This will help Indigenous communities build capacity to govern their own lands according to their cultural needs and values. Six First Nations communities received training in 2018-19, which was the second year of this five year program. Currently, the mineral sector employs 16,500 Indigenous Peoples.

2018-19 Actual Spending	2018-19 Actual Full-Time Equivalent
\$1,403 million	4,171

For more information on Natural Resources Canada’s plans, priorities and results achieved, see the “**Results: what we achieved**” section of this report.

2018–19 Results Story — as per NRCan’s Departmental Results Framework

NRCAN CORE RESPONSIBILITIES

Natural Resource Science and Risk Mitigation
Lead foundational science and share expertise for managing Canada’s natural resources, reducing the impacts of climate change and mitigating risks from natural disasters and explosives.

Innovative and Sustainable Natural Resources Development
Lead the transformation to a low-carbon economy by improving the environmental performance of Canada’s natural resource sectors through innovation and sustainable development and use.

Globally Competitive Natural Resource Sectors
Advance and promote market access, inclusiveness and competitiveness for Canada’s natural resource sectors, in support of jobs and economic growth.

DEPARTMENTAL ACTUAL RESULTS | What has the department achieved in 2018–19?

Canadians have access to cutting-edge research to inform decisions on the management of natural resources

- Scientific products related to natural resources were accessed an average of **482,745** times quarterly by Canadians
- NRCan provided scientific and technical expertise to **96%** of environmental assessment processes
- Stakeholders acknowledged using NRCan’s scientific and technical products **26,142** times in making their decisions
- The department offered **69** training and development initiatives to ensure Indigenous knowledge complemented NRCan expertise
- Quality index of geographic and locational data on Canada’s land, water and infrastructure was **87%**

Natural resource sectors are innovative

- 65%** of NRCan-funded innovation projects resulted in new intellectual property, standards or regulations based on interim results
- 90%** of completed NRCan-funded clean energy innovation projects advanced along the innovation scale
- 7** NRCan-funded green mining technologies, including waste and water management, were proven through demonstrations
- 7** new forestry products that were informed by NRCan tools and knowledge were developed

Access to new and priority markets for Canada’s natural resources is enhanced

- Canada’s market share to the U.S. was **24.8%** and **1.4%** globally for imports of natural resources
- 885** Canadian-owned resource companies were operating abroad in 2017 (2018 results not yet available)

Communities and officials have the tools to safeguard Canadians from natural hazards and explosives

- 100%** of notification for hazardous natural events within Canada were issued in a timely manner (within 4 minutes for earthquakes and 15 minutes for space weather)
- 2** wild fire monitoring tools using remotely sensed information were enhanced
- 64%** of inspection of licensed explosive sites were rated safe. NRCan conducts rigorous and timely follow-up on any facility that does not achieve a satisfactory rating

Clean technologies and energy efficiencies enhance economic performance

- NRCan-funded clean technology demonstrations with economic goals are underway, and will report in **2022**
- For every \$1 that NRCan invested in energy innovation projects, NRCan leveraged an additional **\$3.32** from partner organizations
- 26.7 petajoules** annual energy savings resulted from adoption of energy efficiency codes, standards and practices

Canadians are engaged in the future of the new and inclusive resource economy

- 35%** of policy, regulatory and legislative changes were supported by a formal mechanism for broad public engagement
- 18** joint analytical products were developed with provinces and territories and released to Canadians
- 184** Indigenous groups and communities implicated in economic development projects

Communities and industries are adapting to climate change

- NRCan products and expertise on adaptation were accessed **20,272** times quarterly by communities and industry
- 57%** of Canadian communities and **32%** of industries have taken steps to adapt to climate change as per survey completed in 2017

Canada’s natural resources are sustainable

- 82%** of Canadian electricity was generated from non-GHG emitting sources
- 53** projects were selected for funding through the Clean Energy for Rural and Remote Communities Program to support renewable energy projects
- Sustainable harvesting occurred as **155 million m³** total wood was harvested versus total sustainable wood supply of **225 M m³**, as per State of Forest Report 2018
- 526** Electric vehicle charging stations, **12** natural gas refuelling stations and **6** hydrogen refuelling stations were under development or completed
- 132** megatonnes of CO₂ reduction in greenhouse gas emissions resulted from NRCan-funded clean technology demonstrations
- 8** policies and initiatives were developed collaboratively with Indigenous groups and communities

Enhanced competitiveness of Canada’s natural resource sectors

- 100%** of resource development project decisions were on target as per timelines
- NRCan’s economic and investment data was accessed **191,735** times quarterly





Results: what we achieved

Core Responsibilities

Natural Resource Science and Risk Mitigation

Description

Lead foundational science and share expertise for managing Canada's natural resources, reducing the impacts of climate change and mitigating risks from natural disasters and explosives.

This Core Responsibility supports the advancement of the following **Strategic Priorities**:

- Strengthening Canada's resilience to key natural and human-induced hazards including climate change;
- Enhancing our sustainable resource advantage through science; and,
- Advancing reconciliation with Indigenous Peoples.

Context

NRCan is a science-based department that devotes more than half of its total expenditures (excluding statutory) to science and technology (S&T) activities (\$573 million in 2017-18) with 49% of employees working in S&T. NRCan's science and research helps decision-makers and Canadians make informed choices related to the development and management of Canada's natural resources. The Department collaborates with other federal departments, provincial, territorial and local governments, Indigenous Peoples, academic institutions and industry to generate knowledge, technologies, and innovations to support the improved safety of Canadians, a healthier and sustainable environment, and increased competitiveness of our natural resource sectors. NRCan also works to strengthen connections between different knowledge systems to enhance and support the Department's research and science activities. Indigenous knowledge is an important way of understanding that can improve the knowledge base and better inform policy recommendations and program development.

Results

NRCan’s science and technologies ensured Canadians have access to cutting-edge research to inform decisions on the management of natural resources

Throughout 2018-19, NRCan continued to witness a high level of access and use of its scientific products related to natural resources. These products were accessed by Canadians on average more than 480,000 times quarterly and cited over 25,000 times over the year. NRCan’s scientific and technical expertise was also provided for over 96% of environmental assessment processes for projects that are actively undergoing an environmental assessment review, and received funding in Budget 2018 to increase its capacity to provide scientific and technical expertise for environmental assessments.

NRCan has assessed its geographical and locational data on Canada’s land resources, water and infrastructure through a quality index that reached 81.2% in 2018-19. Lastly, the Department remains committed to advancing reconciliation with Indigenous Peoples in Canada across its science and technology initiatives. In 2018-19 alone, the Department offered 69 training and development opportunities/initiatives for employees to learn about supporting connections between NRCan’s science and Indigenous knowledge systems.

As the Department also recognizes that decision-maker, stakeholder and public trust in research and scientific information depends upon the integrity of the process by which such information is produced, managed and communicated, NRCan adopted its [Policy on Scientific Integrity](#)^{liv} in January, 2019. The policy was co-developed with the Professional Institute of the Public Service of Canada, the Treasury Board Secretariat, and the National Chief Science Advisor’s Office. The policy’s objective is to foster a culture that promotes scientific integrity within the Department and among its clients and collaborators, and strengthens public, employee and stakeholder trust in the credibility and reliability of NRCan research and science.

Innovative ways to improve management of natural resources

Targeted Geoscience Initiative (TGI) is a collaborative federal geoscience program that provides the mineral exploration industry with new ore system models and innovative methodologies to enhance effectiveness of deep exploration of Canada’s key economic minerals and to reduce some of the risks of mineral exploration and support Canadian mining-dependent communities. TGI has improved the understanding of the processes underlying Canadian ore systems, such as gold and uranium. This knowledge, through public geoscience, informs mineral exploration and increases the economic sustainability of existing mines.

The **Groundwater Information Network (GIN)** is a collaboration of NRCan, provinces and territories to share groundwater data using international standards led by the Geological Survey of Canada. GIN developed and ratified a new international standard for groundwater data. It prototyped new approaches to connecting water data, within an international consortium and under the federal climate science plan, and also linked to the global groundwater information monitoring system, becoming its Canadian supplier of groundwater data. GIN serves over a thousand unique web users every month, and for the first time enabled groundwater data from the U.S. and Canadian national systems to be used seamlessly. This facilitates many scientific activities, which drew on data from GIN, and influenced the design of several groundwater data systems internationally.

To support evidence-based decision making, NRCan delivered earth observation data by launching the **Earth Observation Data Management System**,^{lv} making millions of satellite images and derived products available to the Government and an increasing number of products available to the public. NRCan also contributed to Canada's world-class capability in geospatial data, with Canada ranking 5th out of 75 countries in 2019 on the Geospatial Readiness Index, produced by the Global Geospatial Industry Outlook (up two spots from 2018). This index evaluates the geospatial preparedness of countries based on five pillars including data infrastructure, policy framework, institutional capacity (education), user adoption and the geospatial industry fabric (innovation, incubation and accelerators, and capacity). Canada is identified as one of the leader economies that has managed to successfully integrate geospatial solutions at the industrial, governmental and public level.

To support understanding of natural and human impacts on Canada's forest carbon, NRCan collaborated with provincial and territorial governments to produce historical estimates of carbon emissions and removals for Canada's **Greenhouse Gas National Inventory Report** (published in April 2018) as well as projections of future forest carbon emissions and removals for **Canada's Greenhouse Gas and Air Pollutants Emissions Projections Report**^{lvi} (published in December 2018).

To fulfill Canada's obligation as a signatory to the **United Nations Convention on the Law of the Sea (UNCLOS)**, NRCan finalized Canada's Arctic Ocean submission which was filed with the **United Nations Commission on the Limits of the Continental Shelf** in New York. A decade of geoscience research in the Arctic Ocean mapped the seabed and subsoil using heavy-duty icebreakers, ice camps, aerial surveys and autonomous underwater vehicles. The 2100 page submission, using evidence-based geological and geophysical arguments, shows that Canada's continental shelf extends beyond 200 nautical miles and is a natural prolongation of our landmass. Moreover, compelling evidence was presented showing that the development of the continental shelf is tied through a complex series of tectonic and magmatic events to the geological evolution of Canada's landmass. The proposed outer limits are precisely defined by 877 coordinates, encompassing an area of 1.2 million km², including the geographic North Pole. The outer limits will eventually become Canada's last international boundary, conferring sovereignty over the living and non-living natural resources on the seafloor and in the subsoil.

Where applicable, NRCan provided safe and cost-effective logistics throughout the Canadian Arctic to federal, territorial and First Nation governments, universities, northern organizations and international researchers conducting scientific work. Specifically, through the **Polar Continental Shelf Program (PCSP)**, NRCan provided logistics services that enabled 162 science and operations activities in the Arctic and supported an additional 58 federal activities with field equipment across Canada.



Baffin Island

Through NRCan’s **Geo-Mapping for Energy and Minerals Program (GEM)**, NRCan worked in collaboration with provincial and territorial governments, and Northerners, to develop public geoscience on Canada’s North. Phases 1 and 2 of GEM mapped the North to minimum modern standards. In addition to stimulating private sector resource exploration, uptake of GEM results has informed land-use planning related to the growing need for infrastructure to support resource development beyond the exploration stage.

NRCan contributed to safeguarding Canadians from hazards through research and the development of tools

In 2018-19, the Department increased the timeliness of public warnings for hazardous natural events and enhanced the information available to communities and public officials to enable their improved response to natural hazards. For instance, departmental efforts to safeguard Canadians from hazards included the addition of new satellite systems and methodologies that enable better detection and monitoring of active forest fire hot spots.

A notable component of the Department’s 2018-19 R&D activities included the **RADARSAT Constellation Mission (RCM)**,^{lvii} Canada’s newest generation of radar Earth Observation (EO) satellites that will contribute to a better understanding of Canada’s land and natural resources. In 2018-19, NRCan scientists’ advanced Canada’s readiness for the RADARSAT Constellation Mission (launched in

Improving Aviation Operation by Better Forecasting Space Weather

Space weather can affect Global Navigation Satellite System and high frequency radio communications, which are both important for aircraft flying over the pole.

Because of this, the International Civil Aviation Organisation has introduced new requirements for aviation operations, which requires better information on space weather events.

NRCan was one of the centres chosen to provide space weather advisory information. Through their research, NRCan scientists have developed research that is being used to develop forecasts of space weather effects on the Global Navigation Satellite System.

June 2019) by introducing and evaluating new imaging modes, building a data simulator for users to reduce their pre-launch risks, and developing world class calibration methods to ensure data quality.

To improve efficiency and reliability of our client’s geospatial data, NRCan released a major new version of its **Precise Point Positioning (PPP) service (SPARK)**. This service supports many industrial and scientific activities, specifically the oil and gas industry, glaciology, coastal and earthquake hazards, and marine science for precise positioning at sea. Utilizing updated geodetic tools, NRCan contributed to scientific understanding of the Great Lakes watershed, Canada’s groundwater and surface water interaction, and mitigation of climate change scenarios.

To further improve Canada’s ability to monitor and respond to earthquakes, the Department installed 116 earthquake-monitoring stations, completed 26 **Global Navigation Satellite System** stations, put in place a new software system to ensure rapid automatic detection of earthquakes and consolidated one of two mission-critical data centres for hazard monitoring to improve robustness and reduce operating costs. In 2018-19, through its earthquake and space weather monitoring, NRCan was able to issue notifications for potential hazardous natural events, within four minutes for earthquakes above magnitude 4.0 and within 15 minutes for significant space weather events, 100% of the time.

To increase Canada’s resiliency to address wildland fire, NRCan continued to implement the **Canadian Wildland Fire Strategy (CWFS)**^{lviii} recommendations. These recommendations were endorsed by the FPT Canadian Council of Forest Ministers (CCFM) at the 2016 meeting in the Yukon. As part of the CWFS implementation, the forest sector consulted nationally with organizations and individuals to build a list of priority research needs. These research needs are published as the **Blueprint for Wildland Fire Science in Canada (2019–2029)**,^{lix} and represent a national consensus of research priorities and a business case for increased investment in wildfire innovation (see textbox).

Blueprint for Wildland Fire Science in Canada (2019–2029)

The Blueprint is a strategic 10-year plan of action focused on building national wildland fire science capacity. Under the Blueprint, research priorities are categorized by theme, which illustrate challenge and inform existing science gaps and questions. The themes are:

- (1) Understanding fire in a changing world;
- (2) Recognizing Indigenous knowledge;
- (3) Building resilient communities and infrastructure;
- (4) Managing ecosystems;
- (5) Delivering innovative fire management solutions; and
- (6) Reducing the effects of wildland fire on Canadians.

The Blueprint will also enhance horizontal collaboration between FPT scientists, augmenting prevention, mitigation capabilities and preparedness capacity, as well as enhance commitment to **Canada’s FireSmart** Program.

In collaboration with the provincial governments, forest sector companies and academia, NRCan led and funded large-scale research on an **Early Intervention Strategy**^{lx} to mitigate the risk of **spruce budworm**^{lxi} outbreaks in Atlantic Canada and to protect the regional economy. Preliminary results are positive, as spruce budworm populations have decreased substantially in

New Brunswick for the first time since 2014. NRCan also delivered a national risk assessment in collaboration with federal, provincial and territorial governments, providing the most current knowledge synthesis of the mountain pine beetles forest pest that will guide future federal action and research priorities. Since 2010, NRCan has invested more than \$12.9 million in science addressing the spread of mountain pine beetle. The federal government has also provided significant economic and program responses to mitigate impacts in Western Canada, totalling \$349 million since 2002.

NRCan enhanced federal emergency awareness and response to record flooding in New Brunswick and floods in British Columbia through the near real-time provision of 26 satellite-derived open water flood extent maps using satellite imagery from Canada (**RADARSAT-2**),^{lxii} Europe (SENTINEL-1) and Japan (ALOS-2). NRCan published the Floods in Canada map collection as open data on the Government of Canada Open Maps website, and updated the NRCan **Floods and River Ice Break-Up**^{lxiii} web page to include a dynamic map depicting active floods in Canada (within the last 72 hours).

NRCan scientists conducted research on how to measure open water and flooded vegetation extraction, and developed algorithms for ice mapping from satellite imagery and national ice jam database mode. This will lead to a new suite of flood tools and statistical models for use in upcoming emergency flood mapping and rivers predisposed to ice jamming.

To further support emergency management applications, NRCan developed new foundational layers published on **the Federal Geospatial Platform**^{lxiv} and **Open Maps**,^{lxv} identifying nearly 1.2 million building footprints. Much of this work was accomplished through a new high-resolution elevation model that covers Northern Canada in its entirety and nearly half of Canada's 100 largest cities in the South, which would make it possible in an emergency to predict what properties, through the building footprints, could be affected.

Open Science and Data Platform (OSDP)

NRCAN is leveraging the technology and data work achieved by the **Federal Geospatial Platform Project** to develop the OSDP, a focused, online platform that enables public discovery, access and exploration of science products and evidence relevant to cumulative environmental and socio-economic effects of development activities.

Through the OSDP, decision-makers, stakeholders and the public will have better access to science and data associated with individual project assessments, baseline environmental data at a national scale coverage with regional detail; interoperable environmental, health, social and economic data; tools to conduct meaningful data analysis; and, shared Indigenous knowledge.

To strengthen regulations aimed at improved security for the management and storage of explosives, NRCan proposed amendments to the **Explosive Regulations**^{lxvi} (published in May 2019), which expanded the coverage of the **Restricted Components Program**^{lxvii} that regulates substances commonly used to make homemade explosives. The expanded coverage and adoption of the Risk-Based Inspection Plan focuses on inspections by federal explosives inspectors. By increasing the effectiveness of compliance verification, NRCan increased industry awareness for safety and security of explosives and chemical precursors. NRCan also augmented security

initiatives by expanding the number of Memorandums of Understanding (MOUs) with organizations with aligned interests. To improve the handling of explosives, NRCan worked with Transport Canada to address public safety and commercial issues regarding the safe handling of explosives at Canadian ports and wharfs. While the percentage of inspections of explosives rated safe (64.2%) in 2018-19 is slightly below the target set (70%) for March 2020, frequency of inspections and follow-ups were increased which is expected to lead to higher ratings by next year.

NRCan leads activities to help ensure that communities and industry are adapting to climate change

NRCan strives to ensure Canadian communities and industry are adequately equipped with the scientific expertise they need to adapt to climate change. In 2018-19, NRCan products and expertise related to climate change adaption were accessed over 20,000 times each quarter. Based on NRCan's 2017 survey (administered every five years), 57% of communities and 32% of businesses indicated they had taken steps to adapt to climate change.

In particular, NRCan developed expertise, skills, and knowledge to support provinces and stakeholders to adapt to the impacts of climate change through 18 contribution agreements in the **Building Regional Adaptation Capacity and Expertise (BRACE) Program**.^{lxviii} Working directly with the provinces, BRACE supports an increase in adaptation uptake and advances related activities by working with stakeholders to deliver training, internships and knowledge exchange activities. Similarly, but more specifically to Canada's forests, NRCan leads a series of collaborative Regional Integrated Assessments with local communities and forest sector stakeholders to develop new knowledge and to identify adaptation solutions for the management of forested landscapes.

Through the **Geological of Survey Canada's Climate Change Geoscience Program**, NRCan continues to make key geoscience knowledge and data publically available in support of adaptation in Canada's North through launching a unique portal for permafrost data (**the Permafrost Information Network**).^{lxix}

To further inform Canadians, the Department also leads the delivery of **Canada in a Changing Climate: Advancing our Knowledge for Action**,^{lxx} which is a national assessment of how and why Canada's climate is changing, the impacts of these changes, and how we are adapting. The assessment is composed of a series of reports that will inform Canadians, support sound decision making on climate change and adaptation that are developed collaboratively with a range of experts, including Indigenous people, and the public.

NRCan also leads **Canada's Climate Change Adaptation Platform**,^{lxxi} which is a multi-sectoral, national forum that identifies shared adaptation priorities and opportunities to address them. In January 2019, NRCan convened the pilot **Climate Adaptation Leaders Forum**, which

Adapting to Climate Change

The North

Canada's North is rich in largely underexplored and undeveloped natural resources. Sustainable development of these resources could contribute to the North's economy but infrastructure resilient to permafrost conditions is required. Using a new approach to improve the national permafrost map, NRCan has provided better information on ground-ice conditions for infrastructure planning, land use and climate change adaptation. **The Permafrost Information Network**, a public portal, is now available to stakeholders for infrastructure and adaptation planning. Models show how Canada's northern landscape (including key northern transportation corridors) will respond to climate warming.

Our coasts

A substantial portion of Canada's population and infrastructure resides along its marine coasts. Knowledge of present and projected coastal sensitivity helps to understand the impacts of climate change on Canada's coasts. Impacts along coasts requires knowledge of projected sea level and coastal sensitivity, which help to understand future flooding potential and assess risk to infrastructure and populations.

NRCan's Canadian Geodetic Survey and Geological Survey of Canada scientists partnered to create a national crustal velocity grid, allowing for the generation of relative sea-level projections for all coastal areas. Now, 485 national and regional maps of projected relative sea-level change, through the 21st century, are available for municipal and provincial planning. Using an innovative statistical technique, derived national-scale coastal sensitivity indices are part of the recent release of **CanCoast**, an online national-scale coastal database.

Northern coastlines are among the fastest changing areas in the world. NRCan scientists monitor the environmentally sensitive Beaufort Sea region, to gain more knowledge of climate-driven change. Improved knowledge helps decision-makers develop effective adaptation strategies for existing and proposed infrastructure and communities.

was chaired by NRCan and Environment and Climate Change Canada. The Forum brought together senior representatives from the Canadian finance and investment sector to discuss the physical impacts of climate change on finance and investment. They considered how to align investment decisions to make Canada more climate change resilient, and improve the consideration of this resiliency in capital decisions and business strategies. The Forum raised the profile of adaptation to the physical risks of climate change among this business sector and identified areas of future action, including the need to focus on adaptation as an opportunity for investments and to improve disclosure of physical climate change risks and solutions in financial reports.

Results achieved

Departmental results	Performance indicators	Target	Date to achieve target	2018–19 Actual results	2017–18 Actual results	2016–17 Actual results
Canadians have access to cutting-edge research to inform decisions on the management of natural resources	Number of times scientific products related to natural resources are accessed by Canadians	300,000 ¹ quarterly average	March 2019	482,745	484,904	349,171
	Percentage of environmental assessment processes for which NRCan provided scientific and technical expertise	100%	March 2019	96% ²	93%	95%
	Number of times stakeholders acknowledge using NRCan's scientific and technical products in making their decisions	120 per year ³	March 2020	26,142	30,250	Not Available ⁴

¹ Since the 2018-19 Departmental Plan, NRCan has revised the methodology to more accurately count access to NRCan's scientific products rather than to the landing pages for these products. The 2017-18 and 2018-19 results reflect the change in methodology. Furthermore, the target was revised upwards to 500,000 in the 2019-20 Departmental Plan (DP).

² NRCan received funding over five years through Budget 2018 to increase its capacity to provide scientific and technical expertise for environmental assessments.

³ NRCan established a new Departmental Results Framework to report its results starting in 2018-19. This target was established using available data at the time of developing the 2018-19 DP and has been revised upwards to 30,250 in the 2019-20 DP.

⁴ NRCan established a new Departmental Results Framework to report its results starting in 2018-19. Several indicators were new as of April 2018 and historical information is not available for all previous years.

Departmental results	Performance indicators	Target	Date to achieve target	2018–19 Actual results	2017–18 Actual results	2016–17 Actual results
	Number of training and development initiatives that enable NRCan to incorporate traditional Indigenous knowledge in conjunction with NRCan science	Target to be determined by 2018-19 baseline ⁵	March 2020	69	Not Available ⁴	Not Available ⁴
	Quality index of geographic and locational data on Canada's land resources, water and infrastructure	Target to be determined by 2018-19 baseline ⁶	March 2019	81.20%	Not Available ⁴	Not Available ⁴
Communities and officials have the tools to safeguard Canadians from natural hazards and explosives	Percentage of hazardous natural events within Canada for which a notification was issued in a timely manner	75% (100% by March 2022)	March 2019	100%	70%	Not Available ⁷
	Number of enhanced wild fire monitoring tools using remotely sensed information	Target to be determined by 2018-19 baseline ⁸	March 2019	2	2	2
	Percentage of inspections of explosives rated safe ⁹	70% (90% by March 2025)	March 2020	64.20%	Not Available ¹⁰	Not Available ¹⁰

⁵ The target was not established in the 2018-19 DP. At the time of the 2019-20 DP, a target of "at least 35" was established for March 2020.

⁶ The target was not established in the 2018-19 DP. At the time of the 2019-20 DP, a target of "At least 70%" was established for March 2020.

⁷ Due to recent enhancements of the earthquake monitoring network and change in the methodology, the results for prior years for this indicator are not comparable.

⁸ The target was not established in the 2018-19 DP. At the time of the 2019-20 DP, a target of "1" was established for March 2020.

⁹ A 'safe' rating indicates an inspection rated "satisfactory or better". NRCan conducts rigorous and timely follow up on any facility that does not achieve a satisfactory rating.

¹⁰ NRCan has revised the methodology to more accurately calculate the percentage of inspections rated safe. This has resulted in a more rigorous inspection ratings regime but means that historical data prior to 2018-19 are not directly comparable to more recent results.

Departmental results	Performance indicators	Target	Date to achieve target	2018–19 Actual results	2017–18 Actual results	2016–17 Actual results
Communities and industries are adapting to climate change	Number of times NRCan products and expertise on adaptation are accessed by communities and industry	Target to be determined by 2018-19 baseline ¹¹	March 2019	20,272	18,602	Not Available ⁴
	Percentage of Canadian communities and industries that have taken steps to adapt to climate change	60% for communities per year 40% for businesses per year	March 2019	57% for communities 32% for businesses ¹² (from 2017 survey)	57% for communities 32% for businesses (from 2017 survey)	50% for communities 30% for businesses (from 2012 survey)

Budgetary financial resources (dollars)

2018–19 Main Estimates	2018–19 Planned spending	2018–19 Total authorities available for use	2018–19 Actual spending (authorities used)	2018–19 Difference (Actual spending minus Planned spending)
\$181,158,584	\$181,158,584	\$211,487,351	\$208,683,836	\$27,525,252

Human resources (full-time equivalents)

2018–19 Planned full-time equivalents	2018–19 Actual full-time equivalents	2018–19 Difference (Actual full-time equivalents minus Planned full-time equivalents)
1,195	1,223	28

Financial, human resources and performance information for the NRCan’s Program Inventory is available in the [GC InfoBase](#).^{lxxii}

¹¹ The target was not established in the 2018-19 DP. At the time of the 2019-20 DP, a target of “At least 19,000 quarterly” was established for March 2020.

¹² This indicator tracks progress on long-term outcomes and is measured through a survey conducted every five years. The next set of results will be available in 2022. The 2018-19 results repeat data from the previous year. The trend from the 2012 to 2017 survey results indicates an increase in steps taken to adapt to climate change. In the 2019-20 Departmental Plan, the date to achieve the target has been revised to March 2023.



Innovative and Sustainable Natural Resources Development

Description

Lead the transformation to a low-carbon economy by improving the environmental performance of Canada's natural resource sectors through innovation and sustainable development and use.

This Core Responsibility supports the advancement of the following **Strategic Priorities:**

- Accelerating the development of clean technology and the transition to a low-carbon economy
- Improving market access and competitiveness
- Advancing Reconciliation with Indigenous Peoples

It also contributes to the achievement of the following Minister of Natural Resources

Mandate Letter Commitments:

- Develop a Canadian energy strategy with provinces and territories
- Make strategic investments in our clean technology sector
- Enhance Canada's tax measures to generate and attract more clean technology investments

Context

With the objective of ensuring that Canada's natural resource sectors remain innovative and are sustainably developed, NRCan fostered clean technology innovation across Canada's energy, mining and forest sectors through several of its programs and initiatives, as well as exploring potential operational applications of Artificial Intelligence (AI) to support efforts to transition to a low-carbon economy.

Results

NRCan works to ensure that the natural resource sectors are innovative

NRCan is bringing innovation to natural resources by advancing clean technologies, developing new knowledge and advancing emerging technologies to commercialization. NRCan continued to fund innovation projects, with 65% of completed projects in 2018-19 resulting in new intellectual property or having had an impact on codes, standards and regulations based on interim results. Ninety percent of NRCan funded clean energy innovation projects that were completed in 2018-19 also advanced along the innovation scale (specifically, one or more level on the technological readiness scale¹³), advancing emerging clean technologies closer towards being ready for commercialisation.

In 2018-19, through the \$75 million **Impact Canada Initiative**,^{lxxiii} NRCan launched five prize-based Clean Technology Challenges:

- The Sky's the Limit;
- Generating New Opportunities Indigenous Off-diesel Initiative;
- Crush It!;
- Power Forward; and,
- Women in Cleantech.

These challenges will help unlock breakthrough solutions to complex and persistent problems, including sustainable fuel for aviation, alternatives to diesel in Indigenous communities, new rock crushing technologies for mining, modernizing power grids, and greater representation of women in the cleantech sector (see text box). To launch the **Power Forward Challenge**,^{lxxiv} NRCan partnered with the UK Department of Business, Energy and Industrial Strategy to bring Canadian and UK innovators together to modernize power grids to better integrate clean energy sources and have a more flexible and resilient digital network. Power Forward will create new economic opportunities for

Women Making an Impact in Clean Tech

The **Women in Cleantech Challenge** was designed to have a meaningful impact on the under-representation of women in Canada's cleantech sector by supporting a cohort of entrepreneurs with the resources – financial, business, technical – that they need to be globally competitive. Over the course of the Challenge, the entrepreneurs receive: a stipend that allows them to work full-time on their venture; incubation support services from MaRS Discovery District to build their business acumen; and, science and technology expertise from federal labs to de-risk their technologies. The program aims to increase awareness of the key role women must play in tackling our greatest challenges, and to highlight the successes of the six Challenge finalists to serve as an inspiration for the next generation of female cleantech entrepreneurs. The finalists are currently advancing a wide array of promising technologies, ranging from autonomous energy harvesting boats, to the creation of bioplastics from waste. At the end of the 2.5 year incubation period, the entrepreneur with the most promising technology will receive an additional \$1M investment to further scale her business.



Left to Right: Finalists - Nivatha Balendra, Luna Yu, Amanda Hall, Alexandra Tavasoli, Julie Angus, and Evelyn Allen

¹³ Technological readiness levels can be viewed at: <https://www.ic.gc.ca/eic/site/080.nsf/eng/00002.html>

innovators in both countries and supporting competitiveness for smart grid technologies to 2030 and beyond.

Since 2016, seven new forestry products have been developed every year that were informed by NRCan tools and knowledge, consistently surpassing the target of two per year. An illustration of this includes two software tools, one for evaluating seed transfer alternatives in response to climate change and a second that developed baseline forest succession rules to support sustainable forest management in the Maritime forestry sector.

The success of NRCan funded green mining technologies has also been proven through the demonstration of two new projects for 2018-19, rock bolt sensor and ventilation simulation software (in collaboration with the National Research Council of Canada) for assessing benefits of ventilation on demand in mines. With these two new demonstration projects NRCan has already reached its cumulative target, set for March 2022, of seven projects.

Internationally, Canada continued to show global leadership as a founding member of **Mission Innovation (MI)**,^{lxxv} a global initiative of 24 countries and the European Union, working to accelerate clean energy solutions. In 2018-19, NRCan chaired the MI Steering Committee and Ministerial Planning Team that worked to support Canada in hosting member countries at the 4th ministerial in May 2019. Canada also collaborated with MI counterparts in eight Innovation Challenges, including serving as co-lead of the Sustainable Biofuels and Clean Energy Materials Innovation Challenges. NRCan continued to make investments toward the Federal government's MI commitment to double investments in clean energy innovation over five years (from \$387 million in 2014–15 to \$775 million by 2020), with a federal investment of \$539.1 million in Year 3, contributing to accelerate global clean energy innovation, ensuring clean energy technologies are widely affordable and supporting economic growth.

NRCan supports clean technologies and energy-efficiencies that enhance economic performance

Overall, in 2018-19, for every dollar that NRCan invested in research, development and demonstration of energy innovation projects, NRCan leveraged an additional three dollars from investor organizations. In terms of energy efficiency, the total annual energy savings resulting from adoption of energy efficiency codes, standards and practices has continued to progress, with 26.7 petajoules (PJ) saved in 2018-19, up from 20 PJ in 2017-18.

Under the **Clean Growth Program (CGP)**,^{lxxvi} NRCan selected 50 research, development and demonstration projects in the energy, mining and forest sectors to co-fund with provinces and territories. Project announcements included: replacing diesel equipment with battery electric vehicles at Goldcorp's Borden mine, developing Titanium Corporation's technology to remediate oil sands tailings, while recovering minerals and demonstrating an in-pit extraction

process at Canada’s Natural Horizon oil sands mine that promises to reduce energy use and GHG emissions. NRCan’s new **Science and Technology Assistance for Cleantech (STAC)**^{lxxvii} initiative also provided small to medium sized enterprises funded under the CGP with access to in-kind scientific and technical resources at federal research centres to help them overcome a lack of technical expertise and research infrastructure.

NRCan co-led the **Clean Growth Hub**^{lxxviii} with Innovation, Science and Economic Development Canada (ISED) and in collaboration with 14 other federal departments. The hub provided advice to over 900 clean technology stakeholders on available programs and services that support research, development, technology demonstration, business growth and exports to help in the transition to a low-carbon, low-pollution, and resource efficient economy (see textbox).

Under the **Energy Innovation Program (EIP)**,^{lxxix} NRCan funded 54 external

research, development and demonstration projects to reduce GHGs emissions, while increasing competitiveness, affordability and reliability in Canada’s energy sector. The approved projects fostered innovations in key areas such as renewable energy, smart grids, energy efficient buildings, carbon capture, utilization and storage, and the cleaner production of oil and gas.

**A Success Story from
NRCan’s Clean Growth Hub**

Carbon Engineering’s (CE) mission is to develop and commercialize climate change mitigation technology that captures industrial-scale quantities of CO2 directly from the air and turn the resulting pure CO2 into usable forms for use or storage.

The Clean Growth Hub succeeded in being a critical source of guidance on applicable federal programs for CE and also played an integral role in coordinating whole-of-government engagement and information sharing.

“There’s a reason that every trip to Ottawa begins with a meeting at the Hub – by bringing all of the relevant parties together, the Hub enables carbon engineers to do in one meeting what would otherwise take a week of meetings” – *Geoffrey Holmes, Business Development, Carbon Engineering.*

Two funding streams were also launched under the EIP: In partnership with Breakthrough Energy (BE), NRCan developed **Breakthrough Energy Solutions Canada**,^{lxxx} a game-changing public-private initiative to accelerate the development and commercialization of clean technologies with potential for GHG significant emissions reductions (see textbox). Additionally, NRCan and Alberta Innovates developed the **Canadian Emission Reduction Innovation Network (CERIN)**,^{lxxxi} a joint initiative that supports targeted infrastructure investments at existing facilities and sites across Canada, and brings together national expertise into an integrated network.

Breakthrough Energy Solutions Canada

In 2018-19, NRCan entered into a first of its kind public-private partnership with Breakthrough Energy (BE), led by Bill Gates and global investors, to develop the **Breakthrough Energy Solutions Canada (BESC)**. BESC aims to accelerate the development of clean energy technologies in the electricity, transportation, buildings and manufacturing sectors with the potential to significantly reduce global GHG emissions (0.5GT/year globally). BESC provides a unique opportunity for Canadian entrepreneurs and start-ups to access the expertise, funding and valuable insights from NRCan and private investors.

Additionally, the successful cohort of companies funded through BESC will have the opportunity to attend annual “pitch events,” to showcase their innovations to investors and to seek additional private investment opportunities.

NRCan announced funding for three renewable power projects under the \$200 million **Emerging Renewable Power Program**^{lxxxii} to reduce GHG emissions from the electricity sector, build up supply chains for emerging technologies and leverage existing supply chains. For example, the DEEP geothermal project near Estevan Saskatchewan will provide 5 megawatts of clean electricity, employ energy sector workers during construction and provide direct heat for use, resulting in further environmental and economic benefits.

NRCan promoted electricity grid modernization through the \$100 million **Smart Grid Program**.^{lxxxiii} In 2018-19 it supported 24 projects across Canada. Through the Smart Grid Program, NRCan funded demonstrations and deployment of smart grid technologies across Canada, including: \$10.6 million to support a battery and solar powered smart grid project in Edmonton, which will result in a more resilient and reliable power grid; \$5.7 million to modernize the energy grid for the City of Saint John by using artificial intelligence to optimize the efficiency and cost effectiveness of the city’s existing system; and invested in central monitoring to improve efficiency, lower system losses and to better integrate renewable energy sources in Saskatchewan.

The Government has also put in place a fiscal system that supports energy projects, such as the lowest marginal tax rate for new business in the G7. For example, the Government is supporting business investment in clean technologies (e.g. EV charging stations and energy storage equipment) by providing full and immediate deduction of its cost until 2024; thereby providing proponents with the policy certainty needed to better plan future clean energy investments. In addition, the Government introduced the **Accelerated Investment Incentive**^{lxxxiv} applicable to a broader range of capital investments in the natural resource and other sectors.

Canada has also one of the world’s most promising domestic markets for small modular reactors (SMRs). Conservative estimates place the potential value for SMRs in Canada at \$5.3 billion between 2025 and 2040. Over the course of 2018, NRCan convened and provided co-funding for interested provinces, territories and power utilities to develop the Canadian **SMR Roadmap**^{lxxxv} to engage stakeholders on the future of small modular reactors in Canada. The SMR Roadmap report was released in November 2018.

In the mining sector, NRCan’s **Green Mining Innovation (GMI)**^{lxxxvi} continued to lead improvements to the mining sector’s environmental performance through collaboration and knowledge sharing. The GMI launched six collaborative projects under the Pan-Canadian **Mining Value from Waste Project**^{lxxxvii} to explore innovative processes and technologies that extract value from mine waste and how to reduce their environmental impact and liability. This included examining options to obtain value from tailing wastes, both by recovering valuable metals and by using the wastes as resources in other applications. In addition, NRCan initiated two projects under the **Canadian Mining Science and Engineering Laboratory Network** to accelerate innovation and clean technology development in the mining sector. NRCan also worked with the Canadian Standards Association to develop codes and standards for introducing hydrogen in underground mines to replace diesel.

NRCan continues to explore the potential applications of artificial intelligence (AI) in Canada’s natural resource sectors and in the delivery of the Department’s mandate by facilitating improved understanding of AI and its role in advancing innovation. Results include identifying 40 priority AI based projects across NRCan (e.g. accelerating the development of new materials to improve energy efficiency), collaborating with academia and industry to build AI capacity across the natural resource sectors, and creating a cross-sector AI working group to collaborate on and communicate AI-related issues and initiatives. NRCan also used AI to support Augmented Reality for a representation of Canada bedrock and mineral potential in 3D and explore the potential for earth sciences and geology. Lastly, NRCan developed targeted AI and data analytics training for employees to build departmental AI knowledge and capacity.¹⁴

¹⁴ To learn more about AI and how it can be used to solve problems, consult **Simply Science**, NRCan’s online magazine at <https://www.nrcan.gc.ca/simply-science>.

The scientists and engineers at NRCan’s **Canmet research centres**^{lxxxviii} and other federal energy research facilities undertook 175 applied research and development projects that supported Canada’s transition to a low carbon economy. These innovative ventures, funded through the **EIP**^{lxxxix} and the **Program of Energy Research and Development (PERD)**,^{xc} resulted in significant accomplishments to advance clean electricity and transportation, sustainable bioenergy, cleaner fossil fuels, energy efficiency, and value-added advanced materials for the energy, transportation and manufacturing sectors. (See textbox).

In 2017, NRCan in collaboration with provinces and territories, introduced **Build Smart: Canada’s Building Strategy**.^{xcii} This is Canada’s plan to transform the built environment and set a path to improved energy efficiency. The program includes higher efficiency standards, net-zero energy ready building codes, and increasing use of benchmarking, labelling and disclosure. In 2018, NRCan released Action Plans under **Build Smart**,^{xciii} as well as market transformation roadmaps for energy-using equipment.

Through the **Green Infrastructure Programs**,^{xciii} NRCan is advancing the modernization of energy efficiency related codes and standards across Canada. The Department is supporting National Research Council’s development of increasingly stringent model building codes for new and existing buildings by 2022-23 (to be published in 2025). The Department is also collaborating with provinces and territories on code adoption and implementation and working with partners on affordable solutions.

In conjunction with the provincial and territorial governments, NRCan continued work to introduce labelling of energy use in buildings. NRCan launched its **EnerGuide Home Rating Portal**,^{xciv} which allows EnerGuide participants to view their home’s energy efficiency rating and suggests helpful home upgrades to improve efficiency, as well as share it with potential homebuyers. Additionally, NRCan conducted

Canmet Labs – Science in action

NRCan’s Canmet labs are leaders in conducting scientific research and development areas such as biofuels, energy efficiency, pipeline materials and oil spills. For example, scientists are:

- **Making Steel Production Sustainable with Biofuels:** Canmet researchers developed and installed a gas/vapour sampling unit at the site of Char Biocarbon, where they are developing a carbon-neutral sustainable biofuel for ironmaking and other applications. Arcelor Mittal Dofasco is preparing a trial run using 20 tonnes of this biofuel. The data provided by Canmet’s sampling unit is essential to making these trials a success.
- **Making Homes More Energy Efficient:** Canmet researchers demonstrated that hybrid heating systems, and combining natural gas fireplaces with air source heat pumps, can reduce GHG emissions. By supplying a typical home with a hybrid heating source with smart controls, GHG emissions can be reduced by 30%, and help Canada transition to a low-carbon economy.
- **Enhancing The Safety of Oil Pipelines:** In developing a standard methodology to test oil pipeline corrosion, Canmet researchers successfully linked their methodology to real world performance of pipelines. This methodology is being used to revise the safety standard (G170 ASTM) for oil pipelines, to help make them safer.
- **Oil Spill Science:** Canmet expertise has been instrumental in informing national level dialogue and policies including Transport Canada regulations development; technical support for federal Indigenous engagement; science input to National Energy Board pipeline reviews, and advice to environmental assessment reviews of East Coast Offshore production projects.

randomized controlled experiments to learn more about Canadians’ understanding of EnerGuide labels, inform label design, and to improve uptake of EnerGuide evaluations from a home energy advisor.

NRCan also continued to enhance **ENERGY STAR Portfolio Manager**^{xv} to support benchmarking and labelling of energy use in commercial and institutional buildings in Canada, for example by expanding the existing ENERGY STAR score feature to additional building types and implementing the new ENERGY STAR certification program to recognize high performing and energy efficient buildings. As a result of this program, 120 buildings have been certified in 2018-2019. NRCan also supported the construction of multiple demonstration projects in 2018-19 to showcase energy efficient designs, practices, and construction.

NRCan supported the development and adoption of energy efficient practices by launching the new **ENERGY STAR Brand Book**,^{xvi} which provides a better understanding of how to properly use the ENERGY STAR brand. The department also developed three amendments to Canada’s *Energy Efficiency Regulations* to introduce or update minimum energy performance standards covering 38 types of equipment, including residential, commercial and industrial heating and ventilation products. These regulatory amendments will come into force by December 2019.

NRCan worked with Canadian industry and North American partners to improve industrial energy efficiency, drive competitiveness, and accelerate the uptake of energy management systems. The Department supported 14 energy management projects through **NRCan’s Industrial Energy Management Program**.^{xvii} In addition, 13 facilities were certified in ENERGY STAR for Industry Certification and 19 facilities were registered in the ENERGY STAR Challenge for Industry. NRCan also convened ENERGY SUMMIT 2018, which engaged over 425 industry leaders on the importance of energy efficiency.

Canada’s natural resources are sustainable

Culminating from the NRCan led Generation Energy dialogue in 2017-18, the **Generation Energy Council^{xcviii}** presented its report on June 7, 2018, which proposed pathways to the Government of Canada on how to build Canada’s energy future. These pathways include wasting less energy, powering clean communities, using more renewable fuels, and increasing Canada’s economic competitiveness and energy sustainability.

In 2018-19, through the **Electric Vehicle Infrastructure Demonstration Program^{xcix}**, NRCan supported the demonstration of 10 real-world next-generation and innovative electric vehicle (EV) charging infrastructure projects across Canada to advance technology and overcome barriers to EV infrastructure adoption in urban environments. In addition, the **Electric Vehicle and Alternative Fuel Infrastructure Deployment (EVAFID) Initiative^c** has to date resulted in the opening of 134 EV fast chargers, four natural gas stations, and two hydrogen stations. Looking forward, NRCan is actively implementing Phase 2 of the EVAFID initiative which will further increase the number of public EV and alternative fuel facilities available across Canada to 1,000 EV fast chargers coast-to-coast, 22 natural gas chargers along freight routes, and 15 hydrogen chargers in metro areas by 2024. Advancing the deployment of zero emission vehicle infrastructure is supporting Canada’s ambitious zero-emission vehicle targets (10% of light duty vehicle sales by 2025, 30% by 2030, and 100% by 2040).

NRCan supported renewable energy and capacity building projects that reduce reliance on diesel in rural and remote communities by selecting 53 projects, 51 of which are located in Indigenous communities, for funding through the **Clean Energy for Rural and Remote Communities (CERRC) Program^{ci}**. In addition to reducing their reliance on diesel fuel as an

Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative (EVAFID)

SKY Solar Canada Ltd & Bi-Directional Charging

SKY Solar Canada Ltd. is constructing 12 solar-powered EV-charging stations at five sites across Ontario, some of which will be able to deliver energy back from the battery to the electricity grid.

Partnership with the Region of Peel

The Government of Canada invested in the construction of three electric vehicle stations in Brampton and Mississauga with the Region of Peel to encourage the use of electric vehicles and provide more choice and convenience.

Partnership with Hydro-Quebec, the City of Montreal and AddEnergie

NRCan, Hydro-Quebec and the City of Montreal are collaborating with AddEnergie to develop charging technologies to support an increase in EV use. The partnership will help create over 1,000 stations across Canada, including residential, commercial and public charging stations. These projects will also create 86 permanent jobs in Canada over a five-year span, and help prevent greenhouse gas (GHG) emissions through accelerating the transition to cleaner transportation.

Growing Infrastructure in British Columbia

The Government of Canada investments will support three B.C. recipients to encourage Canadians to get into zero-emissions vehicles and use low-carbon fuels. The B.C. Institute of Technology will demonstrate advanced charging stations and develop a way to control and monitor EV chargers from different vendors. The hydrogen Technology and Energy Corporation will install a retail hydrogen fuelling station in the Vancouver area, part of a six-station network it is building in B.C.’s lower mainland and Victoria. B.C. Hydro will demonstrate an EV charger for use in multi-unit residential buildings. It will also deploy 21 level 3 fast chargers across the province to further Canada’s vision for a coast-to-coast network.

energy source, CERRC is building community capacity to own and operate renewable energy systems that provide important economic opportunities and promote energy self-reliance. For example, the **BioHeat stream of CERRC**^{cii} has a budget of \$55 million over six years to deploy forest-based bioenergy technologies in rural and remote communities. This includes supporting the installation, retrofit or investigation into the feasibility of biomass heating or combined heat and power systems for community or industrial applications. NRCan took a supply-chain approach to support innovation, competitiveness and the transformation of the forest sector in other ways, including through the forest product facilities across Canada that bring about the next wave of transformation in bioenergy, biomaterials, biochemical and advanced building products. The Department has supported policies related to the forest sector's potential contribution to Clean Growth.

Under the **Greening Government Services**,^{ciii} NRCan facilitated increased departmental awareness by developing e-training modules on energy efficiency and emission reduction; delivering in-class training amounting to 358 person-days; holding nine community of practice sessions; and providing technical information, advice, and services to 59 federal organizations. Similarly, the Department analyzed a third of its administrative fleet vehicles to determine the most suitable low-emission option. Preliminary estimates of this analysis indicate the potential for a 40% reduction in emissions.

Making Canada's natural resources sustainable entails a variety of key actions such as using clean energy, building infrastructure to reduce emissions, advancing new clean technology, while supporting communities facing the greatest challenges. These and other NRCan activities aimed at transitioning Canada to a low-carbon economy have allowed the department to support Canada's overall efforts to increase the amount of electricity generated from non-emitting sources by 0.4% in 2018-19 (to 82%). NRCan also funded clean technology demonstration projects that have resulted in direct GHG emissions reductions by 1.32 megatonnes.

For the forest sector, sustainability includes in part ensuring Canada's annual harvest comes under the allowable cut. Overall, Canada continues to harvest less wood compared to the calculated sustainable supply, with 155 million m³ harvested in 2018-19 compared to the total wood supply of 223 million m³. Indigenous groups hold tenure to 10.5% (2017) of Canada's annual allowable cut.

To ensure that Indigenous rights and interests inform NRCan's approach to sustainable development, 8 policies and initiatives were developed collaboratively with Indigenous groups and communities in 2018-19. This includes ensuring Indigenous participation on the **Canadian Energy Regulator Act**^{civ} governance structure.

Results achieved

Departmental results	Performance indicators	Target	Date to achieve target	2018–19 Actual results	2017–18 Actual results	2016–17 Actual results
Natural resource sectors are innovative	Percentage of NRCan-funded innovation projects that result in new intellectual property, standards or regulations	5% of projects will have IP or an impact on codes, standards and regulations by project completion (typically 2-4 years)	March 2022	65% ¹⁵	Not Available	42% (From eco-Energy Innovation Initiative) ¹⁶
	Percentage of NRCan-funded clean energy innovation projects advancing along the innovation scale	50% of RD&D projects advance one level on the technological readiness scale (TRL) by project completion (typically 3-4 years)	March 2022	90% of completed projects advanced one TRL level ¹⁷	Not Available	86% (From eco-Energy Innovation Initiative) ¹⁶
	Number of NRCan-funded green mining technologies, including waste and water management, proven through demonstrations	7 technologies ¹⁸	March 2022	7	5	3
	Number of new forestry products developed that are informed by NRCan tools and knowledge	2 per year	March 2019	7	7	7

¹⁵ This indicator tracks progress on results at the completion of NRCan-funded projects in 2022. The 2018-19 result is an interim progress that shows the overall completed projects, 65% of them have resulted in intellectual property or have had an impact on codes, standards and regulations.

¹⁶ Results provided are for reference from the ecoEnergy Innovation Initiative, the predecessor to the Energy Innovation Program. Due to differing objectives between programs and individual projects, these results cannot be treated as baseline or comparative for new programs implemented in 2017-18 and 2018-19 as part of Budget 2017 announcements.

¹⁷ This indicator tracks progress on results at the completion of NRCan-funded projects. NRCan will report progress in future Departmental Results Reports. The 90% figure represents only a fraction of the full program portfolio and is provided only as an indication of progress to date.

¹⁸ The number of technologies reported over the years are cumulative.

Clean technologies and energy efficiencies enhance economic performance	Success of NRCan-funded clean technology demonstrations in terms of economic performance	50% success rate measured by project completion (typically 3-4 years)	March 2022	Not Available ¹⁹	Not Available ⁴	Not Available ⁴
	Ratio of leveraged investments in energy innovation projects funded by NRCan	1:1 ratio of industry investment to government investment	March 2019	3.1:1	2.6:1	0.8:1
	Total annual energy savings resulting from adoption of energy efficiency codes, standards and practices	Annual savings of 600 petajoules (PJ)	December 2029	26.7PJ	20.0PJ ²⁰	Not Available ²¹
Canada's natural resources are sustainable	Percentage of Canadian electricity generated from non-GHG emitting sources	90%	March 2030	82%	81.6%	80.8%
	Number of renewable energy projects in remote communities and off-grid industrial operations	50	December 2022	0 ²²	Not Available ²³	Not Available ²³

¹⁹ This indicator tracks progress on results at the completion of NRCan-funded projects. No projects with economic goals were completed during 2018-19.

²⁰ The 2017-2018 results have been revised to ensure application of consistent methodologies and baselines used in the calculation of the results. The petajoule savings resulting from improved building code standards is now based on the 2015 National Energy Code for Buildings (NECB), instead of the 2011 NECB, which reduced the savings attributed to improved building codes. As a result, the petajoules saved in 2017-2018 have been revised to 20.0 rather than the 27.4 petajoules that were previously reported in the 2019-20 Departmental Plan.

²¹ The standards for calculation of energy efficiency have changed since 2017 and the results for prior years for this indicator are not comparable.

²² This indicator measures the number of completed renewable energy projects in remote communities and off-grid industrial operations in 2018-19. However, the 53 projects mentioned in the main body of the report refer to the number of projects that NRCan selected in 2018-19 for participation in the Clean Energy for Rural and Remote Communities Program.

²³ This is a new indicator implemented in 2018-19. Past actuals are not available as the indicator tracks a new program that began in January 2018.

	Amount of wood harvested compared to the sustainable supply	Harvest is less than sustainable supply	March 2019	155 million m ³ total harvest versus total wood supply of 223 M m ³ (SoF, 2018 – data from 2016)	160 million m ³ total harvest versus total wood supply of 226 M m ³ (SoF, 2017 – data from 2015) ²⁴	148 million m ³ total harvest versus total wood supply of 227 M m ³ (SoF, 2016 – data from 2014) ²⁴
	Number of low-carbon recharging and refueling stations under development or completed	900 electric vehicle recharging stations, 15 natural gas and 12 hydrogen refueling stations	March 2026 ²⁵	Electric vehicle charging stations = 526 Natural gas refuelling stations = 12 Hydrogen refuelling stations = 6	Electric vehicle charging stations = 102 Natural gas refuelling stations = 7 Hydrogen refuelling stations = 3	Not Available
	Change in greenhouse gas emissions resulting from NRCan-funded clean technology demonstrations	<u>Clean Growth Program:</u> 0.3 to 0.7 megatonnes in direct annual GHG reduction, dependent on projects received, success of projects and on-going operation at full production capacity by 2026 <u>Energy Innovation Program:</u> 4.25 megatonnes of direct annual GHG reductions	March 2026 (Clean Growth Program) March 2030 (Energy Innovation Program)	Clean Growth Program: Not Available ²⁶ Energy Innovation Program: 1.32 Mt/year ²⁷	Clean Growth Program: Not Available ⁴ Energy Innovation Program: 1.2 Mt/year ²⁷	Clean Growth Program: Not Available ⁴ 0.8 Mt/year (From eco-Energy Innovation Initiative) ²⁸

²⁴ The Actual Results in 2016-17 and 2017-18 have been revised to reflect consistency with the State of Canada's Forests Report.

²⁵ The date to achieve the target was revised to 2024 in the 2019-20 Departmental Plan.

²⁶ This indicator tracks progress on results at the completion of NRCan-funded projects. No projects were completed during 2018-19, as projects were at the early stages of implementation.

²⁷ On track for 2026 and 2030 targets. Projects are just now underway and only represent a small percent of the final target.

²⁸ Result provided is for reference from 2016-17 eco-Energy Innovation Initiative project reports, the predecessor to the Energy Innovation Program.

		and a combined total 10-16 megatonnes GHG direct and indirect reductions per year by 2030				
	Number of policies and initiatives developed collaboratively with Indigenous groups and communities	7 per year	March 2019	8	Not Available ⁴	Not Available ⁴

Budgetary financial resources (dollars)

2018–19 Main Estimates	2018–19 Planned spending	2018–19 Total authorities available for use	2018–19 Actual spending (authorities used)	2018–19 Difference (Actual spending minus Planned spending)
\$564,281,850	\$564,281,850	\$568,249,310	\$483,259,791	(\$81,022,059)

Human resources (full-time equivalents)

2018–19 Planned full-time equivalents	2018–19 Actual full-time equivalents	2018–19 Difference (Actual full-time equivalents minus Planned full-time equivalents)
1,461	1,581	120

Financial, human resources and performance information for NRCan’s Program Inventory is available in the [GC InfoBase](#).^{cv}



Globally Competitive Natural Resource Sectors

Description

Advance and promote market access, inclusiveness and competitiveness for Canada's natural resource sectors, in support of jobs and economic growth.

This Core Responsibility supports the advancement of the following **Strategic Priorities**:

- Strengthening Canada's resilience to key natural and human-induced hazards and climate change;
- Improving Market Access and Competitiveness; and,
- Advancing Reconciliation with Indigenous peoples.

It also contributes to the achievement of the following Minister of Natural Resources

Mandate Letter Commitments:

- Modernize the National Energy Board;
- Review Canada's environmental assessment process; and,
- Develop a North American clean energy and environment agreement.

Context

Advancing and promoting globally competitive natural resource sectors is important for Canada, which has the third largest per-capita of natural resource endowment in the world, accounting for 1.7 million Canadian jobs, and contributes to 17% of the country's GDP.^{cvii} Supporting access to new and priority markets, engaging Canadians in the future of our resource economy, and enhancing the competitiveness of our sector will benefit Canada's economy. In 2018-19, NRCan undertook several initiatives to support Canada's globally competitive natural resource sectors.

Results

NRCan is working to enhance access to new and priority markets for Canada’s natural resources

Throughout 2018-19, Canada’s natural resource sectors remained resilient in the face of U.S. tariffs placed on Canadian steel and aluminum imports. In spite of these tariffs, Canada’s market share to the U.S. was 24.8% and 1.4% globally in 2018-19, surpassing the established targets of 24.4% and 1.2% respectively. Additionally, NRCan increased the number of department-led trade missions that supported the development or expansion of market access for natural resources, surpassing its target of 26 per year with 39 missions in 2018-19. As not all NRCan missions were venues for non-governmental stakeholders, the average number of companies, provinces, territories, and Indigenous leaders did not meet performance indicator targets. However, stakeholders participated substantially in several missions, such as the 2019 Clean Tech Forum, where 40 companies participated; a forest products mission to Asia, which included 6 provincial/territorial representatives, 44 companies and eight Indigenous representatives; and the LNG Producer Consumer Conference/Hydrogen Energy Ministerial in Japan, which included 12 companies and two provincial/territorial representatives.

To advance a globally competitive natural resource sector, NRCan supported Canadian efforts to develop key infrastructure to get natural resources to market, such as **LNG Canada’s** liquefied natural gas export facility. LNG’s facility is the largest private sector investment in Canadian history, and it is expected to create 10,000 jobs at the height of its construction. Additionally, NRCan supported TMX efforts and Enbridge Gas’ Line 3 replacement program through the Indigenous Advisory and Monitoring Committee.

The Department spearheaded federal participation in efforts to address the impacts of the severe oil price differential on the Canadian industry and workers. Collaboration with other federal departments and agencies led to announced measures valued at \$1.6 billion to support jobs and workers in Canada’s oil and gas sector, promote energy and market diversification, and clean technology innovation.

In 2018-19, NRCan, with oversight from former Supreme Court of Canada Justice Frank Iacobucci, led focused and meaningful Phase III consultations, through meetings with 129 Indigenous groups affected by the **Trans Mountain Expansion Project (TMX)^{cvii}** in response to the Federal Court of Appeal’s decision on marine shipping and adequacy of Indigenous consultations (August 2018). This included meaningful two-way dialogue and work with Indigenous communities and federal entities on mitigation and accommodation measures. We also led the coordination of the whole of government input to the National Energy Board Reconsideration process; including scientific evidence, information requests and final written argument. These submissions helped to inform the **National Energy Board Reconsideration**

Report's.^{cviii} The TMX project was subsequently approved in June 2019, as it was considered to be in the Canadian public interest, in support of economic growth, and subject to strong environmental protections.

On November 30, 2018, Canada signed an historic agreement with the U.S. and Mexico, the **Canada-U.S.-Mexico Agreement (CUSMA)**^{cix} that will maintain the mutual benefits of existing natural resources trade, facilitate deeper integration of North American energy markets, enhance energy competitiveness and expand export opportunities. This outcome was supported by NRCan participation in the negotiations and advocacy missions at the Ministerial and senior official level. CUSMA includes a Canada-U.S. Side Letter on Energy that will facilitate energy development through greater cooperation and enhanced regulatory and transparency measures, and provide unfettered access to energy infrastructure. The Agreement also includes protections against future U.S. Section 232 trade actions.

NRCan further maintained engagement with the U.S. and Mexico to advance North American energy collaboration and energy market integration, with an agreement to advance a new framework for collaboration. Bilaterally, Canada hosted the **Canada-U.S. Steering Committee for Nuclear Energy R&D Cooperation** to discuss ways to deepen collaboration between the two countries while also leveraging expertise and capabilities.

NRCan also engaged in the negotiation of **Pacific Alliance** and **MERCOSUR** free trade agreements to modernize Canada's trade relationships and achieve market access improvements, promote inclusive trade, and emphasize the importance of a rules-based trading system.



NRCan signed memoranda of understanding related to energy efficiency, mining, and nuclear cooperation with Argentina to facilitate information sharing, business, research and development opportunities, and the development, and refining of resource governance approaches.

Furthermore, to enhance access to markets in the Asia Pacific region, NRCan cooperated bilaterally with China and India in a number of areas. With China, NRCan supported Canada's engagement in the **Economic and Financial Strategic Dialogue**^{cx} to deepen bilateral trade and investment by expanding cooperation on energy and clean technology, also deepened bilateral commercial cooperation on energy through the Track II Energy Dialogue. With India, NRCan worked on the development of an **Energy Cooperation Action Plan**.

Under the **Comprehensive Economic and Trade Agreement (CETA)**^{cxii} Raw Materials Dialogue, NRCan worked with the European Commission to boost commercial opportunities for

Canada's exploration, mining and clean technology firms in the European Union marketplace, and to attract investments. At the **Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF)^{cxiii}** (in Geneva, Switzerland, October 15-18, 2018), Canada demonstrated leadership by sharing its best practices on mine closure, responsible business practices, and community engagement.

To expand cooperation in oil, gas, electricity, renewable energy and energy efficiency, enhance strategic energy partnerships, and promote Canada as a stable investment destination, NRCan executed high-level missions to target markets such as India, Japan, China and the UAE. The Department led Canada's presence at global trade and investment events, such as the China Mining, Mining Indaba, Prospectors and Developers Association of Canada Conference, Association for Mineral Exploration Roundup, CERAWEEK, the Global Petroleum Show, the World Gas Conference and the LNG Producers and Consumers Conference.

NRCan also engaged in key multilateral fora, such as the **International Energy Agency, the International Energy Forum, G7, G20, and CEM/MI** to position Canada as a global leader in the energy transition and as a clean and reliable supplier of energy products, technology and services.

NRCan continued to secure market access for Canadian diamond producers and users through its administration of the **Export and Import of Rough Diamonds Act^{cxiii}** and regulations, which implement Canada's international obligations under the **Kimberley Process Certification Scheme**. In 2018-19, the Department issued Kimberley Process certificates, valued at close to \$3 billion, for the export of rough diamonds, thereby supporting the diamond mining, diamond cutting and polishing, and tool and die industries in Canada, while also enabling individual Canadians to export rough diamonds.

Ensuring that Canadians are engaged in the future of the new and inclusive resource economy

The percentage of policy, regulatory and legislative changes with broad public engagement was 35% in 2018-19, below the annual target of 70%. The higher level observed in 2017-18 was due in part to the ongoing Generation Energy Dialogue public consultations. Formal mechanisms for consultations on NRCan policy, regulatory and legislative changes in 2018-19 were targeted, in the majority, at impacted stakeholders and Indigenous communities. At the same time, the Department has almost doubled the production of its number of analytical products (18), in collaboration with provinces and territories, in order to advance Canada's natural resources and find ways to address competitiveness and barriers to investment. As well, 184 Indigenous groups and communities were implicated in economic development projects in 2018-19.

NRCan has also supported progress on major projects, the development of infrastructure and regulatory review processes. Building on broad public engagements advances were made on **Bill C-69**, which received Royal Assent in June 2019. The new rules provide for more and earlier opportunities for meaningful participation. Early public engagement will ensure reviews happen in partnership with Indigenous Peoples, that communities have their voices heard, and that companies know what is required of them. In particular, implementation of the legislation led to the coming into force of the **Canada Energy Regulator (CER)**^{cxiv} in August 2019, a modern energy regulator to help oversee a strong, safe and sustainable Canadian energy sector, as it transitions to a low-carbon economy. The CER replaces the **National Energy Board** and is built on modern effective governance, more inclusive engagement, greater Indigenous participation, stronger safety and environmental protection, and timelier project decisions. By recognizing Indigenous rights, culture, and interests in project reviews, and working in partnership from the start, the Government of Canada will advance reconciliation, and arrive at better project decisions. CER increases opportunities for Indigenous Peoples to be active partners and to be consulted in impact assessments from the outset.

To support Indigenous-led economic development, an additional investment of \$10 million over three years was made in the **Indigenous Forestry Initiative (IFI)**^{cxv} with 42 projects announced this year.

To establish Canada as a world leader in sustainable mineral development, and to build the foundation for long-term success at home and abroad, NRCan, in partnership with the provinces

Meaningful Partnerships with Indigenous Peoples

In 2018-19, NRCan advanced meaningful Indigenous engagement and partnerships, and addressed their priorities and interests related to natural resource development. The interdepartmental **Strategic Partnerships Initiative – West Coast Energy** contribution program provided nearly \$8 million to 52 Indigenous communities and organizations in BC to address priorities related to jobs and economic growth, environmental action, fish habitat restoration, and engagement. Similarly, with funding from FedNor, the **Centre of Excellence for Indigenous Mineral Development** enhanced the participation of Indigenous people in the mines industry.

The **Indigenous Advisory and Monitoring Committees (IAMCs)** brought together Indigenous and government representatives to review and monitor TMX and Line 3 Replacement projects. The two IAMCs delivered over \$7 million in contribution funding, including support for two ground-breaking monitoring initiatives that facilitated Indigenous participation in regulatory activities. The IAMCs also advanced work on Indigenous inclusion in emergency management and the integration of Indigenous Knowledge in activities along the two pipeline routes that cross British Columbia, Alberta, Saskatchewan and Manitoba.

The **Economic Pathways Partnership (EPP)** pilot provided tailored supports (such as pathfinding, proposal development, and convening potential funding partners) to assist Indigenous communities that may be impacted by the TMX and Line 3 projects to access existing federal economic development programs and services.

Furthermore, through **CMMP** outreach activities, NRCan engaged and strengthened relationships with Indigenous peoples through outreach activities (e.g. forums, learning events, and conventions); and advancing Indigenous participation in the mining sector through co-development of career training, skills development, and knowledge sharing.

Through the **Indigenous Forestry Initiative (IFI)**, NRCan has provided funding to support 42 Indigenous-led forest-based economic development projects involving three broad categories: environmental stewardship, use and management of forest resources, and participation in the forest bioeconomy.

and territories, released the **Canadian Minerals and Metals Plan (CMMP)**^{cxvi} in March 2019. Developed under a mandate from Canada’s Mines Ministers, the Plan will raise Canadians’ awareness of the importance of the minerals sector, respond to ongoing and emerging challenges, and help position Canada for opportunities offered by an evolving economy. It includes a vision, principles and strategic directions that governments, industry and stakeholders can pursue to foster a competitive, responsible, and sustainable industry that can leverage opportunities and drive long-term success. In parallel with broader engagement efforts with Canadians, research studies were undertaken to help inform the development of the CMMP, including a diagnostic and forward looking analysis of the industry and an Indigenous gender-based analysis. The CMMP highlighted the need to take action on gender equality and identified strategies to increase the number of women and visible minorities in the mining sector; advance Indigenous participation, particularly of Indigenous women; and, support workers who need to update their skills for modern operations. Increased Indigenous engagement was fostered through a National Forum on Advancing Indigenous Participation in mining with 43 Indigenous leaders, regional meetings, and capacity building supported by four outreach grants.

NRCan also supported Crown-Indigenous Relations and Northern Affairs Canada in developing the **Arctic and Northern Policy Framework**,^{cxvii} which was developed in consultation with provinces, territories and Indigenous groups to reorganize and reprioritize federal activities in the Arctic. The framework will increase partnerships and collaboration between the federal government, Indigenous Peoples and territorial and provincial governments. This policy framework and the **Federal Science and Technology Infrastructure Initiative** will also foster more collaborative federal science.

NRCan is enhancing competitiveness of Canada’s natural resource sectors

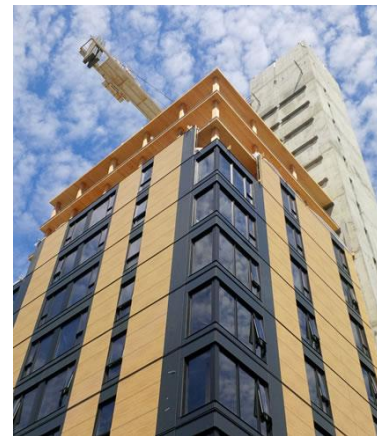
In 2018-19, 100% of resource development project decisions were on time, helping to support a more effective, accountable, transparent and timely approach to the regulatory review of resource development projects. Additionally, in 2018-19, NRCan’s economic and investment data was accessed over 190,000 times per quarter, assisting Canadians and Canadian firms to have information to make decisions around natural resources.

The Government has engaged with a number of external partners and stakeholders to identify key competitiveness challenges and opportunities facing the natural resource sectors. This included: regular meetings with provinces and territories; **Economic Strategy Tables**,^{cxviii} **Joint Government-Industry Competitiveness Roundtables**; **Atlantic Offshore Competitiveness Roundtable**; and the **Generation Energy Council**.^{cxix} For example, by working with provincial counterparts, and industry stakeholders on the **Joint Working Group on the Future for Canada’s Upstream Oil and Gas Industry (final report)**,^{cxx} and the **Atlantic Offshore Competitiveness Roundtable**, the Federal Government can better understand and address the competitiveness challenges of this industry. Similarly, in support of innovation, NRCan provided

advice to the **Resources of the Future**^{cxxi} and the **Clean Technology Economic Strategy Tables**,^{cxxii} which resulted in proposed visions, targets, and sector-specific recommendations.

In the forest sector, Canada continued implementing the **Forest Bioeconomy Framework**^{cxxiii} designed to stimulate new economic activity by converting sustainably managed renewable forest-based resources into value-added products and services using novel and repurposed processes. Measures include supporting the bioeconomy through targeted investments in low-carbon processes and commercialization of new fibre-based innovation and technologies. Through the Forest Innovation Program, NRCan also leveraged science and partnerships to build a secure and accessible Canadian forest biomass and fibre supply baseline to support clean fuel standards and enable successful bio-product marketing.

NRCan launched the **Green Construction through Wood (GCWood) Program**^{cxxiv} to encourage greater use of wood in non-traditional construction projects in Canada. The aim of the program is to broaden the awareness of, and domestic capacity for, innovative non-traditional infrastructure through demonstration projects, education and training, and support for revised building codes and standards. Building with wood offers many benefits, including GHG emission reductions and opportunities for economic growth. The GCWood Program's calls for proposals were launched in three streams: tall wood; low-rise non-residential; and timber bridges.



Brock Commons is an 18-story hybrid mass timber student residence at University of British Columbia in Vancouver.

Through the **Expanding Market Opportunities Program**,^{cxxv} NRCan partnered with industry and provinces to maintain and grow markets for Canadian forest products in South Korea, China, Japan, India and others. NRCan through the **Forest Innovation Program (FIP)**^{cxxvi} supported industry in the commercialization of first-in-kind and first-in-Canada technologies using forest fibre across the country through our **Investments in Forest Industry Transformation Program**^{cxxvii} (a component of FIP). NRCan also helped the forest sector pursue its ongoing transformation through the development and adoption of innovative, science-based solutions such as Enhanced Forest Inventory (EFI) that uses ground-based, airborne and satellite remote sensing technologies to measure the characteristics of trees, forest stands, forests and landscapes.

Internationally, NRCan demonstrated its global leadership in climate change mitigation through increased use construction and sustainable forest management by organizing the 76th session of the **UN Economic Commission for Europe Committee on Forest and Forest Industry**, held for the first time in Canada. The Department, along with Agriculture and Agri-Food Canada, also co-chair the **International Bioeconomy Forum (IBF)**^{cxxviii} with the European Commission. The IBF is a multilateral platform for international cooperation on key research and innovation

priorities and horizontal activities in the bioeconomy. Through the IBF Forest Bioeconomy Working Group, NRCan is working to advance the key pillars of the Forest Bioeconomy Framework to create a global, sustainable bioeconomy. In May 2019, NRCan organized a plenary meeting of the Forum in Vancouver.

NRCan also demonstrated strong energy sector leadership. Most notably, Canada held the G7 presidency in 2018. In this role, NRCan hosted the **G7 Energy Ministers**,^{cxxxix} in Halifax, where discussions centred on working together to build the energy systems of tomorrow, focusing on four main pillars: developing sustainable energy resources; preparing the workforce; promoting interconnected, open, transparent and stable energy markets; and modernizing power systems. Support was secured for numerous outcomes including initiatives on marine plastic litter, earth observation and coastal management, cyber security, modernizing power systems and electrical grids and supporting clean and resilient energy systems in Small Island Developing States. During its presidency, Canada helped mainstream gender equality as part of all aspects of the G7's work, and received endorsement for the Equal by 30 campaign (part of Canada's commitment to the **Clean Energy, Education and Empowerment (C3E) Initiative**²⁹ from all G7 countries.

In addition to its G7 Presidency, NRCan demonstrated its leadership through participation in several international events. Canada co-chaired the 2018 **G20 Energy Transitions Ministerial Meeting**^{cxxx} with Brazil, and Argentina, who hosted the event. NRCan played an important role in securing a consensus communiqué, reinforcing that the global community can come together to reach consensus to support energy security, reliability, affordability and enable the transition to a low-carbon future. On the margins of this meeting, Canada committed to undertaking a joint peer-review on inefficient fossil fuel subsidies with Argentina. This will aid in ensuring both of our countries remain on track to phase out such subsidies and is another important step in the Government's plan to invest in clean growth.

In May 2018, Canada, the U.S. and Japan co-launched the **Nuclear Innovation: Clean Energy Future Initiative**^{cxxxi} at the 9th Clean Energy Ministerial. The initiative encourages international collaboration on nuclear technology development and deployment, and advanced work in key areas including work with small modular reactors for mining, as well as building on perspectives from women and youth on the role of nuclear energy in clean energy systems of the future. At the first annual **Hydrogen Energy Ministers Meeting** ^{cxxxii} in Nagoya, Japan, Canada reinforced its leadership in the development of hydrogen technology. Lastly, Canada also planned the hosting of **CEM-10/MI-4**,^{cxxxiii} introducing new elements including a focus on a just and inclusive transition, women, youth and Indigenous Peoples. The event, which took place in May

²⁹ The C3E Initiative is an international framework, organized under the Clean Energy Ministerial and the International Energy Agency, working to advance gender equality. Canada chairs the Executive Committee of the C3E and leads on the Awards and Recognition work stream.

2019, attracted over 2,500 delegates, stakeholders and industry representatives from 25 countries. NRCan demonstrated its leadership on the world stage by launching new multilateral initiatives on hydrogen energy and flexible nuclear technologies, as well as advancing public-private collaboration through the launch of **Breakthrough Energy Solutions Canada** to support leading Canadian clean energy entrepreneurs. NRCan’s hosting of **CEM10/MI-4** also offered international partners a unique opportunity to advance their work on the clean energy transition through events such as the **International Bioeconomy Forum** and the **Renewable Cities Conference** (hosted by Simon Fraser University).

NRCan coordinated meetings of the **Energy and Utilities Sector Network** to share information on all hazards, including cybersecurity. NRCan, in partnership with the U.S. Transportation Security Administration, supported the **International Pipeline Security Forum** in Calgary, to bring together policy experts, energy and utilities infrastructure owners/operators, academics, researchers and intelligence practitioners to address common interest regarding pipeline security. NRCan also commissioned a new state-of-the-art research and innovation facility for critical energy infrastructure. The facility serves as a platform for digital security simulation exercises, to support industry in building resilience against cyber-physical threats. NRCan also worked to enhance cyber security protection of critical energy infrastructure through a number of initiatives, including working with U.S. Department of Energy’s, Office of Cybersecurity, Energy Security and Emergency Response to support Canada’s **National Cyber Security Strategy**, launched in June 2018.

Results achieved

Departmental results	Performance indicators	Target	Date to achieve target	2018–19 Actual results	2017–18 Actual results	2016–17 Actual results
Access to new and priority markets for Canada’s natural resources is enhanced	Canada’s share of U.S. and global imports of natural resources	Canada’s market share in the US = 24.4% of total US imports (in value) Canada’s market share in the World (non-US) = 1.2% of the total World imports (in value)	December 2018	24.8% (U.S.) 1.4% (global imports)	25.2% (U.S.) 1.4% (global imports)	23.8% (U.S.) 1.4% (global imports)

Departmental results	Performance indicators	Target	Date to achieve target	2018–19 Actual results	2017–18 Actual results	2016–17 Actual results
	Number of Canadian-owned resource companies operating abroad	904 per year	December 2018	Data not yet available ³⁰	895	839
	Number of NRCan-led trade and promotion missions supporting the development or expansion of market access for natural resources	26 per year	March 2019	39	27	Not Available ⁴
	Average number of companies, provinces/territories and Indigenous leaders participating in trade and promotion missions	Companies: 10 per year Provinces/Territories: 2 per year Indigenous communities: 1 per year	March 2019	Companies: 4.2 per year Provinces/Territories: 0.56 per year Indigenous communities: 0.15 per year	Companies: 6.67 Provinces and Territories: 0.33 Indigenous Communities: 0.22	Not Available ⁴
Canadians are engaged in the future of the new and inclusive resource economy	Percentage of policy, regulatory and legislative changes with formal mechanisms for broad public engagement	70% per year	March 2019	35%	77%	Not Available ⁴
	Number of joint analytical products with provinces and territories	8 per year	March 2019	18	10	11
	Number of Indigenous groups and communities	15 per year	March 2019	184	Not Available ⁴	Not Available ⁴

³⁰ 2018-19 Industry data is not available before December 2019 and will be reported in the 2019-20 Departmental Results Report.

Departmental results	Performance indicators	Target	Date to achieve target	2018–19 Actual results	2017–18 Actual results	2016–17 Actual results
	implicated in economic development projects					
Enhanced competitiveness of Canada's natural resource sectors	Percentage of resource development project decisions on target as per timelines	100% per year	March 2019	100%	100%	100%
	Number of times NRCan's economic and investment data are accessed	32,000 quarterly average ³¹	March 2019	191,735	133,147	31,247

Budgetary financial resources (dollars)

2018–19 Main Estimates	2018–19 Planned spending	2018–19 Total authorities available for use	2018–19 Actual spending (authorities used)	2018–19 Difference (Actual spending minus Planned spending)
\$569,046,044	\$569,046,044	\$586,967,720	\$561,781,790	(\$7,264,254)

Human resources (full-time equivalents)

2018–19 Planned full-time equivalents	2018–19 Actual full-time equivalents	2018–19 Difference (Actual full-time equivalents minus Planned full-time equivalents)
343	407	64

Financial, human resources and performance information for NRCan's Program Inventory is available in the [GC InfoBase](#).^{cxxxiv}

³¹ Since the 2018-19 Departmental Plan, NRCan has revised the methodology to more accurately count access to NRCan's economic and investment data rather than to landing pages for this data. The 2017-18 and 2018-19 results reflect the change in methodology. Furthermore, the target was revised upwards to 150,000 in the 2019-20 Departmental Plan (DP).

Internal Services

Description

Internal Services are those groups of related activities and resources that the federal government considers to be services to support programs development and delivery and required to meet corporate obligations of an organization. Internal Services refers to the activities and resources of the 10 distinct service categories that support Program delivery in the organization, regardless of the Internal Services delivery model in a department. The 10 service categories are: Management and Oversight Services; Communications Services; Legal Services; Human Resources management Services; Financial Management Services; Information Management Services; Information Technology Services; Real Property Services; Material Services; and Acquisition Services.

Results

Open Government and Public Engagement

The Department improved NRCan’s Information Management (IM) and data management by strengthening leadership in **Open Government**, enabling the use of data and information for internal decision-making, policy development, and performance measurement and for engaging with industry on how it can improve its big data strategies. The department continues to build capacity in the design and analysis of experiments and is actively working to embed experimentation into the NRCan departmental data strategy. Furthermore, the Department recently reformed an Experimentation and Analytics unit in April 2018 to advance the experimentation direction for deputy heads, in support of evidence-based policymaking across sectors.

NRCan participated in the development of metrics on publications, data, engagement, and other open science products (e.g. maps) to track collective federal progress on open science activities which was a key commitment. NRCan also led a number of peer-reviewed publications that were published in the **Open Government Portal**.^{cxxxv} NRCan is a leader of **Open Data downloads** and has continued to release more datasets via the **Open Data portal and Open Maps**. For example, NRCan has contributed 80,000 maps and 520,000 photographs to the Federal Science Library in support of open data.

NRCan also pursued communications and outreach activities using exhibits, social media (blogs,

Canada’s Commemorative Map In memory of those who defended our freedom and democracy

NRCan worked in collaboration with the federal, provincial and territorial partners of the Geographical Names Board of Canada to release **Canada’s Commemorative Map**. This interactive map commemorates Canada’s participation in armed conflicts at home and abroad by highlighting a sample of the many geographical features and places named for those that served our country. These commemorative geographical names help Canadians remember war casualties, soldiers, sailors, airmen and airwomen, military leaders, and civilians recognized or decorated for outstanding acts of bravery and sacrifice in battle.

vlogs, etc.), by answering media calls, and by promoting the work of its scientists through its new **Simply Science**^{cxxxvi} online magazine.

Gender based Plus Analysis (GBA+)

NRCan recognizes the importance of Gender based Plus (GBA+), and is committed to ensuring that diverse groups of Canadians benefit from its policies and programs. NRCan's GBA+ Responsibility Centre ensured that GBA+ was being integrated into departmental decision-making processes, by requiring all cabinet and budget documents to undertake a rigorous assessment of the potential implications of any policy or program on diverse populations of Canadians. To further support its integration in decision-making, policy and program development, NRCan increased its network of GBA+ sector advisors and the frequency of its in-house training and coaching services.

Information Management & Technology (IMT) Transformation

NRCan's **IMT Transformation Strategy** was actively implemented to address vulnerabilities and protect departmental assets. This included the conclusion of a year-long IMT Transformation exercise monitoring and enabling funding for IMT investments. This funding is provided for top priority projects across the new four portfolios, including 1) migration to digital, 2) enabling science R&D, 3) reducing business risk, and 4) foundational (i.e. improving how we manage information and deliver technology solutions foundationally).

Emergency Management & Cybersecurity

NRCan continues to address vulnerabilities and protect NRCan assets from **cyber threats**, using a risk-based approach. These measures included establishing Cyber Security safeguards, governance processes, and risk-based approaches to identify cyber security needs and vulnerabilities through engagements with Managers, ensuring that the technology in place meets their needs.

The Department also implemented a new IMT Investment Fund contributing to top priority projects across the four new portfolios mentioned above. NRCan Cyber Security is maintaining proper alignment with strategic direction, while identifying and addressing gaps and emerging issues remain an integral component of NRCan Cyber Security governance and associated services.

Federal Infrastructure Initiative³²

In 2018-19, NRCan successfully completed the work on the **2016 Federal Infrastructure Initiative**. Through this initiative, the Department achieved several results, including upgrading facilities and refits by addressing deferred maintenance and improving how the Department works from repairs to new installations to major structural, mechanical, electrical and building system upgrades. NRCan **Science and New Partnership Opportunities** were advanced by increasing Science Community’s engagement and view of potential opportunities of how the Department could better use the space and advance new partnerships. The Department also became greener through investments in specific energy efficiency upgrades and by incorporating measures into renovations, such as water conservation, energy efficient lab components and building systems (fume hoods, chillers, air handling units) LED lighting and occupancy controls.

Workforce and Workplace

NRCan promoted a healthy, safe and respectful workplace through implementing its **Multi-year Strategy on Mental Health and Wellness in the Workplace**. Actions taken to fulfill this commitment included aligning with the **Federal Public Service Mental Health Strategy**,^{cxxxvii} the guidelines of the **National Standard of Canada on Psychological Health and Safety in the Workplace**,^{cxxxviii} and the 2019 Clerk of the Privy Council’s Report on **Safe Workspaces**.^{cxxxix} The Department continued to foster a culture where mental health, workplace wellness and employee well-being were supported and promoted through all training, communications, engagement initiatives, and wellness tools and resources. To address and promote mental health and reduce the stigma of mental illness in the workplace, NRCan trained 2,020 employees and managers through the **Mental Health Commission of Canada’s (MHCC) The Working Mind training**,^{cxli} and maintained **Creating a Respectful Workplace (G417)**^{cxlii} training as mandatory for all employees. NRCan established a Pride Network for LGBTQ2+ employees and their allies to promote mutual support, educational events, advocacy and networking activities as part of a diverse, inclusive and respectful workplace where employees feel valued, engaged, and productive.

NRCan also advanced gender equality by restoring NRCan’s women’s network and by galvanizing action across the energy sector under the banner of Equal by 30, a commitment by public and private sector organizations to work towards equality for women in the clean energy sector by 2030.

NRCan undertook outreach and recruitment by participating at several **Indigenous Career Job Fairs**. During the summer of 2018, NRCan participated in the **Indigenous Student**

³² The Federal Science and Technology Infrastructure Initiative was renamed “Laboratories Canada” in July 2019.

Employment Opportunity (ISEO)^{exlii} for the third year. Eleven requests were made from the ISEO inventory and six Indigenous students were hired.

In April 2018, NRCan organized a **Talent and Networking Fair** by eliminating barriers associated with public service recruitment. Target groups included Indigenous communities. As of March 2019, NRCan exceeded the workforce ability target of 1.3% for Indigenous Peoples with a representation of 2.1%. The Department also conducted a randomized controlled experiment aimed at improving self-identification rates for employment equity groups.

Budgetary financial resources (dollars)

2018–19 Main Estimates	2018–19 Planned spending	2018–19 Total authorities available for use	2018–19 Actual spending (authorities used)	2018–19 Difference (Actual spending minus Planned spending)
\$138,137,439	\$138,137,439	\$163,550,860	\$149,241,560	\$11,104,121

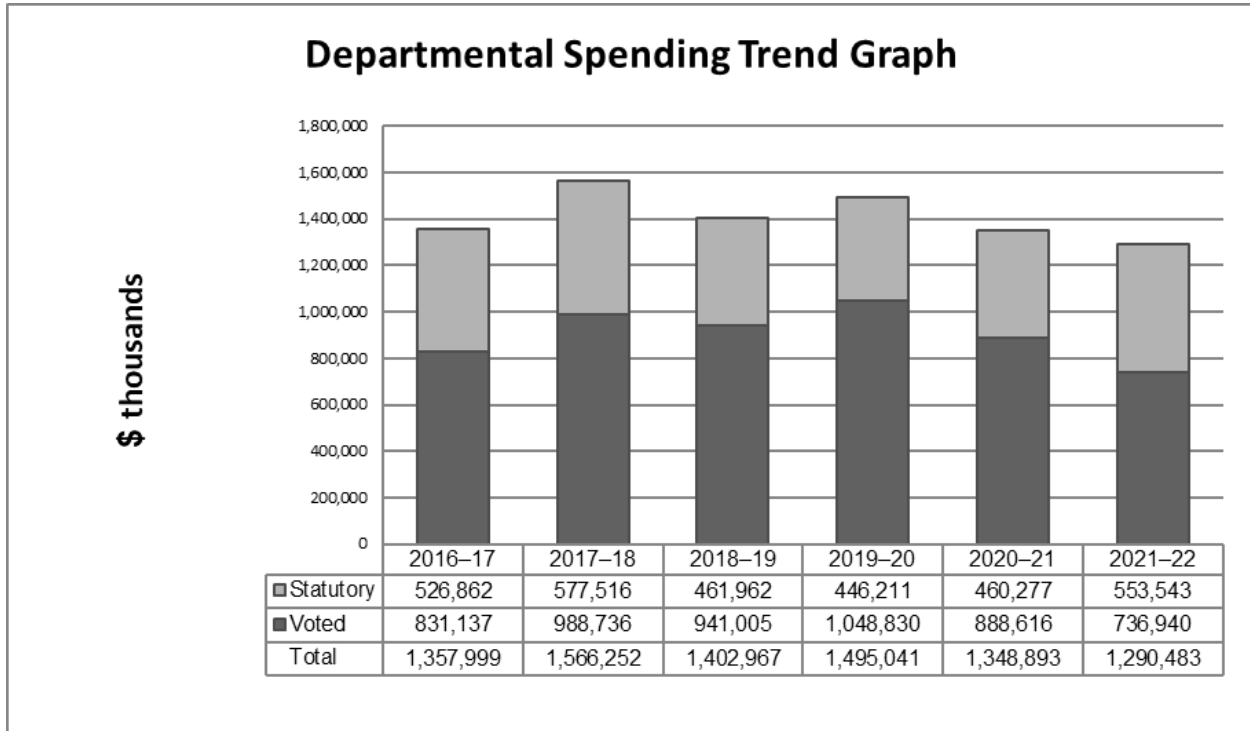
Human resources (full-time equivalents)

2018–19 Planned full-time equivalents	2018–19 Actual full-time equivalents	2018–19 Difference (Actual full-time equivalents minus Planned full-time equivalents)
933	960	27

Analysis of trends in spending and human resources

Actual expenditures

Departmental spending trend graph



Budgetary performance summary for Core Responsibilities and Internal Services (dollars)

Core Responsibilities and Internal Services	2018–19 Main Estimates	2018–19 Planned spending	2019–20 Planned spending	2020–21 Planned spending	2018–19 Total authorities available for use	2018–19 Actual spending (authorities used)	2017–18 Actual spending (authorities used)	2016–17 Actual spending (authorities used)
Natural Resources Science and Risk Mitigation	181,158,584	181,158,584	205,570,026	193,598,174	211,487,351	208,683,836	189,693,261	205,782,987
Innovative Solutions and Sustainable Natural Resource Development	564,281,850	564,281,850	594,180,420	556,279,817	568,249,310	483,259,791	548,425,192	396,734,230
Globally Competitive Natural Resource Sectors	569,046,044	569,046,044	572,418,934	479,831,299	586,967,720	561,781,790	685,107,560	629,574,353
Subtotal	1,314,486,478	1,314,486,478	1,372,169,380	1,229,709,290	1,366,704,381	1,253,725,417	1,423,226,013	1,232,091,570
Internal Services	138,137,439	138,137,439	122,871,508	119,183,842	163,550,860	149,241,560	143,026,202	125,907,344
Total	1,452,623,917	1,452,623,917	1,495,040,888	1,348,893,132	1,530,255,241	1,402,966,977	1,566,252,215	1,357,998,914

From 2016-17 to 2018-19, expenditures increased mainly due to new or incremental spending pertaining to various programs such as the **Energy Innovation Program**,^{cxliii} the **Green Infrastructure**^{cxliv} envelope, the **Clean Growth program**,^{cxlv} **Electric Vehicles and Alternative Fuels Deployment Initiative**,^{cxlvi} as well as collective bargaining increases. These increases were partially offset by reduced spending in the **Federal Infrastructure Initiative** as the program was winding down, and the **Statutory Atlantic Offshore Accords**.

The 2018-19 planned spending of \$1,453 million increased during the year by \$77 million resulting in total authorities available for use of \$1,530 million mainly due to:

- Funding received through Supplementary Estimates and the Budget Implementation Vote mainly for Impact Assessment and Regulatory Processes, **Spruce Budworm Early Intervention Strategy** and Consultations to reconsider the **Trans Mountain Expansion Project**; and,
- The receipt of the operating and capital budget carry forward.

Of the \$1,530 million total authorities available for use in 2018-19, NRCan spent \$1,403 million. The \$127 million in unspent funding is explained mainly by:

- Funding carried forward or reprofiled to future years for various programs, such as **Clean Growth**,^{cxlvii} **Electric Vehicle Infrastructure Demonstrations**,^{cxlviii} and **Impact Canada**.^{cxlix}

Planned spending in Voted authorities from 2019-20 to 2021-22 is declining, mainly as a result of reduced funding profiles for major initiatives and sunsetting programs. Sunsetting programs could be renewed pending future budgetary decisions. Outcomes of such decisions will be reflected in the Department's future budget exercises and Estimates documents.

Planned spending in Statutory authorities is increasing from 2019-20 to 2021-22, mainly as a result of the Atlantic Offshore Accounts. Statutory payment obligations under these accords are largely driven by oil and gas prices, production levels and anticipated corporate income taxes related to offshore operations. The planned spending is based on the Department's economic modeling forecasts prepared in the fall of 2018.

Actual human resources

Human resources summary for Core Responsibilities and Internal Services
(full-time equivalents)

Core Responsibilities and Internal Services	2016–17 Actual full-time equivalents	2017–18 Actual full-time equivalents	2018–19 Planned full-time equivalents	2018–19 Actual full-time equivalents	2019–20 Planned full-time equivalents	2020–21 Planned full-time equivalents
Natural Resources Science and Risk Mitigation	1,208	1,138	1,195	1,223	1,240	1,185
Innovative Solutions and Sustainable Natural Resource Development	1,447	1,524	1,461	1,581	1,590	1,546
Globally Competitive Natural Resource Sectors	335	390	343	407	385	281
Subtotal	2,990	3,052	2,999	3,211	3,215	3,012
Internal Services	906	928	933	960	1,038	1,028
Total	3,896	3,980	3,932	4,171	4,253	4,040

For 2016-17 and 2017-18, the figures represent actual FTEs as reported in Departmental Results Reports. For 2018-19, the planned FTEs are drawn from the 2018-19 Departmental Plan and the 2018-19 actual FTEs reflect the actual FTEs for the year. For 2019-20 and 2020-21, the figures represent total planned FTEs to support NRCan program activities, as identified in the 2019-20 Departmental Plan.

The increase between 2018-19 planned FTEs and the 2018-19 Actual FTEs is partially explained by the new funding received through Supplementary Estimates and the Budget Implementation Vote as explained in the Budgetary Performance Summary section, and partially explained by an increase in labour requirements for innovative energy research and development projects at NRCan laboratories.

The decrease between 2018-19 Actual FTEs and 2020-21 Planned FTEs is mainly explained by the sunsetting of a number of major initiatives. As new initiatives are undertaken or renewals approved, plans for future FTE requirements will be adjusted accordingly.

Expenditures by vote

For information on NRCan's organizational voted and statutory expenditures, consult the [Public Accounts of Canada 2018–2019](#).^{ci}

Government of Canada spending and activities

Information on the alignment of NRCan's spending with the Government of Canada's spending and activities is available in the [GC InfoBase](#).^{cii}

Financial statements and financial statements highlights

Financial statements

The NRCan consolidated financial statements (unaudited) for the year ended March 31, 2019, are available on the [Departmental website](#).

Financial statements highlights

The highlights presented in this section are drawn from the Department's consolidated financial statements.

The consolidated financial statements were prepared using the Government of Canada accounting policies, which are based on Canadian public sector accounting standards resulting in figures that may differ from those provided in other sections of the Departmental Results Report prepared on an expenditure basis. A reconciliation between authorities used on an expenditure basis and the net cost of operations prepared on an accrual basis is set out in Note 3 of the Department's consolidated financial statements.

Condensed Consolidated Statement of Operations (unaudited) for the year ended March 31, 2019 (dollars)

Financial information	2018–19 Planned results [*]	2018–19 Actual results	2017–18 Actual results [†]	Difference (2018–19 Actual results minus 2018–19 Planned results)	Difference (2018–19 Actual results minus 2017–18 Actual results)
Total expenses	1,543,004,776	2,440,808,586	1,607,655,801	897,803,810	833,152,785
Total revenues	37,317,799	27,543,704	25,073,848	(9,774,095)	2,469,856
Net cost of operations before government funding and transfers	1,505,686,977	2,413,264,882	1,582,581,953	907,577,906	830,682,929

* The 2018-19 Planned Results are derived from the amounts presented in the [2018-2019 Future-Oriented Statement of Operations^{cli}](#) and included in NRCan's 2018-19 Departmental Plan.

Total NRCan expenses of \$2,441 million in 2018-19 consist of \$1,710 million in transfer payments, mainly related to non-profit organizations under Innovative and Sustainable Natural Resources Development and to other levels of government under Globally Competitive Natural Resource Sectors, along with \$731 million in other operating expenses. The NRCan total net revenues of \$28 million in 2018-19 resulted from re-spendable revenues such as those from the Geomatics Canada Revolving Fund.

The increase of \$831 million in the net cost of operations before government funding and transfers in 2018-19 is mainly explained by:

- \$899 million increase in transfer payments to non-profit organizations under Innovative and Sustainable Natural Resources Development, primarily due to a transfer payment to the Federation of Canadian Municipalities for the purpose of providing funding to the Green Municipal Fund; and,
- \$95 million decrease in Globally Competitive Natural Resource Sectors mainly due to a 2018 reassessment of royalties resulting in a one-time payment offset by more royalties from higher oil production and pricing.

For the most part, these explanations also account for the increase of \$908 million to the net cost of operations before government funding and transfers between the planned and actual results.

The chart presenting NRCan's actual expenses by type for 2018-19 is available on the [NRCan website^{cliii}](#)

Condensed Consolidated Statement of Financial Position (unaudited) as of March 31, 2019 (dollars)

Financial information	2018–19	2017–18	Difference (2018–19 minus 2017–18)
Total liabilities	1,536,988,588	800,382,482	736,606,106
Total net financial assets	437,494,599	637,331,859	(199,837,260)
Departmental net debt	1,099,493,989	163,050,623	936,443,366
Total non-financial assets	360,303,870	361,353,279	(1,049,409)
Departmental net financial position	(739,190,119)	198,302,656	(937,492,775)

Total NRCan liabilities of \$1,537 million include \$1,407 million in accounts payable and accrued liabilities payable. The increase of \$737 million is mainly related to a 2019 year-end accrual for a payment to the Federation of Canadian Municipalities for the purpose of providing funding to the Green Municipal Fund. This is offset by a decrease in accrued liabilities mainly attributable to a one-time 2018 reassessment of royalties.

Total NRCan net financial assets of \$438 million consist of \$419 million of an amount due from the consolidated revenue fund (CRF), which represents amounts that may be disbursed without further charges to the NRCan authorities.

Total NRCan non-financial assets of \$360 million consist of \$358 million of tangible capital assets.

The decrease of \$937 million in the departmental net financial position, which is the difference between the total non-financial assets and the departmental net debt, is mainly attributable to the increase in accounts payable and accrued liabilities.

Supplementary information

Corporate information

Organizational profile

Minister: The Honourable Amarjeet Sohi, P.C., M.P.

Institutional head: Christine Tremblay

Ministerial portfolio:

- [Atomic Energy of Canada Limited \(AECL\)](#);^{cliv}
- [National Energy Board \(NEB\)](#);^{clv}
- [Canadian Nuclear Safety Commission \(CNSC\)](#);^{clvi}
- [Canada-Newfoundland and Labrador Offshore Petroleum Board \(CNLOPB\)](#);^{clvii}
- [Canada-Nova Scotia Offshore Petroleum Board \(CNSOPB\)](#);^{clviii}
- [Northern Pipeline Agency \(NPA\)](#);^{clix} and,
- Energy Supplies Allocation Board (ESAB) (inactive).

Enabling instrument:

- [Department of Natural Resources Act, S.C. 1994, c. 41](#);^{clx}
- [Forestry Act, R.S.C., 1985, c. F-30](#);^{clxi}
- [Resources and Technical Surveys Act, R.S.C., 1985, c. R-7](#);^{clxii}
- [Energy Efficiency Act, S.C. 1992, c. 36](#);^{clxiii} and,
- [Extractive Sector Transparency Measures Act, S.C. 2014, c. 39, s. 376](#).^{clxiv}
- [Explosives Act \(R.S.C., 1985, c. E-17\)](#)^{clxv}

Year of incorporation / commencement: 1994

Other:

Raison d'être, mandate and role

“Raison d'être, mandate and role: who we are and what we do” is available on [NRCan's website](#).^{clxvi}

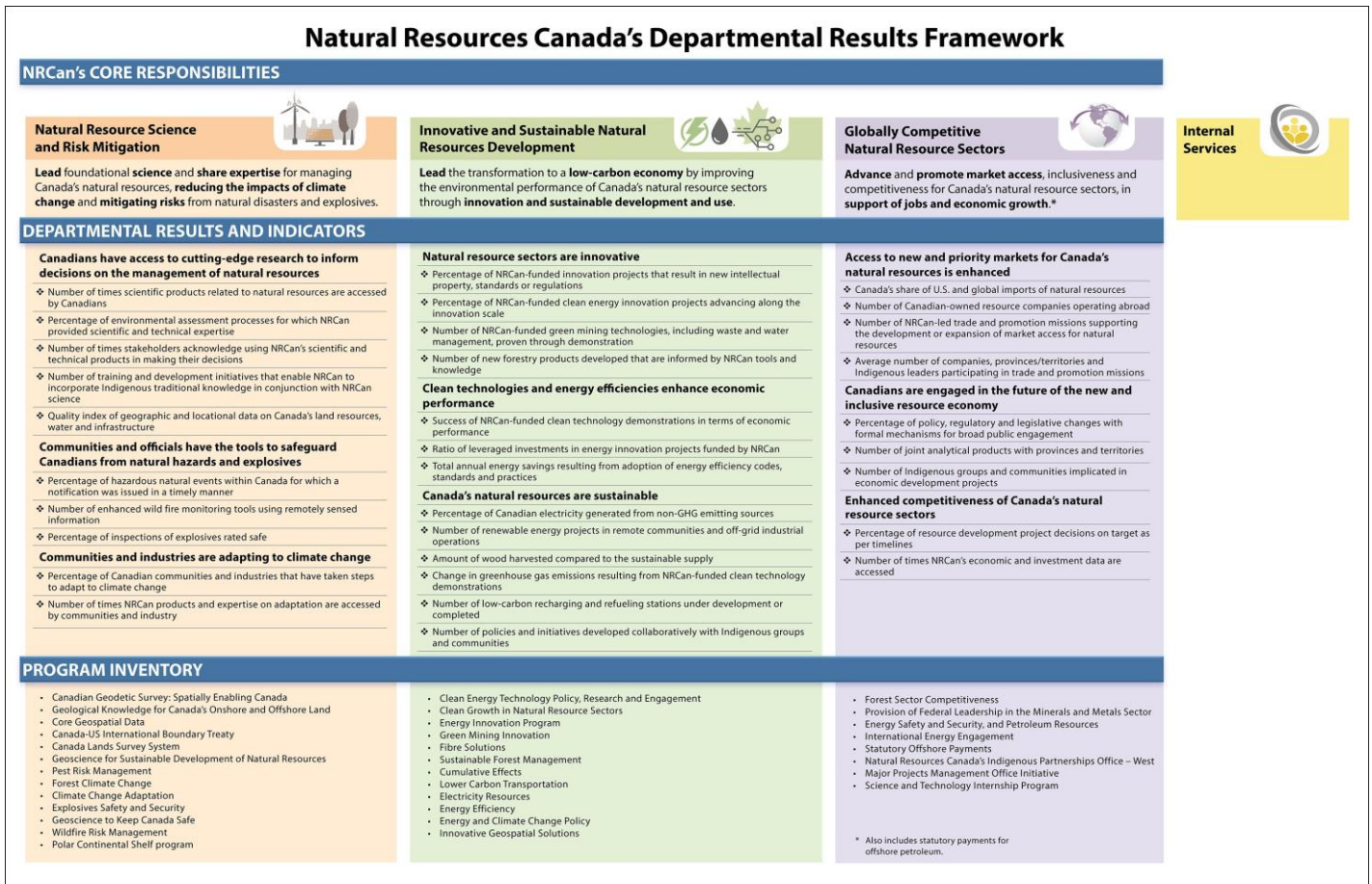
Operating context and key risks

Information on operating context and key risks is available on [NRCan's website](#).^{clxvii}

For more general information about the Department, see the “Supplementary information” section of this report.

Natural Resources Canada’s Departmental Results Framework and Program Inventory of record for 2018–19 are shown below.

Graphical presentation of Departmental Results Framework and Program Inventory



Supporting information on the Program Inventory

Financial, human resources and performance information for the Department of Natural Resources' Program Inventory is available in the [GC InfoBase](#).^{clxviii}

Supplementary information tables

The following supplementary information tables are available on the [Department of Natural Resources website](#).^{clxix}

- ▶ Departmental Sustainable Development Strategy
- ▶ Details on transfer payment programs of \$5 million or more
- ▶ Gender-based analysis plus
- ▶ Horizontal initiatives
- ▶ Response to parliamentary committees and external audits
- ▶ Up-front multi-year funding

Federal tax expenditures

The tax system can be used to achieve public policy objectives through the application of special measures such as low tax rates, exemptions, deductions, deferrals and credits. The Department of Finance Canada publishes cost estimates and projections for these measures each year in the [Report on Federal Tax Expenditures](#).^{clxx} This report also provides detailed background information on tax expenditures, including descriptions, objectives, historical information and references to related federal spending programs. The tax measures presented in this report are the responsibility of the Minister of Finance.

Organizational contact information

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K1A 0E4

Canada

NRCan.media_relations-media_relations.RNCan@canada.ca

<http://www.nrcan.gc.ca/>

Appendix: definitions

appropriation (crédit)

Any authority of Parliament to pay money out of the Consolidated Revenue Fund.

budgetary expenditures (dépenses budgétaires)

Operating and capital expenditures; transfer payments to other levels of government, organizations or individuals; and payments to Crown corporations.

Core Responsibility (responsabilité essentielle)

An enduring function or role performed by a department. The intentions of the department with respect to a Core Responsibility are reflected in one or more related Departmental Results that the department seeks to contribute to or influence.

Departmental Plan (plan ministériel)

A report on the plans and expected performance of an appropriated department over a three-year period. Departmental Plans are tabled in Parliament each spring.

Departmental Result (résultat ministériel)

A Departmental Result represents the change or changes that the department seeks to influence. A Departmental Result is often outside departments' immediate control, but it should be influenced by program-level outcomes.

Departmental Result Indicator (indicateur de résultat ministériel)

A factor or variable that provides a valid and reliable means to measure or describe progress on a Departmental Result.

Departmental Results Framework (cadre ministériel des résultats)

Consists of the department's Core Responsibilities, Departmental Results and Departmental Result Indicators.

Departmental Results Report (rapport sur les résultats ministériels)

A report on an appropriated department's actual accomplishments against the plans, priorities and expected results set out in the corresponding Departmental Plan.

experimentation (expérimentation)

Activities that seek to explore, test and compare the effects and impacts of policies, interventions and approaches, to inform evidence-based decision-making, by learning what works and what does not.

full-time equivalent (équivalent temps plein)

A measure of the extent to which an employee represents a full person-year charge against a departmental budget. Full-time equivalents are calculated as a ratio of assigned hours of work to scheduled hours of work. Scheduled hours of work are set out in collective agreements.

gender-based analysis plus (GBA+) (analyse comparative entre les sexes plus [ACS+])

An analytical process used to help identify the potential impacts of policies, Programs and services on diverse groups of women, men and gender differences. We all have multiple identity factors that intersect to make us who we are; GBA+ considers many other identity factors, such as race, ethnicity, religion, age, and mental or physical disability.

government-wide priorities (priorités pangouvernementales)

For the purpose of the 2018–19 Departmental Results Report, those high-level themes outlining the government’s agenda in the 2015 Speech from the Throne, namely: Growth for the Middle Class; Open and Transparent Government; A Clean Environment and a Strong Economy; Diversity is Canada’s Strength; and Security and Opportunity.

horizontal initiative (initiative horizontale)

An initiative where two or more departments are given funding to pursue a shared outcome, often linked to a government priority.

non-budgetary expenditures (dépenses non budgétaires)

Net outlays and receipts related to loans, investments and advances, which change the composition of the financial assets of the Government of Canada.

performance (rendement)

What an organization did with its resources to achieve its results, how well those results compare to what the organization intended to achieve, and how well lessons learned have been identified.

performance indicator (indicateur de rendement)

A qualitative or quantitative means of measuring an output or outcome, with the intention of gauging the performance of an organization, program, policy or initiative respecting expected results.

performance reporting (production de rapports sur le rendement)

The process of communicating evidence-based performance information. Performance reporting supports decision making, accountability and transparency.

plan (plan)

The articulation of strategic choices, which provides information on how an organization intends to achieve its priorities and associated results. Generally a plan will explain the logic behind the strategies chosen and tend to focus on actions that lead up to the expected result.

planned spending (dépenses prévues)

For Departmental Plans and Departmental Results Reports, planned spending refers to those amounts presented in Main Estimates.

A department is expected to be aware of the authorities that it has sought and received. The determination of planned spending is a departmental responsibility, and departments must be able to defend the expenditure and accrual numbers presented in their Departmental Plans and Departmental Results Reports.

priority (priorité)

A plan or project that an organization has chosen to focus and report on during the planning period. Priorities represent the things that are most important or what must be done first to support the achievement of the desired Strategic Outcome(s) or Departmental Results.

program (programme)

Individual or groups of services, activities or combinations thereof that are managed together within the department and focus on a specific set of outputs, outcomes or service levels.

result (résultat)

An external consequence attributed, in part, to an organization, policy, program or initiative. Results are not within the control of a single organization, policy, program or initiative; instead they are within the area of the organization's influence.

statutory expenditures (dépenses législatives)

Expenditures that Parliament has approved through legislation other than appropriation acts. The legislation sets out the purpose of the expenditures and the terms and conditions under which they may be made.

Strategic Outcome (résultat stratégique)

A long-term and enduring benefit to Canadians that is linked to the organization's mandate, vision and core functions.

target (cible)

A measurable performance or success level that an organization, program or initiative plans to achieve within a specified time period. Targets can be either quantitative or qualitative.

voted expenditures (dépenses votées)

Expenditures that Parliament approves annually through an Appropriation Act. The Vote wording becomes the governing conditions under which these expenditures may be made.

Endnotes

- ⁱ 10 Key Facts on Canada’s Natural Resources. <https://www.nrcan.gc.ca/maps-tools-publications/publications/10-key-facts-canadas-natural-resources/16013>
- ⁱⁱ Clean Growth Program. <https://www.nrcan.gc.ca/climate-change/canadas-green-future/clean-growth-programs/20254>
- ⁱⁱⁱ Clean Growth Hub. <https://www.ic.gc.ca/eic/site/099.nsf/eng/home>
- ^{iv} Electric Vehicle Infrastructure Demonstration (EVID) Program. <https://www.nrcan.gc.ca/climate-change/green-infrastructure-programs/electric-vehicle-infrastructure-demonstration-evid-program/20467>
- ^v Smart Grid Program. <https://www.nrcan.gc.ca/climate-change/green-infrastructure-programs/smart-grids/19793>
- ^{vi} Economic Strategy Table – Resources of the Future. <https://www.ic.gc.ca/eic/site/098.nsf/eng/00010.html>
- ^{vii} Economic Strategy Table – Clean Technology. <https://www.ic.gc.ca/eic/site/098.nsf/eng/00008.html>
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